The Mismeasurement of Illegal Drug Markets: The Implications of Its Irrelevance^{*} Peter Reuter¹

Introduction

The largest illegal market in the United States currently is that for illegal drugs. It may be, in terms of share of GNP, the largest ever. Given the low quality of estimates of income from any other illegal market, the statement is hard to challenge but I believe that one can make a reasonable case that, compared with the other candidates (e.g. prostitution, illegal gambling, counterfeiting) illegal drugs are likely to generate much higher total revenues to sellers. Certainly numbers are presented in a variety of fora, predominantly political, suggesting that it is a major economic activity both in the United States and globally. Figures such as \$500 billion for world sales are thrown around quite glibly².

Even brief scrutiny of the global numbers suggests that they are grossly overstated.

Though drug markets are large, and involve a surprisingly large number of Americans on a parttime basis³, the total value of annual sales in the United States is likely to be around \$50 billion, less than 1 percent of GDP and less than 2 percent of Personal Consumption Expenditures. The global figure is likely to be no more than twice this. One hundred billion dollars represents a large market but in the context of total global trade flows of almost \$3trillion, it is a very modest share

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¹ Professor, School of Public Affairs and Department of Criminology, University of Maryland. ² For a scholarly claim citing \$500 billion see Tullis, L. *Handbook of Research on the Illicit Drug Traffic: Socioeconomic Consequences* (New York, Greenwood Press, 1991). For the United Nations use of this figure, see United Nations Drug Control Program *Drugs and Development: Discussion prepared for the World Summit for Social Development*, June 1994, p.1. A respected journalist Jessica Mathews, recently retailed this figure, citing federal enforcement agencies: "We Lie in a Dangerous Neighborhood" *Washington Post*, April 24, 1995.

³ The most systematic estimate, using the household survey described below, is 1.8 million persons selling in 1991; Caulkins, J. and D. McCaffrey "Drug Sellers in the Household Population", unpublished paper, November 1993. It is likely that most of them sell on a very occasional basis; see Reuter, P.; MacCoun, R. and P. Murphy *Money from Crime: A Study of the Economics of Drug Selling in Washington,D.C.* Santa Monica, CA. RAND, 1990.

indeed. That share declines to the trivial when account is taken of the fact that most of the value added is domestic, so that valuing the trade at import prices reduces it to probably no more than \$20 billion.

In recent years the federal government has developed systematic estimates of domestic expenditures that do indeed provide a reasonable basis for scaling the size of these markets. However, these coexist with an essentially madcap series of federal figures on international production and prices that make a mockery of the whole enterprise. These estimates and their components are so inconsistent and erratic that they demonstrate what might reasonably be called a "reckless disregard" for the truth. Moreover, though it would be surprising if the government estimates of domestic expenditures were (say) only half of the true value, the year to year fluctuations in these estimates may be wrong even in direction, let alone scale.

Does this mismeasurement matter? For those interested in the size of the underground economy, the answer is clearly yes; estimates of the largest illegal market are potentially of considerable significance. However, the estimates were not developed for those purposes but to help in the development of drug policy. If policy making with respect to drugs were rational, or at least as analytically driven as say monetary policy, then the exaggeration would be a serious problem. I shall argue that the numbers are in fact just decorations on the policy process, rhetorical conveniences for official statements without any serious consequences. Indeed, the irrelevance of these numbers is itself a condemnation of drug policy decision making.

This paper has three sections. The first examines the official estimates of drug production, both in the U.S. and the rest of the world, and sales in the United States, showing how implausible they are. The second describes the process that generates them and its bureaucratic imperatives. Finally I consider the policy interpretation of the mismeasurement.

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The Estimates

International Production Figures

The U.S. devotes considerable resources to estimation of drug production by other nations⁴. Those estimates, published each year in the *International Narcotics Control Strategy Report (INCSR)*, are essentially without competition internationally; certainly they are regarded as more authoritative than any other reports, such as the documents of the United Nations International Drug Control Program, which themselves often cite the INCSR estimates. The failure to include estimates of U.S. domestic production, particularly of marijuana is a conspicuous omission, explained awkwardly by the specific use to which Congress intended to put these numbers, namely providing incentives to other countries to improve their drug control efforts⁵.

