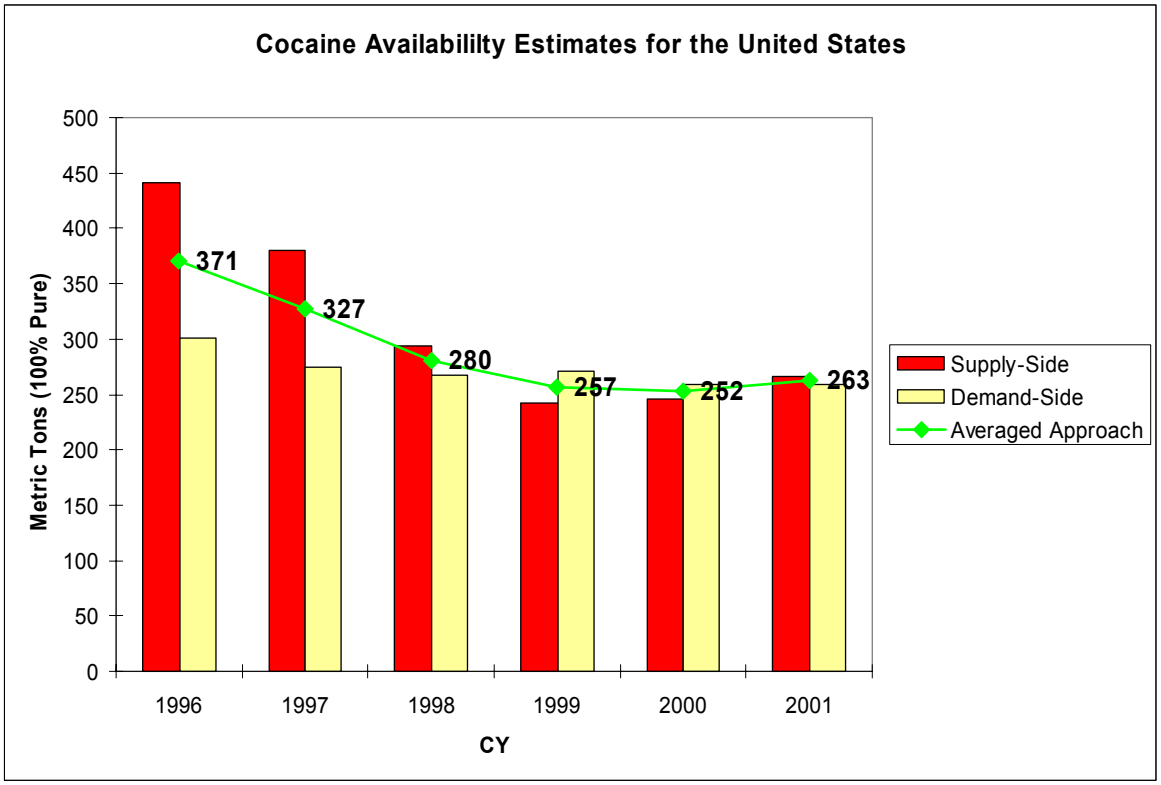
Chapter 1: Estimate of Cocaine Availability in the United States

Based on a the Department of Justice's Interagency Drug Flow Model Steering Committee tasking to estimate cocaine availability for the Calendar Year 2001, the Cocaine Working Group created a model for the estimation process and tested it across six years worth of data. This was done in anticipation of the need for complying with recurring annual estimates for 2002 and beyond. The main feature of the Working Group's model is the averaging of independent supply- and demand-side estimates to represent what we believe is the best point estimate of cocaine availability each year. This technique appears to have produced consistent results showing fairly narrow ranges of availability for the most recent four years, 1998-2001, within roughly a 5-10% spread annually between supply and demand estimates suggesting a stable availability during this four year time period, as shown in Figure 1-1.

Important conclusions to be derived from the modeling effort are the extent of uncertainty throughout the data sets and the importance of working to refine our estimates. While we believe that our combined estimative model provides a generally accurate point estimate for recent years, continued uncertainties in the available data sets and estimates make it difficult to accurately measure year-to-year changes in cocaine availability. Under the current conditions the best that can probably be done is to identify an overall availability trend rather than accurately measure the degree of change. To increase the accuracy of the various data sets over time, and allow us to correctly measure changes requires continued analytical focus on these data sets beyond completion of this task.

Figure 1-1 Cocaine Availability in the U.S.



