

**Demonstrating the Utility of ADAM's Drug Use Calendar Data:
A Group-based Trajectory Analysis of Crack Cocaine Use Among Adult Male Arrestees.**

Brad A. Myrstol

University of Alaska Anchorage

The purpose of this paper is to demonstrate the utility of the drug use calendar data collected by the *Arrestee Drug Abuse Monitoring* (ADAM) program. The paper begins with a brief description of the major drug use data collection systems currently in use in the United States. This is followed by an overview and discussion of the development of the *Drug Use Forecasting* (DUF) program and subsequent transition to ADAM, with particular attention paid to the inclusion of a drug use calendar in the ADAM redesign. The paper concludes with the presentation of results from an analysis of crack cocaine use from a sample of adult male arrestees interviewed in 2000. A group-based trajectory analysis shows there is substantial heterogeneity in crack cocaine use levels among adult male arrestees in the year preceding arrest, that individual use trajectories cluster into distinctive trajectory groups, and that there are a variety of drug use trajectory groups in the population of crack users who are arrested and booked into local jails. In addition, the analysis highlights several social, demographic and behavioral factors that may influence the probability of trajectory group membership.

A Brief Description of Drug Use Data Collection Programs in the U.S.

In the United States, a tremendous amount of resources are expended to monitor illicit drug use and gauge its consequences – particularly crime. Among the most widely known drug use research programs are the *National Survey on Drug Use and Health* (NSDUH) and the *Drug Abuse Warning Network* (DAWN), both of which are funded by the Substance Abuse and Mental Health Services Administration, the *Monitoring the Future* study (MTF) which is funded by the National Institute on Drug Abuse and the *National Youth Survey* (NYS) which is funded through a partnership of the National Institute of Mental Health and the National Institute of Justice. The NSDUH targets civilian, non-institutionalized Americans aged 12 or older, while DAWN collects data on all drug-related visits to hospital emergency departments and drug-related deaths investigated by medical examiners and coroners. MTF collects annual data from nationally representative samples of 8th, 10th and 12th graders enrolled in public and private schools. The NYS collects information on both conventional and deviant behavior (including drug use) from a nationally representative of American youth (who are now adults) first recruited into the study when they were between the ages of 11 and 17 in 1976. In combination these studies collect drug use information from a wide variety of populations; however, with the exception of the NYS, none of these studies collect data from members of the military, transient/homeless persons, or institutionalized populations – those in jails, prisons, and mental hospitals. These sampling exclusions are particularly important because of the heightened risk of drug use (and addiction) among jail and prison inmates, as well as those suffering from mental illness.

Filling the void for those incarcerated in jails and prisons are two research programs administered by the Department of Justice: the *Survey of Inmates in Local Jails* (SILJ) and the *Survey of Inmates in State and Federal Correctional Facilities* (SISFCF). The SILJ collects data from a representative sample of persons held in U.S. jails, including both pre-trial detainees and convicted offenders. The SISFCF surveys nationally representative samples of inmates in state and federal prisons. Each asks inmates a variety of questions about their drug use prior to arrest and subsequent incarceration, including lifetime use, past-month use and whether or not they were under the influence when they committed the offense for which they are incarcerated. The data collected from these two studies has long served as the foundation for the study of the drug use–crime nexus in the United States.

Drug Use Forecasting

In 1987 the National Institute of Justice initiated the *Drug Use Forecasting* (DUF) program to complement the other drug use monitoring systems then in use. Like the SILJ, the intent of the DUF program was to gather drug use information from those held in jails. Jails are a particularly important site for the study of the drug use because of the wide variety of at-risk persons who enter them. Unlike prisons, which house convicted felons almost exclusively, jails are populated mostly by people who commit minor offenses: misdemeanants and local ordinance violators. While they are typically portrayed as primarily crime control institutions, in practice jails serve a significant role as institutions of community social control tasked with managing society’s “rabble” – community members who are viewed by the mainstream as bothersome and unseemly because of their unconventional behavior and appearance (Fitzpatrick & Myrskog, 2008; Irwin, 1985). Because they serve in this role, jails are particularly useful sites for capturing information on the drug use behaviors marginalized populations – like the homeless – that are at heightened risk of drug use and abuse.

