The Potential for Accurately Measuring Behavioral and Economic Dimensions of Consumption, Prices, and Markets for Illegal Drugs

Bruce D. Johnson and
Bruce D. Johnson, National Development and Research Institutes, Inc. 71 West 23rd Street, 8th Floor, New York, NY 10010, Tel.: 1-212-845-4500, fax: 1-917-438-0894, e-mail: bruce.johnson@ndri.org

Andrew Golub
Andrew Golub, National Development and Research Institutes, Inc. 47 Prospect Parkway, Burlington, VT 05401, Tel.: 1-802-862-6717, fax: 1-917-438-0894, e-mail: andrewgolub@verizon.net

Abstract

There are numerous analytic and methodological limitations to current measures of drug market activity. This paper explores the structure of markets and individual user behavior to provide an integrated understanding of *behavioral* and *economic (and market)* aspects of illegal drug use with an aim toward developing improved procedures for measurement. This involves understanding the social processes that structure illegal distribution networks and drug users' interactions with them. These networks are where and how social behaviors, prices, and markets for illegal drugs intersect. Our focus is upon getting an up close measurement of these activities. Building better measures of consumption behaviors necessitates building better rapport with subjects than typically achieved with one-time surveys in order to overcome withholding and underreporting and to get a comprehensive understanding of the processes involved. This can be achieved through repeated interviews and observations of behaviors. This paper also describes analytic advances that could be adopted to direct this inquiry including behavioral templates, and insights into the economic valuation of labor inputs and cash expenditures for various illegal drugs. Additionally, the paper makes recommendations to funding organizations for developing the mechanisms that would support behavioral scientists to weigh specimens and to collect small samples for laboratory analysis—by providing protection from the potential for arrest. The primary focus is upon U.S. markets. The implications for other countries are discussed.

1. Introduction

This article provides relevant analytic and methodological approaches to more accurately measure the amounts of illegal drug(s) consumed, as well as prices and market activities associated with such consumption. In a major review of all national-level U.S. surveys and information systems, the U.S. National Research Council (NRC, 2001) delineated many limitations of existing data collection programs. This article will highlight two of their recommendations that remain central to an improved scientific understanding about the operation of illegal drug markets and regular users' relationships to them. As stated in the report:

Existing surveys of drug use collect information on frequencies of use, but not on the quantity of drugs users consume. The absence of information on drug consumption leaves a major gap in the nation's ability to monitor the dimensions of drug problems. Data on drug consumption are essential to understanding the operation of drug markets; the dynamics of initiation, intensification, and desistance; the response of drug use to changes in prices; and the public health and economic consequences of drug use. **The committee recommends that work be started to develop methods for acquiring consumption data** [emphasis in original]. The committee acknowledges that obtaining accurate consumption data may present problems that can not be easily solved. Accurate quantity information cannot be elicited directly if drug consumers do not have quantitative knowledge of the weight and purity of the drugs bought on any given purchase occasion. The committee could not find systematic research on the subject. (NRC, 2001: 86).

The committee is unaware of any effort that is underway in the federal government or elsewhere to develop methods for collecting price data on illegal drugs. **The committee recommends that work be started to develop methods for improving data and acquiring more reliable drug price data** [emphasis in original]**....** It may be possible to carry out a survey in which … [subjects] are asked the price of their last drug purchase (if any), the date of the purchase, the name of the drug, and the quantity purchased. As in ADAM [Arrestee Drug Abuse Monitoring], the quantity would be specified in informal terms such as bags, vials, lines, etc. Alternatively, randomly sampled individuals could be asked to keep diary records of their purchases over some period of time. The survey would be designed to reach high-risk groups such as homeless people as well as those currently reached by surveys such as the NHSDA [National Household Survey on Drug Abuse]. (NRC, 2001: 111).

These concerns were echoed at a National Institute on Drug Abuse (NIDA)-sponsored conference in October (NIDA, 2004). Leading U.S. scientists from many disciplines presented over two dozen papers regarding various behavioral and economic models that could potentially improve data quality with the intent of improving policies aimed at drug abuse control. In summarizing the available research to date, the presenters consistently noted the many difficulties associated with careful measurement of consumption and price/market information—the same issues noted by NRC (2001). Some of these issues related to lack of methodology and others to lack of data sources in the U.S. This article is organized to provide analytical guidance about how the NRC (2001) recommendations could be implemented in a future program of research to develop improved measurement of illegal drug consumption, prices, and markets. Near the end, the paper notes how the criminalization of drugs in the U.S. and the policies of federal/state agencies have erected a multitude of barriers that prevent systematic research on the amounts and concentrations of illegal drugs being consumed by illegal drug users. The substantial barrier of costs of testing for quantitative amounts of illegal drugs will also be addressed.

The discussion reviews a complex scientific literature about issues that are only occasionally addressed and remain poorly understood regarding the reciprocal relationships among behaviors (primarily drug consumption), economics (prices paid), and markets for illegal drugs. Most of this literature relates to drug use in the U.S. However, many of the market structure features and research procedures for their analysis are probably relevant to understanding illegal drug markets in other countries, especially most western democracies. The authors suggest how to develop an integrated understanding of *behavioral* aspects and *economic (and market)* aspects associated with illegal drug use. The *behavioral* aspects include consumption activity, purchase experiences, the different jobs, activities and crimes (including involvement with drug sales and distribution) which generate funds for obtaining drugs. The *economic* aspects include monetary valuations and market exchanges such as purchase price

(s) of illegal drugs, the dollar values of such drugs, an understanding of illegal markets, and labor inputs that are valued in dollars associated with procuring illegal drugs. The analytic focus will consistently attempt to relate the behavioral aspects to the economic aspects.

Since much remains unknown, this article seeks to advance the methodology for understanding the social processes behind these phenomena (behaviors, economics, and markets). What are the social processes that affect the quantities actually consumed by regular users of heroin, crack, or marijuana in various time windows? How much money, labor inputs, and economic value is involved? And how much of which activities and behaviors support such use? The subsequent sections of this paper outline the general structure of U.S. drug markets, examine the challenges to measuring individual consumption behavior and the challenges to measuring economic variables. Afterwards, the paper describes how these measurement challenges could be overcome by a comprehensive research agenda using extended ethnographic observation.

