

Chapter 5: Estimates of Drug Consumption in the United States

This report addresses estimates of the quantity of drugs consumed in the United States based on what is known about the drug user population and their drug use patterns. It begins by first assembling existing consumption estimates for the following four major drugs of abuse: cocaine, heroin, marijuana, and methamphetamine. While consumption estimates for these drugs are at varying degrees of refinement, all rely to some extent on assumptions about the drug user population and their drug use patterns. For each of these drugs, the major underlying assumptions – both explicit and implicit – utilized in arriving at the consumption estimates are reviewed and documented. By identifying the key assumptions driving the estimates, it then becomes possible to examine the impact of alternative assumptions on the total estimated volume of the drug consumed in the U.S. Given the limited time and resources allocated to this review, the focus is on how these estimates can be improved, both in the short-term as well as in the long-term.

The Working Group reviewed existing U.S. drug consumption estimates as a starting point. Since scientific work in this area is extremely limited, the group focused on both published material and the gray literature, which includes unclassified documents made available to the working group. Without endorsing any of the estimates, the Working Group examined four documents in detail.

While some of the estimation work reviewed stated working assumptions, there were many instances where key items were not explicit nor fully documented. The impact of these assumptions on resulting consumption estimates is not trivial. Therefore, the Working Group's focus was to examine the underlying and sometimes undocumented assumptions as an initial step; document these assumptions when possible or show knowledge gaps when there is limited information; and demonstrate how changing the values of a few key assumptions can shift the magnitude of resulting estimates up or down. In the absence of adequate time or resources to actually recalculate these estimates, the Working Group focused on identifying recommended steps to improving the consumption estimates in the short-term and in the long-term.

Overview

This report addresses estimates of the quantity of drugs consumed in the United States based on what is known about the drug user population and their drug use patterns. It begins by first assembling existing consumption estimates for the following four major drugs of abuse: cocaine, heroin, marijuana, and methamphetamine. While consumption estimates for these drugs are at varying degrees of refinement, all rely to some extent on assumptions about the drug user population and their drug use patterns. For each of these drugs, the major underlying assumptions – both explicit and implicit – utilized in arriving at the consumption estimates are reviewed and documented. By identifying the key assumptions driving the estimates, it then becomes possible to examine the impact of alternative assumptions on the total estimated volume of the drug consumed in the U.S. To the extent that the consumption estimates can be extended to the year 2000, this reference year is used. Given the limited time and resources allocated to this review, the focus is on how these estimates can be improved, both in the short-term as well as in the long-term.

The report is organized as follows: first, the background and methods behind this review are described. Next, consumption estimates for each of the four drugs are addressed in turn, focusing specifically on making explicit the key assumptions underlying existing estimate(s), demonstrating the impact of alternative key assumptions on such estimates, and assessing the outlook for improving consumption estimates given available or soon-to-be-available data sources.

Background And Methods

The *Consumption Working Group*, hereafter referred to as the Working Group, was tasked by the *Drug Flow Models Steering Committee*, an interagency committee. The Working Group consisted of six representatives from the following agencies:

- Crime and Narcotics Center (CNC)
- Drug Enforcement Administration (DEA)
- National Drug Intelligence Center (NDIC)
- National Institute of Justice (NIJ)
- Office of National Drug Control Policy (ONDCP)
- Substance Abuse and Mental Health Services Administration (SAMHSA).

The Working Group reviewed existing U.S. drug consumption estimates as a starting point. Since scientific work in this area is extremely limited, the group focused on both published material and the gray literature.⁸⁹ In this instance, only one published document provides consumption estimates for four drugs (cocaine, heroin, marijuana, and methamphetamine), and an appendix to another published document provides consumption estimates for heroin specifically. From the unclassified documents made available to the working group, an internal, albeit preliminary document attempts to update consumption estimates for the same four drugs listed above, and an interagency memo documents an estimate for heroin consumption. Without endorsing any of the estimates, the Working Group examined the following documents in detail:

- *What America's Users Spend on Illegal Drugs, 1988-2000* (December 2001), a study commissioned by the Office of National Drug Control Policy and conducted by Abt Associates, Inc. to develop U.S. consumption estimates for heroin, cocaine, marijuana, and methamphetamine
- *Full Market Model* developed separately for heroin, cocaine, marijuana, and methamphetamine by the Drug Enforcement Administration's Statistical Services Section (documented in a memo from Patrick R. Gartin to Martin W. Pracht, December 19, 2001)
- *Interagency Domestic Heroin Threat Assessment 2000* prepared by the National Drug Intelligence Center, specifically "Appendix B: Heroin Consumption in the United States," and
- *A Direct Approach to Estimating Heroin Consumption* and a similar argument for cocaine developed by the Crime and Narcotics Center (documented in a memo from Stanley E. Hillard to Patrick R. Gartin, November 7, 2001).

Pertinent sections of the four documents identified above are reproduced as Section 5-B through Section 5- E of this report.

⁸⁹ Inclusion of the "gray literature" is essential to a comprehensive review when little formal scientific work is available. It becomes even more important to include the unpublished sources in situations when they are the source of estimates that are reported to decision-makers and used in policy discussions. For example, while an interagency estimate of 18 metric tons of heroin consumption annually is not documented in a published source, such an estimate can take on a life of its own.

While some of the estimation work reviewed stated working assumptions, there were many instances where key items were not explicit nor fully documented. The impact of these assumptions on resulting consumption estimates is not trivial. Therefore, the Working Group's focus was to examine the underlying and sometimes undocumented assumptions as an initial step; document these assumptions when possible or show knowledge gaps when there is limited information; and demonstrate how changing the values of a few key assumptions can shift the magnitude of resulting estimates up or down. In the absence of adequate time or resources to actually recalculate these estimates, the Working Group focused on identifying recommended steps to improving the consumption estimates in the short-term and in the long-term.

Drug Consumption Estimates

Estimating consumption of illicit drugs poses a myriad of problems that defy the best efforts of researchers to collect data appropriate for meaningful statistical analyses at the national level or to provide a realistic description of the nature and quantity of the narcotics abusing population and the underground markets in which they operate.

In general, there are several data issues that affect the existing consumption estimates, regardless of the type of drug. The following paragraphs address five key issues.

First, the number of chronic or hard-core users is a long-standing estimation problem, given that a large proportion heavy users of illicit drugs – who account for a substantial proportion of drugs consumed – are not adequately covered in conventional data sources, such as the National Household Survey on Drug Abuse (NHSDA). The hidden nature of this population contributes to the difficulty in accurately portraying the magnitude of total drug use. Furthermore, the terminology and definitions attached to the heaviest users of drugs, such as “chronic user,” “hard-core user,” or “addict,” may or may not coincide with clinical definitions of drug abuse and dependence.

Second, existing estimates do not typically distinguish between addicted users and the so-called “casual users” – often, the latter are not included in the calculation of consumption estimates. For a commonly used illicit drug such as marijuana, the volume consumed by “casual users” is not insignificant.

Third, dosage assumptions often are poorly documented and there appears to be a significant gap in the scientific measurement of typical doses, as well as of typical frequency of dosing. This is complicated by the phenomenon of multi-drug use or substitution, particularly in the context of unsteady supply, so that one cannot safely assume that even an addicted user uses a given amount steadily over time.

Fourth, key data sources used in consumption estimation, specifically the Arrestee Drug Abuse Monitoring (ADAM) program data, are collected at a sub-national level that do not translate to national estimates. The transition from city- or metropolitan area-based information to national assumptions is not adequately justified. Efforts to expand and improve this data source to yield national estimates appear to be in jeopardy at this time.

Fifth, estimates deriving from drug market dynamics, including cash and in-kind transactions, typically use assumptions that are undocumented. There are few sources of data on this subject – beyond

anecdotal information, only ADAM and the 2001 NHSDA⁹⁰ are anticipated to provide concrete data, albeit limited to specific geographic areas or a specific drug.

While not exhaustive, these are illustrative of the specific items that are examined in this report.

The remainder of this section reviews the key data sources used in consumption estimations and then each set of drug-specific consumption estimates is examined in greater detail. The drug-specific subsections address the starting assumptions and their accompanying ambiguities, summarize existing estimates, show illustrative alternative estimates based on modifying values of key components, and identify what improvements can be implemented to refine these estimates in the future.

Key Data Sources

The following data sources are considered essential in arriving at the existing consumption estimates:

- National Household Survey on Drug Abuse
- Arrestee Drug Abuse Monitoring Program/Drug Use Forecasting system
- Uniform Crime Reports
- System To Retrieve Information from Drug Evidence
- Treatment Episodes Data Set
- Domestic Monitor Program

Each of these key sources represents a piece of the picture of illicit drug use. Each has strengths and limitations. It is essential to recognize these at the outset in order to assess the utility of estimates derived using these data as building blocks, as well as the impact of various assumptions and adjustments made in the process of estimating consumption.

- ***National Household Survey on Drug Abuse:*** Existing estimates of drug consumption rely heavily on NHSDA data. It is the Nation's most comprehensive survey of drug use. It measures drug use among the American household population age 12 and older, as well as among people living in group quarters and the homeless living in shelters. Despite the rigorous methods applied by NHSDA researchers and the breadth of the study, there are limitations to the data it provides. The survey's sampling procedures, for example, include only individuals who are part of a household. Thus, transients; incarcerated prisoners; and residents of hospitals, nursing homes, and mental institutions are not included in the survey's sample.⁹¹

An additional complication with relying upon data that is collected from users themselves is that these users may knowingly or unknowingly misrepresent the frequency or severity of their drug use. The NHSDA does employ techniques that are designed to minimize the lack

⁹⁰ The 2001 NHSDA *Computerized Questionnaire and Specifications (CAPI and ACASI)* includes a new section on market information for marijuana.

⁹¹ The NHSDA covers residents of households (living in houses/townhouses, apartments, condominiums, etc.) noninstitutional group quarters (e.g., shelters, rooming/boarding houses, college dormitories, migratory workers' camps, halfway houses, etc.) and civilians living on military bases. While the survey covers these types of units (they are given a nonzero probability of selection), sample sizes of most specific groups are too small to provide separate estimates. Persons excluded from the survey include homeless people who do not use shelters, active military personnel, and residents of institutional group quarters, such as correctional facilities, nursing homes, mental institutions, and hospitals.

of truthfulness on the part of the interviewees. For example, the survey administrators emphasize to the respondents that their confidentiality will be maintained and computers are used so that respondents can self-interview to ensure greater privacy.⁹² The NHSDA also incorporates techniques such as repetitious questioning that assist in soliciting factual responses from interviewees. In spite of these efforts, it must be assumed that a portion of the responses to the survey is inaccurate.

- ***Arrestee Drug Abuse Monitoring Program/Drug Use Forecasting System:*** A major segment of the less-stable population of chronic drug users – those that are arrested – is well represented in data collected by the ADAM program, formerly known as *the Drug Use Forecasting* (DUF) program. The National Institute of Justice sponsors this data collection program. As the successor to the DUF program, which operated first in 13 sites and later in 23 sites from 1987 to 1997, ADAM serves as a source of information about the drug use of people who are arrested. At ADAM sites, within 48 hours of arrest research teams in cooperation with local criminal justice officials and staff quarterly interview and urine-test individuals arrested and brought to local lockups and booking centers. ADAM routinely employs urine testing as an objective measure of drug use by arrestees. Drug-related variables include self-reports on drug using patterns, how and where arrestees purchased illicit drugs, an index of questions on risk of alcohol and other drug dependency, and experience with drug and mental health treatment. After the interview each ADAM respondent is asked to provide a urine sample for laboratory testing. Arrestees are asked to voluntarily produce urine specimens for analysis. Urinalysis confirms whether the interviewees have used any of up to 10 types of drugs during the two to three days before the interview. ADAM/DUF is the only federally funded data system where urinalysis is utilized to add credence to estimates of drug use when self-reports are unreliable.

In 1998, ADAM data collection was expanded from 23 to 35 sites. In 2000 probability-based sampling plans for male arrestees were instituted for each site and an enhanced interview schedule for adult respondents was introduced. In its new form, ADAM now collects data about the involvement of arrestees with drug treatment and drug markets. Also, starting in 2000, sites are able to provide estimates with known precision, and track trends in drug use within their community and in comparison to other communities. ADAM allows researchers to place confidence intervals around estimates so that researchers and policymakers can assess the significance of trends. One of the limitations of ADAM is that it exists in only 35 communities and does not represent a national sample of arrestees. It is unknown at this time whether NIJ's ultimate goal to expand ADAM to a total of 75 sites in order to collect drug data at the national level⁹³ is on track.

- ***Uniform Crime Reports:*** The Federal Bureau of Investigation (FBI) Criminal Justice Information Services Division compiles and aggregates arrest statistics under the *Uniform Crime Reports* (UCR) program. The purpose of UCR is to measure law enforcement response to crime and to provide data concerning the age, sex, and race of perpetrators. Data are supplied voluntarily by law enforcement agencies across the country on a monthly basis. FBI staff perform various edit checks. UCR does not include bookings for warrants, revocations and some other reasons for being booked, so it understates bookings. While UCR

⁹² Confidentiality is stressed in all written and verbal communications with potential respondents, respondents' names are not collected with the data, and computer-assisted interviewing (CAI) including audio computer-assisted self-interviewing (ACASI) are used to provide a private and confidential setting to complete the interview.

⁹³ The White House, *National Drug Control Strategy, FY 2003 Budget Summary*, February 2002, p. 129.

data are supported by records of local law enforcement agencies, not all agencies supply data for all 12 months of each year.

Drug-related variables include arrests for drug abuse violations; breakdowns for sale/manufacture and possession; and drug types, including heroin or cocaine and their derivatives, marijuana, synthetic or manufactured drugs, and other dangerous, nonnarcotic drugs. UCR data can yield characteristics of drug arrestees. In using UCR data for drug consumption estimation, certain charges were often assumed to be more likely related to chronic drug use. The basis of these assumptions are largely undocumented.

- **System To Retrieve Information from Drug Evidence:** The *System To Retrieve Information on Drug Evidence* (STRIDE), operated by the DEA, is the primary source of data for drug price and purity, providing lab analyses of street-level drug purchases. STRIDE maintains an inventory of drug exhibits submitted to DEA laboratories and contains all the information from the laboratory analysis of each exhibit. The data elements include information on place collected, how acquired (e.g., purchased, seized), price if purchased, name of the drug, potency of the drug, adulterants and diluents found, and how the exhibit was packaged. STRIDE information is used as an investigative tool by agents in the field and provides a database which is used to analyze both strategic and tactical intelligence, establishing drug-trafficking patterns as well as detecting the appearance of new drugs. Because the purpose of STRIDE is primarily in support of operations, the representativeness of the data for research and estimation purposes is limited.
- **Treatment Episodes Data Set:** The *Treatment Episode Data Set* (TEDS) is a minimum data set of information collected by SAMHSA about individuals admitted to treatment, primarily by providers receiving public funding. The TEDS universe consists primarily of those substance abuse treatment facilities that receive public funding through from State Substance Abuse Agencies. TEDS includes patient-level data on admissions to these facilities and contains data on approximately 1.6 million admissions per year from 1992 to the present. Variables include drug use history, clinical and treatment data, and patient demographics. While publicly funded treatment providers comprise a major segment of all providers, TEDS data do not cover the entire treatment population.
- **Domestic Monitor Program:** The *Domestic Monitor Program* (DMP), conducted by DEA's Intelligence Division, is a heroin purchase program designed to provide data on the purity, price, and origin of retail-level heroin available in the open-air drug markets in 23 metropolitan areas of the United States. Each quarter, the DEA provides funding for the undercover purchase of retail-level heroin, and each heroin purchase subsequently undergoes chemical analysis to determine the purity, adulterants, diluents, and geographic origin of heroin sold at the retail level in the 23 cities. DMP purchases are included in the broader STRIDE data described above (Section 3.1.4).
- **Other Data Sources:** In addition, the Drug Abuse Warning Network (DAWN) and the Community Epidemiology Work Group (CEWG) are frequently cited as sources of location-specific information, and the *Full Market Model* estimates use the Monitoring the Future study.

Elements of each data source that are particularly relevant to a specific drug are discussed greater detail in the following sections.