The DUF program made a number of significant methodological and substantive contributions to the study of drug use among jail inmates. First, because DUF participants were interviewed within 48 hours of arrest (hence a sample of “arrestees” rather than “inmates”), the program was able to capture drug use information from low-level offenders – like the homeless – who are usually released shortly after booking, and are therefore systematically excluded from other studies of jail populations. Second, DUF was designed to provide local prevalence estimates of illicit drug use. This was a particularly important innovation because it provided local stakeholders within each study catchment area – law enforcement, substance abuse treatment and social service providers – with timely, detailed drug use information that could be used to develop locally relevant prevention and treatment programs. The third major innovation of the DUF program was its collection of multiple waves of data at each research site each year, which enabled it to closely monitor local drug use trends among the arrestee population and more quickly detect sudden changes in drug use patterns. The fourth, and perhaps most significant innovation of the DUF program, was the inclusion of truly objective measure of drug use. In addition to asking arrestees to self-report drug use, DUF interviewers asked each

respondent to provide a urine sample which was analyzed for the presence of drug metabolites. Each sample collected was screened for the presence of 10 drugs, but the program focused primarily on the “NIDA-5” drugs of cocaine, marijuana, amphetamines, opiates and phencyclidine. This advance is especially notable because unlike all of the other drug use data collection systems that relied exclusively on self-reported drug use, urinalysis provided a measure of drug use that was not subject to intentional deception on the part of arrestees. In addition, because each arrestee’s self-reported drug use could be compared with their urinalysis results, this methodology provided a means to cross-validate arrestees’ self-reports.

Despite these innovations, the DUF program suffered from a number of methodological problems. The most significant issue was the DUF sampling procedure. Instead of using a probability-based sampling methodology, each DUF site employed a convenience sampling procedure. As a result, the data collected had poor external validity - that is, they were not generalizable. A second set of difficulties facing DUF was a lack of standardized data collection procedures, which negatively impacted the reliability of the data collected across sites. There was significant variation across sites with respect to: defining the geographic unit (“catchment area”) for booking facilities; inclusion/exclusion criteria for respondent participation; and privacy of interview areas. Ultimately, the inability of the DUF program to provide scientifically valid and reliable drug use data to local policy makers and treatment providers led to its redesign in 1998, when DUF was transformed into ADAM (Arrestee Drug Abuse Monitoring).

Arrestee Drug Abuse Monitoring

On the surface ADAM closely resembled DUF. Just as it had for DUF, ADAM data collection took place in jails, and the information collected still originated in face-to-face interviews and voluntary urine specimens. But there were dramatic differences with respect to the procedures for selecting arrestees and collecting the data. The most significant changes were the development of data collection procedures that would be common to all sites, and the adoption of probability-based sampling plans for each research site designed to account for variations in the size and structure of local criminal justice systems, the flow of arrestees through booking facilities, and the types of offenses for which people were arrested.

In addition to these methodological changes, ADAM included considerable substantive changes as well. Most notably, the questionnaire was expanded to cover not only recent drug use behaviors, but also arrestees’ prior criminal justice experiences, their exposure to various forms of substance abuse and mental health treatment, an assessment of substance abuse and dependence risk, and the dynamics of local drug markets. Finally, although program was not designed to provide nationally representative estimates of arrestee drug use, the number of ADAM sites was increased to 35 from the 24 sites included in DUF to provide a more comprehensive assessment for the United States. As initially proposed, the ADAM program was to include a total of 75 research sites across the United States. In 2003 when the ADAM program was suspended, there were 39 sites participating.

The ADAM Drug Use Calendar

One of the most important substantive and methodological innovations included in the ADAM redesign was the addition of a drug use calendar. Calendar is a technique researchers use to aid respondents with the accurate recall of events over an extended period of time. It accomplishes this by dividing a recall period (for ADAM, 12 months) into “conceptually manageable units” (for ADAM, one-month segments), and then anchoring memory around interconnected real-life events occurring within each of these units. Examples of the sort of significant life events used as memory anchors were: birthdays; deaths; marriages; separations/divorces; secular and religious holidays; and other miscellaneous events such as the purchase of a new car or starting a new job. Using this methodology, ADAM collected month-by-month data on: housing; inpatient and outpatient substance abuse treatment; mental health hospitalization; arrests; incarceration; and, the level of alcohol and drug use from arrestees for the 12-month period preceding arrest (see Figure 1).