No detail has ever been published on the methodology of these estimates, beyond the fact that they are generated from estimates of growing area, crop per acre and refining yield per ton of raw product; the information sources, even the technology used to produce them (for area estimates) are classified. But while the estimation task is clearly a difficult one, the current estimates have unnecessarily low credibility. They show inexplicable inconsistency over time and across sectors of the industry. Some numbers are simply implausible.

Consider as an example of the unprincipled variation over time, estimates of Burmese opium production, consumption and export. Burma has been estimated to be the largest producer of opium for the illicit market since the early 1980s; since 1989 it may have accounted for over half of world production. In the 1991 *INCSR* the opium available for refining (primarily into heroin) for 1988 was estimated to be 679 metric tons; the figure for 1989 was 1600 metric tons⁶,

⁴ I infer this from the publications and contacts over the years with participants in the estimation process. No cost figures have ever, to my knowledge, been published.

⁵ If a nation is not certified as making maximum efforts to control production and export, then the United States will not provide certain aid and will vote against loans from multilateral financial institutions such as the World Bank.

⁶ Ten tons of opium yield one ton of heroin.

an increase of more than 140 percent. The difference reflected two factors: (1) A rise in total production, generated by a 25 percent increase in cultivation and an unexplained increase in yield per acre; and (2) a dramatic reduction in exports of opium (as opposed to heroin). The result was that estimated heroin production increased from 68 tons to 128 tons.

Then in the following year, the 1992 *INCSR* revised the figure for domestic consumption in 1988 downward from 400 tons to 150 tons, reflecting a downward revision in the number of Burmese opium users from 400,000 to 34,000. Yet this did not lead to any change in the estimate of the amount available for refining in 1988. Also odd is that a 25% increase in the estimated number of Burmese heroin users from 12,000 in 1988 to 15,000 in 1989 led to a more than doubling of the estimate in Burmese domestic heroin consumption from 2.0 tons to 4.5 tons⁷.

These are figures that do not bear close scrutiny, either individually or collectively. The number of opium users in Burma is very unlikely to fall by 90 percent in one year; clearly some analyst in 1992 decided that previous assumptions about the number of opium users in Burma were overstated. Given that the U.S. has had the thinnest diplomatic relations with Burma since about 1989, it is highly unlikely that this change resulted from acquisition of any substantial new data. Similarly, the decision to increase the estimated average consumption of Burmese heroin addicts in 1989 was probably no more than some analyst's distant judgement. The reasonable stability of the total in recent years hides implausible variation in the components of the estimates. The totals have little credibility.

⁷ The implied annual heroin consumption per addict is 300 grams, 10 to 20 times the figure for the United States. For a recent estimate of weekly heroin consumption per addict of about 700 milligrams, about 35 grams per annum, see Rocheleau, M.A. and D. Boyum *Measuring Heroin Availability in Three Cities* Washington, D.C., Office of National Drug Control Policy, 1994. No doubt heroin is vastly cheaper in Burma but incomes are also of the order of 1 percent of U.S. levels.

Mexican Marijuana⁸

The problems are illustrated even more graphically by the published estimates for Mexican marijuana production in the late 1980s. Whereas Burma is distant and hostile, with a government that has little control in many of the major opium producing areas, Mexico is close, an ally for most purposes and (except for Chiappas since 1994) firmly in control of its drug producing territory. Yet the Mexican estimates have relied on often inconsistent and inadequately described methodologies, leading some analysts, including one at INM, to conclude that actual production is "unknowable" and that the agency's estimates are at best rather unscientific guesswork⁹.