Cocaine Consumption Estimates

Since 1991, ONDCP has published a biennial report on expenditures by Americans on illegal drugs. The current version of *What American's Users Spend on Illegal Drugs* (Office of National Drug Control Policy, 2001b), prepared by Abt Associates, Inc., provides comparable estimates of cocaine consumption by Americans for the years 1988 through 1999, and projects estimates for 2000. Abt Associates acknowledges that because of the quality of available data, there is considerable imprecision in estimates of the number of chronic and occasional users of drugs, the retail sales value of their drug purchases, and the amount of drugs they consume. That said, they also believe that the data are sufficiently reliable to conclude that the trade in cocaine has decreased over the last ten years.

The best estimates reported as a result of the study are the following:

- In 1999, about 2.8 million Americans were chronic cocaine users and about 3.2 million were occasional cocaine users.
- The number of occasional cocaine users dropped from 6.0 million in 1988. The number of chronic cocaine users has declined over the last decade (the figure was 3.6 million in 1990).
- In 2000, Americans spent about \$36 billion on cocaine.
- During the latter part of the 1990s, Americans consumed about 271 metric tons of cocaine per year, down from over 300 metric tons earlier in the decade (Table 5-1).

Table 5 - 1 Total Amount of Cocaine Consumed, 1994-2000 (in metric tons)

	YEAR						
	1994	1995	1996	1997	1998	1999	2000
Cocaine	323	321	301	275	267	271	259

Source: Office of National Drug Control Policy. *What America's Users Spend on Illegal Drugs, 1988-2000*. December 2001.

Assumptions

Methodology. The study *What America's Users Spend on Illegal Drugs* derives estimates of consumption. The study is theoretically sound and relies on manipulating a number of estimated variables which themselves require acceptance of some heroic assumptions and are subject to substantial margins of error. However, it is believed that the Abt Associates' study is the best effort to determine the amount of cocaine consumed by Americans in the last decade.

The study relies heavily on the NHSDA. As noted earlier, this survey misses a part of the population that is a key to determining the extent of cocaine use: those chronic drug users who, although not homeless, are too unstable to be considered as part of a household, or who, if part of the household, are unlikely to truthfully self-report.

The study also relies on ADAM/DUF data to shed light on the less-stable population of chronic drug users. Since the data used for the Abt study predate ADAM, this discussion focuses on DUF. Based on self-report and urinalysis of arrestees in 24 cities, Abt's calculation begins by estimating the number of chronic cocaine users who are arrested during the year. A chronic user is defined as those who admitted to using cocaine on more than 10 days during the month before being arrested. That number is then divided by the average number of arrests that chronic cocaine users generate during that year. Then the estimated number of chronic users in jails and is prison subtracted, because they are unlikely to use

cocaine heavily while incarcerated. Abt projected that chronic cocaine users in 2000 numbered 2.7 million.

The next step was to estimate how much the users spend on cocaine. An estimate of the retail sales value of illicit drugs consumed by heavy users follow from multiplying estimates of typical expenditures by estimates of the number of chronic users. Estimates of expenditures by chronic users are then converted to units measured in kilograms of cocaine, so that amount consumed can be compared with the amount of drugs trafficked into the country. This requires an estimate of the prevailing retail prices for illicit substances. Dividing the estimate of retail sales value by the prevailing price paid by users gives an estimate of the total amount of drugs purchased, and this amount can be converted readily into metric ton units.

Chronic users account for about ¾ of the cocaine used in this country, they do not account for **all** illicit drug consumption. The NHSDA provides a reasonably accurate estimate of the amount of more casual drug use. To estimate the number of occasional users, NHSDA data on the number of people who reported cocaine use in the last year were used, minus the number that reported using cocaine on a weekly basis. There were about 2.7 million chronic users and 3.0 million occasional users estimated for 2000 (Table 5-2). The report complements expenditures by chronic users on cocaine based on DUF data with expenditures on cocaine by more casual users who report to the NHSDA. For 2000, Abt projects that chronic and occasional users spent \$35 billion on cocaine and that Americans consumed 259 metric tons.

Table 5 - 2 Estimated Number of Chronic and Occasional Users of Cocaine (thousands), 1994-2000

	YEAR						
	1994	1995	1996	1997	1998	1999	2000
Chronic	3,032	2,866	2,828	2,847	2,800	2,755	2,707
Occasional	2,930	3,082	3,425	3,487	3,216	3,216	3,035

Source: Office of National Drug Control Policy. *What America's Users Spend on Illegal Drugs, 1988-2000*. December 2001.

Determining Chronic Users: The method for computing the national numbers for chronic and occasional cocaine users are a composite of local area estimates and extrapolated to the national estimates. These estimates are derived from DUF data, last collected in 1999. Thus, the data used to derive a national chronic user projection for 2000 was 1999 data. Also, DUF only represents 23 central city jails and lockups. To expand the data to the county in which the jail was located, the chronic user population, which was found in the jail, was multiplied by 1.45% to account for users in the general population in the county or metropolitan statistical area (MSA). The Abt approach necessarily assumes that all hardcore drug users have an appreciable probability of being arrested. It is unknown whether the data collected at DUF sites is even representative of the research catchment areas themselves, let alone places where DUF did not collect data. Abt does spend time explaining how they account for under-reporting of drug use by using the urinalysis results to adjust their estimates. However, Abt does not adequately explain how they adjust for under-reporting of past arrests. Abt explains that they relied on a 1995 DUF Addenda study to arrive at their estimate that there are 2.5 chronic users in the general county population for every chronic user found in the arrestee population. However, this 1995 study occurred in only 6 cities (Chicago, Manhattan, Portland, San Antonio, San Diego and DC). Is it reasonable to base the entire national hardcore rates on the results from these six (mostly large urban) cities?

Because of the self-reporting of the data, which was substantiated with urinalysis in many cases, the chronic user population discovered at the jail was increased by 1.167% to account for underreporting on the part of the inmates.

Because Abt was skeptical of the DUF estimates for women, they simply adjusted the data based on aggregate arrest statistics compiled by the FBI under the Uniform Crime Reports (UCR). According to UCR, men account for 78% of all arrests. Abt made a simple adjustment based on UCR data to add 22% to account for female chronic users.

DUF is not a probability sample. For that reason it could not be used by itself to extrapolate to the national population so the UCR was used. UCR does not include bookings for warrants, revocations and some other reasons for being booked, so it understates bookings. Also, the UCR does not specify bookings by felony, misdemeanor and other categories, so the research imputed the proportion of felonies and misdemeanors based on an analysis of actual booking data from several sites. Some jurisdictions did not report data for the entire year. Certain charges were assumed to be more likely related to chronic drug use. These tabulations provided estimates of the probability that an arrestee would be a chronic user conditional on the charged offense and year. These charges were tabulated on a national level, but little explanation is provided on how locality-based data were extrapolated to the United States as a whole.

Not accounting for persons arrested as juveniles appears to be a major omission. This omission must be due to the fact that no good data exists on juvenile arrestee drug use (DUF/ADAM collect data on juveniles in only a small number of sites, mostly boys with few girl participants, using convenient sampling methods). However, the DUF data, which we do have, show fairly high proportion of heavy drug users among juvenile arrestees.

There are several assumptions working here which may or may not be valid. Without a probability sample, the effort to calculate how many chronic users there are in the United States will remain a little bit better than guesswork.

How much do they spend? Expenditure patterns are an under-researched aspect of drug consumption. The Abt study used DUF data to determine how much users spend on drugs. The Abt study tabulated the costs for each of the 23 sites for each of the eleven years and computed the median expenditure on drugs. Unfortunately, the questions from which the data was derived asked how much users spend on drugs per se, not about expenditures on a specific type of drug. The median amount was used and weighted per site by numbers of users at that particular site. Those estimates over \$2000 were thrown out. The study eliminated those who were dealers. Some of the respondents had trouble answering the questions.⁹⁴ The resulting means were \$237 for cocaine. Average retail purchase, average dosage, frequency of use (chronic), frequency of use (occasional), retail price per pure gram (STRIDE) are not discussed in the report. In 1993, based on NHSDA data, occasional users were estimated to spend \$35 per week. More recent price estimates are unavailable; adjustments were made for the consumer price index. The report determined that \$212 was spent a week on cocaine per chronic user; \$35 a week for occasional users.

The report also accounted for 'income in kind'. It increased cocaine consumption by 11 percent to account for income in kind, and added it to increase the total metric tons. This adjustment for income-in-kind has been 11 percent since 1995. It appears that by adding the 11 percent to the metric tons number, rather than to the price indicators, the report is double counting. The report multiplied the number of the original chronic with several adjustments to account for female, counties, underreporting, etc. Income in kind is already accounted for in the number of users.

Existing Consumption Estimates

The Abt method for calculating cocaine consumption is to first estimate the number of occasional and chronic cocaine users, estimate their weekly expenditures to calculate total expenditures, then divide

⁹⁴ The 2000 ADAM data may mitigate some of the problems associated with this set of calculations.

that expenditure total by an estimate of retail cocaine prices (Office of National Drug Control Policy, 2001a). Table 5-3 below summarizes the figures used in calculation of consumption, and table 5-4 summarizes the price data.

Table 5 - 3 Calculation of domestic cocaine consumption, 1996-2000

Description	Units	YEAR				
		1996	1997	1998	1999	2000
Number of occasional users	thousands	3,425	3,487	3,216	3,216	3,035
Number of chronic users	thousands	2,828	2,847	2,800	2,755	2,707
Weekly expenditure by occasional users	Constant 2000 dollars	\$35	\$35	\$35	\$35	\$35
Weekly expenditure by chronic users	Constant 2000 dollars	\$220	\$188	\$197	\$206	\$212
CPI adjustment		1.10	1.07	1.06	1.03	1.00
Total Expenditures for occasional users ¹	Constant 2000 dollars (billion)	\$6.9	\$6.8	\$6.2	\$6.0	\$5.5
Total Expenditures for chronic users ²	Constant 2000 dollars (billion)	\$32.4	\$27.9	\$28.7	\$29.5	\$29.8
Total Expenditures for all users ³	Constant 2000 dollars (billion)	\$39.2	\$34.7	\$34.9	\$35.6	\$35.3
Retail Prices	Constant 2000 dollars per pure g	\$144	\$140	\$145	\$145	\$152
Barter purchases	percentage	11%	11%	11%	11%	11%
Total consumption ⁴	metric tons	301	275	267	272	259

¹Total expenditures for occasional users=((Number of occasional users)*(Weekly expenditure by occasional users)*(CPI adjustment)*52)/1,000,000,000

²Total expenditures for chronic users=((Number of chronic users)*(Weekly expenditure by chronic users)*(CPI adjustment)*52)/1,000,000

³Total expenditures for all users=(Total expenditures for occasional users) + (Total expenditures for chronic users)

⁴Total consumption=((Total expenditures)/(Retail Price*1,000))*(1+Barter Purchases)

Source:

Alternative Consumption Estimates

In general, Abt often fails to enumerate and properly document their assumptions in arriving at national hardcore drug use estimates. It would be helpful if Abt explained the rationale for their assumptions, do sensitivity analyses with respect to it, and communicate how it might affect results and the associated confidence intervals. Also, Abt does not provide adequate enough documentation for others to comment on, critique and suggest improvements in his methods. Abt needs to provide a rich description of what was done, why it was done, how it was done, the strengths and limitations, and assumptions in a form that is accessible to other researchers to allow a serious review.

Abt work relies on DUF data, prior to probability-based sampling. It is unknown whether the data collected at DUF sites is even representative of the research catchment areas themselves, let alone places where DUF did not collect data. This situation is rectified for the men in ADAM where

representative sampling is used. If there is as little as a 10% swing in either direction, the numbers represented could fluctuate as much as from 231 metric tons to 281 metric tons in annual consumption.

Abt says that a simple adjustment is put in place to deal with the fact that their model is calculated for just men. Abt states that they are very skeptical of the DUF estimates for women so he simply adjusts the data based on aggregate FBI arrest statistics. The FBI estimates that 78% of all arrests are for men so they increase their estimates by 1/.78 or by 1.28. This is a huge logical leap to assume men and women use at the same rate. To the extent that this assumption is not true Abt's estimates can be off considerably. It might have been nice to see what the DUF data say about women and compare it to this very blunt approach. If we assume that women do not use as much as men and increase the rate by 10% instead of 28% to account for women's use the estimate would change considerably. Now we have a range of 201 metric tons to 284 metric tons. If one assumes that the 11% accounted for in income in kind is low, adjust for 25% in the income in kind figure and the consumption figures could go as high as 320 metric tons.

Not accounting for persons arrested as juveniles appears to be a major omission. This omission must be due to the fact that no good data exists on juvenile arrestee drug use (DUF/ADAM collect data on juveniles in only a small number of sites, mostly boys with few girl participants, using convenient sampling methods). However, the DUF data which we do have show fairly high proportion of heavy drug users among juvenile arrestees. If we added 5% for juvenile chronic users our total consumption would be 268MT with everything else being equal.

Table 5 - 4 Alternative Estimates of Cocaine Consumption, 2000

Description	Units	ALTERNATIVE ESTIMATES				
		2000	2000 -10%	2000 +10%	2000 +5% for juvenile chronic users	2000 -12% (decrease 12% for women)
Number of occasional users	thousands	3,035	2,732	3,338	N/A	3,035
Number of chronic users	thousands	2,707	2,437	2,977	2,842	2,437
Total Expenditures for occasional users ¹	Constant 2000 dollars (billion)	\$5.5	\$4.9	\$6.1	\$5.5	\$5.5
Total Expenditures for chronic users ²	Constant 2000 dollars (billion)	\$29.8	\$26.8	\$32.8	\$31.3	\$26.8
Total Expenditures for all users ³	Constant 2000 dollars (billion)	\$35.3	\$31.7	\$38.9	\$36.8	\$31.3
Total consumption with 11% barter purchases ⁴	metric tons	259	231	284	268	288.5
Total consumption with 25% barter purchases ⁵	metric tons	290	261	320	302	257

¹Total expenditures for occasional users=((Number of occasional users)*(Weekly expenditure by occasional users)*(52 weeks)/1,000,000,000

²Total expenditures for chronic users=((Number of chronic users)*(Weekly expenditure by chronic users)*(52 weeks)/1,000,000

³Total expenditures for all users=(Total expenditures for occasional users) + (Total expenditures for chronic users)

⁴Total consumption with 11% barter purchases=((Total expenditures)/(Retail Price*1,000))*(1+ .11)

⁵Total consumption with 25% barter purchases= $((\text{Total expenditures})/(\text{Retail Price} \times 1,000)) \times (1 + .25)$

Outlook for Refining Consumption Estimates and Recommendations

- Use the ADAM data to determine how many chronic drug users there are in the United States.
- Use ADAM data to determine how frequently drugs are used.
- Use ADAM data to determine dosage amounts.

Heroin Consumption Estimates

Estimating consumption of heroin, as with other illicit drugs, poses a myriad of problems that defy the best efforts of researchers to collect data appropriate for meaningful statistical analyses at the national level or to provide a realistic description of the nature and quantity of the narcotics abusing population and the underground markets in which they operate. The data sources noted earlier in this paper represent only bits and pieces of the world of illicit narcotics abuse. These data, while useful subsets, require a number of heroic assumptions, as well as some fairly arbitrary adjustments, when they are used as the basis for deriving national level estimates.

Nevertheless, a number of research efforts have been undertaken using the data sources noted above as well as data from NIDA's Community Epidemiology Working Group (CEWG) and data solicited through interviews with treatment center physicians, law enforcement officials, and even members of the heroin abusing population. Most of these research efforts follow one of two approaches:

- Estimate the number of users and the average quantity of pure heroin (in milligrams) consumed per user per day. The product of these two variables is then multiplied by 365 to arrive at the average quantity of heroin consumed per year.⁹⁵
- Estimate the number of users and the amount of their weekly expenditures on heroin. The product of these two variables is multiplied by 52 (weeks/year) and the result divided by the average retail street price per pure gram of heroin to arrive at the quantity of heroin consumed per year.⁹⁶

While both of these approaches are theoretically sound, both are hampered by inherent weaknesses in the available data and thus require assumptions, which, if altered, would have a substantial impact on the end result. For example, much of the data that are readily available reflect only those drug abusers who have either sought treatment, been arrested, or died of drug related causes. Many drug abusers either do not live in households or are never seen by public health or law enforcement officials and, thus, are not reflected in official statistics on drug abuse. Moreover, the existing data generally reflect the situation in only a relatively few selected urban areas, which may or may not be indicative of the situation at the national level. Thus researchers are forced to assume adjustments to the data based on whatever criteria they deem appropriate. Those assumptions that have a substantial impact on three key variables of the two approaches noted above are discussed below.

