How Much Do Manhattan-Arrestees Spend on Drugs?

Final report to the National Institute of Justice
Regarding Monitoring Drug Markets in Manhattan with ADAM
(2003-IJ-CX-1028)
July 2, 2004

Andrew Golub and Bruce D. Johnson
National Development and Research Institutes, Inc.
71 West 23rd Street, 8th Floor
New York, NY 10010

Abstract

Introduction: Information about individuals' drug expenses can indicate much about the size of drug markets, the financial burden of use, drug-related crime, and potential challenges for treatment. Most often, expenses have been estimated holistically by asking respondents to report how much they spent. In 2000, the Arrestee Drug Abuse Monitoring (ADAM) program introduced an advanced questionnaire using a series of highly specific questions like, "How much cash did you pay for crack that last time you bought it?" *Methods:* This paper describes a procedure for estimating arrestees' drug expenses with the new ADAM questionnaire, discusses pitfalls in interpretation, presents findings for 2,979 ADAM-Manhattan respondents interviewed 2000-02, examines covariates of drug expense, and compares the 2000-02 findings with those obtained from 2,256 respondents interviewed 1998-99 with the previous questionnaire. *Results:* Among 2000-02 arrestees, median drug expense in the past 30 days varied widely with frequency of use and drug-user type. Infrequent marijuana-only users spent as little as $5, daily marijuana-only users spent about $600. Arrestees that used both heroin and cocaine spent over $1000. Estimates with the 1998-99 data were about half as large. *Discussion:* ADAM's new drug market questions may greatly advance the quality of estimates of drug expenses. However, further research is needed to better establish the estimator's accuracy.

1. Introduction

How much drug users spend on their habits can potentially provide various insights into drug-related problems. Of course, drug expenses vary greatly across locations, over time, and with different drug use habits. This paper focuses on drug expenses among Manhattan arrestees surveyed by the Arrestee Drug Abuse Monitoring (ADAM; formerly Drug Use Forecasting or DUF) Program. This population is clearly not representative of all drug users, nor even of those living in New York City. Rather, these drug users represent a particularly disadvantaged population of great interest to criminal justice, drug treatment, drug abuse control, welfare support, and other agencies in the greater New York area. These findings may be of broader interest to communities with similar drug problems. Moreover, the advances in the procedure for estimating drug expense should prove of interest to all locations served by the ADAM program and to other groups interested in building upon these innovations to measure drug expenses elsewhere.

1.1 The value of drug expense information

At the most basic level, drug expenses represent funds that could have alternatively been used for other purposes such as rent, food, health care or child support—presuming these persons had the money in the first place. For many arrestees in Manhattan and other U.S. cities, criminal

activity, arrest, and drug use are part of a distressed life experience involving a lack of education, lack of human and social capital, lack of conventional employment, substandard housing, poor nutrition, poor health maintenance, and difficulty providing support for children often conceived outside of legal marriage (see Anderson, 1999; Currie, 1993; Johnson et al., 1998). Many impoverished drug users resort to crime to support their habits. Their drug expenses may suggest the amount of income-generating crime that may be drug-related. This information could be quite useful to law enforcement, drug treatment and other human services agencies.

Drug markets have a secondary deleterious economic impact. Drug purchases place money in the hands of black market operatives that may be used to support other illicit activities. This represents a black market multiplier effect. The U.S. Office of National Drug Control Policy (ONDCP, 2001) estimated that Americans spent $64 billion on illicit drugs in 2000. Accordingly, ONDCP (2003) set taking the profits out of the drug business as one of the three central priorities of their drug abuse control strategy.

1.2 Prior measures of expenses

The ONDCP issues a series of reports on "What America's Users Spend on Illegal Drugs" (e.g., ONDCP, 2001). These reports present complex calculations involving multiple data sources and numerous assumptions. ONDCP (2001) used ADAM data collected 1989-1994 to estimate the cash drug expense of chronic drug users. ONDCP (2001) excluded ADAM data collected since 1995, due to changes in the questionnaire. From 1989-94 ADAM asked, "How much money do you spend in an average week for *your* drug use, excluding alcohol and tobacco? (Note: An average week refers to an average week in the last month)." (National Institute of Justice or *NIJ*, 1994). In 1995, the question was modestly revised as follows, "In the past 30 days, how much did you spend on drugs for yourself (not including alcohol and tobacco)?" (NIJ, 1995).

ONDCP (2001) estimated that in 2000, chronic cocaine users spent $212 in cash per week (which equals $909 per past 30 days: $212 × 30/7) and chronic heroin users spent $201 per week ($861 per past 30 days). They estimated the average marijuana user spent $74 per month using data from the National Household Survey on Drug Abuse (NHSDA) and the System to Retrieve Drug Evidence (STRIDE).

The quality of responses to these questions was limited by a variety of factors. Arrestees may be unable to recall or unwilling to disclose sensitive information. Prior studies indicated that as few as half of all arrestees may disclose their recent drug use, depending on the drug and other factors (Golub et al., 2002; Harrison, 1997). Moreover, consumer marketing research has found that the quality of responses to *holistic* questions that ask about the frequency, quantity or expense associated with a behavior over time depends on the nature of the behavior (Menon, 1993; Menon et al., 1995). Respondents tend to provide more accurate estimates for behaviors that are frequent, periodic and similar. Blair and Burton (1987) found that persons often store a rate of occurrence in their memory for regular behaviors. For example, a respondent may

remember that they wash their hair every day. Menon (1993) found respondents tended to overreport irregular behaviors by 40%, on average. According to these studies, persons with routine drug purchasing habits (e.g., buying the same amount from the same dealer each day) would be best able to readily provide holistic estimates of their drug expense, as well as their frequency of purchase and frequency of use. Those arrestees with irregular behaviors and dissimilar drug purchase episodes (perhaps resulting from a lack of steady income and drug use binges) would likely provide less accurate information.

To date there has been little research that has compared reported illicit drug use purchases with other measures. Johnson et al. (1985) performed one of the most detailed studies of cash spent on drugs that stands as a landmark in the field. The "taking care of business" study recruited a panel of 201 heroin users from the streets of inner-city Manhattan and interviewed them regularly over a four-week period. Respondents provided detailed information about drug use, drug acquisition, income (including drug sales and economic crimes), and other expenditures for each day. At the initial interview, arrestees were asked to estimate the average amount they spent on drugs in the prior year. On average, these holistic estimates were twice as large as the amounts identified from their daily reports. Moreover, individual holistic estimates and contemporaneous reports were only modestly correlated (ρ=.38). This suggested that subjects may not have thought that carefully about their holistic estimates, presuming that their contemporaneous reports were generally accurate.