The preface to the 1988 annual report of the National Narcotics Intelligence Consumers Committee (NNICC, an interagency group chaired by DEA) warns that "there is little reliable data upon which to base estimates of the quantities of drugs involved."¹⁰ Yet, notwithstanding the lack of first hand evidence of illicit activity that limits accurate production measures, it is often claimed that "the general trends portrayed can be considered reliable."¹¹ In the 1980s, this was belied by discrepancies in the trends for the two official series for these estimates, provided by NNICC and the *International Narcotics Control Strategy Report*. For example, the NNICC estimate of net production (after eradication) rose in 1986 to 5,460 metric tons from 4,125 the year before; the INCSR estimates for the same years were 2,800 in 1986 and 2,700 in 1985. Note that they differ substantially both in absolute value and in the trend; the NNICC figures were higher and rising while the INCSR figures were lower and essentially flat. In 1987 INM showed a slight decrease (about 5 percent) while the NNICC showed an increase of about one third. INM officials

⁸ This section draws extensively on Reuter, P. and D. Ronfeldt *Quest for Integrity: The Mexican-U.S. Drug Issue in the 1980s* Santa Monica, CA., RAND 1992.

⁹ See Kleiman, M. *Marijuana: Costs of Abuse, Costs of Control* Boulder, Colo., Westwood Press, 1989; personal communication from an INM official, 1989.

¹⁰ Drug Enforcement Administration *National Narcotics Intelligence Consumers Committee Report* 1988

¹¹Drug Enforcement Administration *National Narcotics Intelligence Consumers Committee Report* 1984.

explained the discrepancy in the mid-1980s as follows: "The Department of State considers its country estimates more reliable because the data were derived principally from aerial surveys. There are, however, no survey data on marijuana cultivation in Mexico; the State Department relied on random reports from Mexico which were higher than the NNICC figure, which is an extrapolation of seizure data."¹² This is less an explanation than an even handed condemnation of both estimates!

The fundamental unsoundness of the whole series of estimates was demonstrated vividly at the end of the decade. The U.S. estimate of Mexican marijuana production was dramatically increased in the 1990 *INCSR*, from a total of 5,700 tons in 1988 to 47,000 tons in 1989, as the result of changes in estimation techniques¹³. No details of those changes were provided in the published document. Yet it was possible to determine, with no great technical skill, that these figures were implausibly high and should never have been published.

Consider the various ways that Mexican marijuana might have been disposed of: seizures, domestic Mexican consumption, exports to Europe and exports to the United States. Mexican domestic consumption is thought to be quite low, notwithstanding the important histocial association of marijuana in the U.S. with Mexican immigrant groups in the 1930s, a major factor in the passage of the Marijuana Stamp Act in 1937. The State Department estimated the total in the late 1980s to be 100 tons. There are no reports of Mexican exports to European markets, probably because Mexico is not well located to compete with North African, Middle Eastern and domestic production in Europe, which is primarily a hashish rather than marijuana market anyway. Seizures are usually estimated at a few hundred tons. Nonetheless, assume that all these figures

¹² General Accounting Office Border Control: Drug Interdiction and Related Activities Along the Southwestern U.S. Border Fact Sheet GAO/GGD-88-124FS Washington, D.C. September 1988, p.53.

¹³ "New analytic methodologies have enabled the U.S. government to assess more accurately the extent of marijuana cultivation during the past several years" (*INCSR*, 1990, p.13). The report included no revision of previous years estimates.

are major underestimates and that the total for seizures, Mexican consumption and European exports was 12,000 tons.

This would leave 35,000 tons for consumption in the United States markets. How many marijuana users would have to purchase the Mexican product to dispose of this? Rhodes et al. estimated that a joint in 1993 had an average of 0.136 ounces (0.39 grams) of marijuana¹⁴. However Mexican origin marijuana is believed to be of lower potency, so let us assume that each joint contains 1 gram; this will bias the calculation in favor of finding large figures plausible..

A very heavy user of marijuana consumes about 3 joints per day. Giving him time off for colds and work related drug tests, assume that he consumes this amount 333 days a year; this (conveniently) gives a total of 1 kilogram of marijuana annually. That implies that we need 35 million very heavy marijuana smokers to consume 35,000 tons; that would be about half of all persons aged 15-35, the heavy user ages¹⁵. And this does not take into account consumption of domestic U.S. production or what is imported from Jamaica, Colombia etc. Yet reasonable estimates of the total number of heavy users (at least one joint per day) are only about one tenth of the 35 million needed to dispose of the imports from Mexico. Moreover, other estimates of total U.S. consumption have been far lower; e.g. Kleiman came up with figures for 1985 of only about 5,000 tons¹⁶ and prevalence was still declining in the late 1980s .