⁹⁵ *Full Market Model, Interagency Heroin Threat Assessment 2000, and A Direct Approach to Estimating Heroin Consumption.*

⁹⁶ Office of National Drug Control Policy, *What America's Users Spend on Illegal Drugs, 1988-2000.*

Assumptions

Number of Users. Estimating the number of heroin users requires researchers to distinguish between hard core addicts (i.e., chronic users) and casual users since both the rates of daily consumption and the expenditures on the drug will differ substantially for each group. The standard approach has been to assume that a chronic user consumes heroin on more than 10 days per month, and anything less than that is considered casual use. Whether this is a reasonable assumption is open to question. For example, TEDS data indicates that of individuals in treatment for heroin abuse in 1996, 83 percent used heroin daily and another 4 percent used between three and six times per week.⁹⁷ However the assumption of more than 10 days per month implies that in 1996 only 67 percent of heroin abusers were chronic users, while in 2000, 78 percent were chronic users.⁹⁸

The number of chronic users cited in the most recent studies also depends on an assumption that all chronic drug users have a substantial probability of being arrested. However, many researchers find that most heroin users do not show up in the criminal justice or treatment systems for a substantial period of time, and many never do.⁹⁹ In addition, there does not appear to have been an inclusion of persons arrested as juveniles in the arrestee data, although there is clearly a high proportion of drug use among juvenile arrestees.

Rates of Usage. Researchers who rely on estimates of daily rates of usage must necessarily estimate an average use rate that can be applied to chronic users and one that can be applied to casual users. Such rates can be extremely problematic due to substantial variation in the package size and purity of the heroin purchased on the street as well as variation in the tolerance of the user. Some research has found that chronic users also vary their heroin use depending on the time of day, the day of the week, and what other substances are taken with the heroin.¹⁰⁰ According to many epidemiologists, chronic heroin users generally use the drug two to four times per day, although the more heavily addicted use more frequently, particularly at lower purity levels. Moreover, as heroin addiction progresses, addicts develop increasing tolerance for the drug and must take increasingly higher doses or take them more frequently to avoid withdrawal. Withdrawal symptoms generally occur from three to five hours after an addict's last dose.¹⁰¹ Method of administering the drug can also affect rates of usage. Generally injectors use heroin of lower purity than snorters. Thus, the distribution of these two categories can impact the average rate of usage.

In addition, The data from which to derive average rates of usage come largely from laboratory tests of seized heroin and from treatment center and law enforcement records. These represent a relatively small sample of the total heroin abuse occurring nationwide, and may or may not adequately represent reality.

Price of Heroin. Researchers who estimate heroin consumption based on expenditure of abusers must derive an average price per unit of pure heroin in order to convert total expenditures to total quantities consumed. However, those who have done so have tended to rely on very small samples of price data (e.g., data from six US cities) to extrapolate to the entire nation. Since the price per unit can

⁹⁷ National Drug Intelligence Center, *Interagency Domestic Heroin Threat Assessment*, Appendix B: Heroin Consumption in the United States, February 2000.

⁹⁸ Based on data in Abt study (Table 3) p.9

⁹⁹ At least one expert has noted that it generally takes from three to five years for a heroin addict to become visible to health or law enforcement officials.

¹⁰⁰ Agar, Bourgois, French, & Murdoch, 1998.

¹⁰¹ National Drug Intelligence Center, *Interagency Domestic Heroin Threat Assessment*, Appendix B: Heroin Consumption in the United States, February 2000.

vary substantially across geographic areas, as well as with the size of the purchase and the intended method of administration, any given average price may be subject to substantial margin of error. Although the researchers have attempted to adjust prices for the distribution of different methods of administration, it is questionable how stable such data is over time. In addition, the basic price data is often for a year substantially earlier than the one for which the estimate of consumption is being made, and the researchers' only recourse appears to be an adjustment based on the Consumer Price Index, which is certainly not representative of a chronic user's market basket of goods and services.

Even the estimation of what abusers spend per week is subject to considerable uncertainty as the data collected is for expenditures on all drugs, not just heroin. Thus a breakdown of these expenditures by different drug types must be inferred by the researcher, and what this inference is based on is not always made clear. Moreover, drug sales are not always for cash. This presents the problem of estimating the value of different types of income in kind as well as trying to determine how much of total expenditures are represented by income in kind. Determining the degree of uncertainty that such estimates may introduce is a virtual impossibility. In this arena, one could defend almost any number.

Existing Consumption Estimates

Despite the shortcomings in data and assumptions described above, the studies that have been undertaken in recent years have been done in a rigorous and scholarly manner, and while not necessarily definitive of the problem, they are at least indicative of the order of magnitude of the heroin abuse problem in the United States. The tabulation below shows the basic variables and results of three of the more recent US Government or Government sponsored studies of which we are aware.

Table 5 - 5 Heroin Consumption Estimates, 2000

Study	Variables Estimated	(mt of heroin consumed)
<i>Full Market Model</i> ¹⁰²	Chronic Users (898,000)	10.0
	Casual Users (253,000)	
	Chronic Use Rate (30mgs/day)	
	Casual Use Rate (15mgs/week)	
<i>What America's Users Spend on Illegal Drugs</i>	Chronic Users (898,000)	13.3
	Casual Users (253,000)	
	Chronic Expenses/week (\$201.)	
	Casual Expenses/week (\$ 50.)	
	Retail Price/Pure Gram (\$839.)	
<i>Interagency Heroin Threat Assessment 2000</i>	Users (980,000) ¹⁰³	17.9
	Average Use Rate (50mgs/day)	

¹⁰² Values for chronic and casual users are updated to reflect the most recent version of *What America's Users Spend on Illegal Drugs* (December 2001).

¹⁰³ The *Global Heroin Threat to the United States*, July 2000, provides the following explanation for the estimated number of users. For the purpose of providing a reasonable realistic U.S. heroin consumption for this assessment, a conservative estimate of 50 mg per day average dosage of pure heroin was used, calculated for a population of 980,000 hard-core users, of whom 83 percent are believed to use heroin daily. This average daily dosage is substantially less than the likely requirements of many longtime addicts and is an attempt to normalize the full spectrum of users, including the increased number of younger new users whose tolerance levels may still be relatively low. Many analysts and treatment professionals, however, believe that 50 mg as the estimate for average daily dosage for heroin users in the United States underestimates overall U.S. market demand. Consumption by occasional users was also factored into our calculation.

The DEA estimate uses the smallest use rates. These use rates are based on estimating that a “single dose” of street heroin contains 10-20mgs of pure heroin and is taken 1.5 – 1.6 times per day. Both the single dose estimate and the frequency of administration appear to be relatively low as averages for chronic users. DEA’s own Domestic Monitor Program (DMP), for example, implies that the average quantity of pure heroin in a “single dose” is 23mgs, and many epidemiologists suggest that chronic users generally consume at least two to four times per day.¹⁰⁴ This implies a minimum consumption rate of 46mgs per day for chronic users. The use rate for casual users in the DEA model implies that such users are consuming only a little over 2mgs per day.

The ONDCP sponsored study derives estimates of what abusers spend on heroin each year and then divides this number by the average retail price per pure gram of street heroin to arrive at a total quantity of heroin consumed. We have already noted some of the problems inherent in the data and assumptions used in this type of estimate, probably the most significant of which is the estimate of the average price per pure gram of heroin. By the researchers’ own admission they are “... especially concerned that the street prices may have been lower than shown ... If that is so, then our estimates for heroin consumption would be too low ...”.¹⁰⁵ The researchers also point out that if they used the same methodology to derive the average retail unit price for heroin that they used for cocaine, then the heroin price would have been less than half that shown above. Instead, they bifurcated the market into injectors (who pay relatively high unit prices for low quality heroin) and snorters (who pay relatively low unit prices for high quality heroin). They then weight the heroin prices by the market shares of injectors (62%) and snorters (38%), thus obtaining a higher average price than would otherwise be the case. The researchers do note that they are uncomfortable with this adjustment.¹⁰⁶

The NDIC study concentrates on chronic heroin use and derives an estimated range for average daily use of 46 – 92 milligrams, based on DMP data (i.e. 23mgs of pure heroin in a “single dose”) and the epidemiology estimate that chronic users consume from two to four times daily. The researchers then argue that a realistic national average would be 50 mgs per day, and that even this rate is likely to be conservative. Some support for this view can be gleaned from research performed by the Crime and Narcotics Center for 34 countries. This research, *Estimating Narcotics Consumption in Selected Countries*,¹⁰⁷ found that the average daily rate of heroin consumption per user ranged from 60 to 120 mgs of pure heroin during the late 1990s and that the median was about 60-80 mgs. These data may be somewhat biased on the high side however, since they were based on the sample of users that were seen by either law enforcement or health and treatment officials. Most users who either seek help from health facilities or cross the path of law enforcement officials are those who have been using the drug long enough to have built up substantial tolerance levels or developed serious health problems. Such abusers clearly would be using at the higher end of the consumption rate spectrum.

Alternative Consumption Estimates

Given the uncertainty surrounding all of the estimates of heroin consumption, we have set out below some alternative assumptions and results for the three studies noted above. Whether these alternatives are better or worse than those in the original studies is not the issue; only that they are equally plausible and have a substantial impact on the results.

¹⁰⁴ NDIC. *Interagency Domestic Heroin Threat Assessment*, Appendix B: Heroin Consumption in the United States. February 2000.

¹⁰⁵ Office of National Drug Control Policy, *What America’s Users Spend on Illegal Drugs, 1988-2000*, p.18.

¹⁰⁶ Office of National Drug Control Policy, *What America’s Users Spend on Illegal Drugs, 1988-2000*, p.45.

¹⁰⁷ The report issued in May 2000 is not widely available since it is classified.

In the DEA model, for example, one could easily justify using the 23 mgs “single dose” based on the DMP data and a frequency of use of 2 or 3 times per day for chronic users and once a week for casual users. Such adjustments would yield total annual heroin consumption of 15.4 metric tons vice 10.0 metric tons. Similarly, in the ONDCP sponsored study, for every \$100 reduction in the average retail price for heroin, the estimate of annual consumption would increase by 2 – 3 metric tons. Thus, if the retail price of heroin were calculated using the same method that was used for cocaine the price would be halved and the estimate of total consumption would be almost double (i.e. 25 metric tons vice 13.3 metric tons).¹⁰⁸ It is also instructive to note that if the average street-buy in the US were the “dime bag” (i.e. a \$10 bag containing an average of 23 mgs of pure heroin), then the average street price per pure gram would be about \$435 vice the \$839 used in the ONDCP sponsored study, and the annual quantity of heroin consumed would be 26.4 metric tons. Finally, in the NDIC model, a use rate of 40 mgs per day would lower the NDIC consumption estimate to 14.3 metric tons, while a use rate of 60 mgs per day would raise the estimate to 21.5 metric tons. The point is that, given the vagaries of the data, any of these numbers are plausible.

An important data issue in all of these estimates is what the distribution of users looks like in terms of their use rates. Obviously, chronic users are at the higher end of that distribution and, if there are many more chronic users than casual users, the distribution will be skewed toward the high end. Although we cannot know with certainty what the distribution looks like, there is some research that, although dated, suggests use rates for chronic abusers are higher than those included in the DEA model. For example, a study sponsored by ONDCP in 1994 noted that heroin habit size had increased substantially between 1981 and 1992 due to rising purities, falling prices, and increased snorting as the method of administration. The study went on to note that median consumption rate of heroin in New York was 700 mgs of pure heroin per week (100 mgs/day) and that the mean was 972.5 mgs per week (139 mgs/day), while in Chicago the median rate was 280 mgs per week (40 mgs/day) and the mean was 350 mgs per week (50 mgs/day).¹⁰⁹ In addition, a 1998 study of heroin addict habit sizes in San Francisco, Baltimore, and Newark found that the average use rate per day ranged from lows of 14, 62, and 51 milligrams of pure heroin to highs of 224, 258, and 227 milligrams respectively for these three cities.¹¹⁰ Since heroin prices have continued to fall throughout the 1990s and snorting probably is even more prevalent now than in the early 1990s, it seems unlikely that average habit sizes would have declined. While two cities are not a sufficient sample to extrapolate to the entire country, these data do suggest that average use rates may be higher than commonly believed.

It is also interesting to note that the weekly expenditure data in the ONDCP sponsored study (\$201. per week for chronic users and \$50. per week for casual users) imply average use rates of 67 milligrams per day of pure heroin for chronic users and 16 milligrams per day of pure heroin for casual users.¹¹¹ If we apply these use rates to the number of chronic and casual users in the ONDCP sponsored study, the quantity of heroin consumption would equal 23 metric tons vice 13.3 metric tons. This only illustrates a potential inconsistency between the weekly expenditure data and the average retail price per pure gram used to convert total expenditures to total quantity of heroin consumed. As noted earlier, a lower average retail price per pure gram would yield a higher quantity of heroin consumed.

¹⁰⁸ Office of National Drug Control Policy, *What America's Users Spend on Illegal Drugs, 1988-2000*, p.45.

¹⁰⁹ ONDCP, *Heroin Users in New York, Chicago, and San Diego*, November, 1994, pp 26-27.

¹¹⁰ Agar, Bourgeois, French, & Murdutch, op. cit., pp 922-923.

¹¹¹ This assumes that the average street buy is the “dime bag” (a \$10. bag containing 23 mgs of pure heroin). For example:

$$\begin{aligned} \$201./\$10. &= 20.1 \text{ bags per week} \\ 20.1 \text{ bags}/7 \text{ days} &= 2.9 \text{ bags per day} \\ 23 \text{ mgs} \times 2.9 \text{ bags} &= 67 \text{ mgs per day} \end{aligned}$$

One final alternative estimate is instructive. As noted above, the true distribution of chronic vs. casual users is unknown and the standard definition is to consider those who consume heroin 10 or more days per month as chronic users. Because heroin is highly addictive, most chronic users or addicts will eventually be consuming multiple times per day, as long as the drug is available and they have the wherewithal to acquire it. Thus, it seems likely that true addicts would be consuming considerably more than 10 days per month. This would change the distribution of chronic vs. casual users in the studies cited above, with fewer chronic users and a greater number of casual users among the 1,151,000 total. For example, if the number of chronic users were 600,000 instead of 898,000 and casual users numbered 551,000 instead of 253,000, the total amount spent on heroin in 2000 would be \$8.5 billion vs. \$11.2 billion, assuming the same average weekly expenditures cited in the ONDCP sponsored study. However, the average weekly expenditures of chronic users likely would be higher since we are now defining a smaller number of more heavily addicted users as chronic. Indeed, even the weekly expenditures of casual users likely would be higher, as this category would now include the influence of expenditures by a portion of those who consume more than 10 days per month. Assuming that these average weekly expenditure numbers turned out to be \$210. for chronic users and \$60. for casual users (vice \$201 and \$50 respectively), the total amount spent on heroin in 2000 would now be \$9.2 billion. Assuming the average retail price per pure gram was \$435., the total quantity of heroin consumed would be 21.1 metric tons. Alternatively, if the average retail price per pure gram were the \$839 as cited in the ONDCP sponsored study, the total quantity consumed would be only 11.0 metric tons.

Given the foregoing discussion and the available data to date, we believe the most prudent estimate of heroin consumption in the United States should be a range of roughly 14 – 20 metric tons per year. The mid-point of this range (17 metric tons), though not necessarily any more accurate than either of the end-points, does imply an average daily use rate (48 mgs/day) and average retail price per pure gram (\$676) well within the error ranges of all the methodologies cited above. Indeed, in any methodology involving multiplicative combinations of estimated variables, each with its own error range, the error range of the end product will be magnified several fold.