The insights and recommendations presented draw upon the authors' extensive experience analyzing the social structure of drug phenomena (mostly in the U.S. and especially in New York City). The authors have led several extended research projects examining the natural history of major drug eras in the New York City (NYC) metropolitan area including expansion of the Marijuana Era in the 1960s and 1970s (Johnson, 1973), Heroin Injection (Johnson et al., 1985;Johnson and Golub, 2002), Crack (Johnson et al., 1995), Crack distribution (Johnson et al., 2000), and recently Marijuana/Blunts (Golub, 2005;Golub and Johnson, 2006a,b;Golub et al., 2004,Ream et al., 2006;Sifaneck et al., 2006). They have recruited a wide variety drug users and identified drug abuse patterns among arrestees and criminals (Golub and Johnson, 1997, 1999,2001,2004,2005,2006b;Johnson et al., 2006b), impacts of policing upon arrestees (Golub et al., 2003,2004), an analysis of new drug detection technologies (Liberty et al., 2004), estimating hard drug users and sellers (Davis and Johnson, 2000;Davis et al., 2003), an in-depth analysis of violence among crack abuser households (Dunlap et al., 1996;Dunlap et al., 2003a,b), and other projects. A variety of research projects have documented similar patterns of illegal distribution in other societies, including Britain (Parker 2000), Italy (Ruggiero 2000), and other western countries (Natarajan and Hough 2000).

2. Illegal Drug Markets

Drug users must obtain supplies from the endpoints of complex illegal distribution networks (see Johnson, 2003). As social processes, illegal distribution networks are where and how social *behaviors, prices, and markets* for illegal drugs intersect. Accordingly, these markets are often where police target both buyers and sellers for arrest and criminal sanctions. This section presents an outline of the role structure of illegal drug distribution networks and then describes how typical purchasers interact with these networks.

Table 1 presents the general structure of drug markets. Variations will exist across drugs, over time, and across distribution groups, but this figure is generally accurate for the U.S. and provides a basis for this analysis which is primarily interested in the lowest levels of this structure (Johnson et al., 1990;Johnson et al., 2000). This hierarchy can be subdivided at various alternative points. The manufacturing end (growers and manufacturers) can be distinguished from the wholesale business level (traffickers and dealers) and the retail business level (sellers and low-level distributors).

2.1 U.S. drug markets

For imported drugs, the dealers represent the entry point into U.S. markets. Table 1 delineates the four levels of domestic distributors. *Upper-level distributors* (or traffickers) often import cocaine/heroin from producer countries, purchase and/or sell multiple kilograms of cocaine. This level also includes distributors of U.S. grown marijuana. They oversee the financing,

smuggling, and transport of these drugs, rarely "handling," "possessing" or "transacting in" the drugs they own. These upper-level distributors develop and maintain transnational networks of persons who conduct importation and distribution of wholesale quantities, and are labeled as organized criminal groups (MacCoun and Reuter, 2001). The next level of *dealers* routinely purchase large "wholesale" level units of crack, cocaine, or heroin (e.g. kilograms of cocaine or heroin), by weight or by dollar amounts (Curtis and Wendel 2000). *Retail sellers* are the equivalent of clerks in stores. They facilitate the transactions whereby the final retail consumer receives drugs in exchange for money (almost always cash). They are the generally lowest level in the distribution chain responsible for both money and drugs. However, they often employ a wide range of *low-level distributors* to handle either the delivery of drugs or the collection of money. Low-level distributors engage in a loose assortment of roles in which they are responsible for drugs or money, but not both including "holders," "transporters," "mules," "deliverers," "counters," "lookouts," and "backups," (Johnson et al., 1985,Davis et al. 2005a).

In the U.S., the markets and distribution networks differ substantially across drugs. This is because each illegal commodity has its own unique history of cultivation/production, has a complex set of exchanges before reaching the ultimate consumer, has a distinctive base of intermittent and regular consumers, and a varied set of distributors. There is extensive evidence that most persons engaged in distribution of illegal drugs involve relatively few participants who may change, and frequently dissolve or reform with several new members. Few highly organized distribution organizations have been identified as having a substantial share of the market for any illegal substance; moreover, U.S. law enforcement systematically seeks out and dismantles those organizations it can identify. While some individuals may both use and/or sell a variety of substances, their behaviors will have little influence on the local markets for each drug. This also means that a government policy which is effective at disrupting supplies for one market (say heroin), may have little or no impact upon the market for another commodity (say marijuana or ecstasy).

2.2 Retail sales

Typical consumers of a given illegal drug must have sufficient money—usually cash—to make their purchase. In addition, those seeking to make a purchase of illegal drugs must also accomplish a set of role performances designed to conceal the illegal transaction from police or other nonusers. This may involve the correct use of local argot (Johnson et al., 2006a). The potential buyer must work thru distribution networks to locate a potential seller and will often have to make the purchase thru a lower level distributor functioning as a go-between so that buyer and seller never meet. As a result, a buyer may expend a considerable amount of time either searching or subsequently waiting before the transaction is completed. Purchases of marijuana, the most widely used illegal drug among middle income persons, are often easily arranged from delivery services (Curtis et al., 2002; Sifaneck et al., this volume)—this is true in both wealthy areas (such as lower Manhattan) and in poor communities (Harlem). But delivery services have a minimum purchase per delivery that is often about twice as high as the lowest standard retail price (e.g. a dime bag will cost $20 or more when delivered). In short, completing an illegal drug transaction can be potentially time consuming and difficult—in addition to being expensive, especially for the novice.

The clear distinction between buyers and sellers evident in legal markets is often less clear in illegal markets. Many consumers engage in selling or assist in selling the illegal drugs they wish to consume (Davis et al., 2005a,b). Almost all distributors also consume illegal drugs (although some sell drugs they do not consume regularly). Many distributors of heroin and crack primarily provide their labor and skills in exchange for the drugs they consume (Johnson et al., 1985). Often they receive no cash payments, but consume a portion of the drug(s) they

are to sell. Proportionately very few *nonusers* of illegal drugs ever engage in illegal sales or transfers of drugs (see Johnson et al., 2000;Johnson et al., 2006).

3. Consumption Behaviors

Historically, consumption behavior has been difficult to accurately measure. Survey research typically asks respondents to retrospectively recall their behaviors over the past 30 days, or even longer. Data obtained in this manner may be quite inaccurate and likely does not capture the day-today variability in actual consumption of illegal drugs. Research suggests that people may forget days that they did not use illegal drugs, or overemphasize the days that they use three or four times, whereas the more typical pattern is one or two consumption episodes a day (Johnson et al., 1985;Taylor and Costa, 2003). The consumer marketing literature suggests that the accuracy of these types of retrospective estimates of frequency or amount consumed over a period of time can vary widely (Blair and Burton, 1987;Golub and Johnson, 2004;Menon, 1993;Menon et al., 1995). In contrast, recall of more recent events such as those occurring on the previous day or even the past week, may be more accurately recalled. This section discusses a range of obstacles to measuring individual drug consumption including disclosure, and the need to understand how consumption varies with frequency of use and with drug–related behavioral activities.