Figure 1. Sample ADAM Drug Use Calendar (Adapted from Original)

CALENDAR											
PAST 12 MONTHS											
12	11	10	9	8	7	6	5	4	3	2	1
H	O	L	I	D	A	Y	S				
B	I	R	T	H	D	A	Y	S			
O	T	H	E	R	E	V	E	N	T	S	
R	E	S	I	D	E	N	C	Y			
I	N		P	A	T	I	E	N	T		
O	U	T		P	A	T	I	E	N	T	
M	E	N	T	A	L	H	E	A	L	T	H
A	R	R	E	S	T						
J	A	I	L		P	R	I	S	O	N	
A	L	C	O	H	O	L					
M	A	R	I	J	U	A	N	A			
C	R	A	C	K	C		CO	CA	IN	E	
P	O	W	D	E	R		CO	CA	IN	E	
H	E	R	O	I	N						
ME	TH	AM	PH	ET	AM	INE					
O	T	H	E	R		D	R	U	G		

LEVELS

ALCOHOL:
(5+ drinks/day)

DRUGS:
(Any use)

0 = None
 1 = 1 day/wk
 (1-7 days/mo)
 2 = 2-3 days/wk
 (8-12 days/mo)
 3 = >3 days/wk
 (13-30 days/mo)

The drug use calendar was administered to all respondents who reported using illicit drugs within the past year. At the outset, respondents were shown the calendar, provided a brief

explanation of its content and how information would be recorded in it, and encouraged to actively participate in its completion. Then, arrestees were asked to describe any significant life events that happened to them in the preceding year. Interviewers recorded respondents' recollections in the calendar and these events were used as reference points by respondents to aid with the recall of their drug use for each of the 12 months preceding arrest. For each drug used in the past year, arrestees were first asked if they used 12 months previously (for example, if an arrestee was arrested in May of 2000, they would be asked if they used that drug in June of 1999). If an arrestee responded in the affirmative, they were then asked to provide their best estimate of the frequency of their drug use that month ("0"=*None*; "1"=*1 day/week, 1-7 days/month*; "2"=*2-3 days/week, 8-12 days/month*; "3"=*More than 3 days/week, 13-30 days/month*). Interviewers would then proceed to ask arrestees about their use for each month leading up to their current arrest, using the respondent's critical life events to anchor their memory and assist with recall. This sequence was followed for each drug the respondent reported using within the 12-month period preceding their arrest.

Demonstrating the Utility of the ADAM Drug Use Calendar

The argument being put forth here is that one of the most significant methodological and substantive contributions ADAM makes to the study of the drug use–crime connection is its use of a drug use calendar, which provides for the collection of detailed month-by-month data on the frequency and intensity of arrestee drug use for the entire 12-month period preceding arrest. Collection of these data is important for advancing the scientific understanding of the link between drug use and crime because they permit a dynamic analysis of the relationship, and consequently it has the potential to dramatically alter current understandings of the connection between drug use and crime. With some notable exceptions (e.g. Elliott, Huizinga, & Menard, 1989; Huizinga, Menard, & Elliott, 1989; Menard, Mihalic, & Huizinga, 2001), much of the research examining the link between drug use and crime has been myopic in its approach because of an overly narrow view that tends to limit its focus to drug use within the context of a criminal event, rather than viewing drug use as a phenomenon with a history, a behavior that changes and evolves over time. As a result, there has been a tendency to over-simplify not only the nature of drug use, but also the relationship between drug use and criminal offending.

A developmental approach on the other hand, explicitly recognizes that an individual's use of drugs, like other behaviors, varies over time and attempts to understand how these larger developmental patterns (called "trajectories") influence criminal offending. What follows is a demonstration of a developmental approach to the analysis of the ADAM drug use calendar data. The data used come from the ADAM program, and are limited to the year 2000. That year, a total of 35 sites located in 26 states and the District of Columbia participated in the study. A total of 21,161 adult male arrestees were interviewed, 32.7 percent (n=7,160) of whom reported lifetime use of crack cocaine. Just under 20 percent (n=4,170) reported using crack cocaine at least once during the 12-month period preceding their arrest. A total of 369 cases were removed from the sample prior to the analysis because of missing values in the drug use calendar. The

final sample size was 3,801 adult males who reported using crack cocaine in the year prior to their arrest.