Outlook for Refining Consumption Estimates

There is good news and bad news with respect to the outlook for better estimates of heroin consumption. The good news is that data collection efforts are likely to improve as collectors better understand the kinds of information and the extent of coverage needed by researchers engaged in estimating national levels and trends in heroin consumption. Data series, such as ADAM, are already scheduled for improvements that will make estimates based on them more reliable. The bad news is that the resources (read dollars) needed to effect major improvements in data collection and coverage may substantially exceed those that are likely to be available.

Recommendations

Short-Term

Accept, as an interim measure, the range of heroin consumption noted above.

Develop a plan that advocates specific actions to be taken to improve data collection for both methodologies (what users spend & how much they use per day). Approaching the problem from both perspectives will help to identify inconsistencies or consistencies. The plan should also include estimated costs of these efforts both in terms of manpower and dollars, as well as a specific sub-plan to lobby for allocation of the requisite resources to implement the collection plan. Assign a specific agency or create a national level task force to coordinate and monitor the execution of all the individual aspects of the data collection plan.

Long-Term

Assuming the resources are made available, implement the action plan developed in the short term. In addition, efforts should be made to expand the DMP and the Heroin Signature Program to include more samples from a greater variety of sources.

The above recommendations may, at first blush, seem like asking for the moon. However, if we are to seriously address the issue of estimating heroin consumption (or that of other illicit drugs), there can be no substitute for sample data that is truly representative of the using population. When the domain in which the data must be collected is an illicit market, the task of obtaining representative data is both more difficult and more expensive.

Marijuana Consumption Estimates

Assumptions

The estimate of the amount of marijuana consumed in the United States is based upon an ostensibly simple equation: the number of marijuana users in the United States multiplied by the amount of marijuana each user consumes. However, the straightforwardness of this calculation belies the complexity of the overall question to be answered. The data applied to this equation are based upon four key assumptions that are reliable to various degrees. These assumptions are discussed in detail in the remainder of this section.

The Number of Marijuana Users in the United States. Typically, estimates of the number of drug users are based upon consequence indicators (e.g., drug-related treatment admissions, emergency department episodes, mortality data) or on evidence provided by the users themselves (e.g., surveys, voluntary drug tests). In the case of marijuana, the applicability of estimates based upon data from consequence indicators was limited. Many individuals use marijuana frequently and at relatively high dosages without ever entering treatment, visiting an emergency room, or suffering a drug-related fatality. Thus, to base an estimate of the total number of marijuana users on data from consequence indicators likely would provide an inaccurate perspective.

Relying upon information provided by marijuana users themselves may yield a more accurate estimate. However, there are drawbacks to this method of data collection as well. The first potential problem—the difficulty of collecting marijuana use information from a sufficiently broad sampling of users—is mitigated by the existence of the NHSDA. The NHSDA, which derives its information from a representative sampling of individuals throughout the United States, provides an estimate of the number of the nation’s marijuana users. Limitations to NHSDA are noted in an earlier section of this paper.

When applying NHSDA data to the question of how many marijuana users reside in the United States another problem arises. The NHSDA reports the number of individuals who have used marijuana 1) at least once in their lifetime, 2) at least once in the past year, and 3) at least once in the past month. In the report, *What America’s Users Spend on Illegal Drugs 1988-2000*, only the data provided by those individuals who used marijuana in the past month are employed to estimate the total number of marijuana users in the United States. That is, the data provided by individuals who reported having used marijuana in the past year, but not in the past month, are not used. The implications of this are potentially significant. In 2000, an estimated 10,714,000 individuals used marijuana in the past month, and 18,589,000 used marijuana in the past year. Thus, the amount of marijuana consumed by nearly 8,000,000 users was not factored into the final consumption estimates. The impact of this omission is difficult to gauge. It is reasonable to assume that the majority of the individuals who used marijuana in the past year but not in the past month consume the drug relatively infrequently and in relatively small amounts.

Calculating the Number of Joints Per Month That the Average User Consumes. Relying upon NHSDA estimates to determine how many marijuana users are in the United States ultimately leads to another problem. The object of determining the number of marijuana users is to apply that number to simple calculation: the number of marijuana users in the United States multiplied by the amount of marijuana each user consumes. This calculation is dependent upon the ability to develop an estimate of how much marijuana the average user consumes. This is problematic because individuals use marijuana at varying rates and in unlike quantities. To some extent, NHSDA data reflect these disparate usage patterns, but these nuances are lost when the overall estimate of the number of total users is applied to the calculation mentioned above. For example, in 2000 7.2 percent of 12 to 17 year olds, 13.6 percent of 18 to 25 year olds, and 3.0 percent of individuals over the age of 26 used marijuana in the past month. For the purposes of estimating how much marijuana these individuals consumed, it is necessary to determine whether members of each age group consumed the drug at the same rate: e.g., is it likely that a 12-year old used marijuana as frequently and in the same quantities as a 25-year old?

In spite of this likely disparity, the report *What America's Users Spend on Illegal Drugs 1988-2000* assumes that all marijuana users consume the drug at the same rate and with the same frequency. Thus, one calculation is used to accommodate usage by males and females, adolescents and adults, frequent users and users who tried the drug for the first time in the past month, individuals who use only marijuana and those who use other drugs as well,¹¹² etc.

The lack of information regarding the number of joints that the average user consumes also poses a problem. The 2000 NHSDA did not address this question; NHSDA stopped questioning users about the number of joints they used in 1994. Because of this information gap, the report *What America's Users Spend on Illegal Drugs 1988-2000* uses the figure reported in 1994 (18.7 joints per month). This assumption is problematic because it fails to reflect usage trends over the past 6 years. The potential for this assumption to have a serious impact on the final marijuana consumption estimate exists but is difficult to quantify. For example, a seemingly dramatic increase in the total number of marijuana users in the United States may prove insignificant in terms of the quantity of the drug consumed if a large portion of that increase represents younger individuals who may use the drug infrequently or in small quantities. However, if these younger users are assumed to consume marijuana at the standard rate of 18.7 joints per month, the impact of this increase will be falsely perceived to be much greater than it is.

The assumption that users continued to consume marijuana at the rate of 18.7 joints per month also is problematic because it does not address in the fact that in recent years the THC (*delta-9 tetrahydrocannabinol*) content of marijuana has increased. The *National Drug Threat Assessment 2002*, prepared by the National Drug Intelligence Center, reports that "potency as characterized by THC content is still increasing. According to data from the Potency Monitoring Project, the THC content of commercial-grade marijuana increased from 1997 to 2000 for commercial-grade (4.25% to 4.92%) and for sinsemilla (11.62% to 13.20%)."¹¹³ Despite this increase, the *National Drug Threat Assessment 2002* states that:

Traffickers in foreign source areas and in the United States supply users with marijuana of varying potency, and while high-grade marijuana appears to receive more publicity, lower potency

¹¹² According to NHSDA data, approximately 59 percent of current illicit drug users consumed only marijuana, and 17 percent used marijuana and another illicit drug in the past month.

¹¹³ The *National Drug Threat Assessment 2002* provides the following explanation of the Potency Monitoring Project. "The Potency Monitoring Project, conducted at the University of Mississippi and funded by the National Institute on Drug Abuse, analyzes samples of marijuana seized by federal agencies."

marijuana—much of which is produced in Mexico—is more endemic. Even in major domestic cultivation areas, large amounts of marijuana produced in Mexico are available.

Given the range of THC content of the marijuana available in the United States, it is likely that the assumption that the average user consumes 18.7 joints per month is not sufficiently representative of the wide range of users it is meant to accommodate.

Calculating the Average Weight of a Joint. An additional problem results from the focus on marijuana joints in *What America’s Users Spend on Illegal Drugs 1988-2000*. In that report, the joint is considered to be a standard measure of consumption. That report estimates that the average joint contains 0.014 (specifically 0.0136 ounces—0.39 grams) of marijuana. However, the amount of marijuana contained in a joint is not fixed.¹¹⁴ Thus, even if a user consumes a constant number of joints, the amount of marijuana consumed may vary dramatically. In addition, marijuana may be consumed in forms other than the joint (e.g., via a bong or blunt).¹¹⁵ These other means of consumption are not addressed in *What America’s Users Spend on Illegal Drugs 1988-2000*.

Calculating the Average Price of Marijuana Per Ounce. The report *What America’s Users Spend on Illegal Drugs 1988-2000* provides an estimated price per ounce for marijuana, but does not provide a detailed discussion regarding the source of this information so it is not possible to assess the reliability of this information. Because this issue is not explained fully it is impossible to determine what, if any, allowances were made for noncash transactions.

Existing Consumption Estimates

Table 5 - 6 Marijuana Consumption Estimates, 2000

Number of Users	10,714,000
Joints Used per Month	18.7
Weight of a Joint	0.0136 ounces
Price per Ounce (1/3 ounce purchase)	\$284
Total Annual Expenditure	\$9,289,038,000
Total Metric Tons Consumed	927

Source: Office of National Drug Control Policy, 2001. *What America’s Users Spend on Illegal Drugs, 1988-2000*.

The estimates in Table 5-6 are based upon the data and calculations provided by the report *What America’s Users Spend on Illegal Drugs 1988-2000* prepared by Abt Associates, Inc. The number of users and the total metric tons consumed differ from those presented in *What America’s Users Spend on Illegal Drugs 1988-2000* because in that report the number of users in 2000 was based upon a projection. Since that report was prepared, NHSDA released its estimates for 2000 so in the table above the projected number of users was replaced with the actual NHSDA estimates.

The series of calculations used to arrive at the total metric tons consumed follows.

¹¹⁴ The 1997 NNICC prepared by the Drug Enforcement Administration states that a joint contains one-half gram [of marijuana] on average...” This information was included in *What America’s Users Spend on Illegal Drugs 1988-2000*.

¹¹⁵ According to the 1997 NNICC, a blunt may contain as much as 6 times [the amount of marijuana contained in a joint]. This information was included in *What America’s Users Spend on Illegal Drugs 1988-2000*.

- The average user consumes 18.7 marijuana joints per month; each joint contains 0.0136 ounces of marijuana. [$18.7 \times 0.0136 = 0.25432$ ounces (the amount of marijuana that the average user consumes each month)]
- The average user consumes 0.25432 ounces of marijuana per month; the price per ounce for marijuana (for a 1/3-ounce purchase) is \$284. [$0.25432 \text{ ounces} \times \$284 = \$72.23$ (the amount the average user spends on marijuana each month)]
- The average user spends \$72.23 per month on marijuana. [$\$72.23 \times 12 \text{ months} = \867 (the amount the average user spends on marijuana each year)]
- The average user spends \$867 on marijuana per year; the NHSDA estimates that there are 10,714,000 people in the United States who have used marijuana in the past month. [$\$867 \times 10,714,000 = \$9,289,038,000$ (the annual estimated expenditure for marijuana in the United States)]
- The annual estimated expenditure for marijuana in the United States is \$9,289,038,000; the price per ounce for marijuana (for a 1/3-ounce purchase) is \$284. [$\$9,289,038,000 / \$284 = 32,707,880$ ounces (the amount of marijuana—in ounces—consumed annually in the United States)]
- Converted to metric tons: 32,707,880 ounces = 927 total metric tons consumed annually in the United States.

The result of the above calculations—that 927 metric tons of marijuana were consumed in the United States in 2000—must be regarded with some skepticism when marijuana seizure data for 2000 are acknowledged. According to the Federal-wide Drug Seizure System, in 2000, approximately 1,200 metric tons of marijuana were seized in the United States, and a large portion of the seized marijuana was from foreign sources.¹¹⁶ Thus, according to these estimates the amount of marijuana seized exceeded the amount of marijuana consumed in the United States. Abt Associates, Inc., the preparers of *What America's Users Spend on Illegal Drugs 1988-2000* the report upon which this document relies heavily, offer one explanation for the fact that marijuana seizures exceed the final consumption estimate.

There may be a measurement problem. That is, the tonnage from seizures may include nonsalable bulk, and thus, seizures may overstate the consumption-equivalent of marijuana seized at the border.

However, the authors acknowledge that this argument does not adequately explain the disparity between the amount of marijuana seized and the amount consumed.

...it seems unlikely that marijuana growers would continue to export into the United States when the probability of detection and seizure of product was as high as is implied by the combination of the consumption and seizure estimates.

Alternative Consumption Estimates

It is likely that the estimate of marijuana consumption detailed above (927 MT) is too low.¹¹⁷ There are various reasons that this may be the case, many of which are discussed in detail in the

¹¹⁶ Marijuana seizure information is taken from the *National Drug Threat Assessment 2002* prepared by the National Drug Intelligence Center.

¹¹⁷ The marijuana consumption estimate provided in *What America's Users Spend on Illegal Drugs 1988-2000* is somewhat higher than the figure calculated here (1,047 metric tons compared with 927 metric tons). While the

Assumptions portion of this section. The failure to include the nearly 8 million individuals who used marijuana in the past year (but not in the past month) probably has resulted in a much lower final consumption estimate. If the amount of marijuana consumed each year by these past year users is factored in, it raises the overall marijuana consumption estimate to 957 MT.¹¹⁸ If allowances are made for the approximately 2 percent of the general population not captured by the NHSDA, and if these are assumed to be all past-month users of marijuana, the overall estimate is raised another 18 MT for a new total of 975 MT.¹¹⁹ The marijuana consumption estimates yielded by these calculations are likely still underestimates, in part because the NHSDA data upon which the estimates are based rely on information self-reported by users themselves. This may render the estimates considerably lower as users likely underreport the amount of marijuana they consume.

The *Full Market Model* provides a much higher, alternative estimate for the amount of marijuana consumed in the United States. DEA's Statistical Services Section yielded a marijuana consumption estimate of 4,270 metric tons for 2000.¹²⁰

Outlook for Refining Consumption Estimates

The primary obstacle to developing a reliable estimate of the amount of marijuana consumed in the United States results from the limitations and constraints of the data upon which the estimate is based. Thus, these supporting data must become more comprehensive, relevant, and meaningful for the accuracy and reliability of the overall estimate to improve. The outlook for this endeavor is promising as data collection agencies develop more rigorous methods and a more inclusive scope.

NHSDA data will remain a key component of the marijuana consumption estimate calculation. No other survey offers the resources or coverage that the NHSDA provides. Furthermore, NHSDA researchers have already implemented changes that will render the data it provides more immediately applicable to this project. For example, the implementation of computer-assisted interviewing ensures an increased sense of privacy and (likely) a greater degree of accuracy with regard to the information the respondents provide. In addition, the 2001 iteration of the NHSDA supplies new information about marijuana markets, including data regarding prices and quantities consumed. This information will prove essential to developing more accurate consumption estimates.

Marijuana market information now may be supplemented by data gathered and analyzed as part of the Arrestee Drug Abuse Monitoring Program (ADAM). Recent reports produced by ADAM provide

higher figure may be closer to the actual amount consumed in the United States, it should not be assumed to be more accurate. Abt Associates, Inc. arrived at the figure of 1,047 metric tons because the NHSDA user data were not available for 2000 at the time of publication of their report. Thus, their estimated number of past month users was based on the projection that the number of users would increase from 11.9 million in 1999 to 12.1 million in 2000. In fact, the estimated number of past marijuana users as reported by NHSDA in 2000 was approximately 10.7 million.

¹¹⁸ According to NHSDA data, in 2000, an estimated 18,589,000 individuals used marijuana in the past year. Of these users, 10,714,000 reported past month use. Thus, the remaining 7,875,000 past year users represent the group being discussed here. For the purposes of this calculation, these past year users were assumed to have consumed an average of 10 marijuana joints during the past year. When these values (number of users and amount of marijuana consumed) were applied to the calculation described above (Section 3.3.2), the result was 30.36 MT. This figure has been added to the previous estimate of 927 MT.

¹¹⁹ For purposes of this calculation, this subpopulation missed by the NHSDA are assumed to have consumed marijuana at the rate of past month users.