Perhaps as the result of this critique, the 1991 *INCSR* announced a further revision in estimation methodology. The estimate of area harvested was increased, reflecting a dramatic downward revision in the estimate of acreage eradicated. However, a new distinction was introduced between "usable plant yield" and "whole plant yield"; the former, more relevant to

¹⁴ Rhodes, W. et al. *What America's Users spend on Illegal Drugs, 1988-1993* Washington, D.C., Office of National Drug Control Policy, 1995, p.20.

¹⁵ Chen, K. and D. Kandel "The Natural History of Drug Use from Adolescence to the Mid-Thirties in a General Population Survey" *American J. Public Health* Vol 85, No.1, January 1995; pp. 41-47.

consumption estimates, was put at only half the latter. The new 1989 estimate of usable plant available for export after domestic consumption and Mexican seizures was 29,700 tons. Though an improvement over the previous figure, it was still utterly implausible, requiring U.S. consumers to account for far more than is consistent with current estimates of prevalence. Only in 1991 did the official figures start to approach even remotely plausible levels, though still being far higher than other estimates of total U.S. consumption.

Though I will not describe all the twists and turns since then, it is worth noting the current state of estimates. The 1994 *INCSR* lists the following series for usable plant yield:

Table 1: Estimates of Mexican Marijuana Production

(in metric tons)

1989	1990	1991	1992	1993
30,200	19,700	7,795	7,775	6,280

Source: International Narcotics Control Strategy Report, 1994

Only for the 1990 figure is any footnote explanation offered suggesting a change in methodology; yet no one seriously maintains that 1993 Mexican cannabis production is 20 percent of its 1989 level. The wholly implausible 1989 figure remains in the series, though the INCSR makes numerous later year revisions.

Another means of establishing the implausibility of the 1989 and 1990 figures is to consider their implications for Mexican export earnings. The farmgate price of marijuana in Mexico was estimated to be \$50-100 per pound; the border price, after distribution within Mexico, was estimated at \$136-455 per pound. Even taking the lower bound of the border price (which seems very low, given other price estimates for wholesale prices in the U.S.), the 35,000 tons of marijuana exports generates earnings of \$11 billion for 1989, compared to recorded export

¹⁶ Kleiman, M. *Marijuana: Costs of Abuse, Costs of Control* Boulder, Colo. Westwood Press, 1989.

earnings of \$40 billion; surely this would be enough to make nonsense of analyses of Mexican currency fluctuations.

These figures should never have survived a review process. As the above analysis suggests, it is easy to establish that they are far outside the plausible range. Yet the estimation process is so detached from analysis of domestic indicators that these figures have been able to survive for many years. Colleagues of mine at RAND have recently developed elementary "mass conservation" models that impose consistency checks on estimates¹⁷; the Mexican figures do not survive in that kind of framework. The discipline is simple enough that one may reasonably ask why it has not been done before.

International Price Series

The federal government also publishes price data for foreign production, covering both intermediate and final product¹⁸. Though prices are in principle easier to observe than quantities, these series show obvious inconsistencies. This is not the place for a lengthy description of all the anomalies of these series instead, let me just provide two illustrations:

1. In every year for which the data are published, the price for refined cocaine is lower in Colombia than the other two major producing countries (Bolivia and Peru). Yet is also asserted that most exports of Bolivian and Peruvian cocaine go through Colombia. It is difficult to tell an economically plausible story in which Colombian exporters prefer to buy the more expensive product in foreign countries, and then incur the cost and risk of shipping it into

¹⁷ Separate models are available for cocaine, heroin and marijuana. Resetar, S. and B. Dombey-Moore *A System Description of the Cocaine Trade* Santa Monica, CA., RAND, 1994. Childress, M *A System Description of the Heroin Trade* Santa Monica, CA. 1994. Childress, M *A System Description of the Marijuana Trade*. Santa Monica, CA. 1994;

¹⁸ Drug Enforcement Administration *The Illicit Drug Wholesale/Retail Price Report* various years.