3.1 Measuring use

In addition to recall problems, drug users may not fully disclose, underestimate, or misreport their consumption of illegal drugs in one-time surveys. A very large literature documents that users of illegal drugs commonly withhold information about actual and recent use of different substances (for reviews see Harrison, 1997;Magura and Kang, 1996, and Golub et al., 2005a,b). A central finding emerged from across several studies, only about half of the people detected by biological measures (usually urinalysis) as having metabolites of cocaine or heroin actually disclose that they have used the substance in the past two or three days (the window of detection).

Beyond failing to report, respondents can also understate or underestimate how much they are actually using (Golub et al., 2002;Johnson et al., 2006a). Or due to memory lapses, they can provide inaccurate reports about their consumption behavior. Improved strategies for getting details about actual consumption episodes during different days by the same person appears to be necessary to improve future measurement of illegal drug use.

3.2 Measuring frequency of use

A major finding of survey research is that the more frequently and regularly people use illegal substances, the more they consume across a typical year. Although a minority among users of any given drug, daily and multi-daily drug users probably consume most of the supply (Johnson et al., 1985,Golub and Johnson, 2004). Everingham and Rydell (1994) estimated that with the maturing of crack markets in the 1990s, heavy users were consuming most of the cocaine being sold in this country. The U.S. Office of National Drug Control Policy (ONDCP) (2001) estimated that chronic users (who used 13 of the past 30 days) consumed 85% of all the cocaine purchased in the U.S. in 2000. Although not well measured by existing instruments (NRC, 2001), the most frequent users may also be able to consume larger quantities during their use episodes.

Weekly but especially daily drug users consume larger quantities of illegal drugs and spend more on them than less frequent users, especially if they use cocaine or heroin. Golub and Johnson (2004) calculated the drug expense of ADAM-Manhattan arrestees interviewed 2000– 02 using the detailed drug market information introduced in the ADAM questionnaire in 2000.

Drug expense varied substantially across drugs used and frequency of use. Infrequent marijuana users spent as little as $5 per day of use (median values). Daily marijuana users spent four times as much ($20) on each day of use. Respondents that used both heroin and crack spent about $65 per day of use; most of these respondents reported use nearly every day. These differences added up. The median marijuana-only user spent $2,190 per year as opposed to the $15,000 spent by heroin and crack users on a range of drugs. These rates were somewhat higher than estimates for the nation calculated by ONDCP (2001). However, the differences across type of drug use were consistent between the studies.

Regular users exhibit considerable variability in their consumption of illegal drugs across episodes, on a daily basis, and over a week or month. A key theme that is a widely overlooked by current surveys is the wide variability by which persons use or do not use illegal drugs (Johnson et al., 1985). Many near daily users report days without the use of their preferred drug. Obtaining details about days of nonuse among regular users, whether and how they avoid symptoms of dependency, why they do not use, and the importance of their nonuse days are an important subtopic for future study. In addition, even on days when they consume drugs, considerable variability exists about the number of different use episodes per day, and even the episodes themselves are quite variable. Even though the typical consumption units (e.g. dime bag) appear to be the same, the drugs used may change or the source of income used to purchase it, as well as the associations the subject has with other users and sellers may be highly variable.

To the extent that heroin, cocaine, and marijuana use can result in dependence and continued reuse, those highly dependent may use these substances multiple times a day on most days of the month—they become a major focus for public policy. Such multi-daily users may engage in frequent criminal activities and expend much of their criminal and legal income on their preferred illegal substance.

Because so few persons in national surveys are multiple daily users, however, good measures of the quantities they consume are poorly measured (Golub and Johnson, 2002;Wright et al., 1997).

3.3 Measuring drug-related behavioral activities

Substantial variability in consumption patterns within and across subjects is likely due in large measure to their behavioral activities, which are rarely measured or considered. Current methodology for asking survey questions effectively ignores such variation. However, such variability may be quite significant in the lives of individual drug users. Likewise, reports of how they earn money from crime or legal work, and from day-to-day, and across a month may also be highly variable. A given criminal episode may produce a large income one day and so result in purchase and use of several consumption units that day; yet the same type of criminal episode the next day may generate less income, and support much lower consumption. Measuring and understanding the variability in income generating episodes and consumption episodes could provide a greatly improved understanding of how many units were consumed and how much income was needed to generate that consumption. A related difficulty is that drug users often pool their money to purchase drugs and then subsequently share drugs, so that the quantity being consumed by an individual, in both dollars and quantity, needs very careful reporting and analysis.

One way of studying these complex interconnected activities is by creating behavioral templates based on extended observations and in-depth interviews. Individuals effectively develop typical patterns in support of their consumption and expenditures for illegal drugs, as well as their dependence on the drug, network of associates, and other subcultural influences. Brantingham and Brantingham (1984) introduced the concept of *templates* into the criminology

literature to understand the similarity of these patterns across criminal events committed by a person and across different persons.

Templates were conceptualized as a repertory of behaviors that were repeatedly enacted to complete a crime event. For example, a subject might have a *shoplifting* crime template, where he goes to various stores, steals certain types of products, generally avoids detection, has a steady group of customers who will buy stolen merchandise—these are all behaviors that create economic value—that is, the cash with which to buy heroin (see Johnson et al., 1993). Moreover, a given subject's consumption template may include locating his same dealer, making the purchase, and finding a quiet place to consume the drug by himself. For many crack and heroin users, such an individual crime template, followed by the consumption episode may be their most typical pattern. But many other subjects and many other crime and consumption episodes by a given individual may be considerably more complex. The rich nature of these templates, and the extent to which they are repeated (or not) day after day and week after week, will be important to document in future research.

Most prior economic researchers (see NRC, 2001) have primarily estimated the amounts of cash (monetary amounts) paid for illegal drugs. Yet extensive ethnographic research indicates that many persons end up consuming illegal drugs for which they have not provided money, although an expectation of subsequent reciprocity generally holds. For example, Dunlap et al. (2005) found that blunts or joints filled with marijuana are regularly shared by those present but that persons who regularly avoid paying money get labeled freeloaders or moochers and are often excluded from subsequent group sharing episodes (Johnson et al., 2006c). On the other hand, Caulkins and Pacula (2006) found that more than half of all marijuana users— especially less frequent users—across the U.S. obtain their marijuana for free, typically from friends.