A group-based modeling approach (see: Nagin, 1999; 2005) was used to explore the drug use trajectories of this sample of arrestees. This analytic method assumes the following: (1) the development of drug use varies between individuals over time; (2) the drug use trajectories of individuals may cluster into distinctive groups; and (3) if there are distinctive drug use trajectory groups, there will be a mixture of them within the population. The group-based approach accomplishes two important analytic tasks. First, it determines if there is, in fact, heterogeneity in the developmental trajectories within this sample of crack cocaine-using arrestees. To the extent that crack cocaine use patterns vary, and that these variations have differential effects on the probability of criminal offending, this is an essential step in understanding the link between crack cocaine use and crime. Second, if the procedure results indicate that there are distinct trajectory groups, the probability of membership in each trajectory group will be computed for every individual in the sample. These probabilities can then be used to assign individuals to groups. Once that is accomplished, demographic and behavioral profiles of group members can be used as an initial foray into the identification of factors that may influence membership in trajectory groups.

Figure 2. Crack Cocaine Trajectory Groups
Male Arrestees (n = 3,801)

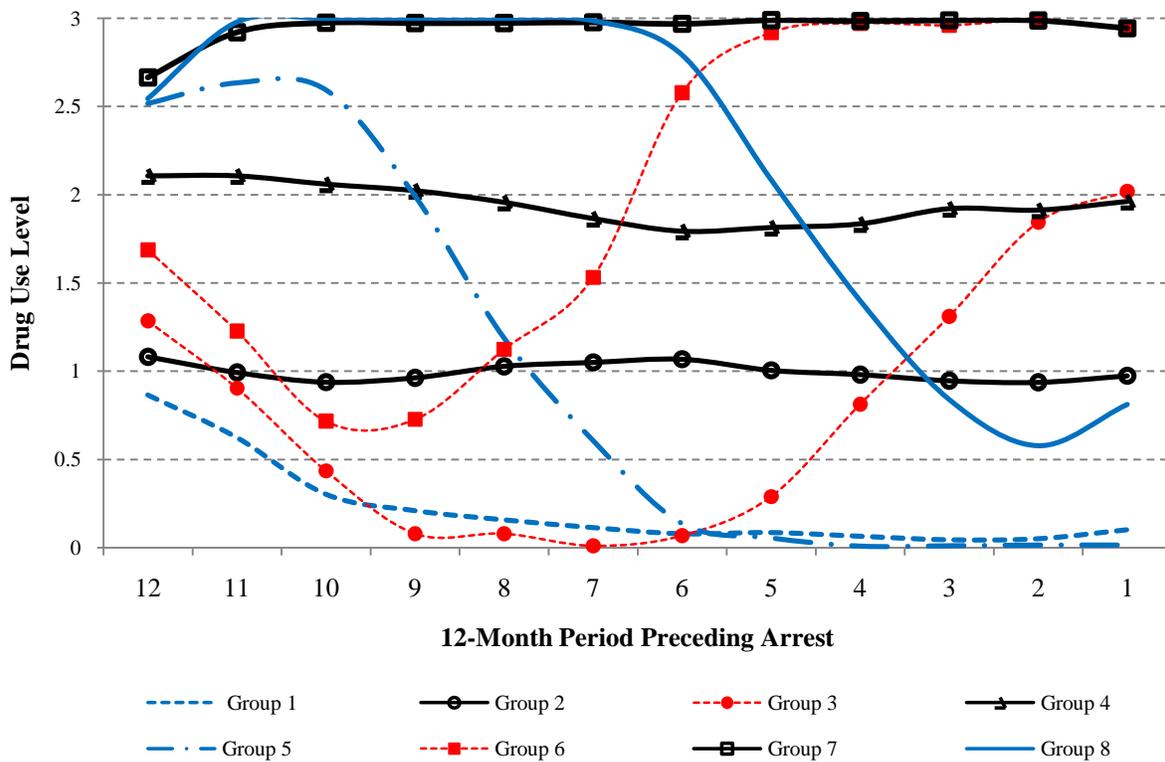
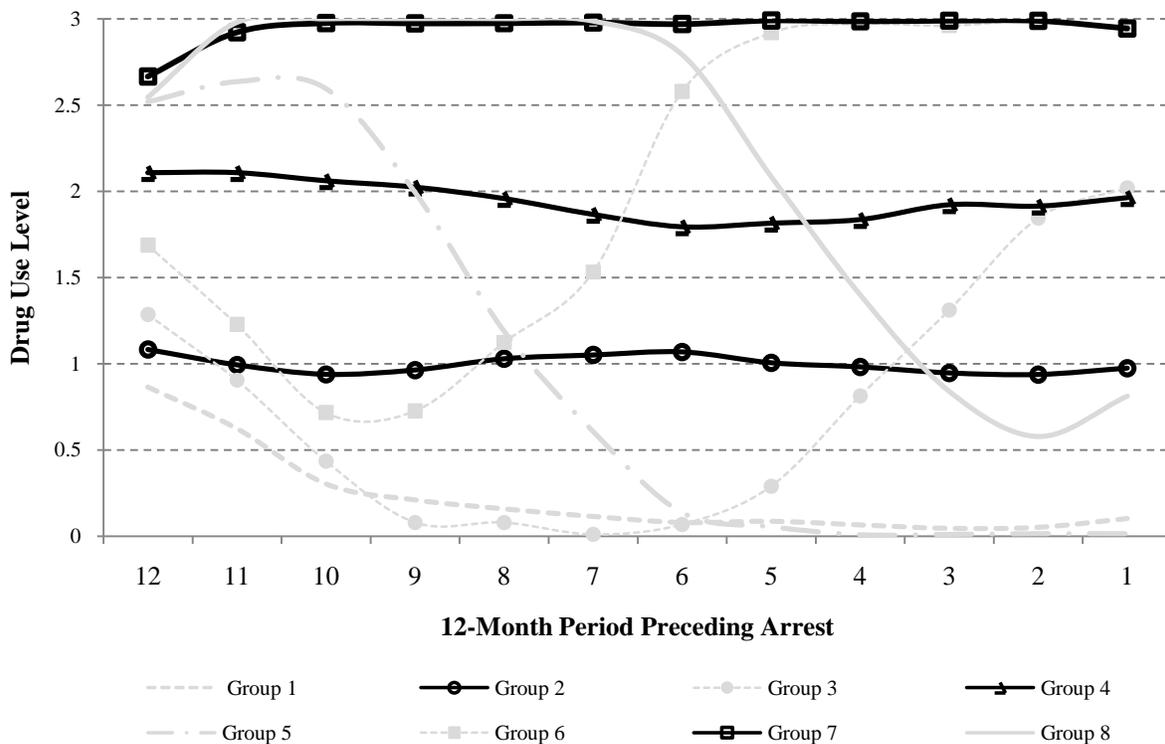