1.3 A new episodic estimator

In 2000, ADAM introduced a substantially revised questionnaire (NIJ, 2001). The drug market section includes 29 questions (spanning seven pages) regarding the last time the respondent obtained each of five drugs. Questions ask about explicit episodes like, "How much cash did you pay for crack that last time you bought it." (NIJ, 2001, p. 87). Questions also explicitly inquire about non-cash transactions, "Think about the last time you got crack without paying any cash for it…" (NIJ, 2001, p. 85). This information allows for consideration of drugs obtained from gifts, theft, advances on credit to sell, exchanges for other merchandise, exchanges for services such as assistance in drug distribution, and exchanges for sexual favors. We refer to this total market value obtained by cash purchase and other means as a respondent's estimated *drug expense*. This paper introduces a procedure for estimating drug expense from ADAM's *episodic* information, discusses potential pitfalls in interpretation, presents results obtained with ADAM-Manhattan data collected 2000-02, examines covariates of drug expense, and compares the 2000-02 estimates using this new episodic estimator with estimates obtained 1998-99 using the previous holistic estimator. To facilitate the comparison of estimators, the paper introduces a second episodic estimator for *cash drug expense* (the amount each respondent paid in cash), because the holistic estimator ADAM employed prior to 2000 did not ask about non-cash transactions.

There are a variety of factors that potentially affect the accuracy of the episodic estimator and the legitimacy of the comparison of estimates with the previous holistic estimates including a selection effect, a decomposition effect, and the use of different years with each estimator. The accuracy of the episodic estimator depends on the central assumption that an arrestee's last episode was typical of his or her experiences in general. Taylor and Costa (2003, p. 62) explained that ADAM chose to ask about the last transaction instead of a typical transaction because, "[A]rrestees were often unable to accurately describe a 'typical' exchange in which they obtained drugs. They either resorted to 'war stories' or 'best scores'.…frequently episodes blend[ed] together…in the interviewees' memories. … Instead, arrestees were asked to describe the last (*most recent*) instance…" However, an arrestee's last purchase might not be typical. Arrestees may have higher expenses to the extent that drug users are more likely to sustain arrests during a period of heavy drug use (Johnson et al., 1990). This potential bias would affect both holistic and episodic estimators. The episodic estimator may be further biased to the extent that a large transaction may be more likely to lead to an arrest than a smaller one.

The accuracy of the episodic estimator could also be enhanced or potentially biased by use of the decomposition strategy ADAM employed whereby respondents were asked about acquisition of each type of drug separately. Studies have indicated that decomposition can improve the accuracy of reported frequency of cigarette smoking (Means et al., 1994), utilization of health care services (Means and Loftus, 1991), credit card expenses (Srivastava and Raghubir, 2002), and a variety of frequent behaviors, particularly if the respondent engages in them on an irregular but frequent basis like snacking, drinking from a water fountain or stopping to talk with friends (Menon, 1997). On the other hand, Belli et al. (2000) found that decomposition can lead to overestimates. They noted that respondents tended to underestimate large frequencies and overestimate small ones. Hence, the sum of a series of decomposed questions can potentially lead to an overestimate of the total expense.

Ideally, we would have liked to compare the holistic and episodic estimators for drug expense using the same persons or using similar samples obtained at the same time. However, such data were not available. Therefore, we chose to compare estimates during successive time periods. Conceivably, the difference in the estimates could reflect a variety of differences in the data including: changes over time in sampling procedures, differences in police priorities over time, changes in drug prices due to market shifts, and changes in prices due to inflation (estimates were not adjusted for inflation).

2. Methods

2.1 The ADAM Program

In 1987, the U.S. National Institute of Justice established the Drug Use Forecasting [DUF] program to measure trends in illicit drug use among booked arrestees in most large cities (or

counties) with a total population of at least 1 million, as well as many smaller cities for geographic diversity (also see ADAM, 2003; Hunt and Rhodes, 2001; NIJ, 2001). The program obtains both self-report and urinalysis data from arrestees. In 1997, the program was retitled ADAM. In 2000, ADAM introduced significant changes to the survey instrument, sampling procedures, and public-use datafiles (see Hunt and Rhodes, 2001). As of the time of this writing, ADAM data collection has been on hiatus since January 29, 2004, as a Federal cost-saving measure (NIJ, 2004). ADAM data are used for research purposes only. The public release datasets do not include any personal identifiers. As a further safeguard, the authors of this paper signed agreements with the National Archive of Criminal Justice Data assuring that confidentiality will be maintained as a condition for use of the data.

At inception, the ADAM program sought to monitor substance use among serious offenders: persons charged with a felony offense were oversampled; persons charged with a citation were excluded at most but not all sites; and persons charged with drug offenses were not allowed to exceed 20% of the sample. In 1998-99, more than 80% of arrestees approached agreed to participate at most ADAM sites (ADAM, 1999, 2000). During this period, ADAM-Manhattan successfully recruited 2,256 cases. Starting in 1998, ADAM began to phase in sampling strategies designed to yield a statistically representative sample of arrestees for each site. This sampling plan was fully implemented by 2000. From 1998 through the first quarter of 2001, ADAM also interviewed arrestees in the four other boroughs of New York City. These cases were excluded from our analyses.

During the 2000-02 period, the ADAM-Manhattan program approached a random sample of 4,248 arrestees, 70% were available and agreed to participate, yielding 2,979 respondents. The ADAM public-use data files include post-sampling stratification weights for adult male arrestees to account for differential probability of sampling associated with time of arrest and booking facility (Hunt & Rhodes, 2001).

For this analysis, the ADAM-Manhattan sample weights were modified to control for non-participation in each year for 2000-02 and for the oversampling of female arrestees in each year 1998-2002. Female arrestees and ADAM respondents interviewed before 2000 were assigned initial sample weights of 1.0 reflecting the fact that the sampling plan provided no information as to which arrestees might have been more (or less) likely to have been eligible for the survey. The ADAM public-use datasets for 2000 and later provide basic demographic information for eligible respondents that decline to participate in the survey. We used logistic regression to identify any systematic variation in non-participation associated with age, race/ethnicity and arrest charge for data from each site, in each year since 2000, and for male and female adult arrestees separately—six individual models. Sample weights were multiplied by the inverse of the probability of participation estimated from the logistic regression models. To avoid an over reliance on any one case, no individual weight was increased more than 10-fold. Use of these revised sample weights yields unbiased estimates representing all arrestees eligible for the ADAM program as opposed to just those that agree to participate. Sample weights were further adjusted so that female arrestees accounted for 20% in each multi-year sample: 1998-99, 2000-02. The U.S.

Federal Bureau of Investigation (FBI) estimated that females comprised 22% of all arrestees nationwide in 2000 (FBI, 2001) and 23% in 2001 (FBI, 2002) as part of their Uniform Crime Reporting (UCR) Program.

2.2. Characteristics of the 1998-99 and 2000-02 samples

This section describes the characteristics of both samples and then discusses the differences between them (see Table 1). Most of the ADAM-Manhattan arrestees were either black (55-58%) or Hispanic (26-30%). Relatively few were white (10-13%). The mean age was 33 years. Overall, the respondents did not fare well on various conventional measures of adult status attainment. Many had not completed high school (36-38%), most were single (84-87%), and about one-third held full-time jobs (31-33%).