4. Measuring Economic Variables

4.1 Measuring drug price

Due to illegality and active law enforcement, illegal drug markets are organized quite differently from legal markets for commodities (such as coffee) (Reuter, 2000). Variable unit pricing (prices expressed in dollars and cents--e.g. $1.25 for coffee—with a range of prices for different grades or brands of a similar product) is rare in illegal markets. Rather illegal retail units are typically sold at a currency unit (a $10 or $20 bill)—but the quantity and quality of the product is unknown and variable. In New York City, the dime ($10) bag is the common lowest priced retail unit generally available for heroin and crack, and is very common for marijuana (Golub and Johnson, 2004;Johnson et al., 2006a,b; Sifaneck et al., in press). In the 2000s, the bag (see-thru Ziploc baggies) has replaced the vial (Johnson et al., 1990) as the most common packaging for crack. Each drug has its own shifting subcultures and institutional structures associated with use, purchase, drug market organization, importation, and production. As a result, the going price of a relatively pure gram of heroin is substantially higher than a gram of cocaine, which is higher than a gram of marijuana; other illegal commodities (e.g., methamphetamine, ecstasy) have their own unique price and consumer base.

4.2 Measuring quantity and purity

While importers and wholesale dealers (Table 1) may use scales to weigh their product, most retail sellers often do not know the precise quantity of the substances they receive from wholesalers. At the street level, neither buyer nor seller has precise measurements of the quantity or potency of a drug. The retail seller may know how many times they cut (with diluents) the heroin or cocaine. But the resulting mixtures in retail unit bags contain unknown

weights and purity levels. The typical purchaser is even less likely to know precisely how much product is in their retail purchase or to weigh it. Indeed, most buyers and sellers do not think about the amounts in scientific terms (e.g. weight in milligrams of pure heroin or crack; grams of marijuana). Rather, a wide variety of argot terms such as *dynamite*, *average*, or *garbage* are used to describe the quality of street drugs purchased often based directly on the quality of the high obtained (Johnson et al., 2006a,b; Sifaneck et al., in press). In short, the quantitative amounts contained in illegal drugs, remains one of the most poorly documented and rarely measured phenomenon in illegal drug markets (NRC, 2001). Until substantial progress is made to improve the measurement of weights and purity/potency of the illegal specimens, progress in measuring quantities, prices, and consumption of illegal drugs will be seriously restrained.

The U.S. government currently attempts to track the price and purity of drugs based on drugs seized in the course of law enforcement under the System to Retrieve Drug Evidence (STRIDE) program. This program is subject to a wide variety of biases due to the unsystematic nature of data collection (Horowitz, 2001;NRC, 2001). Using STRIDE data, Caulkins and Reuter (1998) found evidence of important reductions in the price for pure grams of cocaine and heroin occurred in the 1980s and 1990s. Apparently, the quality of illegal drugs in standard retail units in New York City and elsewhere had increased because retail unit costs have not shifted substantially.

The price—or alternatively purity—of drugs can vary widely across purchasers depending on the strength of a drug user's connection into the distribution network. Buyers cannot go to a legitimate store or other retail establishment to make their purchases. A buyer unknown to local sellers will often have difficulty making a purchase, as sellers will be reluctant and suspicious that the person might be an undercover police officer. In many cases, the buyer will often need to pay a middleman to purchase and return drugs (Furst et al., 1999), and thus pays both the seller and a middleman for their efforts. Illegality and exclusion from licit markets means that an illegal seller may not have the specific drug (or quality) that the buyer wishes to purchase, so another substance (or poor quality product) may be offered. Buyers rarely have an opportunity to examine and compare among several products or brands before purchasing from a given distributor.

4.3 Measuring involvement in complex acquisition strategies

Strategies to understand the "prices" paid for illegal drugs must grapple with several major issues, especially "shared," "free," and "in-kind" drugs. Due to the high costs for small amounts of drugs, many users cannot raise enough cash to purchase illegal drugs and sometimes lack adequate connections with sellers. Individuals with less money collaborate ("go in on") with others to make a substantial purchase, but these contributors also share the drug, even when there's not enough to satisfy any of the participants. Prior ethnographic experience suggests that the pooling of money and sharing in the heroin and crack subcultures is usually limited to persons who contribute money toward the purchase—and many arguments occur over how much each participant actually consumes (Bourgois, 1998).

Many other issues make economic valuation of consumption and pricing difficult. People give gifts of drugs, steal them, borrow them, and find other ways of exchanging services (clothing, goods, sex) for drugs (ADAM, 2003;Johnson et al., 1985;Golub and Johnson, 2004). In these situations, the consumer has paid no money, but has obtained a real economic value roughly equivalent to the value of the illegal product consumed. The *economic value* of such consumption should be included in the overall consumption rate among the population being studied. While seldom done systematically, careful questioning of subjects during consumption protocols can yield relatively precise estimates of the proportion(s) of dollars they contributed to purchases, the approximate amounts they consumed personally, and the economic values of what they used "for free" (Golub and Johnson, 2004). Subjects can also be asked to estimate

quantities and dollar values of drugs used by co-purchasers and freeloaders during sessions where shared consumption occurred (Johnson et al., 2006a).

4.4 Measuring behavioral activities to support drug-related purchases

Illegal drug users often engage in behavioral activities such as drug distribution, crime, and other hustles to generate funds to purchase their drugs. An extensive literature documents that most poor (street-level) heroin and crack users will need to engage in some kind of illegal behaviors in order to obtain money with which to purchase their drug(s) of choice (Blumstein and Wallman, 2006;Inciardi and McElrath, 2004;Johnson et al., 1985,1993). They engage in criminal activities such as shoplifting, burglary, and then must sell the stolen merchandise in order to obtain funds to purchase drugs. Of course, persons with higher education and especially those with steady employment may have legal income available that may be sufficient to cover the expense of their consumption.

Drug users often contribute labor and other non-monetary inputs to their habits. These factors need to be considered to understand the fuller cost of a drug habit. The use of behavioral templates (see Section 3.3) can provide a narrative resource that identifies the nature of these economic elements. The labor inputs associated with obtaining and using illegal drugs could help develop improved economic valuations of crime, search, and consumption time. In addition to cash payments for illegal drugs, many persons must invest considerable time and mental effort to generate the cash from which the purchase will be made. Specifically, the length of time needed to locate and complete a criminal event constitutes a substantial labor activity. The economic value of such "labor inputs" can be measured in time units (hours and minutes) and possibly multiplied by a person's estimated hourly wage rate, representing an opportunity cost. Three different forms of labor inputs could be distinguished: "Crime inputs"-- Economic values (measured by the duration in time) associated with planning, seeking, committing a criminal episode, and the sale of stolen merchandise. "Wait/search inputs"— economic values associated with locating a seller and completing a sales transaction; this also includes "waiting" for a delivery service to come to the location of the retail sale. "Consumption values"—economic values associated with the planning, organizing, and duration of the consumption episode as well as the time spent consuming and feeling the effects of the drug. Researchers would need to develop careful definitions of the beginning and ending times of these three values, allow for considerable overlap, and review carefully the accounts provided by subjects. Researchers would also need to grapple with technical details to avoid double counting costs since many of these inputs have an implicit economic value based on the cash or goods received. Additionally, researchers would need to make distinctions between activities that qualify as an economic input as opposed to those more appropriately designated as leisure.