¹²⁰ The *Full Market Model* incorporates the following drug use-related data sets and corresponding demand indicators: National Household Survey on Drug Abuse, Monitoring the Future study, Arrestee Drug Abuse Monitoring Program, Drug Abuse Warning Network, Treatment Episode Data Set.

detailed information about marijuana purchases by arrestees in ADAM sites throughout the United States.

Recommendations

The two most critical components of the marijuana consumption estimate calculation are 1) the number of users in the United States and 2) how much marijuana these users consume. Thus, these are the two subject areas in which data refinement is most essential. Since the marijuana consumption estimates produced in the report *What America's Users Spend on Illegal Drugs 1988-2000* and in this document are low, it is likely that the number of users and/or the amount of marijuana these users consume was underestimated.

Estimated Number of Users

- Include the nearly 8 million individuals who used marijuana in the past year but not in the past month.
- Continue to implement strategies designed to elicit truthful, accurate information from marijuana users.
- Undertake additional research to determine how to account for possibly untruthful or inaccurate information provided by marijuana users.

Amount of Marijuana Consumed

- Examine the role of increasing THC content.
- Conduct research to determine whether existing estimates of marijuana usage remain accurate.
- Undertake further research to develop formulas that accommodate different users' rates of usage.
- Undertake further research to determine the impact of using marijuana in different forms (e.g., joints, blunts, bongs).
- Determine the extent to which noncash transactions influence the estimates of marijuana prices.

Methamphetamine Consumption Estimates.

Methamphetamine abuse is now seen as a major problem in the U.S. However, the best estimates on this issue suffer from considerable imprecision. All of the methamphetamine consumption estimates below are best treated as having wide (but unknowable) confidence intervals. These estimates are based on analyses of mostly TEDS, DUF, and STRIDE data. This analytic work was conducted by Abt Associates and was published in *What America's Users Spend on Illegal Drugs, 1988-2000* (Office of National Drug Control Policy, 2001b). The most recent data, based on Abt research, suggests that in 2000 about 600,000 hardcore methamphetamine users exist in the U.S., and they consumed about 20 metric tons of methamphetamine at the cost of about \$5.4 billion (in 2000). Also, the number of methamphetamine users and expenditures on methamphetamine has increased over the past decade.

Assumptions

Very little methamphetamine use is found in the general population and in schools. Therefore, the NHSDA and MTF are not particularly useful for estimating methamphetamine use. Researchers have come to rely on using more specialized populations to arrive at estimates of methamphetamine use. One

approach is to use DUF data. When applied to methamphetamine, the approach does not work very well. Estimates using DUF are problematic for two reasons. The first is that methamphetamine use is rare among arrestees in many cities, so the estimates are really based on the experiences of a few cities, and those experiences are then prorated across the nation. The fact that so few cities account for the estimates may impart additional uncertainty to the calculation. The second reason for skepticism is that the DUF methamphetamine use estimates vary markedly from year to year.

The other approach is to use TEDS data. In a study for ONDCP, Abt used TEDS data to estimate the number of chronic methamphetamine users. The first problem with relying on TEDS data are that some of those who were diagnosed as needing treatment for methamphetamine said they did not use methamphetamine in the last month. Abt argued that such users are probably not chronic users and excluded them from the calculations. The second problem arises when one substance abuse provider referred clients to another provider. If these referrals were for a continuum of care, they would amount to double counting, so Abt excluded such cases from the analysis. A third problem is that TEDS under-represents treatment admissions. In 1998 TEDS included about 83 percent of all TEDS-eligible admissions and about 67 percent of all treatment admissions. (A "TEDS eligible admission" is an admission to a program that receives public funding.) To adjust for under-counting, Abt took the average of the two under-count estimates (1 divided by 0.67 and 1 divided by 0.83). A fourth problem is that the TEDS public release data combines treatment for methamphetamine with treatment for other stimulants. Abt assumed that methamphetamine accounted for about 79 percent of treatment admissions where stimulants were identified as the primary substance of abuse, so Abt adjusted their estimates by multiplying them by 0.79.

Existing Consumption Estimates

Table 5 - 7 Summary of Abt study for ONDCP - 1998 Estimates

Items	Number & Source	Assumptions
Number of users (general assumptions)	NA	3/4 of all users are chronic; 1/4 occasional
Rate of users entering treatment	TEDS	limitations to TEDS data (data does not capture all admissions; includes other stimulants, etc.)
Number of chronic users Median weekly expenditure	669,000 (TEDS) \$173 (DUF)	assumes that chronic users seek treatment when used to calculate annual expenditures it is multiplied by 4/3 to account for occasional users, original 1995 base projection relies on 1995 Six City DUF Drug Market Study
Price per pure gram	\$294	relies partly on DEA STRIDE data
Total expenditures	\$8.0 billion	
Total amount consumed	27.2 MT	

Abt used TEDS data to estimate the number of chronic methamphetamine users. Abt first estimated the rate at which chronic methamphetamine users entered substance abuse treatment during 1998, the most recent year of TEDS data. Abt started with the total number of adults who entered treatment during 1998 and for whom methamphetamine was diagnosed as the primary or secondary drug of abuse. Abt divided the data into Metropolitan statistical areas, computed the number who entered treatment in each MSA, estimated the rate at which chronic users entered treatment in each MSA, and divided the former by the latter to estimate the number of chronic drug users in each MSA. The national estimate was the sum of the estimates across the MSAs with some adjustments (see below section on “assumptions”). Abt estimated that about 670,000 Americans use methamphetamine at a level sufficient that a clinician would deem them to need treatment.

Unfortunately, Abt has not thoroughly test the sensitivity of this estimate to alternative assumptions. Also, this single point-estimate of 670,000 for 1998 does not provide any information about earlier and later years. To get that information Abt did an overlay of the 670,000 estimate on trend estimates based on the DUF data after subtracting for chronic users incarcerated in prisons and smoothing over three-year periods (see Abt report page 23 for trend data)

After arriving at an estimate for the number of chronic methamphetamine users, Abt proceeded to calculate estimates for total expenditures for methamphetamine (based on weekly expenditures and price per pure gram data) and amount of methamphetamine consumed/purchased in metric tons. To provide an estimate of total expenditures for methamphetamine, Abt had to first calculate numbers for weekly expenditures and price per pure gram of methamphetamine. Estimates of weekly expenditure on methamphetamine are uncertain because the data are sparse. In the absence of hard data, Abt assumed that chronic users of methamphetamine spent about \$200 per week in 1995. Abt’s reasoning was that expenditures by chronic methamphetamine users are probably comparable to expenditures by chronic cocaine and heroin users, and chronic heroin and cocaine users spend about \$200 per week. The estimate of total revenue comes from multiplying the number of chronic users by their weekly expenditure, and then multiplying by 52 to determine a yearly expenditure. The result was multiplied by 4/3 (the reciprocal of 0.75) to account for occasional users. Abt estimates that in 1999 methamphetamine users spent somewhat less than \$6 billion per year on methamphetamine use. The next step was to estimate the price of methamphetamine. The final step is to divide total revenue by the price per pure gram. If casual users account for roughly 25 percent of consumption, the 1999 estimate is roughly 18 metric tons.

There is scant evidence to support any secondary check on these calculations. According to the TEDS data, 15 to 18 percent of treatment admissions between 1993 and 1998 identified cocaine as the primary drug of abuse. Methamphetamine was the primary drug for between 1.3 percent (1993) and 3.6 percent (1998) of admissions. If we take the 1998 numbers to imply that there were 4.1 chronic cocaine users for every 1 chronic methamphetamine user, and if we accept the earlier estimates of the number of chronic cocaine users, then there would be about 680,000 chronic methamphetamine users during 1998. That agrees closely with the estimate reported above, but this assumption of proportionality is tenuous. If we take the 1993 numbers to imply that there were roughly 13.5 chronic cocaine users for every chronic methamphetamine user, and if we again use the earlier estimates of chronic cocaine users, we would say there are about 230,000 chronic methamphetamine users in 1993.

Alternative Consumption Estimates.

One alternative to the TEDS-based estimate for estimating chronic/hardcore methamphetamine use comes from the Drug Use Forecasting data set (now called ADAM). To calculate methamphetamine estimates based on DUF data, Abt applied the same computing algorithms used to derive estimate for cocaine and heroin. According to Abt’s calculations, for 1998 there are about 300,000 hardcore users of methamphetamine (defined as using more than ten days per month). Combining the DUF data from all

years, hardcore methamphetamine users spend about \$90 per week on their use of methamphetamines. The estimate of total revenue comes from multiplying the number of hardcore users by their weekly expenditure, and then multiplying by 52 to determine a yearly expenditure. The result was multiplied by 4/3 (the reciprocal of 0.75) to account for occasional users. Methamphetamine users currently spend somewhat more than \$2 billion per year on methamphetamine use. The next step was to estimate the price of methamphetamine. The final step is to divide total revenue by the price per pure gram. If casual users account for roughly 25 percent of consumption, the estimate is 9 to 16 metric tons.

Outlook for Refining Consumption Estimates

The ability to improve estimates of the quantity of methamphetamine used ultimately depends on obtaining data from methamphetamine users. These data, however, are not now obtained and would probably be difficult to obtain because methamphetamine users themselves reliably know neither how much they consume nor the purity of the methamphetamine they ingest.

Given that the data for reasonably accurate estimates is difficult to obtain, there are refinements that could be made with the existing data. This section focuses on TEDS as it is used in the methamphetamine estimates in *What America's Users Spend on Illegal Drugs 1988-2000* (pages 20-23).

At the end of the second paragraph on page 20, the authors note that “the estimates vary markedly from year to year.” There are now a sufficient number of years of TEDS data that an averaging should give estimates that vary markedly less. On page 22 in the last paragraph, the authors use TEDS data for two years, 1993 and 1998. Using more years of data would improve the estimates.

In the next paragraph on page 20 the authors use the TEDS data to estimate the number of “chronic methamphetamine users.” Their estimate makes use of the rate at which methamphetamine users entered substance abuse treatment. Their estimate could be refined if they analyzed the TEDS data by whether or not the methamphetamine users were being admitted to treatment for the first time or had previous treatment admissions.

In the second paragraph of page 21 the authors point out that TEDS under-represents treatment admissions. The adjustments to account for under-representation could be improved by using more up-to-date data on the extent to which TEDS represents the universe of treatment facilities.

The TEDS is an important source of information in the modeling done by the authors, but they do not utilize the data set as effectively as they could. A re-analysis of the TEDS would help to refine the estimates.

Recommendations

Short-Term. The prior section offers several ways in which the estimates could be improved. If the short-term is considered as the next year, perhaps the most important recommendation is to improve the estimates with existing data. A second recommendation is to obtain better information on how much is ingested on average and how frequently. Clinicians who treat methamphetamine users would be able to offer such anecdotal information. Although anecdotal information is not representative of all users in the country, it should help to improve the estimates.

Long-Term. In the next few years, it is recommended that new data sources be obtained for methamphetamine and other drugs. This will require additional federal spending, of course. In the absence of this new data, the estimates will continue to be difficult to defend.

Conclusions And Recommendations

While consumption estimates for the four illicit drugs of interest exist, it must be noted that these are extremely sensitive to any alterations in the assumptions that underlie the calculations. The effect of adjustments on the underlying components of the estimates can be large and multiplicative, as illustrated above. Ultimately, the solution to more reliable consumption estimates rests in a better data infrastructure.

There are several key questions with less than adequate answers at this time, such as:

- How many chronic users of each drug are there in the United States?
- What are the dose sizes and dosing patterns various user types?
- How does one monitor the purity of various drugs?
- What is the value of both cash and non-cash transactions to obtain drugs?

Short-Term Improvements

In the short-term, there are data improvements in the horizon that we expect will lead to improved consumption estimates. Two examples rest with the NHSDA and with ADAM.

NHSDA in 2001 includes, for the first time, information on the market dynamics of marijuana. Since marijuana is the most commonly used illicit drug, and since the NHSDA provides relatively good population coverage on marijuana, this is a substantial improvement in the components of marijuana consumption estimation.

The prospects of ADAM's expansion into a system that will permit national estimates bode well for the enhancement of drug consumption estimates. As reported in the Office of Justice Program's budget submission for 2003, an additional \$4 million in FY 2003 is expected to bring the program to 60 sites, on the way to "NIJ's ultimate goal of expanding ADAM to a total of 75 sites in order to collect drug data at the national level" (ONDCP FY 2003 Drug Budget Summary, p. 129). However, the Working Group is concerned that the ADAM program now appears to be at a standstill at 35 sites, which is a far cry from the national estimates. If the ADAM program expansion is derailed, then it represents a major step backward in our ability to reliably estimate drug consumption numbers.

These two examples show how specific enhancements in existing data systems can potentially improve consumption estimates in the immediate future. To augment these, the Working Group also recommends immediate studies of a limited scope that could begin to address some of the questions posed above. For example, in the near term under the aegis of policy research, a comprehensive review of the scientific literature might be undertaken to examine dose sizes and dosing patterns of heroin, cocaine, marijuana, or methamphetamine users. If it is found that little reliable or valid information exists, this could form the basis of identifying research questions that can be channeled to drug agencies with a research mandate, such as NIDA.

Long-Term Improvements

In the long-term, there is a need for an explicit data plan and infrastructure to support valid and reliable estimation of illicit drug consumption on a regular and timely basis. Some elements of this already exist, what is required is a definitive focus on this particular estimation task. For example, ONDCP's Advisory Committee structure has an inter-agency Subcommittee on Data, Research and Interagency Coordination. One of the major tasks of this Subcommittee is to "convene a forum on

integrating information and drug control policy” (Office of National Drug Control Policy, 1999). As an already ongoing interagency effort, this Subcommittee can potentially be harnessed to address specific issues relating to consumption estimation, since all the agencies generate data needed are represented. The Drug Flow Models Steering Committee might consider the Subcommittee among its options for institutionalizing the exploratory work that is being undertaken by the various working groups.

The longer horizon also has to consider the estimation of drug consumption in the context of a broader drug policy research agenda. As part of a comprehensive review of policy research needs, the National Research Council (NRC) was commissioned by ONDCP to;

1. assess existing data sources and recent research studies that support policy analysis;
2. identify new data and research that may enable the development of more effective means of evaluating the consequences of alternative drug control policies; and
3. explore ways to integrate theory and findings from diverse disciplines to increase understanding of drug abuse and the operation of drug markets. (National Research Council, 2001).

Many of the recommendations by the NRC are pertinent to the estimation of drug consumption. The NRC Committee asserts that “consumption data are critical to assess the responsiveness of drug use to enforcement” and “recommends that work be started to develop methods for acquiring consumption data” (National Research Council, 2001, p. 3). This area of research is in its infancy. The Working Group recommends that, in the Steering Committee’s efforts to advance the science of consumption estimation, that a systematic review and consideration the findings from this report be undertaken to inform the future Working Group efforts.

Appendix 5-A - What America's Users Spend on Illegal Drugs 1988-2000

[page 9 excerpt]

Other policy analysts have reported their own estimates, and these can be compared with our estimates. For example, Rhodes, Langenbahn, Kling and Scheiman provided one national estimate of 508,000 chronic heroin users, and a second national estimate of 582,000 chronic heroin users. The authors explain why both estimates probably understate the true number. We are aware of only one other national estimate of heroin addicts, by Hamill and Cooley, who concluded there were 640,000 to 1.1 million heroin addicts in 1987. The higher estimate is consistent with our 1988 estimate of over one million chronic heroin users.

Table 3 - Estimated Number of Chronic and Occasional Users of Cocaine and Heroin (Thousands), 1988-2000

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
NHSDA ¹													
Cocaine Chronic	1,100	980	850	806	829	615	734	582	608	682	595	595	537
Cocaine Occasional	6,000	5,300	4,600	4,478	3,503	3,332	2,930	3,082	3,425	3,487	3,216	3,216	3,035
Heroin Occasional	170	150	140	359	304	230	281	428	455	597	253	253	253
DUF ²													
Cocaine Chronic	3,434	3,334	3,133	2,976	2,854	2,773	2,665	2,575	2,524	2,506	2,502	2,457	2,436
Heroin Chronic	1,341	1,266	1,119	1,015	955	945	932	923	910	904	901	898	898
Composite													
Cocaine Chronic	6,000	5,300	4,600	4,478	3,503	3,332	2,930	3,082	3,425	3,487	3,216	3,216	3,035
Heroin Occasional	170	150	140	359	304	230	281	428	455	597	253	253	253
Cocaine Chronic ²	3,984	3,824	3,558	3,379	3,269	3,081	3,032	2,866	2,828	2,847	2,800	2,755	2,707
Heroin Chronic	1,341	1,266	1,119	1,015	955	945	932	923	910	904	901	898	898

Columns may not add due to rounding. Estimates for 2000 are projections

Sources: NHSDA 1988, 1990 through 1999; DUF 1988 through 1999; Uniform Crime Reports (UCR) 1988 through 1999.