[Table 1 about here]

Most ADAM respondents reported use of at least one of the following illicit drugs (66-76%) in the past 30 days: marijuana, powder cocaine, crack, heroin and methamphetamine. Methamphetamine use among ADAM-Manhattan arrestees has been extremely uncommon. Less than 1% of ADAM-Manhattan arrestees were detected as recent methamphetamine users from 1995 through 2000 (ADAM, 2000, 2003). Therefore, we left methamphetamine use out of our analyses. Drug-user type was categorized based on self-report of any past-30-day use according to the following hierarchy: marijuana-only, powder-cocaine-only, crack, heroin, heroin+powder cocaine, and heroin+crack. Marijuana-only (34-44%) was the most common drug-user type. Respondents that reported using powder cocaine, crack or heroin were classified according to use of those drugs, irrespective of whether they used marijuana. Powder cocaine and crack users that did not use heroin were classified as either powder-cocaine-only users (8-12%) if they did not use crack or crack users (25-29%) if they used crack, irrespective of whether they used powder cocaine. A similar hierarchical scheme was used to distinguish heroin users (8-9%), heroin+powder cocaine users (5%), and heroin+crack users (9-11%). Frequency of drug use was calculated as the maximum for marijuana, powder cocaine, crack and heroin, irrespective of drug-user type. Daily or near daily drug use (43-48%; 28-30 of past 30 days) was the most common frequency category among illicit drug users.

The 2000-02 dataset included more Hispanics and fewer whites; more arrestees in their twenties and fewer in their thirties; more arrestees for drug possession and fewer for violent index crimes; fewer drug users; a higher proportion of marijuana-only users and lower proportion of crack users (consistent with continuing changes in the arrestee composition identified in Golub and Johnson, 1999); a smaller proportion of daily or near daily drug users and more 12-27 day users. For this study, we considered the differences associated with drug use and arrest composition to be potentially more important than those associated with demographic or status attainment. The 2000-02 sample included fewer arrestees for serious crimes, fewer users of powder cocaine and crack, and fewer of the most frequent drug users. On this basis, we expected slightly lower expenses among the 2000-02 arrestees, if all else had been equal.

2.3 Estimating drug expense

The basic formula for the episodic estimator of a respondent's drug expense is listed below. The remainder of this section describes how each variable was calculated. A similar procedure was used to calculate cash drug expense (C) substituting the price paid ($P_{d,k}$) for the value of the purchase ($V_{d,k}$).

$$E = \sum_{d}\sum_{k}\left[V_{d,k} \times Y_{d,k} \times T_{d,k} \times M_{d,k}\right]$$

where,
E = total drug expense in the past 30 days
d = index of drugs (marijuana, crack, powder cocaine, heroin)
k = index of transaction types (cash/cash-combo, non-cash)
V = value of drugs obtained at last transaction
Y = percent of drugs obtained at last transaction for own use
T = number of transactions on the day of the last transaction
M = number of the past 30 days on which a transaction took place

The ADAM questionnaire asks each respondent whether they had in the past 30 days obtained any marijuana, crack, powder cocaine, and heroin. For each drug the respondent obtained, the survey then asks if they had ever paid cash and whether they had obtained drugs without paying cash. This identifies up to eight types of drug transactions the respondent may have participated in, cash and non-cash transactions (2 types indexed by k) for each of four drugs (indexed by d).

The value ($V_{d,k}$) of a transaction was based on either the price paid or the amount of a drug obtained, depending on the nature of the transaction. For cash transactions, respondents were asked, "Did you pay cash only, or did you pay cash and something else?" For cash-only transactions, the value was set at the price paid. For cash-combination transactions, we calculated the value of the transaction based on the quantity of drugs obtained using the procedure for non-cash transactions described below. Then we set the value ($V_{d,k}$) of the exchange as either cash paid or the estimated value for the amount of drug obtained, whichever was larger. There were numerous occasions when the price paid in a cash-combination was higher than the estimated value of drugs obtained.

We used a two-step procedure for estimating the value of non-cash transactions. First, we examined the types of units involved in transactions for each drug. For example, marijuana was variously purchased in units of bags, ounces, joints, and blunts (an inexpensive cigar in which the tobacco filler is replaced with marijuana). For each type of unit, we examined the distribution of prices per unit paid in cash-only purchases as well as the median and the mode. We then set a typical price-per-unit for each drug and each type of unit. Second, we estimated

the value of non-cash transactions as the number of units obtained multiplied by the typical price per unit.

The episodic estimator isolates the proportion of the purchase value that was "for you to use yourself" ($Y_{d,k}$) and scales the amount up by multiplying by the number of purchases in the past month (estimated as $T_{d,k} \times M_{d,k}$). ADAM (2003, p.70) similarly estimated the number of units purchased in the past thirty days by multiplying the number of units obtained in the last transaction by $T_{d,k}$ and $M_{d,k}$. However, that report did not take the next step of multiplying by the value of the transaction and percent obtained for own use to estimate drug expense.

Potentially, the episodic estimate of drug expense for a respondent could be highly inaccurate if anything about the last purchase was atypical. Conceivably, all four intermediate variables describing the dimensions for a drug transaction ($V_{d,k}$, $Y_{d,k}$, $T_{d,k}$, $M_{d,k}$) could be large. When multiplied together, this could potentially result in a very large and highly inaccurate estimate. This potential inaccuracy has important implications for interpreting findings. We return to these concerns in the Discussion.

2.4 Covariates of drug expense

Economic data are often highly skewed right. Consequently, the mean can be unduly influenced by a few cases with large values. ONDCP (2001) dealt with this problem by excluding particularly large responses. However, one purpose of this study was to determine if we would obtain larger estimates with the new episodic estimator. So, excluding large estimates was antithetical to our purposes. We used two other approaches commonly employed with economic data: medians and logarithms. In tables, we report median expenses as a more robust measure of central tendency than the mean.

To study covariates of drug expense, we calculated the logarithm of the dependent variable prior to performing least-squares regression, as a variance-stabilizing technique. The analysis revealed how drug expense among ADAM-Manhattan arrestees 2000-02 varied simultaneously with frequency of use, a drug-user type, age, heroin injection, race, ethnicity, gender, interview year and arrest charge. Afterwards we took the anti-logarithm of coefficient estimates, which yielded a multiplicative model. Accordingly, these anti-log coefficients were interpreted in a similar manner as odds ratios in a logistic regression. An F-test indicated which variables were associated with statistically significant variation in drug expense. The R^2-change identified roughly which variables were associated with the largest amount of variation in drug expense.