5. Overcoming Obstacles—Towards Better Measurement

5.1 The potential for ethnography

This section describes what could be achieved with extended ethnographic observation. A fundamental building block for improving measurement of actual consumption, behaviors, and economics is to develop strong rapport with subjects who regularly use the illegal drug(s) of interest. A one-time interview and completion of a standard survey protocol help initiate a process of building rapport and trust with subjects—but does not secure the types of cooperation needed to obtain the detailed behavioral and economic information sought. Repeated contacts with a given subject are essential for building trust and rapport with drug-using subjects; interviews on a regular basis provides more accurate self-reports, captures daily and weekly variability, and helps overcome the limitations associated with memory fade and disclosure. A central lesson from ethnographic research among users of illegal drug is that they rarely provide full, honest, or complete information at an initial interview (Dunlap and Johnson,

1999;Dunlap et al., 1990). Rather, subjects tend to underreport or to provide (from the scientist's point of view) imprecise answers about what they actually do. During subsequent interviews, as rapport with the subject builds, their trust in the interviewer's neutrality rises, research goals become clearer, and research participation becomes a more enjoyable activity. The subject begins to disclose more information, including what had been withheld earlier, as well as provide more precise details about what they do, how they do it, how much they do, why they do it (or not), and whom they do it with.

Only over time and after strong rapport and trust have been established will most subjects give detailed answers to questions about behaviors and economic activities, and permit the constant probing for more details and precise amounts involved. Subjects will often also permit an observer (the ethnographer) to accompany them on daily activities so that illegal market transactions may be directly observed (Beckett et al., 2006;Bourgois, 1998). These direct observations can help validate information reported in interviews on other occasions. Repeated observations and interviews—especially on a weekly or monthly basis—can be especially valuable for obtaining details about the number of consumption episodes, the amount consumed (in street units), prices paid, amounts shared, and behaviors (crime and/or income generating activities) related to illegal drug consumption events. Many illegal drug users will routinely report to a local storefront and provide the requested data in exchange for modest incentives (Johnson and Lipton, 1980;Beschner and Akins, 1980). Such repeated interviews with the same subject are especially helpful to document the variations in crime and illegal drug consumption templates, as well as the amounts of income generated from specific crime episodes, and choices made to expend given amounts on various licit (tobacco and alcohol) and illegal substances (heroin, crack, powder cocaine, marijuana, etc.). Such data would help document the extent of a person's dependency, and contrast their claimed use with concrete expenditures.

5.2 Challenges to weighing street samples

The absence of information in drug subcultures about the actual weights and purity of standard street retail units means that virtually all drug users would happily and eagerly let researchers weigh the drugs they purchase--if there were no fears of legal consequences (see Section 5.3). [1] These respondents would eagerly provide details about what they believed they had bought, the characteristics of the retail seller (or delivery person), the price(s) paid, and other details about specific transactions. A major reluctance expressed by street drug users is that compulsion makes them so eager to consume their recent purchase that they cannot wait until a researcher with a scale appears to weigh or sample their product. However, well trained ethnographers can locate and get marijuana users to wait until the products are weighed on a scale (see Sifaneck et al., in press; Harrison et al., in press).

5.3 Challenges to measuring purity of street samples

It would also be useful to get small samples of illegal drugs (say 10–30 mgs) to conduct laboratory tests for the presence of various drugs and common adulterants. Most behavioral researchers now obtain a Federal Certificate of Confidentiality (COC)—this guarantees the privacy of all information provided by research subjects; it also protects all research data from legal seizure and use by police, courts, and other administrative action. But the current COC does not clearly protect researchers nor research staff who possesses illegal drugs—even when those drugs have been obtained as part of an authorized research protocol. Thus, most

---

[1]Earlier, one legitimate company tested the weight and purities (and identified diluents and adulterants) of street drugs sent to them. In the 1970s, PharmChem provided fee-for-service testing of samples of illegal drugs that consumers paid them to analyze. The company ceased doing so when they became a major drug detection laboratory and depended mainly upon government and business contracts to test urine specimens.

researchers will not risk the slight possibility of arrest for illegal drug possession, for fear of harming their professional careers and reputations (and possibly destroying their opportunities to get future federal funding). The absence of protections for professional researchers or their staff to (legally) possess or transport illegal drugs effectively deters researchers and has prevented the collection of samples for quantitative and qualitative analysis for research purposes.[2]

While the DEA has procedures whereby authorized researchers can apply for special permission to obtain DEA-supplied heroin, cocaine, and marijuana for research purposes (to be conducted in tightly controlled laboratory experiment), the authors have never heard of any professional researcher(s) being authorized by DEA to obtain, legally possess, and/or transport illegal drugs—obtained by street purchase or sampling from user's supplies—for the research purposes envisioned herein. The vast majority of survey or ethnographic researchers would never even consider applying to the DEA or NIDA for such permission.

If NIDA and NIH seriously wish to address the NRC (2001) critique and to develop new technologies for more systematically measuring the quantities of illegal drugs consumed, as well as the price and purities of these substances, these agencies will need to develop special arrangements with the DEA that authorizes NIH/NIDA-funded researchers to obtain, sample, and transport illegal drugs obtained from sampled street drug users. Perhaps an interagency agreement somewhat similar to a COC could be negotiated by NIDA/NIH staff with DEA staff which specifically authorizes the Principal Investigator (and their research staff) to legally collect specimens (as described above) of illegal drugs and transport them to a laboratory for appropriate analysis. Until such authorization can be obtained, highly qualified investigators will never attempt to submit proposals for NIH review that would suggest collecting and analyzing specimens of illegal drugs.

5.4 The high cost of drug testing

A final obstacle is the sheer cost of testing. Many screening tests are both relatively accurate and inexpensive for detecting the "presence" of several illegal drugs in specimens. However, measuring the quantity and purity of a sample requires more expensive testing. The "gold standard" for quantitative analysis in forensic toxicology is Gas Chromatography/Mass Spectrometry (GCMS). Virtually all police and law enforcement laboratories have these devices—as do many university laboratories. But GCMS has three very major drawbacks: 1) Each run takes 15–30 minutes; identifying the presence of more than one drug as well as diluents can take multiple runs; 2) The complex machinery and interpretation of results necessitates hiring highly skilled staff (often with master's degree or higher) which adds to the cost; 3) The GCMS equipment and consumable supplies are very expensive. A GCMS run typically costs $30 to $100 or more.