Figure 2 presents the results of the trajectory group analysis. (Figures 3, 4 and 5 present the same results, but highlight groups according to one of three trajectory shapes: “stable,” “declining” and “escalating.”) A total of eight trajectory groups emerged from the calendar data. Three of these groups (#2, #4, #7 – see Figure 3) demonstrated considerable stability in their level of crack cocaine use in the year preceding arrest, and comprised approximately 61 percent of the total sample (28%, 14% and 19%, respectively). Members of Group #2 used crack cocaine at a rate of 1-7 days per month; members of Group #4 reported using between 8-12 days per month; and members of Group #7 consistently used crack cocaine anywhere from 13 to 30 days out of each month.

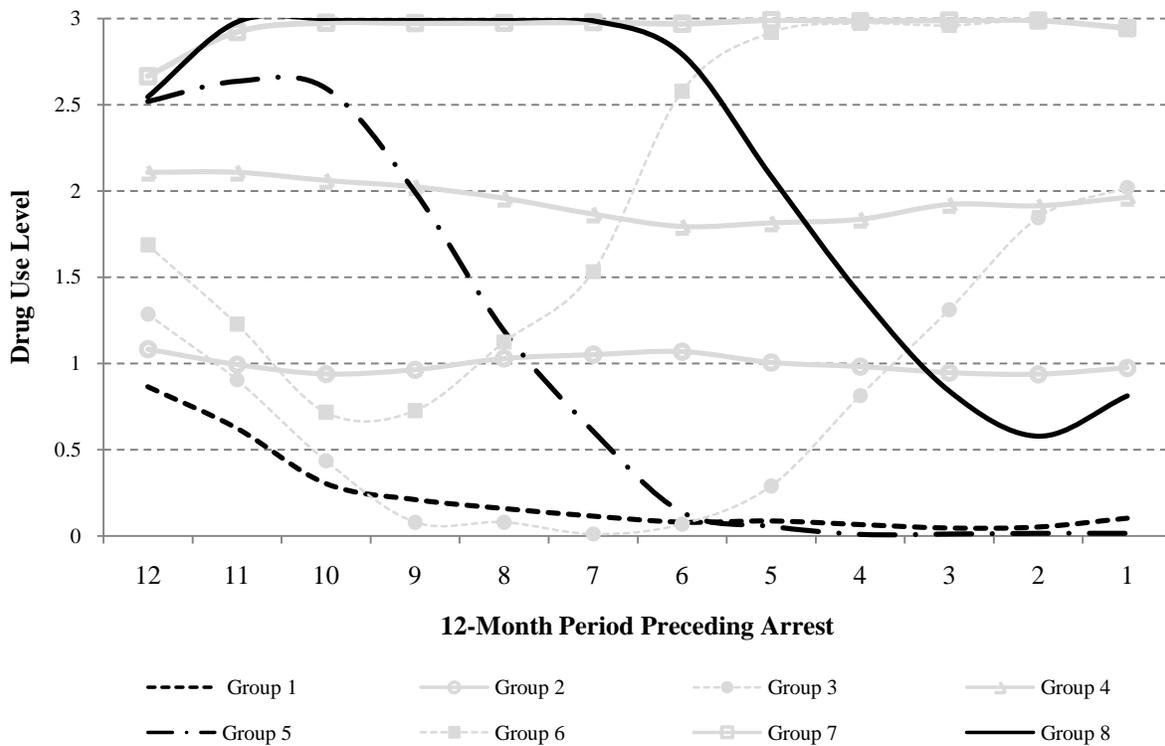
Figure 3. Crack Cocaine Trajectory Groups: Stable Trajectory Groups
Male Arrestees (n = 3,801)



Three additional groups (#1, #5, #8 – see Figure 4, next page) demonstrated declining trajectories over the one year period prior to arrest. Members of Group #1, which was the largest of these three groups (23% of the sample), began the year using crack cocaine 1-7 days per month but quickly desisted. Group #5 on the other hand (5% of sample), began the year using crack cocaine at pace of nearly every other day, and Group #8 reported using even more frequently than that. Approximately 10 months prior to arrest, Group #5 members’ use levels decline to near-zero very rapidly, converging with Group #1 desisters approximately 5 months prior to arrest. In contrast, Group #8 users (3% of sample) persisted using at a rate of at least 13 days out of every month until roughly six months prior to arrest. At that point they, too, initiated

a rapid desistance process. At two months prior to arrest, members of Group #8 were using at a rate of less than one day a week; their use level rebounded to roughly one day a week during the last month, when they were arrested. These groups constituted slightly less than a third of the sample (23%, 5% and 3% respectively).

Figure 4. Crack Cocaine Trajectory Groups: Declining Trajectory Groups
Male Arrestees (n = 3,801)



Finally, two groups of respondents demonstrated dramatic escalations in crack cocaine use in the months leading up to their arrest (see Figure 5, next page): Group #3 (4% of sample) and Group #6 (3% of sample). Both groups began the year using crack cocaine approximately 6-9 days per month, and then declined rapidly. Roughly nine months prior to their arrest, Group #6 members' use levels began an equally rapid ascent, using at a frequency of at least 13 days per month roughly four months prior to arrest. The use levels of Group #3 members also increased rapidly, but the increase began about three months later than that of Group #6 and peaked at a significantly reduced use level, between 8-12 days per month.

These results reveal that there is, in fact, considerable heterogeneity in the use trajectories of adult male arrestees who use crack cocaine. Put another way, these data show that crack cocaine use provides multiple pathways to arrest and jail. The findings presented above also suggest that there are three major groups of crack cocaine users: (1) those that used at a consistent level over time, at varying intensities; (2) those whose use was on the wane prior

arrest; and (3) those that dramatically escalated the frequency of their use in the weeks and months prior to arrest.

Figure 5. Crack Cocaine Trajectory Groups: Escalating Trajectory Groups
Male Arrestees (n = 3,801)