3. Results

3.1. Characteristics of drug purchases

The majority of ADAM-Manhattan 2000-02 arrestees obtained drugs in the past 30 days (67%, see Table 2). Nearly every respondent that reported using drugs in the past 30 days (66% of the sample, Table 1) also reported having acquired drugs. This indicates that efforts by ADAM interviewers to maintain logical consistency across these questions were generally successful. The most commonly obtained drug was marijuana (46% of all respondents and 69% of those that acquired drugs: 46% ÷ 67%, Table 2).

The episodic estimator explicitly identifies non-cash transactions, unlike the holistic estimator used by ADAM before 2000. The older holistic estimator would have gotten incomplete information about the 31% (100%-69%) of the drug obtainers that had non-cash or cash-combination transactions. Moreover, the holistic estimator would have gotten no information from the 8% of drug obtainers that never paid cash. The percentage of any non-cash only transactions was higher for marijuana (16%) and powder cocaine (12%) than for heroin (6%) and crack (5%). The median These variations across drugs are consistent with site-specific results for male arrestees published by the ADAM (2003, p. 80) Program. In 2000, male arrestees were more likely to report a non-cash transaction to obtain marijuana than either powder cocaine or crack. ADAM (2003, p. 80) also reported that New York City male arrestees had the highest rate of cash-only transactions among the 23 sites included in the report.

[Table 2 about here]

Table 3 lists the purchase units for cash-only transactions that were reported by at least 1% of the respondents. The table also lists the typical price that we used in our estimates for the value of non-cash and cash-combo transactions. This list includes suggested response categories that appear on the ADAM questionnaire as well as responses commonly provided in the other (specify) section. The most common purchase unit for marijuana, crack and heroin was the bag (54%-88%, see Table 3). Powder cocaine was slightly more frequently purchased by the gram (44%) than the bag (37%). Only a few other units were reported by more than 5% of the respondents that obtained each drug: 8% of marijuana users bought by the ounce; 5% of powder cocaine users bought foil packets; and among crack users 9% obtained vials, 15% obtained grams and 7% obtained rocks.

[Table 3 about here]

Many respondents specified nickel, dime and $20 bags in the other (specify) category—indicating that an even higher percentage of respondents purchased their drugs by the bag. It also indicated that the bag identifies the type of container but not necessarily the quantity or even the price of the drug. A histogram of price per bag (Figure 1) identifies $10 as the most common price for a bag of powder cocaine, crack and heroin. Bags of marijuana were purchased for $5 slightly more often than for $10. The discrete nature to these price distributions with peaks at $5,

$10, and $20 suggest that drugs are packaged into units for convenient and quick sales. Because of the potential for arrest, drug dealers have a strong incentive to keep transactions concise. One technique is to maintain a simple pricing scheme. Andrade, Sifaneck and Neaigus (1999, p. 279) described the operation of one highly-disciplined heroin market in Manhattan:

"A well implemented system of look-outs, bouncers and sellers kept strict order at the moment of actual transactions. After a command by whomever was in charge of keeping order while selling, users had to form a row, money in hand, and ask no questions. After all of them were dispatched, sellers and their operatives disappeared. Sometimes the row could be as long as 40 to 50 people, and the whole copping process would still last only a few seconds for each customer, a couple of minutes for the whole crowd."

[Figure 1 about here]

3.2 Covariates of drug expense

Among ADAM-Manhattan arrestees that reported obtaining drugs, the median drug expense for the past 30 days was $370. A regression analysis for the logarithm of drug expense identified statistically-significant systematic variation across three of the nine factors analyzed (Table 4). Frequency of use was by far the most important factor accounting for approximately 42% of the variation. User-type was the next most important factor accounting for about 6% of the variation followed by age, which accounted for less than 1% of the variation.

[Table 4 about here]

The constant in Table 4 represents the drug expense for the reference population, respondents whose attributes match the reference case for each variable. Accordingly, the model indicates that infrequent (used on only 1 of the past 30 days) marijuana-only users under the age of 21 spent on average about $7, a rather modest drug expense. However, drug expense increased rapidly with frequency of use. Arrestees that reported use on 2-4 of the past 30 days spent on average 4 times as much as infrequent users. Daily or near daily users spent on average 76 times as much as infrequent users. Marijuana-only users tended to spend about one-quarter to one-half as much as arrestees that used other illicit drugs. Arrestees in their 30s tended to spend about 40% more than those under the age of 21.

Table 5 examines the variation in drug expense and habit size with user-type and frequency of use in greater detail. Not surprisingly, infrequent marijuana-only users had the smallest drug expense. Those that reported use on only 1 of the past 30 days reported a median expense of $5 for that day and for the entire month. Marijuana-only users that used on more days also spent more per day. The median expense for the most frequent users was $20 per day. Cocaine-powder-only, crack and heroin users tended to spend three to four times as much per day of use ($30-$40) than marijuana-only users. Arrestees that used both heroin and either cocaine powder or crack had the highest per day expenses ($58-$64). Moreover, the majority of them used on a daily or near daily basis (60-61%). The median drug expense over the past 30 days for heroin+crack users was $1,491.

[Table 5 about here]

3.3 Comparison of episodic and holistic estimates

Figure 2 compares the distribution of cash drug expenses (excluding non-cash transactions) using the episodic and holistic estimators. The x-axis follows a logarithmic scale in which each successive category represents a 3.2-fold increase ($\sqrt{10}$) in the size of the expense. The episodic estimator identified many more arrestees as having spent $1,000 or more in the past 30 days. The holistic estimator identified more expenses in the $32 to $100 range. Overall, the median cash drug expense of $405 using the episodic estimator was twice the median of $200 identified with the holistic estimator. The median cash drug expense was also higher than the median drug expense (including non-cash transactions) of $370 for the ADAM-Manhattan 2000-02 sample. Removing non-cash transactions reduced the expense estimated for each respondent, but it also removed from the calculation the numerous arrestees with smaller drug expenses that reported never paying cash for drugs. This led to the non-intuitive finding that the median cash drug expense was actually higher than the median overall drug expense.

[Figure 2 about here]

Working with the ADAM-Manhattan 1998-99, we stumbled upon an addition reason to be suspicious of the holistic estimator. Table 6 indicates the variation in cash drug expense with drug-user type and frequency for the ADAM-Manhattan 1998-99 and 2000-02 data. For the holistic estimator, median cash drug expense per day declined substantially with frequency of use, especially for marijuana-only and powder-cocaine-only users. This stands in sharp contrast with the increase in cash drug expense with frequency of use estimated with the episodic estimator. An increase in drug expense with frequency of use is more consistent with much of what we understand about drug dependence, tolerance, binges, and identity. Persons that become more involved with a drug tend to use more of the drug and consequently spend more on their habit.