In the future, special effort needs to be devoted to developing new technologies that can provide quantitative results about illegal drugs, and to also substantially reduce the costs per test. Moreover, new technologies do not need to provide the high degree of precision (usually expressed in nanograms per milliliter, ng/ml) provided by GCMS testing. Inexpensive (although less precise) procedures using GCMS have not yet gained widespread acceptance and are unlikely to substantially reduce the costs low enough to encourage frequent quantitative testing. One new technology uses Spectral Fluorescence Signatures (SFS) may eventually prove effective. A startup company, Nartest Technologies, has developed a device in which

---

[2]The Drug Enforcement Administration (DEA) does authorize its agents and many police officers to make such purchases and/or to transport illegal drugs to authorized locations (usually police property offices and/or state/city laboratories) for analysis. The STRIDE data is based upon such DEA purchases; the methodological shortcomings of their approach is well documented elsewhere (NRC, 2001; Caulkins. this volume; Pacula, this volume).

the technician inserts a very small amount of the illegal drug, a high intensity light is flashed at the specimen; the device makes multiple measurements of the reflected light which creates a unique and multidimensional profile and color combination—the specimen's molecular "signature—on a computer screen (Sominsky et al., 2006). This signature is compared with a large database of previously documented "known drug profiles," using a complex computerized algorithm to identify the closest match. This device can straightforwardly detect the presence of small amounts of most major drugs of abuse (cocaine, crack, marijuana, methamphetamine) as well as many common adulterants (e.g. lactose, other sugars, quinine, caffeine, procaine, pseudo-ephedrine, etc.). In addition, this technology has considerable potential (not yet documented) that could provide approximate concentrations of the illegal substance. The device is fast (a run takes less than a minute) and the device does not require special materials (e.g. standard) or careful calibration of each test run, as does GCMS (Sominsky et al., 2006). Once commercially available, this procedure may overcome the limitations of GCMS cited above. If such a technology becomes available, it could both reduce costs of quantification and provide the basis for more carefully assessing the quality of illegal drugs for purposes of conducting the research recommended by the NRC (2001).

6. Conclusion and Discussion

The recommendations by the NRC (2001) to improve the measurement of consumption, prices paid, and markets of illegal drugs have now gone largely unaddressed for five years, although the NIDA workshop on behavior and economics (Oct. 2004) and the papers presented in this issue of *Drug and Alcohol Dependence* constitute an important step towards developing a research agenda that can systematically address these issues. Overall, many researchers in America have sufficient training in ethnographic and survey approaches to sample a variety of illegal drug users and to sample users of specific drugs. They could straight forwardly design research projects that would collect the very data suggested by NRC (2001) as cited above including: self-reports of consumption of various drugs, prices paid for retail units, weight of street samples, and purity/composition information based on laboratory analysis of small street samples.

But such researchers will need considerable assistance from funding agencies to overcome the major impediments to doing so: 1) permission to legally possess small amounts of illegal drugs collected from illegal drug users for transport to laboratories for testing; and 2) sufficient funding to cover the high costs of measuring the quantity and purity of illegal drugs specimens. The expertise needed to undertake an active research agenda on behavior and economics of illegal drug use is well represented in this journal, as well as by many other researchers not included herein. The funding agencies will need to provide a focused RFA that would have designated funding for several multi-year projects. It is time to begin such an active research agenda.

References

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

Beckett K, Nyrop K, Pfingst L. Race, drugs, and policing: understanding disparities in drug delivery arrests. Criminology 2006;44 (1):105–138.

Beschner, G.; Akins, C. Ethnography: a research tool for policymakers in the drug and alcohol fields. National Institute on Drug Abuse; Rockville, MD: 1980.

Blair E, Burton S. Cognitive processes used by survey respondents to answer behavioral frequency questions. J Consumer Res 1987;14:280–288.

Blumstein, A.; Wallman, editors. The crime drop in America. revised edition. Cambridge; New York: 2006.

Bourgois P. The moral economies of homeless heroin addicts: Confronting ethnography, HIV risk, and everyday violence in San Francisco shooting encampments. Subst Use Misuse 1998;33 (11):2323–2351. [PubMed: 9758016]

Brantingham, P.; Brantingham, P. Patterns in crime. Macmillan; New York: 1984.

Caulkins J. Price and purity analysis for illicit drug: data and conceptual issues. in press this journal

Caulkins JP, Pacula RL. Marijuana markets: inferences from reports by the household population. J Drug Issuers 2006;36 (1):173–200.

Caulkins JP, Reuter P. What price data tell us about drug markets. J Drug Issues 1998;28 (3):593–612.

Curtis, R.; Wendel, T.; Spunt, B. We deliver: the gentrification of drug markets on Manhattan's Lower East Side. Final report to the National Instititute of Justice. 2002 [Accessed on 6 July 2006]. www.ncjrs.gov/app/Publications/abstract.aspx?ID=197716

Curtis, R.; Wendel, T. Toward the development of a typology of illegal drug markets. In: Natarajan, M.; Hough, M., editors. Illegal Drug Markets: From Research to Prevention Policy, Crime Prevention Studies. 11. Criminal Justice Press; Monsey, NY: 2000. p. 121-152.

Davis WR, Johnson BD. Criminal justice contacts of hard drugs users and sellers in Harlem. Albany Law Rev 2000;63:101–145.

Davis WR, Johnson BD, Liberty HJ, Randolph D. An enumeration method of determining the prevalence of hard drug users and operatives in Central Harlem. Drug Alcohol Depend 2003;72:45–58. [PubMed: 14563542]

Davis WR, Johnson BD, Randolph D, Liberty H. Gender differences in distribution of cocaine and heroin in Central Harlem. Drug Alcohol Depend 2005a;77:115–127. [PubMed: 15664713]

Davis WR, Johnson BD, Randolph D, Liberty H, Eterno J. Comparing police drug-allegations with enumerations of drug users/sellers. Policing 2005b;28 (4):594–608.

Dunlap E, Golub A, Johnson BD. The lived experience of welfare reform in drug-using welfare-needy households in inner-city New York. J Sociology Social Welfare 2003a;30 (3):39–58.

Dunlap E, Golub A, Johnson BD. Girls' sexual development in the inner city: from compelled childhood sexual contact to sex-for-things exchanges. J Child Sexual Abuse 2003b;12 (2):73–96.

Dunlap E, Johnson BD. Gaining access to hidden populations: strategies for gaining cooperation of sellers/dealers in ethnographic research. Drugs and Society 1999;14 (12):127–149.

Dunlap E, Johnson BD, Rath J. Aggression and violence in households of crack sellers/abusers. Appl Behavioral Science Review 1996;4 (2):191–217.