Methodology Overview

The Cocaine Working Group was represented by members from the following organizations: Central Intelligence Agency (CIA), United States Customs Service (USCS), Defense Intelligence Agency (DIA) (Chair), Drug Enforcement Administration (DEA), El Paso Intelligence Center (EPIC), National Drug Intelligence Center (NDIC), Office of National Drug Control Policy (ONDCP), State Department, Treasury Department and United States Interdiction Coordinator (USIC). The working group developed a model that sequentially subtracted losses to the cocaine system from a starting point, as shown in Table 1-1. For the supply-side approach, the starting point was the averaged cocaine production estimate. Since the cocaine production estimate is expressed as pure cocaine (100% purity) and not in terms of the purity of real-life cocaine as it is manufactured from processing laboratories, a purity factor was applied based on the average wholesale purity of seized cocaine annually since 1998 to reflect more accurately the supply of cocaine. Consumption estimates for foreign markets were estimated and subtracted using 1998 as a base year, with updates from 2000 and extrapolated when data was not available for other years. Additionally, seizures around the world were subtracted. The residual from these subtractions produced the supply-side availability estimate. For the demand-side approach, estimates for domestic consumption were used as the residual without considering any losses. The residuals from both approaches were averaged and compared to show trends in availability.

Averaged Potential Production

The supply-side model sequence starts with the averaged potential cocaine production. Averaged potential cocaine production is the average of current year and past year official U.S. figures for potential cocaine production. The concept of averaging two production estimates is used because the official year-end estimate is not designed to calculate the total year's worth of cocaine production. These design limitations included in the year-end figure assume (1) that any eradicated plant did not produce prior to eradication, (2) that any mature coca plant imaged at the end of the calendar year was productive throughout the year and (3) that all coca leaf was harvested and processed into finished cocaine. To compensate for the first two issues, the working group decided to average two years of cocaine production estimates which would have the effect of minimizing the tendency to overestimate the productive capacity of immature coca plants at the beginning of the year and maximizing the tendency to underestimate the productive capacity of coca plants prior to eradication. The third issue is not quantifiable since it is impacted by parameters not currently measured and includes variations in weather, the timing of planting, harvesting decisions, and market demand

The official U.S. figures for year-end potential cocaine production are based on year-end estimates of net coca cultivation combined with estimates for coca yield, cocaine alkaloid content and cocaine processing factors. The formula and data for converting coca cultivation into year-end cocaine potential production are provided in Section 1-A for Colombia, Peru and Bolivia.

The four primary components of potential cocaine production are net coca cultivation, coca leaf yields, cocaine alkaloid content and cocaine processing efficiencies.

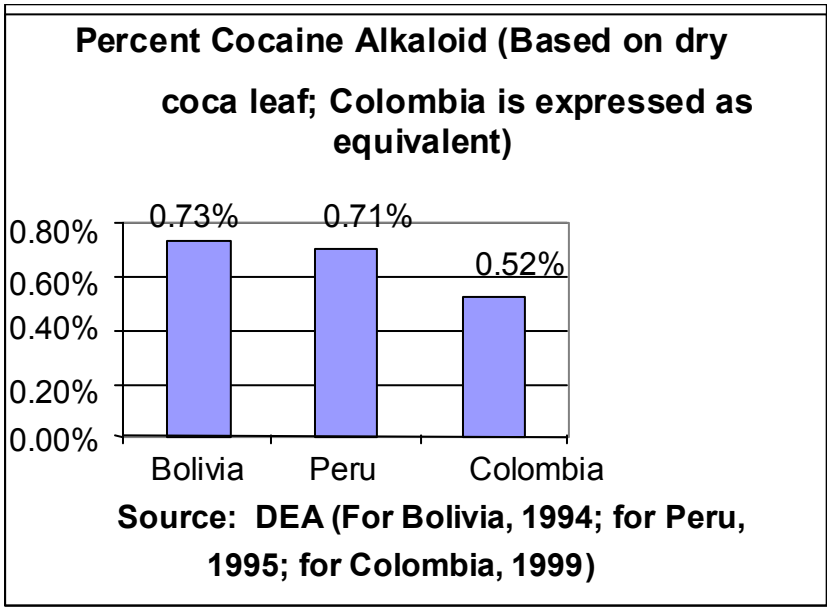
Estimates for coca cultivation are based primarily on satellite-imagery sampling within known growing areas normally imaged within a relatively narrow time period during a year. Because the sampling estimate is statistically based, the standard of error of the cultivation estimate can be determined. The error rate varies from year to year but averages about +/- 10 percent. The model