[Table 6 about here]

4. Discussion

The new drug market questions added to ADAM in 2000 obtain extensive information about arrestees' drug market transactions. This paper expands the use of this information to its logical next step. We introduce a procedure for estimating each arrestee's drug expense in the past 30 days and examine the covariates of drug expense among ADAM-Manhattan 2000-02 arrestees. Drug expense varied widely with frequency of use, and drug-user type (refer to Tables 4 and 5). Arrestees that reported marijuana use on only one of the past 30 days had the lowest estimated drug expenses, a median of $5 in the past 30 days. A relatively modest expense on the order of purchasing a new t-shirt or a movie ticket. The median financial burden of daily marijuana-only users when annualized of $7,300 ($20 per day × 365) was much more substantial. To put this

amount in perspective, consider that a person working 35 hours a week at the U.S. Federal minimum wage of $5.15 per hour would earn $9,400 over the course of an entire year, before any deductions. Within a distressed community, a daily marijuana habit represents a hefty burden. Other illicit drugs represented an even heavier burden. The 9% of arrestees that used both heroin and cocaine had median past-year drug expenses around $15,000, in substantial excess of a minimum wage income. Supporting this financial drain likely required many of these arrestees to engage in a considerable amount of income-producing crime, especially because only a third of all arrestees reported holding a full-time job.

The cash drug expenses for ADAM-Manhattan arrestees 2000-02 estimated using the episodic estimator were compared to findings for arrestees 1998-99 using the previous holistic estimator. The median episodic estimate ($405) for cash drug expense in the past 30 days was twice the median holistic estimate ($200). It is disconcerting that two estimators seeking to measure the same quantity provided very different estimates. It suggests that one, the other, or perhaps both are inaccurate. Alternatively, the difference could be an artifact of our imperfect comparison involving two different datasets.

There were several important differences between the ADAM-Manhattan 1998-99 and 2000-02 samples. The 2000-02 data included more marijuana-only users and fewer daily or near daily users of any drug. This difference would have led to lower cash drug expenses in 2000-02, instead of the higher expenses observed. Another possibility is a shift in drug prices. The U. S. Drug Enforcement Agency (DEA, 2003) provided comparisons of drug prices nationwide over the 1998-2001 period based on their purchases for law enforcement related purposes. Overall, they found that cocaine, heroin and marijuana prices ranged widely but that during the 1998-2001 this range was relatively stable. Of course, these are national estimates and prices may have risen locally in Manhattan. The DEA did find that the average purity of cocaine purchased on the street by the gram steadily declined from 69% in 1998 to 56% in 2001. This represents an effective increase in the price of pure cocaine. To obtain the same amount of pure cocaine at the lower purity level would require purchasing 23% more of the drug on the street ([69%÷56%]-1). This could potentially account for some but by no means all of the increase in cash drug expenses measured by ADAM-Manhattan from 1998-99 to 2000-02.

There are several reasons to suspect the inaccuracy of the holistic estimator. Prior survey research suggested holistic estimators tend to be positively biased especially for irregular activities (Menon, 1993; Johnson et al., 1985). In the taking-care-of-business study, Johnson et al. (1985) identified that holistic estimates were twice as high as actual cash drug expenses. In this paper, we also found that holistic estimates for cash drug expense declined with frequency of use, which contradicted our expectations based on the nature of dependence, tolerance, binges, and identity.

However, there is much reason to be cautious in concluding by default that the episodic estimator is accurate. The episodic estimator yielded even larger estimates of drug expense than the holistic estimator. This suggests that the episodic estimator might also be positively biased. There are several theoretical reasons discussed previously that also suggest the episodic

estimator might be positively biased: a possible selection effect whereby arrestee's last purchase can be potentially larger than a typical transaction; a possible decomposition effect whereby asking respondents to separately describe their purchases of each type of drug can lead to overestimates of each and a larger overestimate of the total; and the possible compounding of errors that can result when responses pertaining to drug market participation are multiplied together.

We would like to see the validity of the episodic estimator directly tested using the taking-care-of-business methodology. Such a study should include different types of drug users, not just heroin users as in the original study. We would also suggest that the study be used to validate all of the individual components of the episodic estimator: cash paid for the last transaction, the number of transactions on the day of the last transaction, and the number of the past 30 days on which a transaction took place. Further validation research could establish whether the episodic estimator is biased or not and the extent of any possible bias as well as suggest further improvements in questionnaire design and procedures for interpreting results.

Acknowledgements

The research presented was supported by a grant from the National Institute of Justice (2003-IJ-CX-1028). The authors thank Stephen J. Sifaneck, two anonymous reviewers from the journal, and three anonymous reviewers from NIJ, for very helpful suggestions leading to the improvement of the paper. Points of view and opinions expressed do not necessarily reflect the positions of the National Institute of Justice nor National Development and Research Institutes.

References

Anderson, E., 1999. Code of the street: Decency, violence, and the moral life of the inner city. Norton, New York.

Andrade, X., Sifaneck, S.J. & Neaigus, A., 1999. Dope sniffers in New York City: An ethnography of heroin markets and patterns of use. Journal of Drug Issues 29 (2): 271-298.

Arrestee Drug Abuse Monitoring (ADAM) 1999. 1998 Annual report on drug use among adult and juvenile arrestees. NCJ 175656. National Institutes of Justice, Washington, DC. Accessed on May 5, 2004, from http://nij.ncjrs.org/publications/pubs_db.asp.

Arrestee Drug Abuse Monitoring (ADAM) 2000. 1999 Annual report on drug use among adult and juvenile arrestees. NCJ 181426. National Institutes of Justice, Washington, DC. Accessed on May 5, 2004, from http://nij.ncjrs.org/publications/pubs_db.asp.

Arrestee Drug Abuse Monitoring (ADAM) 2003. 2000 Arrestee Drug Abuse Monitoring: Annual report. NCJ 193013. National Institutes of Justice, Washington, DC. Accessed on May 5, 2004, from http://nij.ncjrs.org/publications/pubs_db.asp.

Belli, R.F., Schwarz, N., Singler, E., Talarico, J., 2000. Decomposition can harm the accuracy of behavioral frequency reports. Applied Cognitive Psychology, 14, 295-308.

Blair, E., Burton, S., 1987. Cognitive processes used by survey respondents to answer behavioral frequency questions. Journal of Consumer Research, 14, 280-288.

Currie, E. 1993. Reckoning: Drugs, the cities, and the American future. New York: Hill and Wang.

Drug Enforcement Agency (DEA) 2003. Illegal drug price and purity report. DEA Publication 02058. Accessed on May 5, 2004, http://www.usdoj.gov/dea.

Federal Bureau of Investigation (FBI) 2001. Crime in the United States 2000: Uniform crime reports. Accessed on May 5, 2004, from http://www.fbi.gov/ucr/ucr.htm#cius.

Federal Bureau of Investigation (FBI) 2002. Crime in the United States 2001: Uniform crime reports. Accessed on May 5, 2004, from http://www.fbi.gov/ucr/ucr.htm#cius.

Golub, A.L., Johnson, B.D., 1999. Cohort changes in illegal drug use among arrestees in Manhattan: From the heroin injection generation to the blunts generation. Substance Use and Misuse, 34 (13), 1733-1763.