Colombia for re-export. If there is some constraint on expanding production in Colombia, the price for that cocaine should be higher, representing its transportation cost advantage¹⁹.

2. The relative prices of the intermediate product, base, and the final product (HCL) move erratically for both Bolivia and Peru. In 1990 the difference between HCL and base prices in Peru is reported to be \$3,480; in Bolivia in the same year the difference is \$1,525. In 1992 the Peruvian margin has increased to \$4,950, while the Bolivian margin has slipped to \$1,150. Given the low transportation cost for base and the ease of processing, the large and growing difference between processing costs in the two countries seem quite implausible.

The heroin series are no better. The price of morphine, an intermediate product in the refining of illicit heroin, is sometimes recorded as higher than the final product. The export price of heroin from Southeast Asia is stable in the late 1980s, notwithstanding large increases in estimated product and falling prices elsewhere.

Expenditure Estimates

Only recently have domestic counterparts to the foreign production estimates become available from the government. Though estimates of the number of persons using illicit drugs are produced annually²⁰ and attract a great deal of attention, there has never been a similar interest in quantities and expenditures; the sources and implications of this lack of interest are discussed in the final section. The Office of National Drug Control Policy has been sponsoring such estimates since 1991²¹ but they have attracted little attention or scrutiny. The most recent available figures are given in Tables 2 and 3.

¹⁹ In theory it is possible that the Colombian cocaine prices are not really market prices but instead internal prices for an integrated producer, set low for some intra-firm bargaining. This seems implausible, given that there are some independent cocaine producers in Colombia. ²⁰ The National Household Survey on Drug Abuse (NHSDA), with sample sizes of between 20,000 and 32,000 in recent years, produces these estimates. *National Household Survey on Drug Abuse: Main Findings* Washington, D.C. Substance Abuse and Mental Health Services Administration (annual).

²¹ The latest of three published versions is *What America's Users Spend on Illegal Drugs: 1988-1993.* Washington, D.C. Office of National Drug Control Policy, 1995.

(in metric tons)								
	1988	1989	1990	1991	1992	1993		
Cocaine								
High	311	382	230	293	280	283		
Low	244	286	215	230	224	224		
Heroin								
High	9	11	13	10	9	11		
Low	5	5	6	4	3	9		
Marijuan	910	880	850	750	715	740		
Source: What America's Users Spend on Illegal Drugs, 1988-93 Tables 5 and 6 ²²								

 Table 2:
 Total U.S. Consumption of Illicit Drugs, 1988-1993

Table 3: Total U.S. Expenditures on Illicit Drugs, 1988-1993

Total	64.4	65.8	61.1	54.8	52.4	48.7
Other Drugs	3.2	2.8	2.3	2.4	2.2	1.8
Marijuana	8.9	9.0	9.6	9.0	10.1	9.0
Heroin	11.2	11.5	10.3	8.2	7.0	7.1
Cocaine	\$41.1	\$42.5	\$38.9	\$35.2	\$33.1	30.8
	1988	1989	1990	1991	1992	1993

(in billions of 1994 dollars)

Source: What America's Users Spend on Illegal Drugs, 1988-93 Table 8

In contrast to the international figures, these estimates are thoroughly documented and have their origins in very diverse types of calculations. The cocaine and marijuana estimates are derived from the household survey data, supplemented by various other surveys that cover populations (e.g. prisoners and college dormitory students) not included in the household survey, or which provide more data about the average amounts consumed by particular groups of users.

²² The marijuana consumption totals are estimated from figures provided in Table 6 on the number of users, number of joints per month per user and the weight of marijuana per joint.

Given that a small share of all users account for a large share of total cocaine consumption²³, particular attention is given to ethnographic studies that include consumption figures for heavy users.

Heroin estimates are generated by a different process, since the NHSDA is thought to miss most of the population of frequent heroin users, who tend to be transient if not homeless, and difficult to track down for interviews. The estimates are generated by a complex procedure from the number seeking admission to treatment and interviews with intravenous drug users in a large scale ethnographic study²⁴

Note first that the marijuana consumption estimates in Table 2 are almost an order of magnitude smaller than implied by the Mexican production estimates, though most of that production is destined for the United States market. Even the recent INCSR estimates for Mexico are at least eight times those for total U.S. consumption. That seven hundred tons in 1993 generated almost \$10 billion in retail sales; assuming prices are measured reasonably accurately, certainly much more so than quantities, then the notion that the U.S. imports 6,000 tons, with domestic sales value of \$70 billion seems particularly implausible.