Table 1- 1 Worksheet showing model parameters, data, and results

Line	Adjustment	Purity	Calculation	1996	1997	1998	1999	2000	2001
1	Average Potential Production	Pure	See table 1-n	940	913	850	804	820	879
2	Average Purity of Exported Cocaine			0.86	0.86	0.86	0.84	0.82	0.78
3	Avg. Potential Production	EQ	Line 3= Lines (1)/(2)	1093	1062	988	957	1000	1127
4	Less seizures in Source Zone	EQ		75	81	90	77	85	78
5	Consumption in Source Zone	Pure		124	131	138	145	152	160
6	Less consumption in Source Zone	EQ	Line 6=Lines (5)/(2)	144	152	160	173	185	205
7	Est. available to depart Source Zone	EQ	Line 7= Lines (3)-(4+6)	874	828	738	708	730	844
8	Less seizures in non-US Transit Zone	EQ		0	0	0	11	7	18
9	Less seizures in non-US Arrival Zone	EQ		23	37	30	37	19	36
10	Consumption in Non-US Arrival Zone	Pure		138	146	153	161	183	192
11	Less consumption in non-US Arrival Zone	EQ	Line 11=Lines (10)/(2)	160	170	178	192	223	246
12	Estimate to depart Source Zone to US	EQ	Line 12=Lines (7)-(8+9+11)	690	622	530	468	484	544
13	Less seizures in US transit Zone	EQ		53	86	81	74	87	109
14	Less seizures in US Arrival Zone	EQ		85	54	66	56	43	34
15	Less federal seizures inside US	EQ		20	18	17	20	14	17
16	Less state and local seizures	EQ	Key data is missing	UNK	UNK	UNK	UNK	UNK	UNK
17	Consumption in transit Zone	Pure		17	19	21	25	30	33
18	Less consumption in Transit Zone	EQ	Line 17=Lines (17)/(2)	20	22	24	30	37	42
19	Estimate available for US consumption	EQ	Line 19=Lines (12)-(13+14+15+16+18)	513	441	342	288	300	341
20	Supply-side est. for US availability	Pure	Line 20=Line (19)*(2)	441	380	294	242	246	266
21	Demand-side estimate for US availability	Pure		301	275	267	271	259	259
22	Difference between two approaches	Pure	Line 22=Lines (18-19)	140	105	27	-29	-13	7
23	Point Estimates for US availability	Pure	Line 23=Lines (20+21)/2	371	327	280	257	252	263

compensated for limitations in the official U.S. cultivation figure resulting from the inability to image coca fields in Colombia's Narino Department in 2000. The yearend 2001 U.S. estimate for the Narino was about 12,100 hectares. The official U.S. estimate for 2000 acknowledged the existence of coca grown in Narino but did not quantify an amount because CNC was not able to complete a statistically significant survey there during that year. To compensate for the lack of vital information, the working group estimated, based on all available information—including United Nations Drug Control Policy (UNDCP)/Colombian government surveys for 1999 and 2000—that Narino had no coca at the end of 1998, 6,050 hectares of coca at the end of 1999, and about 12,100 hectares of coca at the end of 2000 and 2001.[1] Based on the appropriate leaf yield, alkaloid content, and base processing figures for Narino (Section 1-A), the working group estimated that potential cocaine production in Colombia was 537 metric tons at the end of 1999 (vice 520 metric tons) and 622 metric tons at the end of 2000 (vice 580 metric tons). Potential cocaine production at the end of 2001 already included an estimate for Narino so no changes are needed for that year for yearend potential production. Adjustments in yearend potential for 1999 and 2000 result in slightly higher "average" potential for 1998, 1999, 2000, and 2001.

Figure 1-2 - DEA Operation Breakthrough Data on the Percentage of Cocaine Alkaloid in Dry Leaf



The estimate for cocaine base processing efficiencies in Colombia was changed from about 45 percent to 69 percent as a result of DEA research published in Operation Breakthrough, February 2001. The higher efficiency factor has been applied to all estimates going back to 1995.

[1] UNDCP/Colombian government surveys using commercial satellite photography indicated that there were 3,959 hectares of coca in Narino in March 1999, 9,343 hectares there in August of 2000, and 7,494 there at the end of October 2001. Interpolating this data indicates that a little more than 6,000 hectares of coca could have been in the Narino by the end of 1999. If indeed, coca cultivation in the Narino declined in 2001—as indicated by the UNDCP/Colombian data—because of aggressive eradication efforts, that would mean that cultivation there at the end of 2000 would probably be at least as great as it was at the end of 2001.

Average Purity of Exported Cocaine

The model adjusts the averaged potential cocaine production number by wholesale purity, which was based on seizure samples greater than one kilogram or roughly two pounds. The reason for this factor is to accurately reflect the volume of cocaine departing illicit processing laboratories in South America. Changes in the purity level can also be used to help interpret changes in the cocaine system. The purity levels are calculated by averaging four calendar year quarters of cocaine samples analyzed through the Drug Enforcement Administration's Special Testing and Research Laboratory (STRL). Each quarter, cocaine samples are acquired through seizures of cocaine in South America and the United States.