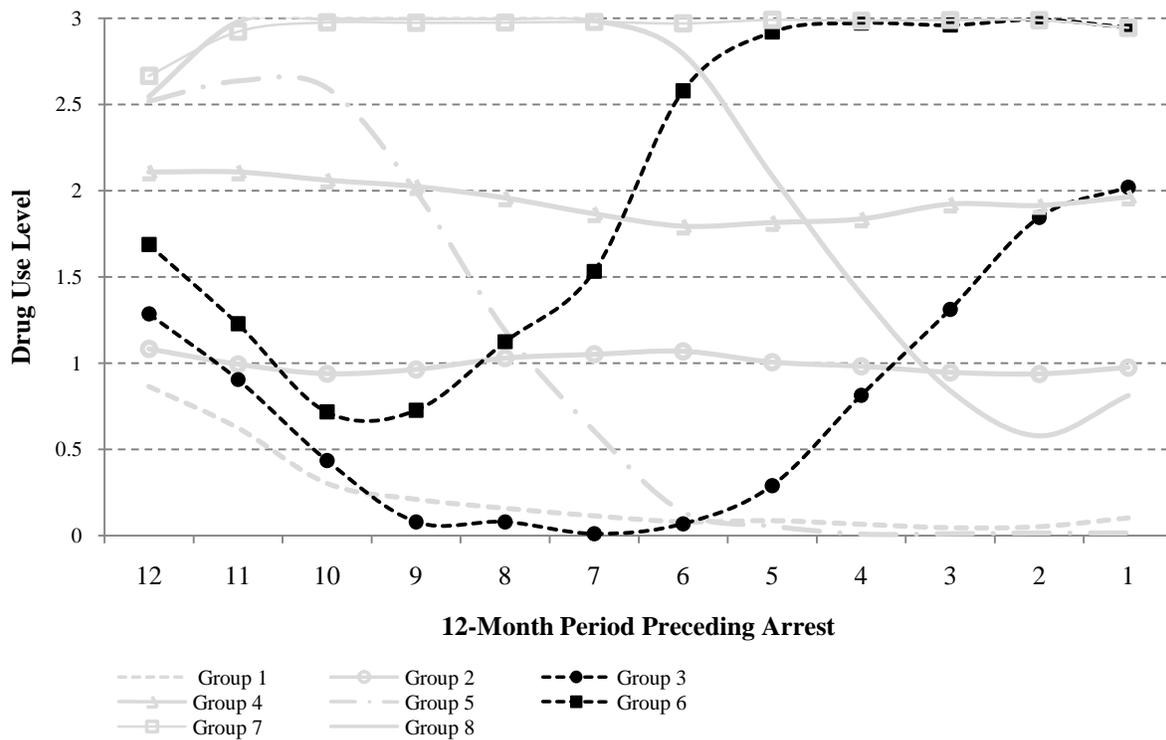


Table 1 presents results from the second stage of the analysis, the construction of demographic and behavioral profiles of crack use trajectory groups. The intent of this analysis is to offer at least a preliminary answer to the question, “Do members of these trajectory groups differ in measurable ways?” The answer is “Yes.”

These data show that members of the “stable” trajectory groups, particularly those in Group #2 and Group #4, are notably older than crack users with escalating or desisting trajectories. Members of the stable crack trajectory groups are also disproportionately Black/African American. Members of trajectory Group #7, which were those that used crack most heavily, are also disproportionately unemployed and homeless. Notably, unemployment and homelessness were also concentrated among the two groups of “desisting” crack cocaine users who reported heavy use for at least a portion of the preceding year (Group #5 and Group #8). Other than the higher-than-average number of Black/African American members, members of the “escalating” groups were not markedly different from crack cocaine users in general – a finding that may, in itself, be notable. Lastly, results of the social-demographic profile analysis show that education and marital status do not differ between any of the eight trajectory groups.

Table 1. Socio-demographic, Current Charge, and Other Drug Use Behaviors
by Crack Cocaine Trajectory Groups