Golub, A., Johnson, B.D., Taylor, A., Liberty, H.J., 2002. The validity of arrestees' self-reports: Variations across questions and persons. Justice Quarterly, 19 (3), 101-126.

Harrison, L., 1997. The validity of self-reported drug use in survey research: An overview and critique of research methods. In: Harrison, L., Hughes, A., (Eds.) The validity of self reported drug use: Improving the accuracy of survey estimates, National Institute on Drug Abuse Research Monograph 167. National Institute on Drug Abuse, Washington, DC, pp. 17-36.

Hunt, D., Rhodes, W., 2001. Methodology guide for ADAM. National Institute of Justice, Washington, DC.

Johnson, B.D., Dunlap, E., Maher, L., 1998. Nurturing for careers in drug abuse and crime: Conduct norms for children and juveniles in crack-abusing households. Substance Use and Misuse, 33 (7), 1515-50.

Johnson, B.D., Goldstein, P.J., Preble, E., Schmeidler, J., Lipton, D.S., Spunt, B., Miller, T., 1985. Taking care of business: The economics of crime by heroin users. Lexington, Lexington, MA.

Johnson, B.D., Williams, T., Dei, K.A., Sanabria, H. Drug abuse in the inner city: Impact on hard drug users and the community. In: Tonry, M., Wilson, J. W. (Eds.), Drugs and crime, vol. 13. University of Chicago Press, Chicago, pp. 9-67.

Means, B., Loftus, E.F., 1991. When personal history repeats itself: Decomposing memories for recurring events. Applied Cognitive Psychology, 5, 297-318.

Means, B., Swan, G.E., Jobe, J.B., Esposito, J.L. 1994. The effects of estimation strategies on the accuracy of respondents reports of cigarette smoking. In: Schwarz, N., Sudman, S., (Eds.) Autobiographical memory and the validity of retrospective reports. Springer-Verlag, New York, pp. 105-119.

Menon, G., 1993. The effects of accessibility of information in memory on judgments of behavioral frequency. Journal of Consumer Research, 20, 431-440.

Menon, G., Raghubir, P., Schwarz, N., 1995. Behavioral frequency judgments: An accessibility-diagnostic framework. Journal of Consumer Research, 22, 212-228.

Menon, G., 1977. Are the parts better than the whole? The effects of decompositional questions on judgments of frequent behaviors. Journal of Marketing Research, 36, 335-346.

National Institute of Justice [NIJ] 1994. Data Collection Instrument for 1994 Data, Part 1 Survey Data, 1995, and Heroin Addendum Data, 1995. ICPSR Study # 9477. Accessed on May 5, 2004, from http://www.icpsr.umich.edu/NACJD/archive.html.

National Institute of Justice [NIJ] 1995. Data Collection Instrument for Part 2 Survey, 1995, and Gun Addendum, 1995. ICPSR Study # 9477. Accessed on May 5, 2004, from http://www.icpsr.umich.edu/NACJD/archive.html.

National Institute of Justice [NIJ] 2001. Arrestee Drug Abuse Monitoring (ADAM) Program in the United States, 2000, Part 1: Adult male arrestee data, codebook and data collection

instrument. ICPSR Study # 3270. Accessed on May 5, 2004, from http://www.icpsr.umich.edu/NACJD/archive.html.

National Institute of Justice [NIJ] 2004. NIJ provides further information on ADAM Program decision. Accessed on May 5, 2004, from www.ojp.usdoj.gov/nij/pdf/adam_letter.pdf.

Office of National Drug Control Policy [ONDCP]. 2001. What America's users spend on illegal drugs 1988-2000. NCJ-192334. White House, Washington, DC.

Office of National Drug Control Policy [ONDCP]. 2003. National Drug Control Strategy. NCJ-198157. White House, Washington, DC.

Taylor, B.G., Costa, M., 2003. Drug markets. In: Arrestee Drug Abuse Monitoring (ADAM), 2000 Arrestee Drug Abuse Monitor: Annual report. NCJ 193013. National Institutes of Justice, Washington, DC. pp. 59-91.

Table 1
Composition of the ADAM-Manhattan 1998-99 and 2000-02 arrestee samples

	1998-99	2000-02		1998-99	2000-02
Demographics			*Top arrest charge*		
Male	80%	80%	Drug possession	21%	25%**
Female	20%	20%	Drug sales	9%	9%
			Property index[d]	13%	13%
Black	58%	55%	Violent index[e]	15%	7%**
Hispanic[a]	26%	30%**	Other[f]	42%	46%
White	13%	10%**			
Other/missing	3%	5%	*Any illicit drug use in past 30 days*		
			Yes	76%	66%**
<21	14%	15%	No	24%	34%**
21-29	23%	26%**			
30-39	37%	32%**	*Drug-user type (among users)*		
40+	26%	27%	Marijuana-only	34%	44%**
Mean age	33 yrs	33 yrs	Powder-cocaine-only	12%	8%**
			Crack	29%	25%**
Status attainment			Heroin	8%	9%
No H.S. degree	36%	38%	Heroin+powder cocaine	5%	5%
H.S. degree	61%	62%	Heroin+crack	11%	9%
Single[b]	87%	84%**	*Frequency of drug use(among users)*		
Married[c]	13%	16%**	1 of past 30 days	4%	5%
			2-4 of past 30 days	10%	13%
Employed full-time	31%	33%	5-12 of past 30 days	20%	18%
Employed part-time	11%	12%	13-27 of past 30 days	17%	21%**
Not employed	58%	56%	28-30 of past 30 days	48%	43%**
			Mean frequency	20 days	19 days

**ANOVA test of the difference between 1998-99 and 2000-02 datasets statistically significant at the α=.01.

[a]Starting in 2000, ADAM asked separate questions regarding race and ethnicity. Arrestees that reported Hispanic ethnicity were coded as Hispanic irrespective of their reported race.

[b]Includes separated, widowed and divorced respondents.

[c]Includes common law marriages.

[d]The FBI (2002) identifies burglary, auto theft, arson, and grand larceny as property index offenses. This estimate includes both grand and petit because the ADAM program charge codes do not distinguish between the two.

[e]The FBI (2002) identifies murder, rape, aggravated assault and robbery as violent index offenses.

[f]The other arrest charge category includes primarily less serious offenses. The most common other offenses were trespassing, farebeating, and disturbing the peace.

Table 2
Prevalence of cash and non-cash purchases among arrestees that obtained drugs, ADAM-Manhattan arrestees 2000-02

	Marijuana	Powder Cocaine	Crack	Heroin	Any Drug
% of sample that obtained	46%	15%	24%	15%	67%
Among obtainers					
Cash only	66%	74%	78%	81%	69%[a]
Cash + Non-cash[b]	18%	14%	17%	13%	22%
Non-cash only	16%	12%	5%	6%	8%

[a]Paid cash-only for all drugs purchased in past 30 days.