The STRL began its purity level program in 1997 but an annual estimate for a purity level was not available until 1998 based on data starting in March 1998. The model assumed that the purity levels for 1997 and 1996 remained constant with the 1998 level. Other scenarios could have been assumed but there was no way to reasonably determine the magnitude in either direction, lower or higher. Section 1-A provides an explanation for the decline in purity detected since 1998.

The STRL does not use a statistical sampling process to calculate purity. Roughly a third of the total samples used for testing are foreign. About 94% of these samples come from non-Colombian cocaine seized primarily in Peru and Bolivia, even though current estimates indicate that over 90% of the cocaine entering the U.S. is Colombian cocaine. Since the last quarter of 2001, isotropic ratio analysis determined that over 90% of the cocaine exhibits seized in the United States and analyzed by DEA were of Colombian origin.

In addition, the STRL database does not provide a way to track intelligence-related information about the its domestic samples which comprise 2/3 of its testing, such as weight and seized location. This information would be helpful in better understanding the distribution of the domestic cocaine purity. Data from the STRIDE database, for example, shows dramatic variations in the purity of cocaine samples collected within the U.S. While the STRL database provides the name of each law enforcement laboratory where the sample originated, it does not provide a cross-reference number that could be used to find the original sample in the federal or state lab.

Cocaine Seizures

Cocaine seizures are used in the model and compiled by the following geographic categories: the Source Zone, Transit Zone, non-US Transit Zone, Arrival Zone, non-US Arrival Zone, U.S. federal seizures inside the U.S. and U.S. state and local seizures inside the U.S. The Source Zone is the continent of South America. The Transit Zone is the sovereign nations and the waterways between South America and the U.S., except for Puerto Rico and the U.S. Virgin Islands. The non-US Transit Zone is the sovereign nations and the waterways between South America and the Eastern Hemisphere, Oceania and Canada, except Puerto Rico and the U.S. Virgin Islands. The Arrival Zone is the land, air and maritime entry points along the borders of and within the U.S., Puerto Rico, and the U.S. Virgin Islands. The non-U.S. Arrival Zone is any country not included in the Source, Transit or U.S. Arrival zones, primarily the Eastern Hemisphere, Oceania and Canada. Cocaine seizures within the U.S. that are not part of the U.S. Arrival Zone are either collected by federal law enforcement agencies or state/local agencies.

Seizure data for all geographic areas except for state and local seizures are reviewed and stored in the United States Interdiction Coordinator-sponsored Counterdrug Consolidated Database (CCDB). The

CCDB contains a variety of information in addition to seizure data and for this reason is classified as National Security Information. The vast majority of seizure information in the CCDB is not National Security Information. Those seizures that contain classified information are not classified in themselves, rather the sensitive information refers to specific aspects of the seizure that are not relevant or needed to compile seizure statistics. All seizures in the CCDB are utilized for this model.

A subset of the data stored in the CCDB is also contained in the DEA's Federal Drug Seizure System (FDSS) database which contains all federal law enforcement seizures and some state and local seizures; however the CCDB is used as the compilation tool for global seizures. While CCDB is classified, accessible electronically, able to contain exhaustive information about a seizure and easy to use, FDSS is not classified but it is also not easily accessible, has limited data and is not easy to use.

Section 1-C provides a detailed listing of how the seizure information in Figure 1-2 was derived. The appendix also provides procedural information to replicate the aggregate data, assuming access to the CCDB and National Security Information is authorized.

While some state and local seizure data is available, a complete understanding of U.S. state and local cocaine seizures is not possible. For this reason, the model shows UNK (unknown) to reflect this lack of understanding. Only some state and local seizure data is available through a variety of databases, and the extent to which there is duplication or completeness in this data is unknown. There is therefore no reasonable estimate of the magnitude of U.S. state and local seizures.

Foreign Cocaine Consumption

Of the key factors needed to estimate cocaine availability in the U.S., foreign consumption estimates are the most imprecise. Prevalence and average-use parameters, which are key values for determining consumption, are difficult to estimate. Cocaine use estimates were base lined for 1998 and was based on data from many Latin American and European countries. Updated information in new surveys for 2000 allowed the working group model to interpolate estimates for 1999 and extrapolate for 2001. For the years 1997 and 1996, the model extrapolated backwards from the 1998 baseline.