		STABLE GROUPS			ESCALATING GROUPS		DESISTING GROUPS		
Characteristics	Total	#2	#4	#7	#3	#6	#1	#5	#8
Age (mean)	36.3	55.1	56.1	38.1	34.0	36.3	34.2	36.0	36.3
Black/Af. American (%)	48.2	44.8	63.1	64.0	48.7	53.5	30.0	46.8	45.6
Unemployed (%)	38.7	32.5	38.2	47.5	38.7	42.6	36.7	44.8	43.9
Homeless last month (%)	16.8	13.7	15.0	22.3	11.3	16.4	16.1	22.2	21.9
Divorced/Separated (%)	24.1	25.2	20.5	25.7	24.0	25.4	24.0	22.3	23.7
L/T High School (%)	28.8	29.6	30.1	30.6	23.3	32.0	27.1	23.2	29.8
Current Charges									
Any felonies (%)	46.5	42.7	48.3	47.0	52.7	48.4	44.7	51.6	65.8
Any misdemeanors (%)	56.2	58.9	54.0	56.0	48.7	50.0	59.3	50.0	46.5
Any violent offenses (%)	16.7	18.2	15.0	12.8	14.7	15.6	19.2	18.6	16.7
Any property offenses (%)	24.4	18.9	28.6	27.6	26.0	28.7	22.4	32.0	29.8
Any drug offenses (%)	29.0	28.1	32.9	33.1	28.0	26.2	25.3	25.3	29.8
Any order maint. off. (%)	12.1	13.7	12.6	12.9	12.7	7.4	10.4	9.8	10.5
Any Prob/Parole viol. (%)	7.7	6.1	5.8	5.1	10.7	8.2	11.1	11.3	10.5
Other Drug Use									
Teen onset (%)	25.7	24.7	21.9	24.9	36.0	26.2	29.3	23.7	21.0
At-risk: Dependence (%)	78.7	72.8	82.9	89.3	87.3	85.8	68.1	89.6	92.1
Positive U/A: Cocaine (%)	76.4	69.8	89.1	92.4	72.8	74.6	58.0	90.8	92.7

Additional differences emerge upon examination of the charges leveled against members of each trajectory group. Charging differences are clustered among arrestees with desisting trajectories of crack use, in particular. Members of Group #5 and Group #8 were arrested at markedly higher rates for felonies and property crimes, but lower-than-average rates of misdemeanors. It also appears that those with declining rates of crack cocaine use were more likely to be jailed for probation or parole violations. Arrestees who were members of the two escalating trajectory groups were less likely than others to be jailed for misdemeanors; members of Group #3 were more likely to be charged with one or more felonies. Members of Group #6 were much less likely than others to be arrested for order maintenance offenses. Notably, arrestees in the three stable trajectory groups did not display distinct offending patterns. Also of note, trajectory group membership appears to be unrelated to the probability that an individual was arrested for violent or drug offenses.

The last set of variables examined included age of onset, risk of drug dependence and a positive urinalysis result for cocaine. In general, there was little variation in age of onset across drug use trajectory groups. The one exception was for members of Group #3, who were much older than others, on average, when they began using crack cocaine. Disproportionate numbers of this group, along with members of Group #5, Group #6, Group #7 and Group #8 displayed behaviors indicating an elevated risk of drug dependence. The notable exception to this trend

was Group #1. Large majorities of every trajectory group tested positive for cocaine. That being said, distinguishable patterns emerged. Group #4 and Group #7, the two stable trajectory groups with the highest average use levels, were more likely to test positive. Likewise, the two desisting trajectory groups that started out with high use levels at the beginning of the year (Group #5 and Group #8) were also more likely to return a positive urinalysis for cocaine. In contrast, members of Group #1 and Group #2 were much less likely to test positive. Both escalating trajectory groups had average rates of positive urinalysis results.

Summary

The analyses presented above demonstrate one way data from the ADAM drug use calendar can be used to advance our understanding of the relationship between drug use (crack cocaine, specifically) and crime. These data enable researchers to approach the study of the drug use–crime connection in a different way. By analyzing drug use as a dynamic process that evolves over time, researchers can go beyond the limitations of traditional correlational analyses and begin examining the ways in which broader patterns of drug use influence the nature of criminal offending.

Results show that there is substantial heterogeneity in crack cocaine use levels among adult male arrestees in the year preceding arrest, that individual use trajectories cluster into distinctive trajectory groups, and that there are a variety of drug use trajectory groups in the population of crack users who are arrested and booked into local jails. The analysis also revealed that the eight distinct drug use trajectory groups fell under three umbrella categories: (1) those whose crack cocaine use level remained relatively constant over the entire year preceding arrest, although at different levels; (2) those whose crack cocaine use level declined in the months leading up to their arrest; and (3) those whose crack cocaine use escalated dramatically in the weeks and months prior to arrest. These findings suggest that it may be inappropriate to apply overly simple, binary distinctions such as “user” and “non-user,” as the developmental patterns of drug use are highly variable and complex.

This analysis also suggests that there may be social and demographic factors that influence the probability that an arrestee will fall into a distinct cocaine use trajectory group. Factors such as age, race, unemployment and homelessness were all found to be associated with membership in certain trajectory groups. Developmental patterns of crack cocaine use were also found to be associated with the types of charges filed against arrestees, as well as risk of drug dependence and probability of testing positive for cocaine.

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