[b]Includes cash-combo purchases

Table 3
Frequency and typical price of various purchase units, ADAM-Manhattan arrestees 2000-02

	Marijuana		Powder Cocaine		Crack		Heroin	
	Pct[a]	Price[b]	Pct[a]	Price[b]	Pct[a]	Price[b]	Pct[a]	Price[b]
Bag	75%	$10	37%	$10	54%	$10	88%	$10
Nickel bag[c]	2%	$5	1%	$5	2%	$5	- -	- -
Dime bag[c]	3%	$10	1%	$10	7%	$10	2%	$10
$20 bag[c]	1%	$20	1%	$20	- -	- -	- -	- -
Eight ball[d]	- -	- -	1%	- -[g]	- -	- -	- -	- -
Bundle[e]	- -	- -	- -	- -	- -	- -	2%	- -[g]
Vial	- -	- -	1%	- -[g]	9%	$5	- -	- -
Capsule	1%	- -[g]	- -	- -	1%	$5	- -	- -
Plastic container	1%	- -[g]	- -	- -	- -	- -	- -	- -
Foil packet	- -	- -	5%	$20	1%	$10	- -	- -
Gram	3%	$10	44%	$30	15%	$30	3%	$40
Ounce	8%	$100	1%	$300	1%	$125	- -	- -
Pound	1%	$600	- -	- -	- -	- -	- -	- -
Joint	2%	$3	- -	- -	- -	- -	- -	- -
Blunt[c]	2%	$10	- -	- -	- -	- -	- -	- -
Rock	- -	- -	1%	- -[g]	7%	$10	- -	- -
Line	- -	- -	1%	$8.5	- -	- -	1%	$10
Other/missing[f]	2%	- -	5%	- -	3%	- -	5%	- -

- - Less than 1% of cash purchases.

[a]Percent of all cash transactions by drug that involved this type of unit.

[b]Typical price per unit (usually the median) for transactions involving this type of unit.

[c]Category identified from answers recorded as “other (specify)” on the ADAM questionnaire.

[d]An eighth of an ounce or 3.5 grams.

[e]Ten dime bags.

[f]All categories that included less than 1% of cash purchases.

[g]No price was set since no one had a non-cash transaction with this type of unit.

Table 4
Covariates of drug expense (regression results),
ADAM-Manhattan arrestees 2000-02

	Anti-log of estimate (R^2 change)
Frequency of use	(41.5%)
1 of past 30 days[a]	1.0
2-4 of past 30 days	4.0
5-12 of past 30 days	11.7
13-27 of past 30 days	38.9
28-30 of past 30 days	76.0
Drug-User Type	(5.7%)
Marijuana-only[a]	1.0
Powder-cocaine-only	2.3
Crack	3.1
Heroin	1.8
Heroin+powder cocaine	3.3
Heroin+crack	4.2
Age	(0.4%)
<21[a]	1.0
21-29	1.2
30-39	1.4
40+	1.1
Constant	$6.9
R^2	.59

Variables presented were significant at the α=.01 level.

The variations associated with heroin injection, race/ethnicity, gender, interview year and arrest charge were not statistically significant.

[a]Reference category

Table 5
Variation in drug expense by drug-user type and frequency of use, ADAM-Manhattan arrestees 2000-02

	Marijuana-only	Powder-cocaine-only	Crack	Heroin	Heroin+ powder cocaine	Heroin+ crack
% of sample	29%	5%	17%	6%	3%	6%
			Median drug expense by drug-user type			
Past year[a]	$1,825	$4,807	$7,300	$7,300	$13,523	$18,145
Past 30 days	$150	$395	$600	$600	$1,111	$1,491
Per day of use	$10	$31	$40	$30	$58	$64
			Frequency of use by drug-user type			
1 days	7%	7%	3%	8%	1%	1%
2-4 days	13%	19%	16%	6%	10%	7%
5-12 days	20%	20%	18%	17%	12%	11%
13-27 days	21%	26%	24%	18%	16%	21%
28-30 days	40%	29%	39%	51%	60%	61%
			Median drug expense per day of use			
1 days	$5	- -	- -	- -	- -	- -
2-4 days	$10	$24	$25	- -	- -	- -
5-12 days	$10	$31	$24	$20	- -	- -
13-27 days	$10	$40	$55	$36	- -	$68
28-30 days	$20	$36	$44	$40	$74	$63

- -Cells representing fewer than 25 respondents not shown.

[a]Drug expense past 30 days × 365/30.

Table 6
Cash drug expense as a function of drug-user type and frequency of use,
ADAM-Manhattan arrestees 1998-99 and 2000-02

	Marijuana-only	Powder-cocaine-only	Crack	Heroin	Heroin+ powder cocaine	Heroin+ crack
	ADAM-Manhattan 1998-99: Median cash drug expense by drug-user type					
Past year[a]	$1,217	$1,825	$3,650	$3,650	$6,083	$6,083
Past 30 days	$100	$150	$300	$300	$500	$500
Per day of use	$5	$14	$17	$15	$25	$22
Frequency of use	*ADAM-Manhattan 1998-99: Median cash drug expense per day*					
1 days	- -	- -	- -	- -	- -	- -
2-4 days	$6	$25	$17	- -	- -	- -
5-12 days	$5	$15	$14	- -	- -	- -
13-27 days	$5	$13	$17	- -	- -	$15
28-30 days	$3	$8	$17	$17	$26	$27
	ADAM-Manhattan 2000-02: Median cash drug expense by drug-user type					
Past year[a]	$2,190	$4,745	$7,300	$7,300	$14,575	$17,338
Past 30 days	$180	$390	$600	$600	$1,198	$1,425
Per day of use	$10	$32	$40	$30	$60	$61
Frequency of use	*ADAM-Manhattan 2000-02: Median cash drug expense per day*					
1 days	- -	- -	- -	- -	- -	- -
2-4 days	$10	$20	$25	- -	- -	- -
5-12 days	$10	$30	$24	$20	- -	- -
13-27 days	$10	$53	$51	$36	- -	$67
28-30 days	$20	$35	$42	$40	$75	$57

- -Cells representing fewer than 25 respondents not shown.

[a]Cash drug expense past 30 days × 365/30.