Comprehensive cocaine prevalence studies have not been completed for most countries. For these, analytic judgment is used to adopt a comparable prevalence and use profile from those countries that have prevalence and use studies. Even where countries have published studies, they are often obsolete. More accurate information is needed about the size of the addict population in different countries and how much they consume. Section 1-D provides a detailed accounting for each country in the world.

U.S. Cocaine Consumption

Estimates for U.S. cocaine consumption are published periodically by ONDCP. The most recently published estimate from November 2001 provides an estimate for 1999 based on observed data and extrapolates for 2000 and 2001. Section 1-E provides insight into the components used to make the estimate.

U.S. consumption estimates have been made for about a decade using statistically reliable methodologies including epidemiological, econometric and price series analyses. However, many data shortfalls exist such as the reliability of the estimate of the number of hardcore users who consume the

vast amount of cocaine in the U.S. However, since U.S. estimates involve a consistent methodology, there is more confidence in trends than absolute amounts.

Model Interpretation

An important conclusion derived from the modeling effort is the extent of uncertainty throughout the data sets. While the model produces very useful ranges of cocaine availability for the U.S. for the years 1998-2001, the reader is cautioned that the underlying uncertainty discussed throughout this paper and appendices make drawing conclusions about year-to-year changes, such as increases or decreases, an unreasonable endeavor.

The trend for 1998-2001, using the average of the supply-side and demand-side approach, appears to decrease about 10% from 1998 to 1999, then decrease less than 1% from 1999 to 2000, and then increase about 5% from 2000 to 2001. However, these year to year changes are very small and could easily be caused by a variety of incompleteness or inaccuracies in a variety of the data. The four year trend from 1998-2001 yields a slight decrease of about 5%, from 280 to 265 metric tons of pure cocaine. The small yearly changes as well as the small four-year change suggest that cocaine availability in the U.S. throughout 1998-2001 has been relatively stable.

For years 1996-1997, the model was not able to produce useful results probably mostly because of the large extent of extrapolation of data rather than based on measured or available data. During 1996-97, the dramatic shift in coca cultivation from Peru to Colombia probably resulted in a higher-than-normal level of excess productive capacity as large numbers of Peruvian farmers abandoned their fields often without picking mature coca crops. The wholesale purity measurements did not exist because it wasn't until 1998 that these measurements were published. Foreign consumption estimates were not measured as they were based on backward extrapolation from 1998. Seizure data for 1996 did not undergo the reviewing and data basing process currently in place with the CCDB hence the reliability of seizures in that can not be confirmed. Finally, for all years, the absence of complete data for U.S. state and local seizures has some impact on magnitude estimates for availability; but based on a quick review of available state and local seizures in various databases, the working group believes the aggregate magnitude of these types of seizures is probably relatively low.

Recommendations for Improvement

Probably the most important suggestion for improvement is the need for open access to data and assumptions as well as continuing discussions about each parameter considered in the model: coca cultivation and cocaine production, purity levels, foreign and U.S. consumption estimates, and seizure statistics. Equally important is the continued analytical focus on these data sets. Some specific recommendations are:

1) Improve seizure accounting. The discussion of seizure accounting in the body of this report and the appendix is complicated but reflects the reality of how difficult it is to pull seizure data from many sources. Even then, there can be inherent inconsistencies such as calculation of U.S. arrival zone seizures.

2) Improve reporting of purity. The Working Group was not able to reproduce wholesale purities. For consistency, and interagency concurrence, this calculation needs to be transparent.

3) Improve foreign consumption estimates. The Working Group devoted an enormous amount of time and effort, building on previous analyses, to estimate foreign consumption but our allied partners need to share in this difficult task.

Appendix 1-A: Narcotics Crop Cultivation and Potential Cocaine Production Estimates

The US Government's narcotics crop and potential cocaine production estimates are comprised of several critical components: net mature coca cultivation; coca leaf yield per hectare per year; cocaine alkaloid content within the leaf; the efficiency with which the cocaine alkaloid in the leaf is converted into cocaine base; and the efficiency with which cocaine base is converted into pure cocaine hydrochloride. Those key components are multiplied together in the following equation in order to calculate potential pure cocaine production:

- Total mature[2] coca cultivation **X** coca leaf yield **X** leaf cocaine alkaloid content **X** base lab efficiency **X** base-to-HCL lab efficiency = *potential pure cocaine production* (see also Table 1-1, 1-2, and 1-3)

- Prior to the completion of research on Colombian coca yields and processing efficiencies, calculations of potential pure cocaine production were made using direct leaf to HCl conversion rates. For Peru and Bolivia, those direct conversion rates were determined using scientifically derived data on leaf yields, cocaine alkaloid contents, and laboratory efficiencies[3].