¹ The NHSDA was not administered in 1989. Estimates are the averages for 1988 and 1990.

² Due to sample overlap, the estimated number of composite chronic cocaine users is derived from the sum of DUF chronic cocaine users and one half of NHSDA chronic cocaine users.

Simeone, Rhodes, Hunt and Truitt (SRHT) estimated that there were about 300,000 chronic cocaine/heroin users in Cook County in 1995. Assuming a constant proportionality between the number of chronic users in a population and the number of emergency room admissions attributed to them, an extension of the SRHT estimates suggest there are about 3.75 to 4.25 million chronic users in the nation. Although such an

[page 19 excerpt]

Other studies provide comparable estimates. Using a much different estimation methodology, Rand researchers estimated that about 451 metric tons of cocaine entered the United States in 1989. This

compares with our estimates of 447 metric tons in 1990. The Rand researchers estimate that 7.8 metric tons of heroin entered the States in 1991; our estimate is 12.5 metric tons.

We have made major changes to methods used to estimate retail-level prices for cocaine, and as a result, our new price series is lower than our previous price series. The largest differences occur during the earlier part of the time-series. As noted before, current expenditure estimates for cocaine are lower than previous estimates, but lower cocaine prices partly offset what otherwise would be a decrease in total cocaine use. We now estimate much higher cocaine use for 1988 through 1990, but for reasons already explained, we heavily discount the accuracy of estimates for 1988 and 1989 and distrust estimates for 1990.

We also made major changes to the method of estimating heroin prices but are skeptical that even these new estimates truly reflect retail-level market prices. The principal problem is that the retail market seems to be bifurcated between consumers who pay relatively low unit prices for high quality heroin suitable for inhalation and consumers who pay comparatively high unit prices for low quality heroin suitable only for injection. The larger the proportion of the market devoted to high quality heroin, the lower the average price; likewise, the larger the proportion devoted to low quality heroin, the higher the average price. We cannot tell the mix between high quality and low quality purchases; hence, we remain uncertain about how much users typically pay for their heroin. Table 6 reflects a working estimate.

Table 6 - Retail Prices Per Pure Gram for Cocaine and Heroin, 1988-2000 (dollars, 2000 dollar equivalents)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Cocaine	\$180	\$170	\$174	\$178	\$160	\$151	\$147	\$139	\$144	\$140	\$145	\$146	\$152
Heroin	\$2,184	\$1,758	\$1,968	\$1,914	\$1,697	\$1,403	\$1,374	\$1,222	\$1,109	\$1,080	\$851	\$783	\$839

Estimates for 2000 are projections

Source: STRIDE 1981 through 2000

Table 7 - Total Amount of Cocaine and Heroin Consumed, 1988-2000 (in metric tons)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Cocaine	660	576	447	355	346	331	323	321	301	275	267	271	259
Heroin	14.6	16.6	13.6	12.5	11.7	11.2	10.8	12.0	12.8	11.8	14.5	14.3	13.3

Estimates for 2000 are projections

Sources: See Tables 3 through 6.

[page 23 excerpt]

methamphetamine users in 1993, fewer than what we report in the table. Perhaps there is some comfort here that the scale is about right, but precision is elusive.

Assuming the scale is about right, what can be said about the trend? The TEDS data show an increase in admissions with methamphetamine named as the primary drug of abuse. Just 1.0 percent of admissions in 1992 and 1.3 percent of admissions in 1993 were for methamphetamine. This compares with 3.5 percent in 1997 and 3.6 percent in 1998. We see those trends reflected in Table 8.

As another check on trends, reports from the Community Epidemiology Work Group provide a somewhat inconsistent picture from one report to the next. During the last three years, the CEWG has reported that methamphetamine use has decrease and then increased. Our trend statistics show the opposite. However, our choice to smooth the estimates masks the fact that our estimates vary markedly from year-to-year.

We doubt that we have captured the short-term trend during the late 1990s. On the other hand, we have

no reasons to doubt the long-term trend during the decade, which is consistent with treatment admission data and other sources.

Table 8 - Calculation of Total Methamphetamine Consumption, 1989-2000

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Number of Chronic Users	274	269	259	270	302	381	474	584	664	707	669	617	595
Median weekly expenditure	\$327	\$311	\$319	\$196	\$229	\$194	\$232	\$226	\$220	\$189	\$173	\$136	\$132
Price per pure	273	307	358	369	352	271	223	169	187	262	294	316	276
Total expenditures (billions)	\$6.2	\$5.8	\$5.7	\$3.7	\$4.8	\$5.1	\$7.6	\$9.2	\$10.1	\$9.3	\$8.0	\$5.8	\$5.4
Metric tons	22.7	19.0	16.1	10.0	13.6	18.9	34.1	54.2	54.3	35.3	27.2	18.3	19.7

Estimates for 2000 are projections

Sources: NHSDA 1988, 1990 - 1999; STRIDE 1981 - 2000; DUF 1989-1999; Uniform Crime Reports 1988-1999; TEDS 1998

Marijuana

In this section, we estimate the dollar value of marijuana consumption by multiplying the following factors: number of users in the past month, by the average number of joints used in the past month, by the average weight per joint, by the cost per ounce. Calculations are summarized in Table 9

[page 26 excerpt]

Table 9 - Calculation of Total Marijuana Consumption, 1988-2000

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Number of Users (millions)	11.6	10.9	10.2	10.4	9.7	9.6	10.1	9.8	10.1	11.1	11.0	11.9	12.1
Joints used per month	16.9	17.3	17.6	16.6	17.2	17.8	18.7	18.7	18.7	18.7	18.7	18.7	18.7
Weight of a joint (ounces)	0.0134	0.0135	0.0137	0.0135	0.0134	0.0136	0.0136	0.0136	0.0136	0.0136	0.0136	0.0136	0.0136
Price per ounce, 1/3 ounce purchase	\$385	\$361	\$508	\$499	\$545	\$432	\$397	\$340	\$309	\$311	\$322	\$292	\$284
Total expenditure for the year (\$ in billion dollar equivalents)	\$12.1	\$11.0	\$15.0	\$14.0	\$14.6	\$12.0	\$12.2	\$10.2	\$9.5	\$10.5	\$10.8	\$10.6	\$10.5
Metric Tons	894	866	837	793	761	791	874	848	874	960	952	1028	1047

Estimates for 2000 are projections

Sources: NHSDA 1988, 1990 through 1999; STRIDE 1981 through 2000.

Appendix 5-B - Memorandum

Subject
Status Report on Efforts to Develop Estimates of the
Availability of Illicit Drugs for U.S. Consumption

Date
12-19-2001

To
Martin W. Pracht, Chief
Executive Policy and Strategic Planning Staff

From
Dr. Patrick R. Gartin, Chief
Statistical Services Section

The purpose of this memo is to provide a status report on the efforts by the Statistical Services Section (ADSA) to develop estimates of the availability of illicit drugs for U.S. consumption. Developing national estimates for cocaine, heroin, methamphetamine and marijuana availability is a complex and difficult endeavor, largely due to data limitations. However, although there are broad information gaps due to lack of pertinent data, and serious concerns regarding the validity of much of the data that is available, there is much that can be discerned about drug availability from existing data sources. Whereas most efforts to address this problem have generally focused on either the supply side or the demand side of the equation, we have utilized both supply and demand data in the development of what we refer to as Full Market Models. Below, we describe our efforts to arrive at, first, supply side drug availability estimates and, second, demand side consumption estimates.

Supply Side Availability Estimates

Several sources were consulted in our efforts to develop supply side estimates of drug availability, including:

- 1) United Nations Office for Drug Control and Crime Prevention (UNDCP);
- 2) Office of National Drug Control Policy (ONIDCP);
- 3) State Department's International Narcotics Control Strategy Report (INCSR);
- 4) National Drug Intelligence Center (NDIC);
- 5) El Paso Intelligence Center (EPIC);
- 6) CIA's Crime and Narcotics Center (CNC);
- 7) Defense Intelligence Agency (DIA);
- 8) DEA's Intelligence Division;
- 9) Federal Wide Drug Seizure System (FDSS);
- 10) Domestic Cannabis Eradication Program (DCEP); and
- 11) State and Local law enforcement agencies

Using data provided by the sources listed above, and in consultation with representatives from the respective agencies, drug-specific full market models were developed to estimate the availability of cocaine, heroin, methamphetamine and marijuana to U.S. consumers (see Attachments 1-4). From cultivation to consumption, individual market components were identified and attempts were made to quantify each component with relevant data. For example, the foreign cultivation, net foreign produce, and arrival zone seizure components of the full market marijuana model were assigned values based on data obtained from INCSR, NDIC, and EPIC, respectively. Where possible, estimates were derived for individual components based on either direct or indirect indicators. Internal data and published statistics were the primary types of direct indicators. For example, domestic seizure figures obtained through FDSS, estimates of eradication of domestic marijuana cultivation issued by DCEP, and production estimates published in INCSR are direct indicators used in the marijuana model. When direct indicators

were unavailable, indirect indicators were derived based on assumptions or mathematical computations that used estimates from other components within the model. For example, although no direct indicators for total marijuana cultivation were identified, an indirect indicator was produced for the model by adding together the foreign marijuana cultivation and the domestic marijuana cultivation figures.

While we present what we consider our best effort to produce supply side estimates of drug availability, there are caveats that should be taken into consideration when assessing our models. First, there are several model components that could not be quantified due to lack of relevant data, thus rendering our models less than complete. Second, representatives from many of the agencies that were consulted in this effort have expressed grave concerns that issues of data quality make the validity of our estimates questionable at best. Although we agree that the state of available data is far from ideal, we strongly disagree with the stance taken by others that this should preclude efforts such as the one we have undertaken. Developing and discussing an imperfect assessment that future efforts may improve upon is far more useful than taking the position that we can't possibly know for sure how many drugs are available, and should thus not attempt to develop estimates for fear that they will be wrong.

Demand Side Consumption Estimates

A variety of data sources exist that shed light on U.S. illicit drug consumption (see Attachment 5 for a description of major indicators). As with the supply side models, we consulted with and utilized information from several sources to develop our demand side consumption estimates, including:

- Substance Abuse and Mental Health Services Administration (SAMHSA):
 - a) National Household Survey on Drug Abuse (NHSDA);
 - b) Drug Abuse Warning Network (DAWN);
 - c) Treatment Episode Data Set (TEDS);
 - d) Center for Substance Abuse Prevention (CSAP);
 - e) Center for Substance Abuse Treatment (CSAT);
- NIJ's Arrestee Drug Abuse Monitoring (ADAM) program; ONDCP; and
- National Institute for Drug Abuse (NIDA)'s Monitoring the Future Survey

Two approaches to developing demand side consumption estimates were taken, both of which applied a methodology similar to that used in the ONDCP funded report by Abt Associates entitled *What America's Users Spend on Illegal Drugs*. The first approach involved modifying the estimates derived in the ONDCP report cited above. This was accomplished by first obtaining from the authors of the report the estimates they used for hardcore vs. occasional users, dosage, purchases, and uses per day. Based on a variety of factors, adjustments were made to these estimates (e.g., altering dosage amounts) and a revised national consumption estimate for each drug category was produced by multiplying, for hardcore and occasional users separately, the number of users by both the dosage of drug used and the frequency of use, then adding these sub-estimates together. Both the original ONDCP estimates and our modified national consumption estimates can be found in Attachment 6.

The second approach that we took involved attempting to develop what is referred to as a synthetic estimation model. Basically, this involves combining data that apply to various sub-groups of a population in an attempt to develop estimates in the absence of a single data source that applies to the entire population. For example, the ADAM data provide valuable information on drug use, but only for arrestees. Similarly, the TEDS only provides insight into the drug use of those in treatment. Finally, household surveys have been widely criticized for failing to include those who are at greatest risk for drug use, such as persons who are criminally active or in treatment. Given these limitations of the available

data, we proposed disaggregating the drug user population into three sub-populations: (1) those individuals who indicated on the NHSDA that they had used illicit drugs but had neither been treated nor arrested; (2) those individuals that are identified in the TEDS as illicit drug users admitted to a State treatment facility but who have not been arrested; and finally, (3) those individuals that are identified in the ADAM data as arrestees who tested positive for illicit drug use. Combined, the estimates developed from the NHSDA, TEDS, and ADAM data for these three sub-populations could be used to generate a national synthetic estimate for the number of illicit drug users that would likely exceed the accuracy of the gross estimate produced by the first approach discussed above. Including such an estimate in an equation with the dosage amount and frequency of use would represent a sophisticated and comprehensive approach to determining the amount of illicit drug consumption in the U.S.

Unfortunately, two problems have hindered our efforts to develop a national synthetic estimation model as described above. First, although the NIISDA is based on a national sample and the TEDS represents data from across the country, currently available ADAM data do not represent national coverage, and thus cannot be used to develop a national estimate. Fortunately, however, a sampling plan was instituted last year for the ADAM program, and data will soon be available from which national estimates may be derived. The second problem that we encountered had to do with the generally low base rates of heroin and methamphetamine use that resulted in relatively few NIISDA respondents indicating use for these drugs, thus making it difficult to generate reliable national estimates. Through meetings with SAMHSA staff, however, we were informed that recent significant increases in the number of households surveyed in the NHSDA will soon allow for a three-year panel of data that should overcome this problem. Thus, although we are not at this time able to implement our strategy of developing a national synthetic estimation model for illicit drug consumption, the data restrictions that currently hinder such an effort should be removed within the next 6 to 12 months. Once the requisite data are made available, we would strongly urge that work continue on the development of a national synthetic estimation model.

Summary

In our attempt to provide estimates of illicit drug availability in the U.S., we have exhaustively researched national and worldwide sources of information. The approaches taken and assumptions made in this research effort were guided by collaborative input from practitioners and policy makers from the intelligence, enforcement, research, treatment and laboratory communities. Although legitimate and significant concerns have been raised regarding the potential harm that can result from providing policy makers with estimates that may be in error given that they are based on imperfect data, we believe that greater harm is done by not attempting to develop such estimates. Guided by this philosophy, we present the following table, based upon a comprehensive review and analysis of available data pertaining to both supply and demand, as our best assessment to date of illicit drug availability and consumption in America.

Estimates for Availability and Consumption of Illicit Drugs in the U.S.				
Source	Cocaine	Heroin	Meth	Marijuana
Supply side	419 mt	16 mt	66 mt	8,819 mt
Demand side	373 mt	11 mt	14 mt	4,270 mt

There are two key points to be made in regards to the estimates provided in the table above. The first is that our supply side estimates are consistently higher than the corresponding demand side estimates. This is not unexpected, given that the demand side estimates rely heavily on persons providing self-reports of illegal behavior and are therefore likely to be somewhat low. The second point is that for both supply and demand, the quality of available data are arguably best for cocaine and heroin, and it is for these drugs that our two estimates come closest to convergence. By contrast, the relatively larger gaps between the supply and demand estimates for methamphetamine and marijuana are likely explained by

the severe lack of data relating to the amount of each of these drugs that originates within the U.S. Given these issues, it is recommended that the most prudent way to apply the results provided above is to consider a range of illicit drug availability, bounded on the lower side by our demand estimate and on the higher end by our supply estimate (e.g., for cocaine, the availability estimate would be 373 to 419 metric tons). Finally, please note that we consider this to be an ongoing work in progress, and will continue our efforts to research data sources and refine our estimates accordingly.