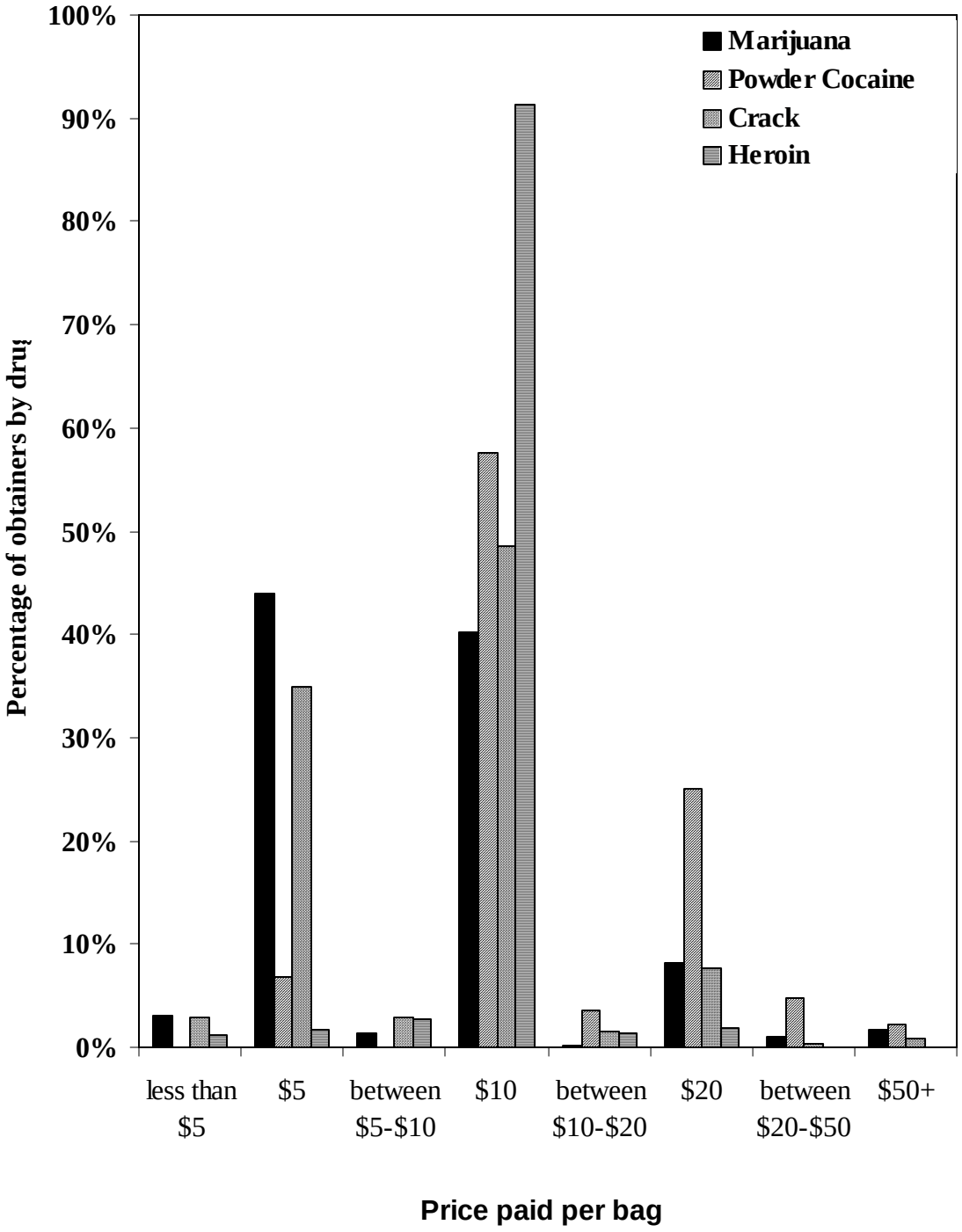

Figure 1:
Variation in price paid per bag of drugs

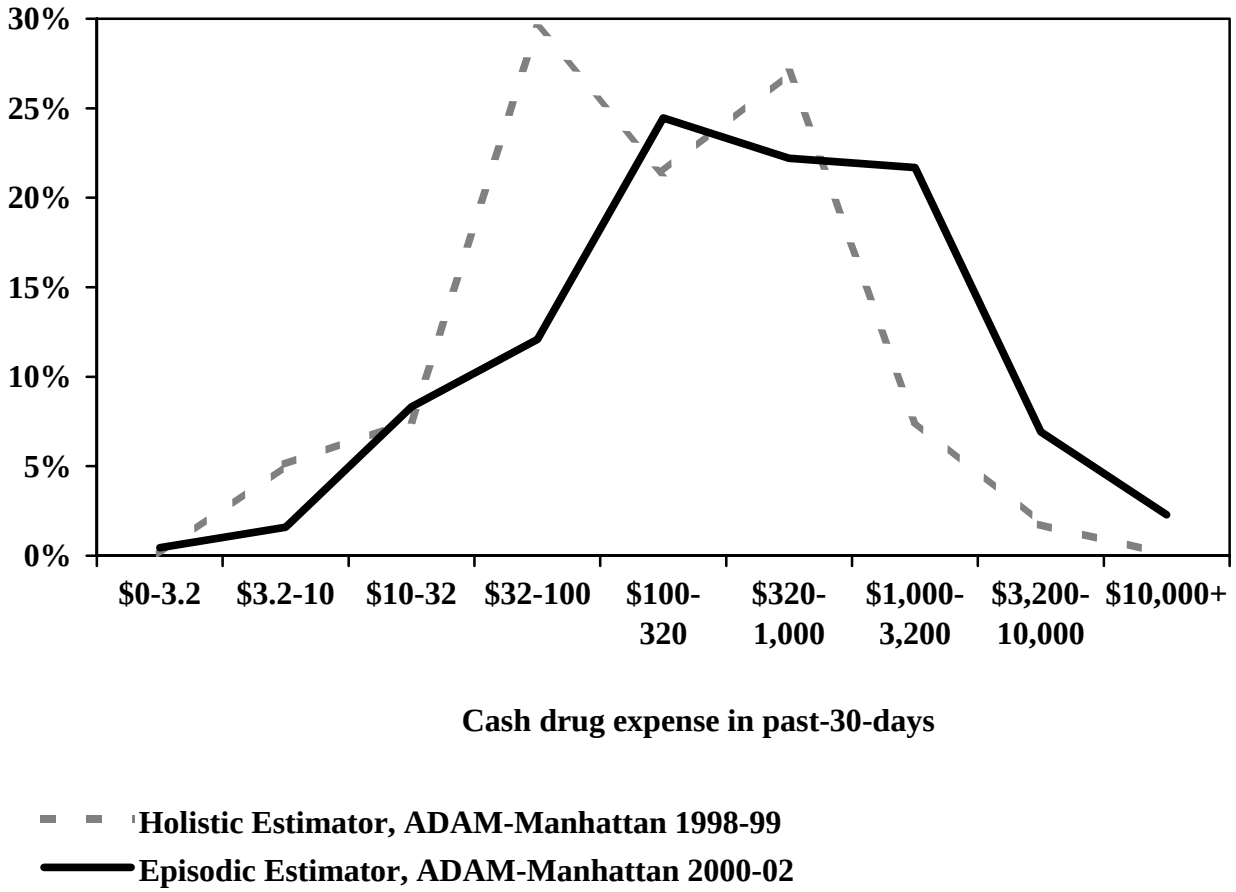

Figure 2
A comparison of the distribution of cash drug expenses estimated using holistic estimator (ADAM-Manhattan 1998-99 data) and episodic estimator (ADAM-Manhattan 2000-02 data)