Estimates of potential cocaine production are not the same as actual production:

- Estimates assume that the regions' farmers harvest all of the coca leaf and that all the harvest is processed. No attempt is made to quantify spoilage or loss from seizure or by other means.

- Estimates of potential cocaine production are measurements of production based on a product with a purity of 100 percent.

- And finally, potential production estimates are based on the end of the calendar year net coca cultivation estimate. Actual potential production during the year will depend, in part, on the rate of change of potential production from one years year-end estimate to another.

Colombia Potential Production Calculations 1996-2001

This section tabulates the cultivation, leaf production, and potential Hydrochloride (HCl) production estimates for each Colombian growing area. The base lab processing efficiency for Colombia is 69.4%, based on Operation Breakthrough analyses. The overall average efficiency of cocaine base to cocaine HCL is 88 percent; this translates into approximately a 1:1 conversion rate based on weight. For the other two components applied to the Colombian cultivation data, leaf yield and cocaine alkaloid content, Table 1-2 shows the values, based on fresh coca leaf. Tables 1-3, 1-4, and 1-5 show the potential production figures for 2000-01, 1998-99, and 1996, 97 respectively.

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[2] When calculating potential production, only mature cultivation is considered. Since almost all farmers interviewed in Colombia reported that they plant their fields using cuttings and pick their first harvest within one year of planting, all of Colombia's crop is considered mature. In Peru and Bolivia, it generally takes between 18 - 24 months for newly planted fields to become productive. Therefore, new cultivation observed during the year is not considered mature for two years.

[3] For example, in Peru, it was determined that roughly 400 kilos of air-dried coca leaf was required to produce one kilo of pure cocaine while in Bolivia, processors required anywhere from 310 to 370 kilos of air-dried coca leaf to produce one kilo of pure cocaine. In addition, in Peru potential production estimates were calculated on total country-wide estimates of air-dried leaf production and not by individual growing areas.

Table 1- 2 Leaf Yield and Cocaine Alkaloid Content Data for Columbian Growing Area

GROWING AREA	Fresh coca leaf yield (mt/ha/yr)	Fresh leaf cocaine alkaloid content
Guaviare	4.7	0.149%
Vichada	4.7	0.149%
Macarena	4.7	0.149%
Putumayo East [1]	4.7	0.149%
Caqueta East	4.7	0.149%
Puerto Leguizamo [1]	4.7	0.149%
Caqueta West	4.1	0.139%
San Lucas	4.1	0.139%
Putumayo	3.9	0.136%
Norte de Santander	3.9	0.136%
Arauca [2]	3.9	0.136%
Narino	3.9	0.136%
Antioquia	3.9	0.136%

Notes:
1. Beginning in 2001, Putumayo East includes the area around Puerto Leguizamo
2. Prior to 2000, fresh coca leaf yield in Arauca was judged to be 4.7 mt fresh leaf/ha/year while cocaine alkaloid content was judged at 0.149%; those data points were updated in 2001 after further analysis.

Table 1- 3 Total Pure Cocaine Production for Columbia, 2000-2001

GROWING AREA	2000			2001		
	Net Mature Cultivation (ha)	Fresh Leaf production (mt)	Potential pure cocaine production (mt)	Net Mature Cultivation (ha)	Fresh Leaf production (mt)	Potential pure cocaine production (mt)
Guaviare [1]	36,100	169,670	175.4	51,600	242,520	**250.8**
Vichada				2,600	12,220	**12.6**
Macarena	2,100	9,870	10.2	2,500	11,750	**12.2**
Putumayo East	2,500	11,750	12.2	2,600	12,220	**12.6**
Caqueta East	19,100	89,770	92.8	25,300	118,910	**123**
Caqueta West	13,100	53,710	51.8	15,000	61,500	**59.3**
San Lucas	8,400	34,440	33.2	4,400	18,040	**17.4**
Putumayo	44,900	175,110	165.3	39,400	153,660	**145**
Norte de Santander	8,100	31,590	29.8	9,300	36,270	**34.2**
Arauca	1,900	7,410	7.0	3,800	14,820	**14**
Antioquia				1,200	4,680	**4.4**
Narino				12,100	47,190	**44.5**
Totals	**136,200**	**583,320**	**577.8 (580)**	**169,800**	**733,780**	**730.1 (730)**
Narino adjust [2]	12,100	47,190	44.5			
Totals	**148,300**	**630,510**	**622.3 (622)**			

Notes: 1. Prior to 2001, Vichada had been included in the Guaviare growing region.
2. Estimate from UNDCP/Colombian government analysis of commercial satellite imagery.