Figure 5-1 - Full Market Model for Cocaine

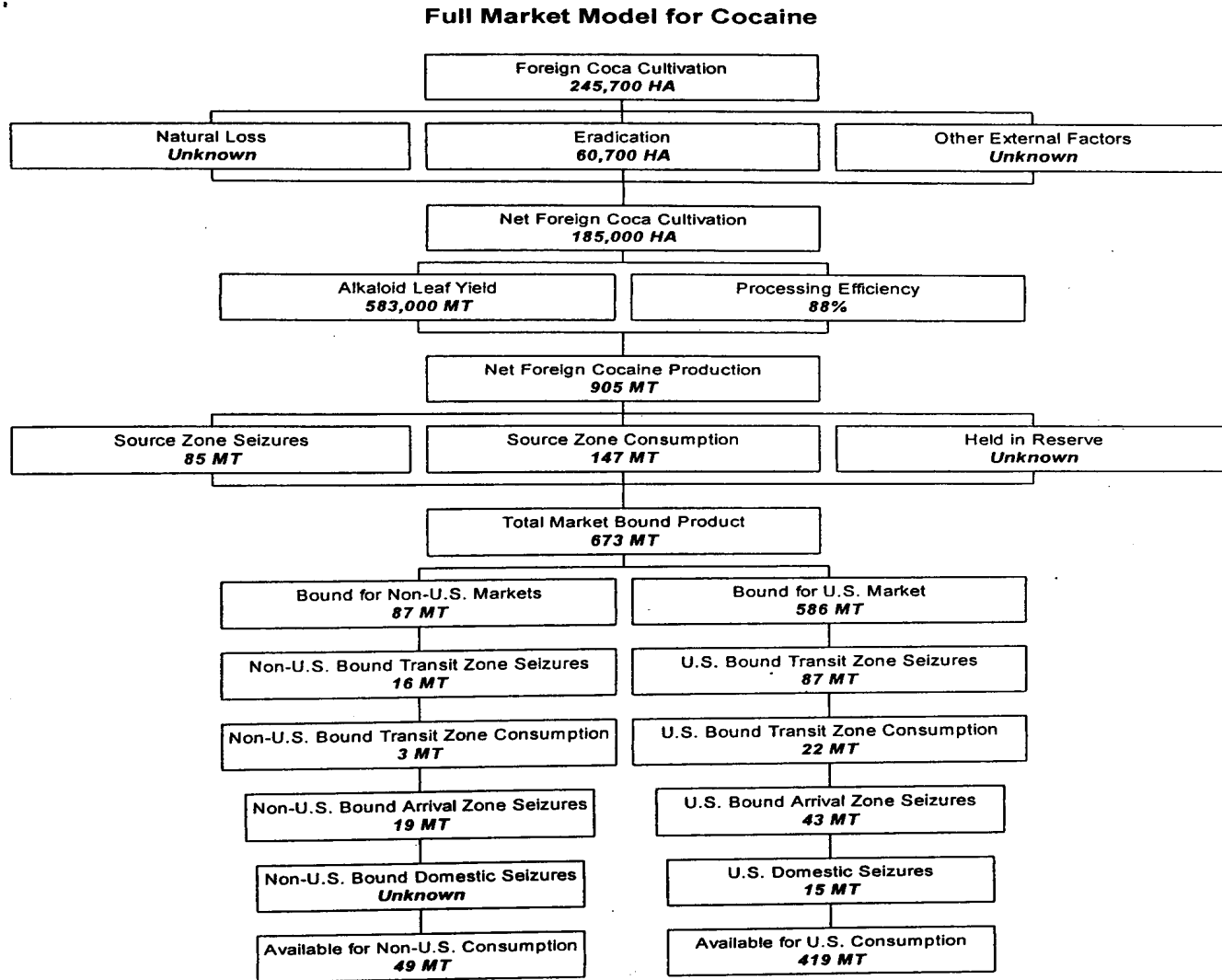


Figure 5-2 - Full Market Model for Heroin

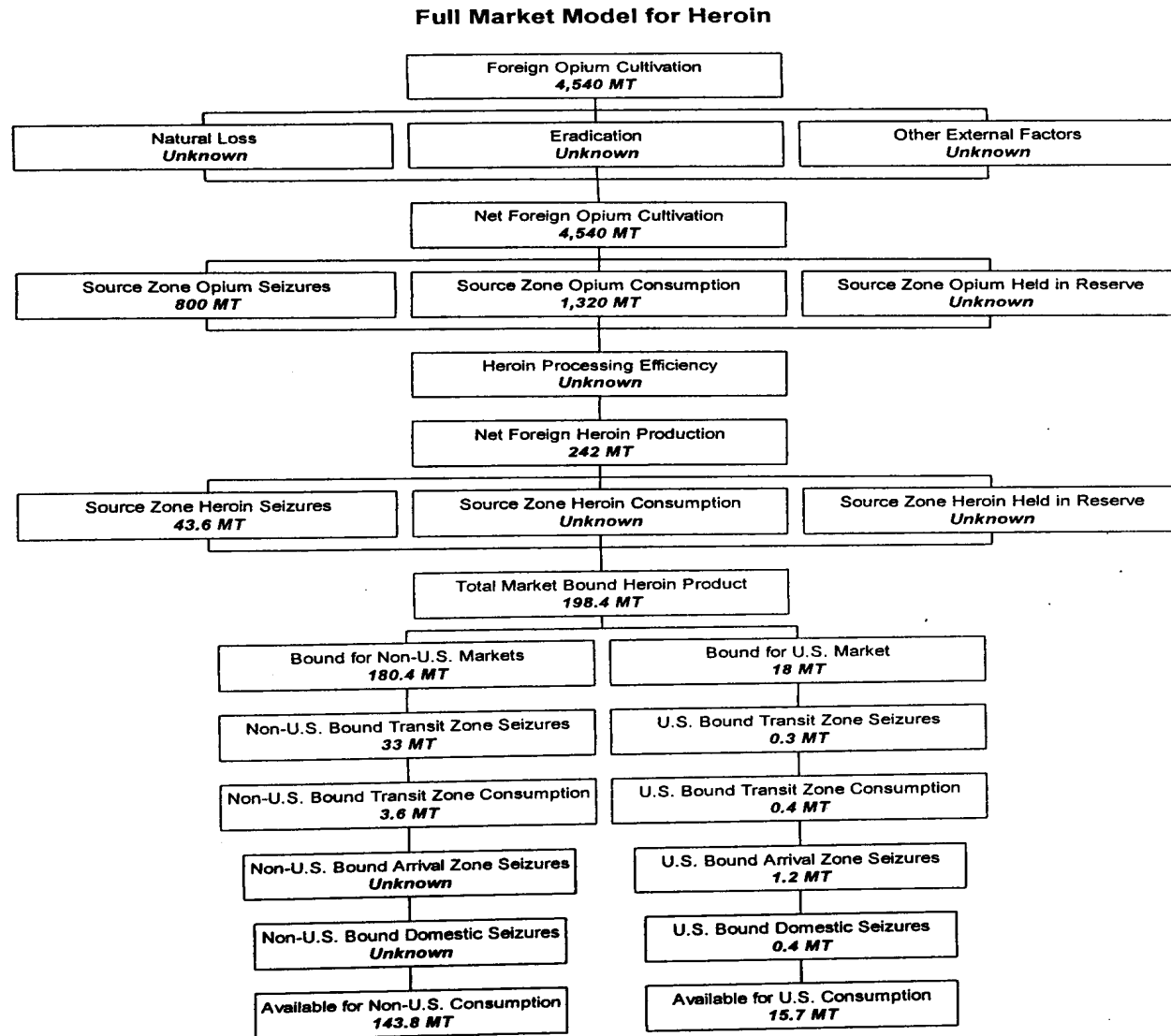


Figure 5-3 - Full Market Model for Methamphetamine

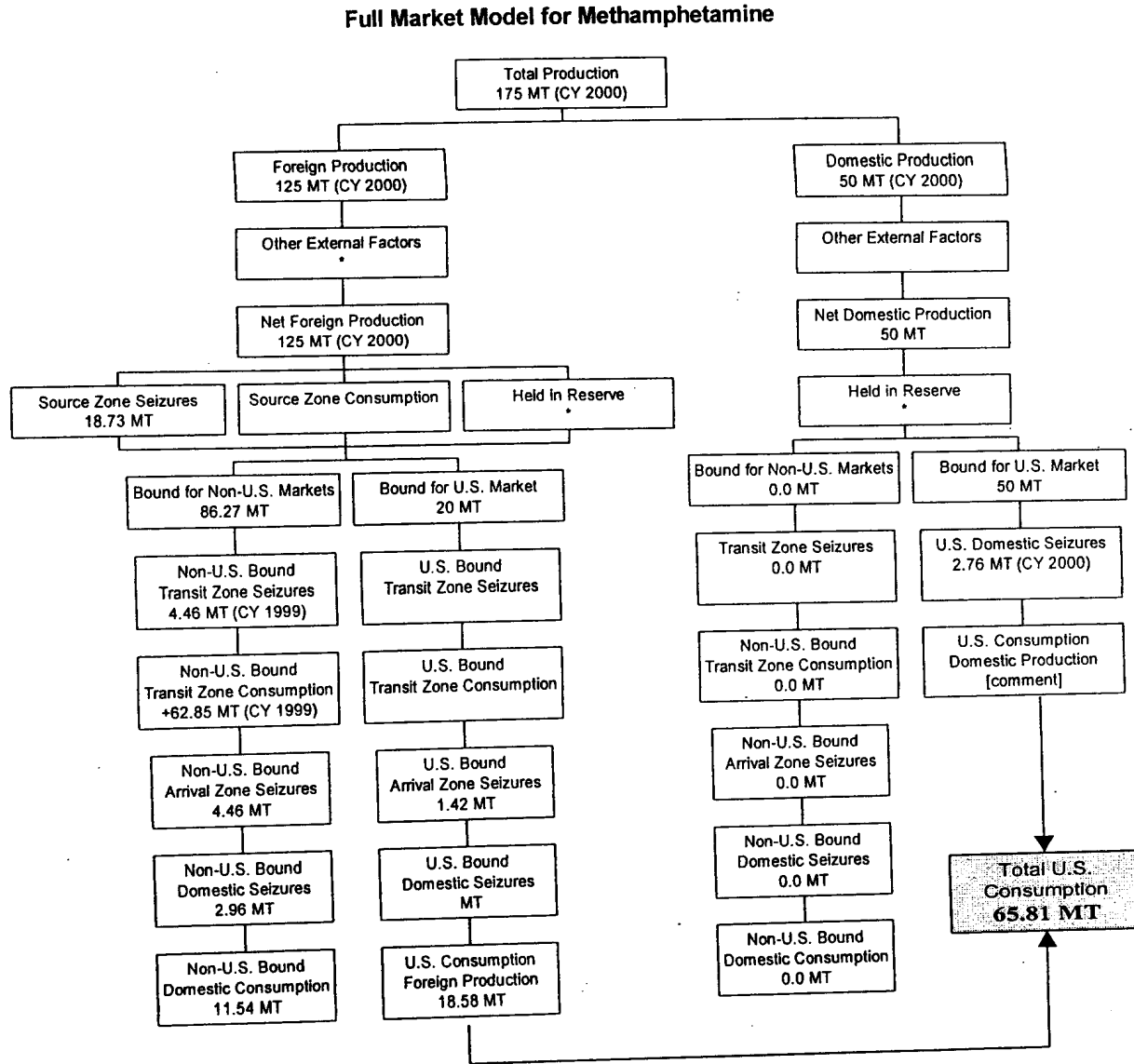


Figure 5-4 - Full Market Model for Marijuana

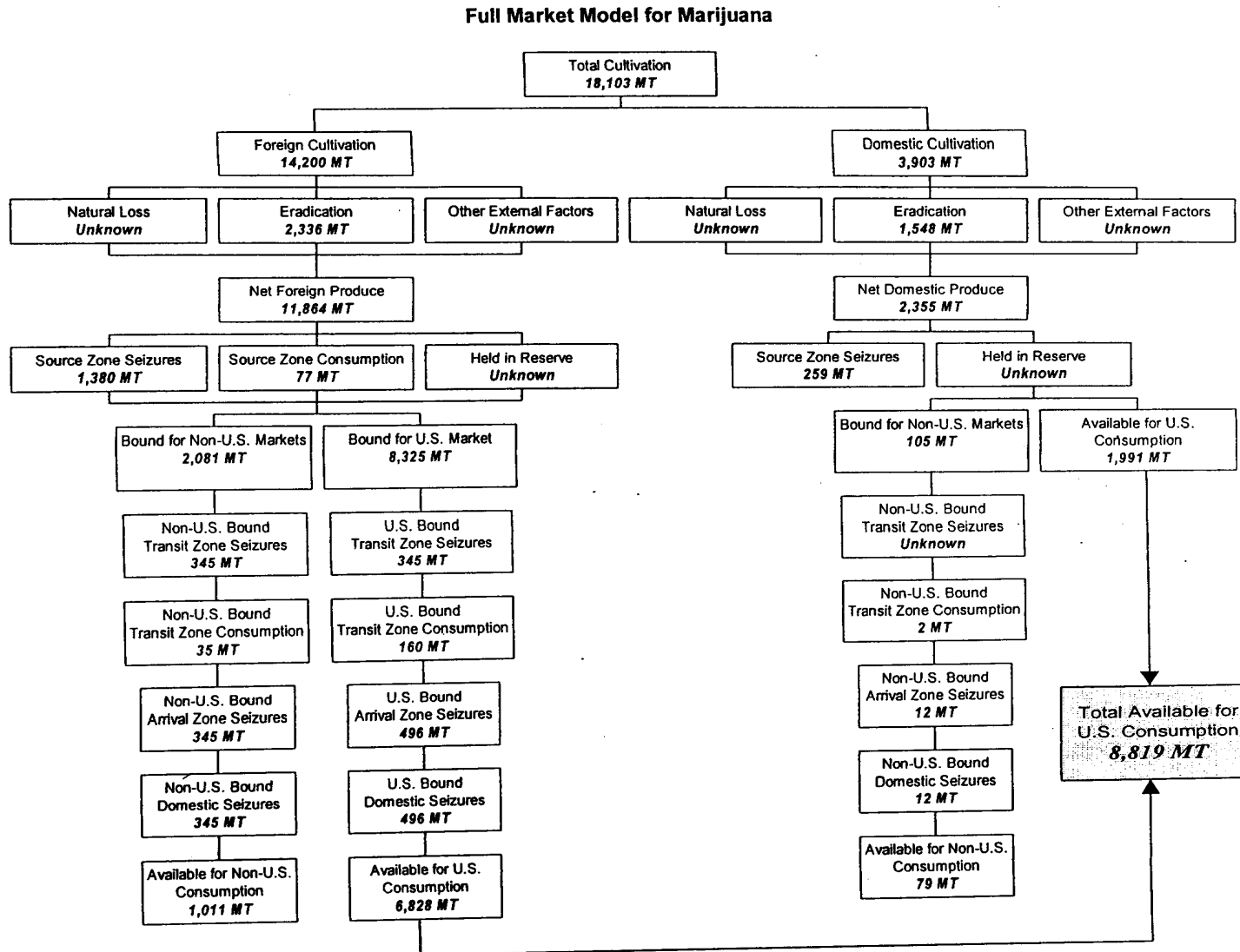


Table 5 - 8 What Americas Users Spend on Illegal Drugs – 2000

	Monthly Purchases	Users Per Day	Seizures(%)	User Estimate	Dosage	ONDCP Consumption Estimate	Estimation Formula	Modified Consumption Estimate
COCAINE	13-17	1.7-2.4	13% (56 MT)	5,460,000	100-200 mgs	269 MT		373 MT
Hardcore	51% of cocaine bought by 22% of sample	CRACK CASH 1.83-2.08 NONCASH 1.34-2.05		3,325,000			$3,325,000 \times 150 \text{ mgs} \times 52 \times 2 \div 1000$ $\div 1000 \div 1000 = 363 \text{ MT}$	
Occasional				2,155,000			$2,155,000 \times 150 \text{ mgs} \times 4 \times 12 \div 1000 \div 1000 \div 1000 = 10.3 \text{ MT}$	
HEROIN	44-52	1.5-1.6	16% (1.6 MT)	1,491,000	10-20 mgs	12.9 MT		11.6 MT
Hardcore				977,000			$977,000 \times 20 \text{ mgs} \times 1.5 \times 7 \times 52 \div 1000 \div 1000 \div 1000 = 10.66 \text{ MT}$	
Occasional				514,000			$514,000 \times 15 \text{ mgs} \times 4 \times 12 \div 1000 \div 1000 \div 1000 = .37 \text{ MT}$	
METHAM-PHETAMINE	CASH 3.17-13.25 NONCASH 1.5-9.9	CASH 1.02-1.26 NONCASH 1.0 – 1.26	22% (3.7 MT)	644,000	50-100 MGS	15.4 MT		14 MT
Users				356,000			$356,000 \times 100 \text{ mgs} \times 365 \div 1000 \div 1000 \div 1000 = 13 \text{ MT}$	
Occasional				288,000			$288,000 \times 50 \text{ mgs} \times 4 \times 12 \div 1000 \div 1000 \div 1000 = .69 \text{ MT}$	
MARIJUANA				11,700,000		1,009 MT		4,270 MT
Users	50% of marijuana purchased by 25% of people in New York 50% of marijuana purchased by 10% of people in New Orleans CASH 5.98-13.27 NONCASH 7.56-10.35	CASH 1.07-1.21 NONCASH 1.17-1.23	22% (1,198 MT)	11,700,000	.3885 MGS		$11,700,000 \times 1 \text{ gram} \times 365 \div 1000 \div 1000 \div 1000 = 4,270 \text{ MT}$	