Dunlap E, Johnson BD, Sanabria H, Holliday E, Lipsey V, Barnett M, Hopkins W, Sobel I, Randolph D, Chin KL. Studying crack users and their criminal careers: scientific and artistic aspects of locating hard-to-reach subjects and interviewing them about sensitive topics. Contemporary Drug Problems 1990;17 (1):121–144.

Dunlap E, Johnson BD, Sifaneck SJ, Benoit E. Sessions, cyphers, and parties: settings for informal social controls of blunt smoking. J Ethnicity Subst Abuse 2005;4 (34):43–77.

Everingham, SE.; Rydell, CP. Modeling the demand for cocaine, MR-332-ONDCP. RAND; Santa Monica, CA: 1994.

Furst RT, Curtis RS, Johnson BD, Goldsmith DS. The rise of the street middleman/woman in a declining drug market. Addiction Res 1999;7(1):103–128.

Golub, A., editor. The cultural/subcultural contexts of marijuana use at the turn of the Twenty-First Century. Haworth; Binghamton, NY: 2005.

Golub A, Johnson BD. Crack's decline: some surprises across U.S. cities. National Institute of Justice. Research in Brief 1997:NCJ 165707.

Golub A, Johnson BD. Cohort changes in illegal drug use among arrestees in Manhattan: from the heroin injection generation to the blunts generation. Substance Use Misuse 1999;34 (13):1733–1763. [PubMed: 10540971]

Golub A, Johnson BD. The rise of marijuana as the drug of choice among youthful arrestees. National Institute of Justice. Research in Brief 2001:NCJ 187490.

Golub A, Johnson BD. The misuse of the "gateway theory" in U.S. policy on drug abuse control: a secondary analysis of the muddled deduction. International J Drug Policy 2002;13 (1):5–19.

Golub A, Johnson BD. How much do Manhattan arrestees spend on drugs? Drug Alcohol Depend 2004;76 (3):235–246. [PubMed: 15561475]

Golub A, Johnson BD. The new heroin users among Manhattan arrestees: Variations by race/ethnicity and mode of consumption. J Psychoactive Drugs 2005;37 (1):51–61. [PubMed: 15916251]

Golub, A.; Johnson, BD. The rise of marijuana as the drug of choice among youth adult arrestees. In: Kelley, MS., editor. Readings on Drugs and Society: The Criminal Connection. Allyn and Bacon; Boston: 2006a. p. 71-84.

Golub, A.; Johnson, BD. Dependence on and treatment for street drugs among Manhattan arrestees. In: Cole, S., editor. Street Drugs: New Research. Nova, Hauppauge, NY; Nova Science Publishers: 2006. in press

Golub A, Johnson BD, Dunlap E, Sifaneck S. Projecting and monitoring the life course of the marijuana/ blunts generation. J Drug Issues 2004;34 (2):361–388.

Golub A, Johnson BD, Taylor A, Eterno JA. Quality-of-life policing: do offenders get the message? Policing 2003;26 (4):690–707.

Golub A, Johnson BD, Taylor A, Eterno JA. Does quality-of-life policing widen the net? A partial analysis. Justice Res Policy 2004;6 (1):1–22.

Golub A, Johnson BD, Taylor A, Liberty H. The validity of arrestee self-reports: variations across questions and persons. Justice Q 2002;19(3):477–502.

Golub A, Liberty HJ, Johnson BD. The variation in arrestees' disclosure of recent drug use across locations, drugs, and demographic characteristics. J Drug Issues 2005a;35 (4):917–940.

Golub A, Liberty HJ, Johnson BD. Inaccuracies in self-reports and urinalysis tests: impacts on monitoring marijuana trends among arrestees. J Drug Issues 2005b;35 (4):940–965.

Harrison, L. The validity of self-reported drug use in survey research: an overview and critique of research methods. In: Harrison, L.; Hughes, A., editors. 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: 1997. p. 17-36.

Harrison L, Erickson PG, Korf DJ, Brochu S. DAVI Team. How much for a dime bag? An exploration of youth drug markets. in press This journal

Horowitz JL. Should the DEA's stride data be used for economic analyses of markets for illegal drugs? J Am Statistical Association 2001;96 (456):1254–1262.

Inciardi, JA.; McElrath, K., editors. The American drug scene. 4. Roxbury; Los Angeles: 2004.

Johnson, BD. Marihuana users and drug subcultures. Wiley; New York: 1973.

Johnson BD. Patterns of drug distribution: implications and issues. Subst Use Misuse 2003;18:1789–1806. [PubMed: 14582578]

Johnson BD, Bardhi F, Sifaneck SJ, Dunlap E. Marijuana argot as subculture threads: social constructions by users in New York City. Brit J Crim 2006a;46(1):46–77.

Johnson, BD.; Dunlap, E.; Tourigny, SC. Crack distribution and abuse in New York City. In: Natarajan, M.; Hough, M., editors. Illegal Drug Markets: From Research to Prevention Policy, Crime Prevention Studies. 11. Criminal Justice Press; Monsey, NY: 2000. p. 19-77.

Johnson, BD.; Goldstein, PJ.; Preble, E.; Schmeidler, J.; Lipton, DS.; Spunt, B.; Miller, T. Taking care of business: the economics of crime by heroin users. Lexington; Lexington, MA: 1985.

Johnson, BD.; Golub, AL. Generational trends in heroin use and injection in New York City. In: Musto, D., editor. One Hundred Years of Heroin. Auburn House; Westport, CT: 2002. p. 90-128.

Johnson, BD.; Golub, A.; Dunlap, E. The rise and decline of drugs, drug markets, and violence in New York City. In: Blumstein, A.; Wallman, J., editors. The Crime Drop in America. revised edition. Cambridge; New York: 2006b. p. 164-206.

Johnson BD, Golub A, Dunlap E, Sifaneck SJ, McCabe J. Policing and social control of public marijuana use and selling in New York City. Law Enforcement Executive Forum. 2006

Johnson BD, Golub A, Fagan J. Careers in crack, drug use, drug distribution and nondrug criminality. Crime and Delinquency 1995;41 (3):275–295.

Johnson, BD.; Lipton, DS. Creative tensions: issues in utilizing ethnographic research within a single state agency. In: Beschner, G.; Akins, C., editors. Ethnography: A Research Tool for Policymakers in the Drug and Alcohol Fields. National Institute on Drug Abuse; Rockville, MD: 1980. p. 36-45.

Johnson, BD.; Natarajan, M.; Sanabria, H. "Successful" criminal careers: towards an ethnography within the rational choice perspective. In: Clarke, R.; Felson, M., editors. New Opportunity Theories Advances in Criminological Theory. Transaction Books; New Brunswick, NJ: 1993. p. 201-221.