Table 1- 4 Total Pure Cocaine Production for Columbia, 1998-1999

GROWING AREA	1998			1999		
	Net Mature Cultivation (ha)	Fresh Leaf production (mt)	Potential pure cocaine production (mt)	Net Mature Cultivation (ha)	Fresh Leaf production (mt)	Potential pure cocaine production (mt)
Guaviare	26,700	125,490	129.8	28,000	131,600	136.1
Macarena				1,800	8,460	8.7
Caqueta East	17,900	84,130	87.0	19,000	89,300	92.3
Caqueta West	21,500	88,150	85.0	14,600	59,860	57.7
San Lucas	2,800	11,480	11.1	4,100	16,810	16.2
Putumayo	30,100	117,390	110.8	45,900	179,010	169.0
Norte de Santander	2,800	10,920	10.3	8,000	31,200	29.4
Arauca				1,100	5,170	5.3
Totals	**101,800**	**437,560**	**434.0 (435)**	**122,500**	**521,410**	**514.9 (520)**
Narino adjust [1]				6,050	23,595	22.3
Totals				**128,550**	**545,005**	**537.2 (537)**

Notes: 1. Estimate from UNDCP/Colombian government analysis of commercial satellite imagery.

Table 1- 5 Total Pure Cocaine Production for Columbia, 1996-1997

GROWING AREA	1996			1997		
	Net Mature Cultivation (ha)	Fresh Leaf production (mt)	Potential pure cocaine production (mt)	Net Mature Cultivation (ha)	Fresh Leaf production (mt)	Potential pure cocaine production (mt)
Guaviare	38,600	181,420	187.6	29,000	136,300	140.9
Caqueta East	9,350	43,945	45.4	13,100	61,570	63.7
Caqueta West	12,250	50,225	48.5	18,400	75,440	72.8
Putumayo	7,000	27,300	25.8	19,000	74,100	69.9
Totals	**67,200**	**302,890**	**307.3 (300)**	**79,500**	**347,410**	**347.3 (350)**

Peru and Bolivia Potential Production Calculations 2000-2001

This section will tabulate the cultivation, leaf production, and potential HCl production estimates for each Peruvian and Bolivian growing area. The base lab processing efficiency for Peru is 44%, and is 45% for Bolivia, based on Operation Breakthrough analyses. The overall average efficiency of cocaine base to cocaine HCL is 88 percent; this translates into approximately a 1:1 conversion rate based on weight. For the other two components applied to the Peruvian and Bolivian cultivation data, leaf yield and cocaine alkaloid content, table 6 shows the values, based on oven-dried coca leaf. Tables 7 and 8 show the 2000-01 data for Peru and Bolivia. Note that the Bolivia figures for 2000-01 are mid-year estimates.

Table 1- 6 Leaf Yield and Cocaine Alkaloid Content Data for Peru and Bolivia

Country	Growing Area	Oven-dried coca leaf yield (mt/ha/yr)	Oven-dried cocaine alkaloid content
Peru	*Lower Huallaga Valley (LHV) Central Huallaga Valley (CHV)*	1.2	0.71%
	Aguaytia & Pachitea	1.6	0.71%
	Upper Huallaga Valley (UHV)	1.8	0.73%
	Apurimac	2.2	0.65%
	Cusco	0.8	0.75%
	Other	1.0	0.71%
Bolivia	*Chapare*	2.3	0.72%
	Yungas	0.8	0.84%
	Other	0.8	0.84%

Table 1- 7 Total Pure Cocaine Production for Peru, 2000-2001

GROWING AREA	2000				2001			
	Net Cultivation (ha)	Net Mature Cultivation (ha)	Oven-dried Leaf production (mt)	Potential pure cocaine production (mt)	Net Cultivation (ha)	Net Mature Cultivation (ha)	Oven-dried Leaf production (mt)	Potential pure cocaine production (mt)
LHV/CHV	1,900	1,000	1,200	3.7	1,000	1,000	1,200	3.7
Aguaytia & Pachitea	2,200	1,000	1,600	5.0	1,000	1,000	1,600	5.0
UHV	12,200	10,700	19,260	61.9	13,700	10,700	19,260	61.9
Apurimac	7,500	6,700	14,740	42.2	8,500	6,500	14,300	40.9
Cusco	7,400	7,100	5,680	18.7	7,400	6,900	5,520	18.2
Other	3,000	3,000	3,000	9.4	2,400	2,400	2,400	7.5
Totals	**34,200**	**29,500**	**45,480**	**140.9 (145)**	**34,000**	**28,500**	**44,280**	**137.2 (140)**

Table 1- 8 Total Pure Cocaine Production for Bolivia, 2000-2001 (mid-year)