Though the heroin and cocaine expenditure series are carefully produced and show no internal anomalies, it is useful to also examine their relationship to official price series and another international production series produced by the federal government. The price data are given in Table 4. They come from a DEA maintained series called STRIDE (System to Retrieve Information from Drug Evidence) but no document describes how these figures are derived from

²³ For example, Everingham and Rydell estimate that 22 percent of cocaine users account for 70 percent of total consumption. Everingham, S and P. Rydell Modeling the Demand for Cocaine Santa Monica. CA. RAND, 1994. ²⁴ Details are provided in *What America's Users Spend on Illicit Drugs* Appendix 1.

STRIDE e.g. whether the high and low figures represent the interquartile range or take account of differences across cities²⁵

(in 1994 dollars per pure gram)							
	1988	1989	1990	1991	1992	1993	
Cocaine							
High	\$186	\$165	\$200	\$168	\$163	\$161	
Low	146	123	187	132	130	120	
Heroin							
High	\$3,007	\$2,713	\$2,199	\$2,543	\$2,614	\$2,553	
Low	1,612	1,343	997	1,046	968	837	

 Table 4. Retail Prices for cocaine and heroin, 1988-1993

Source: What America's Users Spend on Drugs, 1988-1993 Table 4

Note the odd relationship between the heroin price and quantity series in Tables 2 and 4. Though prices fall by somewhere between one sixth and one half (depending on whether one uses the high or low price figures) between 1988 and 1993, total consumption (as reported in Table 2) is esentially flat over this period. Moreover, the consumption totals are very low, given estimates of the total number of dependent users (ca. 500,000) and recent estimates of how much users purchase weekly, now that heroin is both purer and cheaper than it was in the early 1980s. One recent study²⁶ estimated that in New York and Chicago, median weekly consumption was about 700 milligrams, yielding an annual total of about 35 grams; taken nationally that would generate a total consumption of about 18 tons.

The cocaine price and quantity series also produce some implausible relations. In 1990 it is believed that the Colombian government's crackdown on the Medellin traffickers led to a sharp, temporary, decline in total exports, perhaps partly compensated for by a run-down in inventories of

²⁵ On using STRIDE systematically, see Caulkins, J. *Constructing a Price Series for Cocaine* Santa Monica, CA, RAND, 1994.

traffickers. Prices rise by between 20 and 50 percent from 1989 to 1990 and consumption falls by between 25 and 40 percent, suggesting a rather higher elasticity of demand then might have been expected but otherwise not an implausible set of figures. In 1991, when the crackdown had ended, prices fell to the 1989 levels but consumption was much closer to the 1990 figure, rising only between 7 and 26 percent.

A review of the official supply side figures in Table 5 points to a much more substantial problem of consistency. Separately from the cocaine consumption figures, the same research group also produces a series labeled "Cocaine available for consumption in the United States (after discounting [sic] for Federal seizures)". These are supply side estimates, produced by taking estimates of total production in the source countries (Bolivia, Colombia and Peru) and then subtracting estimates of what is seized along the way, consumed elsewhere (including Western Europe) and seized by United States federal government agencies. The estimates for 1989 to 1993 are produced in Table 5. Note that these figures are substantially higher than the domestic consumption estimates reported in Table 2; indeed in 1990 the high end of the range is twice the high end for domestic consumption.

Some of the difference may be explained by seizures made by state and local agencies; in 1987 these agencies were estimated to seize about half as much as their federal counterparts²⁷. Over the period considered here, federal seizures were between about 100 and 120 tons. However, even subtracting 50 or 60 tons from the supply side series, in most years, the supply side estimate is substantially higher than the domestic estimate.

²⁶ Boyum, D. and A.M. Rocheleau *Heroin Users in New York, Chicago and San Diego* Washington, Office of National Drug Control Policy, 1994.