Johnson BD, Taylor A, Golub A. How accurate are arrestees' self reports of their criminal justice histories? J Res Policy 2006d;7 (1):81–101.

Johnson, BD.; Williams, T.; Dei, K.; Sanabria, H. Drug abuse and the inner city: impact on hard drug users and the community. In: Tonry, M.; Wilson, JQ., editors. Drugs and Crime, Crime and Justice Series. 13. Chicago; Chicago: 1990. p. 9-67.

Liberty HJ, Johnson BD, Fortner N. Detecting cocaine use through sweat testing: multilevel modeling of sweat patch length-of-wear data. J Analytic Toxicology 2004;28 (8):667–673.

MacCoun, RJ.; Reuter, P. Drug war heresies: learning from other vices, times & places. Cambridge; Cambridge, UK: 2001.

Magura S, Kang SY. Validity of self-reported drug use in high risk populations: a meta-analytical review. Subst Use Misuse 1996;31:1131–1153. [PubMed: 8853234]

Menon G. The effects of accessibility of information in memory on judgments of behavioral frequency. J Consumer Res 1993;20:431–440.

Menon G, Raghubir P, Schwarz N. Behavioral frequency judgments: an accessibility-diagnostic framework. J Consumer Res 1995;22:212–228.

Natarajan, M.; Hough, M., editors. Illegal Drug Markets: From Research to Prevention Policy, Crime Prevention Studies. 11. Criminal Justice Press; Monsey, NY: 2000.

National Research Council (NRC). Informing America's policy on illegal drugs: what we don't know keeps hurting us. National Academy Press; Washington, DC: 2001.

National Instiue on Drug Abuse (NIDA). Drug abuse: a workshop on behavioral and economic research; Bethesda, MD. October 18–20; 2004.

Office of National Drug Control Policy (ONDCP). What America's users spend on illegal drugs 1988–2000. White House; Washington, DC: 2001. p. NCJ-192334

Parker, H. How young Britons obtain their drugs. Drug transactions at the point of consumption. In: Natarajan, M.; Hough, M., editors. Illegal Drug Markets: From Research to Prevention Policy, Crime Prevention Studies. 11. Criminal Justice Press; Monsey, NY: 2000. p. 59-81.

Ream, G.; Johnson, BD.; Sifaneck, SJ.; Dunlap, E. Distinguishing blunts users from joints users: A comparison of marijuana use subcultures. In: Cole, S., editor. Street Drugs: New Research. Nova; Hauppauge, NY: 2006.

Ruggiero, V. Criminal franchising: Albanians and illicit drugs in Italy. In: Natarajan, M.; Hough, M., editors. Illegal Drug Markets: From Research to Prevention Policy, Crime Prevention Studies. 11. Criminal Justice Press; Monsey, NY: 2000. p. 203-218.

Reuter, P. Connecting drug policy and research on drug markets. In: Natarajan, M.; Hough, M., editors. Illegal Drug Markets: From Research to Prevention Policy, Crime Prevention Studies. 11. Criminal Justice Press; Monsey, NY: 2000. p. 319-329.

Sifaneck SJ, Ream G, Johnson BD, Dunlap E. Retail marijuana purchases in designer and commercial markets in New York City: Sales units, weights, and price per gram. 2006this journal

Sifaneck, SJ.; Kaplan, CD.; Dunlap, E.; Johnson, BD. Blunts and Blowtjes: Cannabis use practices in two cultural settings and their implications for secondary prevention. In: Mata, A., editor. High Risk Families and High Risk Communities: Implications for Prevention and Intervention. Edwin Mellen; New York: 2006.

Sominsky, V., et al. Accuracy of detection of cocaine, marijuana, and methamphetamine in various concentrations using Spectral Fluorescence Signatures. Nartest; Raleigh, NC: 2006.

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

Wright, D.; Gfroerer, J.; Epstein, J. The use of external data sources and ratio estimation to improve estimates of hardcore drug use from the NHSDA. In: Harrison, L.; Hughes, A., editors. The Validity of Self-Reported Drug Use: Improving the Accuracy of Survey Estimates, NIDA Research Monograph 167, NIH Publication No 97–4147. National Institute on Drug Abuse; Rockville, MD: 1997.

Table

Common Roles and Functions at Various Levels of the Drug Distribution Business; Equivalent Roles in the Legitimate Economy.

Approximate role equivalents in legal markets	Roles by "common names" at various stages of the drug distribution"business"	Major functions accomplished at this level
PRODUCERS		
[[Grower/Producer|]]	Coca Farmer, Opium Farmer, Marijuana Grower	Grow coca, opium, marijuana; the raw materials
[[Manufacturer|]]	Collector, Transporter, Elaborator, Chemist, Drug Lord	All stages for preparation of heroin, cocaine, marijuana as commonly sold
TRAFFICKERS		
[[Importer|]]	Multi-Kilo Importer, Mule, Airplane Pilot, Smuggler, Trafficker, Money Launderer	Smuggling of large quantities of substances into U.S.
[[Wholesale Distributor|]]	Major Distributor, Investor, "Kilo Connection"	Transportation and redistribution of multi- and single kilograms
DEALERS		
[[Regional Distributor|]]	Weight Dealers, Pound and Ounce of Cocaine or Heroin; Kilos of Marijuana	Adulteration and sale of moderately expensive products
[[Retail Store Owner/ Proprietor|]]	House Connections, Suppliers, Crack House Supplier, Operator of Delivery Service	Adulteration and production of retail level dosage units (bags, vials, grams, cubes) in large numbers
Assistant Manager, Security Chief, Accountant	Lieutenant, Muscle Men, Transporter, Crew Boss, Crack House Manager/Delivery Scheduler	Supervises three or more sellers, enforces informal contracts, collects money, distributes multiple dosage units to actual sellers
SELLERS		
Store Clerk, Salesmen (Door-to-Door, Phone)	Street Drug Seller, "Runner", Juggler, Private Seller	Makes actual direct sales to consumer; responsible for both money and drugs.
LOW-LEVEL DISTRIBUTORS		
Advertiser, Security Guards, Leaflet Distributor	Steerer, Tout, Cop Man, Lookout, Holder, Runner, Help Friend, Guard, Go-Between, Middleman	Assists in making sales, advertises, protects seller from police and criminals, solicits customers; handles drugs or money--but not both.
[[Servant, Temporary Employee|]]	Run Shooting Gallery, Injector (of drugs), Freebaser, Taster, Apartment Cleaner, Drug Bagger Fence, Money Launderer	Provides short-term services to drug users or sellers for money or drugs; not responsible for both money or drugs