Table 5-9 - Drug-Use Related Data Sets and Corresponding Demand Indicators

Drug Use-Related Data Sets and Corresponding Demand Indicators

Title of Data Set	Sponsoring Agency	Information Available	Population	Estimates				
				All Drugs	Marijuana	Cocaine	Heroin	Meth..
National Household Survey on Drug Abuse	Substance Abuse and Mental Health Services Administration	Presents prevalence for drug and alcohol by age, sex, and region	Household population age 12 and older	Estimated 14.0 million illicit drug users in the US (2000)	Estimated 10.6 million users in the US (2000)	Estimated 1.2 million users (2000)	Estimated 130,000 users (2000)	***
Monitoring the Future	National Institute on Drug Abuse	Reports estimates of drug, alcohol, and tobacco use, and attitudes toward drugs of abuse among American youths	6 th , 8 th , 10 th , and 12 th graders and youth adults age 19	8 th graders: 26.8% 10 th graders: 45.6% 12 th graders: 54.0% (2000)	20.3% 40.3% 48.8% (2000)	4.5% 6.9% 8.6% (2000)	1.9% 2.2% 2.4% (2000)	4.2% 8.9% 7.9% (2000)
Arrestee Drug Abuse Monitoring Program	National Institute of Justice	Monitors the extent of drug use among arrestees by demographic characteristics, charge at arrest, treatment history, and socioeconomic characteristics.	Adult arrestees and juvenile detainees	***	Males 39% Females 26%(1999) ■■■■■■■■■■	Males 34% Females 38%(1999) ■■■■■■■■■■	***	***
Drug Abuse Warning Network	Substance Abuse and Mental Health Services Administration	Monitors drug abuse patterns and trends and assesses the health hazards associated with drug abuse by involvement of drugs in deaths and emergency department episodes.	Drug related deaths and emergency department episodes	243 ED visits per 100,000 population (2000)	39 ED visits per 100,000 population (2000)	71 ED visits per 100,000 population (2000)	39 ED visits per 100,000 population ^ (2000)	6 ED visits per 100,000 population ^^ (2000)
Treatment Episode Data Set	Substance Abuse and Mental Health Services Administration	A minimum data set, reported by States, of demographic and drug history variables on clients admitted to substance abuse treatment. Some States also submit a discharge data set.	Admissions to substance abuse treatment, primarily at facilities receiving public funds. Excludes Federally-owned facilities.	1.5 million annual admissions to treatment for abuse of alcohol and drugs (1998)	13% or about 195,000 admissions (1998)	15% or about 225,000 admissions (1998)	15% or about 225,000 admissions (1998)	5% or about 75,000 admissions (1998)

*** Figures not reported.

^ Includes heroin and morphine

^^ Includes methamphetamine and speed

Note: Note: Data set file, sponsoring agency, information available, and population information obtained through ONDCP at <http://www.whitehousedrugpolicy.gov/drugfact/source.html>

Appendix 5C- Heroin in the United States

The amount of heroin consumed in the United States is relatively unknown. Irregular consumption patterns and the unpredictability of addict populations preclude a precise calculation of consumption levels. However, data derived from drug treatment and law enforcement sources can be formulated into a consumption-based equation that yields a realistic estimate of domestic heroin consumption. This data includes the following information concerning the number of hardcore heroin addicts, dosage, and frequency of use.

- The current hardcore addict population in the United States is estimated to range between 750,000 and 1,000,000.¹ This estimate is based on an extrapolation from overdose deaths, number of applicants for treatment, and number of heroin addicts arrested. The most recent estimate of the domestic hardcore addict population is 980,000. This figure was derived from a 1999 study sponsored by the Office of National Drug Control Policy (ONDCP) designed to determine the expenditure habits of hardcore drug users in the United States. This study adopted the National Household Survey on Drug Abuse (NHSDA) and the Arrestee Drug Abuse Monitoring (ADAM) program definition of a hardcore addict as one who uses heroin more than 10 days in a month.
- An addict's use of heroin will fluctuate because of variations in personal and market conditions. The Treatment Episode Data Set (TEDS), which provides information on the demographic and substance abuse characteristics of individuals admitted to drug treatment programs, indicates that of the individuals in treatment for heroin abuse in 1996, 83.0 percent used daily, 4.0 percent used between three and six times a week, 1.8 percent used between one and two times a week, 2.2 percent used between one and three times a month, and 9.0 percent did not use during the month prior to their admission.
- Once addicted, each addict needs his or her own characteristic dose to keep from going into withdrawal. Withdrawal symptoms generally occur from 3 to 5 hours after an addict's last dose. Consequently, addicts must use heroin several times a day to avoid withdrawal.
- Addicts vary their heroin use depending on the time of day, the day of the week, and the other substances taken with the heroin.¹²¹ Heroin addicts generally use the drug two to four times a day; however, more experienced users use more frequently, particularly at lower purity levels. As heroin use progresses, addicts develop a tolerance for the drug and must take higher doses more frequently to avoid withdrawal.
- An estimate of 50 mg of pure heroin a day was used as a realistic national average. This average daily amount is in all probability less than the requirements of many long-time addicts and considerably more than those of the increased number of younger, new users whose tolerance levels may still be relatively low. Many analysts and treatment professionals believe that the 50-mg daily heroin dose underestimates overall U.S market demand.
- Hardcore heroin addicts do not account for all heroin consumption in the United States. Hardcore addicts consume approximately 75 percent of the heroin used in the United States, while

¹ Joel G. Hardman, Alfred Goodman Gilman, Lee T. Limbird, eds., *Goodman & Gilman's The Pharmacological Basis of Therapeutics*, 9th ed., (New York: McGraw Hill, 1996), 567

¹²¹ Michael Agar, Phillippe Bourgois, John French, and Owen Murdudh, "Heroin Addict Size in Three Cities: Context and Variation." *Journal of Drug Issues* 28, no. 4. 1998:921-940.

occasional users—those who use less frequently than hardcore addicts—consume the remainder.¹²²

- Other approaches using expenditure and supply data to estimate domestic heroin consumption have been developed. The expenditure approach estimates heroin consumption by multiplying the number of hardcore addicts by their admitted expenditures and then converting the result into kilograms of heroin, based on DMP price information. The supply approach estimates heroin consumption by valuing shipments of heroin to U.S. markets. Each approach estimates domestic heroin consumption using different variables, making comparison unreliable.

¹²² Office of National Drug Control Policy, *What America's Users Spend on Illegal Drugs, 1988-1995*, 1997.

November 2001

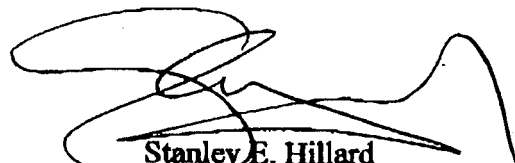
MEMORANDUM FOR: Patrick R. Gartin, Chief, Statistical Section,
Drug Enforcement Administration

SUBJECT: Estimating the Heroin & Cocaine Threat to the United States

1. Because the distribution and sale of heroin (and other narcotic drugs) are illicit activities, the details of which the perpetrators wish to conceal, we believe the most realistic approach to estimating the heroin threat to the United States is to combine the fewest number of estimated variables that will capture the threat with sufficient accuracy to aid in formulating appropriate counterdrug policies. In our opinion, such an estimate would consist of the sum of consumption and seizures.
 - Since there is no rigorous estimate for heroin consumption in the United States, we suggest that the Counterdrug Community's agreed-upon consumption estimate of 18 metric tons (100 percent pure heroin) for the US be used as a starting point, to which would be added seizures at US borders and internal domestic seizures (both converted to 100 percent purity levels). In addition, any seizures in transit abroad that clearly can be identified as bound for the US should also be added, assuming we are trying to assess the threat specifically targeted toward the US market. If we are only trying to assess the threat within the United States, then only internal domestic seizures should be added to the consumption estimate
 - Given the level of resources available to the US Counterdrug Community, it is virtually impossible to estimate year-to-year changes in consumption. Thus, the 18 metric ton estimate reflects average annual consumption in recent years. Accordingly, the seizure data should also reflect average annual seizures over, say, a five-year period (e.g., 1996-2000). Based on seizure data available to this office, this average would approximate 2 metric tons annually.
2. Summing the consumption and seizure data yields an estimate of 20 metric tons annually as the heroin threat to the US. Although this is clearly an approximation of the threat, it probably makes little difference to policy formulation whether the true threat is within 2 or 3 metric tons on either side of 20 metric tons. Moreover, a rough check on this order of magnitude can be obtained from heroin consumption research conducted for other countries of similar size and socio-economic development levels (e.g., Europe). This research, detailed in the attachment to this memo, shows that heroin abusers consume an average of 60 to 120 milligrams of pure heroin per day, and that the bulk of abusers consume at the lower end of this range. Thus, if we assume that US heroin abusers consume at rates similar to their European counterparts and apply 60 milligrams to the current estimate of heroin abusers in the US (i.e., 980,000), the implication is that heroin consumption in the US would be 21.5 metric tons per year. Looked at another way, the 18

metric ton estimate of US heroin consumption implies a consumption rate of 50 milligrams of pure heroin per abuser per day. This is not unreasonable given the nature of these estimates.

3. The same approach can be taken to estimate the cocaine threat to the US. For example, based on ONDCP estimates of annual cocaine consumption in the US during 1996-1999, average annual consumption equals 292 metric tons of cocaine. To this figure should be added the same type of seizures described above for the heroin estimate (i.e., transit zone seizures, arrival zone border seizures, and domestic US seizures). This calculation yields a total average threat estimate for cocaine of 437 metric tons during 1996-99.



Stanley E. Hillard
Chief,

Attachment: A Direct Approach to Estimating Heroin Consumption

A Direct Approach to Estimating Heroin Consumption

Our approach to estimating heroin consumption was based on detailed interviews with more than 250 officials and over 100 recovering addicts in 34 countries. The officials interviewed included law enforcement officers engaged in counterdrug activities at both the local and national levels, physicians and health officials engaged in treatment and rehabilitation of addicts, and some border patrol officers and ministerial level officials. Most of the interviewees had substantial experience in dealing with heroin addicts over periods of 5-10 years. Thus, in most cases the responses to our questions were based on substantial research and/or extensive experience with heroin abusers or abuse problems. In some cases, however, the answers to our questions were little more than educated guesses. During each interview, we posed the following set of questions:

- What is your estimate of the number of heroin abusers in your country? How many of these are hard-core addicts as opposed to recreational/casual users?
- What is the average quantity of heroin sold at retail on the street? How many individual doses does this quantity constitute?
- What is the average purity of these street sales?
- What is the frequency with which addicts consume a given dose (that is, how many times per day)?

We also asked a number of questions concerning the price of drugs, changes in use patterns over time, trafficking patterns and practices, arrests, rehabilitation programs, rates of relapse, etc. While responses to these latter questions added to our understanding of the overall nature and extent of drug abuse problems in the given country, it was the responses to the four key questions noted above that provided the basis for estimating the annual average consumption of a given drug.

Given the appropriate data, the calculation of annual average heroin consumption is shown in the following equations:

$$(1) \text{ (Average Street Buy) } \times \text{ (Average Purity) } = \text{ Average Pure Street Buy}$$

$$(2) \text{ (Avg. Pure St. Buy) } / \text{ (Avg. No. of Doses/St. Buy) } = \text{ Avg. Pure Dose}$$

$$(3) \text{ (Avg. Pure Dose) } \times \text{ (No. of Doses/Day) } = \text{ Avg. Daily Consumption/User}$$

$$(4) \text{ (Avg. Daily Consumption/User) } \times \text{ (No. of Users) } = \text{ Avg. Consumption/day}$$

$$(5) \text{ (Avg. Consumption per day) } \times 365 = \text{ Average Consumption/year}$$

The available data do not always fit neatly into these five equations. For example, whenever possible one must differentiate between abusers who are hard-core addicts and those who are merely recreational users, as both the dosage and frequency of use will be substantially different for each. While some countries can provide reasonable estimates of the number of addicts and the dosages they consume, none of the countries we visited could provide more than a tentative guess at the number of recreational users and the quantities and frequency of their consumption patterns.

Some international organizations—notably the United Nations Drug Control Program (UNDCP) and the European Monitoring Center for Drugs and Drug Addiction (EMCDDA)—have published data on various aspects of drug abuse in Europe and Asia. While we have considered these data in our research effort, neither organization, to our knowledge, publishes data on dosages or frequency of use, nor do they attempt to derive estimates of annual average consumption for individual countries.¹ Thus, we have relied primarily on data provided to us by the officials with whom we spoke in each of the individual countries. We believe that estimates of consumption based on basic information gathered at the local and national level provide the most realistic assessment of the consumption situation for that area or nation. However, due to the relatively short period of our research in each country and the resultant small sample of interviews obtained, we treat the data for each country as individual observations which we then average to arrive at an overall measure of average consumption per addict per day for each of three world regions, i.e., Europe, Southeast Asia, and Southwest Asia. The data on average daily consumption of pure heroin for each of the 34 countries visited are shown in figures 1-3 below.

Because the observations on frequency of administering the drug, as well as on the number of doses in the average street-buy, are based on the sample of users that were seen by either or both health and law enforcement officials, these observations likely reflect the high end of the heroin using population. For example, most of the users who either seek help from health facilities or cross the path of law enforcement officials are those who have been using the drug long enough to have built up substantial tolerance levels or developed serious health problems. Such abusers clearly would be using heroin at least once, if not multiple times, per day. Thus, the sample of users known to the officials we interviewed undoubtedly contains an upward bias when used to represent daily consumption rates for the entire population of abusers. In addition, the heroin using population in all countries is continually changing as hard-core addicts (who are more likely to come in contact with the officials we interviewed) enter treatment facilities, are arrested, or die, and new users (whose tolerance levels are low and who are less likely to have contact with health or law enforcement officials) begin the downhill slide toward addiction.² Since neither we, nor the officials we interviewed, have any idea how many casual users exist in the various countries (and may even underestimate the number of hard-core addicts), we can only hope that any upward bias in our observations is at least somewhat offset by our inability to account for casual users as well as unobserved addicts.³

¹ The UNDCP does publish an estimate of worldwide prevalence of drug use by drug type, but cautions that these figures must be interpreted with care.

² Varying definitions of the term “addict” pose substantial problems for estimating average consumption rates. Some countries consider an addict to be one who uses heroin at least once per week, while others use the term to describe users who take multiple doses per day. Since we cannot determine the distribution of users according to their rates of consumption, we have little choice but to accept the general consensus that the number of addicts cited for each country represent hard-core abusers who are using heroin at least once per day.

³ According to the Dutch Office of Public Health, it generally takes from three to five years for an addict to become visible to a country’s health official.