²⁷ Godshaw, G.; Koppell, R. and R. Pancoast *Anti-Drug Law Enforcement Efforts and their Impact* Wharton Econometric Forecasting Associates, Bala Cynwyd, 1987.

Table 5. Trends in the Cocaine Supply, 1989-1993

	1989	1990	1991	1992	1993
Cocaine available for consumption in	361-473	348-463	337-481	376-539	243-340
the U.S. (metric tons)					
Retail value of cocaine in the U.S. (in	\$52-68	\$67-90	\$51-72	\$55-79	\$33-46
billions of dollars)					

Source: What America's Users Spend on Illegal Drugs, 1988-1993 Table B.

But of more immediate concern to us is the lack of any notable change in the supply available to the United States in 1990; the drop from 1989 is about 3 percent. This of course is inconsistent with the observed increase in U.S. retail price in 1990 and the reduction in estimated consumption, as well as with the official (and plausible view) that the Colombian crack-down had a substantial effect. Reference to the European market or local seizures does not help explain this inconsistency, since these series are unlikely to exhibit year to year changes large enough to explain much of this. To make this lack of change in 1990 even more dramatic, note that the only year of substantial change is 1993 when the estimated supply dropped by about one third. Yet this decline is not reflected, as one might have expected, in either the domestic consumption or retail price figures; indeed, prices dropped by about 5 percent!

The supply side series undermines the credibility of the domestic estimates. Or it may simply be that any figures generated from distant lands by unknown processes should be viewed as worthless.

Global Estimates

Estimates of world consumption or expenditure have no known provenance. Five hundred billion dollars is the standard figure cited in offiical and unofficial publications. The U.S. State Department, despite its imperialistic estimation of production and (often) consumption in individual foreign countries, does not attempt a global estimate. I believe it unlikely that the global figure is much more than twice the U.S. total. Though the US accounts for only 5 percent of world opium production (through its heroin consumption), most opium and heroin is sold in Asia at prices that are a miniscule proportion of the US street price. The US still consumes most of the world's cocaine production. For marijuana, again most of the world production is consumed in countries with much lower retail prices.

The Production Process

I will assume the reader is convinced from the above that the official numbers (prices, quantities, expenditures) are seriously flawed, though the domestic expenditure estimates may be exmpt from that judgement. While I might claim to have expertise in this area, having spent ten years in empirical research related to drug policy, clearly none of the flaws exposed here require any special technical skill or insight to discover; all that is required is a willingness to subject the series, individually and as a group, to some modestly serious analytic scrutiny. This section offers some observations as to why the numbers persist in such disarray.

The current drug production estimates are generally detached from the policy process. Though it is worth noting that it would be hard under any circumstance to produce estimates with the authority and precision of the standard indicators of economic activity, one reason they are of low quality is that they simply have no consequence for any senior decision makers. This is an example of a principle called GOGI (garbage out, garbage in), the converse of the usual GIGO (garbage in, garbage out); since no one uses the estimates for any important purpose, they are produced without care or scrutiny. The State Department is required by statute to produce the international production figures annually. It cannot simply claim an incapacity to meet the statutory requirement. Nor, I suspect, is there any justification for large investments in improving the available data. There is no excuse however for producing implausible figures or inconsistent series but, given the lack of political or external analytic scrutiny, not much incentive to do otherwise.

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The Mexican marijuana production figures illustrate dramatically the detachment of the estimates from the policy process. The increases and declines in the *INCSR* estimates have no apparent consequence for U.S. policy decisions. Congress did not feel the need to take new measures against Mexico when suddenly the State Department produced figures suggesting that the U.S. marijuana market was completely dominated by Mexico; nor did the administration make any noticeable change in policy. There was no cry for increased domestic efforts against marijuana because of the sudden discovery that American users were consuming vastly more than had prevsiously been estimated. The 1989 figure was initially explained simply as the result of changes in estimating techniques, not in the underlying realities. Nonetheless, the implication of the new figures was that Mexico was swamping the United States, and indeed the world, since its 30,000 tons accounted for five sixths of the officially estimated global total. Surely this would be reason for alarm, for a call to Mexico to deal with a problem that must be much more serious than previously realized. Yet, the harshness of U.S. political rhetoric about Mexico's drug control efforts was much slighter at the end of the 1980s, precisely when these estimates were at their highest levels.

The price series are even more separated from the policy process they are supposed to inform. They serve no bureaucratic purpose that I have been able to discern and are almost never cited politically or in the media. One can reasonably ask why they are produced at all. Perhaps the need of U.S. officials to appear authoritative in public discussions is sufficient motivation to produce the numbers, without providing a good reason for doing the job well.

With no audience for these estimates, agencies are motivated to give them little attention. My impression is that no-one of any prominence at the Drug Enforcement Administration or the Department of State ever spent time as an analyst or producer of these estimates. Both agencies, with very different organizational cultures, share a marked lack of interest in numeracy. These problems are exacerbated by the fact that the National Institute on Drug Abuse (the principal federal research agency concerned with illicit drugs) and the Substance Abuse and Mental Health Services Administration (which produces the major indicator series such as the NHSDA and DAWN system) play peripheral roles in the estimation process described here. They are much more data- and analysis-oriented agencies than DEA or the Department of State but as public health bureaus have never been much interested in markets per se, seen as principally the concern of law enforcement agencies. Though the NHSDA does provide critical information for the consumption estimates sponsored by ONDCP, NIDA itself has only recently started to give attention to questions about expenditures and consumption in the survey.

The Potential Uses of Quantity, Price and Revenue Estimates

What is needed by way of measurement? Clearly this is entirely a policy driven enterprise, without any scientific goals. In this respect it differs from the collection of data on domestic use and abuse, which serves a variety of scientific purposes (for example undersanding the etiology of the drug use) as well as programmatic planning. So the central question, putting aside the detail of the statutory requirements imposed on the executive branch by the boundlessly ambitious and imperalistic Congress, is what decisions these figures could usefully inform. At the moment only the certification process makes even a pretense of being connected to these estimates and a pretense is all that it is. Certification decisions are driven by politics rather than numbers; i.e. the administration forgives U.S. friends even when they are deemed non-cooperative (for example, Colombia in 1995²⁸), and condemns those with whom it is not on good terms (e.g. Burma, Iran and Syria). Without a specification of policy needs, the estimates will continue to flounder.

Sensible estimates of quantities, prices and revenues could, in principle, serve a number of important functions. For example, the efficacy of interdiction may be crudely estimated by

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comparing seizures with estimated shipments or by estimating the margin between import and export prices, which represents the smugglers' margin²⁹. Export prices from individual producing countries could be a useful measure of how stringently that nation enforces laws against growers and refiners. The revenue estimates provide a basis for estimating the impact of asset forfeitures; for example, if total revenues are \$50 billion, then \$2 billion in asset forfeitures constitutes a four percent tax, stochastically applied. These kinds of calculations are helpful in developing and understanding of the promise and limits of these kinds of programs.

In 1971 Max Singer had published an oft-cited article arguing that if one believed the official numbers with respect to the prevalence of heroin addiction, the dependence of addicts on theft and the price of a heroin habit, that New York City did not exist anymore; it had been stolen by junkies³⁰. My first published article on drug policy was an extension of that critique³¹, pointing out that though the measurement enterprise had become more elaborate, it still produced striking inconsistencies. Another ten years on, the process has become yet more elaborate. There is coherence and good documentation for the revenue estimates, but the process is still capable of producing much nonsense. Until these series and estimates are integrated into the policy process, they are unlikely to get much better.

²⁸ In 1995, much to the chagrin of Colombian leaders, the President offered only a qualified certification, invoking a "national interest" waiver clause that allows for certification even if the nation is not meeting the criterion of making maximum effort to suppress the trade.
²⁹ For a price oriented analysis of interdiction effectiveness, see Reuter, P.; Crawford, G. and J.

Cave Sealing the Borders: The Impact of Military Involvement in Drug Interdiction Santa Monica, RAND, 1988.

³⁰ Singer, M "The Vitality of Mythical Numbers" *Public Interest,* Spring, 1971.

³¹ Reuter, P. "The (continued) Vitality of Mythical Numbers" *Public Interest* Spring 1984.