GROWING AREA	2000				2001			
	Net Cultivation (ha)	Net Mature Cultivation (ha)	Oven-dried Leaf production (mt)	Potential pure cocaine production (mt)	Net Cultivation (ha)	Net Mature Cultivation (ha)	Oven-dried Leaf production (mt)	Potential pure cocaine production (mt)
Chapare	5,600	5,000	11,500	37.3	4,200	2,000	4,600	14.9
Yungas	13,700	13,100	10,480	39.6	15,300	14,500	11,600	43.8
Other	300	300	240	0.9	400	300	240	0.9
Totals	**19,600**	**18,400**	**22,220**	**77.8 (80)**	**19,900**	**16,800**	**16,440**	**59.7 (60)**

Peru and Bolivia Potential Production Calculations 1996-1999

As mentioned earlier, prior to the completion of research on Colombia coca yields and processing efficiencies, calculations of potential pure cocaine production were made using conversion rates. For Peru and Bolivia, those conversion rates were determined using scientifically derived data on leaf yields, cocaine alkaloid contents, and laboratory efficiencies. Table 9 shows the leaf yield and conversion rates, which are based on air-dried leaf, for Peru and Bolivia over the period 1996-1999.

Table 1- 9 Leaf Yield and Conversion Data for Peru and Bolivia

Country	Growing Area	Air-dried coca leaf yield (mt/ha/yr)	Air-dried leaf: HCl Conversion (mt leaf/mt HCl)
*Peru**			**400:1**
Bolivia	*Chapare*	2.7	**370:1**
	Yungas - Other	1.0	**313:1**

* In Peru up until 2000, potential production estimates were calculated on total country-wide estimates of air-dried leaf production (400:1) and not by individual growing areas.

Table 1- 10 Total Pure Cocaine Production for Peru, 1998-1999

GROWING AREA	1998			1999		
	Net Cultivation (ha)	Net Mature Cultivation (ha)	Air-dried Leaf production (mt)	Net Cultivation (ha)	Net Mature Cultivation (ha)	Air-dried Leaf production (mt)
LHV/CHV				2,000	1,700	2,500
LHV	1,000	1,000	1,300			
CHV	1,100	1,100	1,800			
Aguaytia	4,800	4,800	8,200			
Pachitea	1,300	1,300	2,700			
Aguaytia Pachitea				1,900	1,500	3,000
UHV	21,000	21,000	44,100	15,200	14,800	31,100
Apurimac	9,000	9,000	24,300	8,100	7,800	21,100
Cusco	7,500	7,500	6,800	7,500	7,400	6,700
Other	5,300	5,300	6,400	4,000	4,000	4,800
Totals	**51,000**	**51,000**	**95,600**	**38,700**	**37,200**	**69,200**

Table 1- 11 Total Pure Cocaine Production for Peru, 1996-1997

GROWING AREA	1996			1997		
	Net Cultivation (ha)	Net Mature Cultivation (ha)	Air-dried Leaf production (mt)	Net Cultivation (ha)	Net Mature Cultivation (ha)	Air-dried Leaf production (mt)
LHV	5,000	5,000	6,500	2,800	2,800	3,600
CHV	5,000	5,000	8,000	2,500	2,500	4,000
Aguaytia	15,000	15,000	25,500	8,400	8,400	14,300
Pachitea	6,200	6,200	13,000	2,200	2,200	4,600
UHV	29,400	29,400	60,300	25,000	25,000	52,500
Apurimac	16,800	16,800	43,700	12,600	12,600	35,300
Cusco	9,000	9,000	8,100	8,300	8,300	7,500
Other	8,000	8,000	9,600	7,000	7,000	8,400
Totals	**94,400**	**94,400**	**174,700**	**68,800**	**68,800**	**130,200**

The potential production estimates for Peru were then calculated by dividing the sum of the leaf productions for each growing area and dividing by the 400:1 conversion factor. Table 1-12 below shows the calculated and reported figures.

Table 1- 12 Total Pure Cocaine Production for Peru, 1996-1999

Year	Air-dried Leaf production (mt)	Potential pure cocaine production (mt)
1996	174,700	437 (435)
1997	130,200	326 (325)
1998	95,600	239 (240)
1999	69,200	173 (175)

The potential production figures for each Bolivian growing area, over the 1996-1999 period are shown below.

Table 1- 13 Total Pure Cocaine Production for Bolivia, 1998-1999

GROWING AREA	1998				1999			
	Net Cultivation (ha)	Net Mature Cultivation (ha)	Air-dried Leaf production (mt)	Potential pure cocaine production (mt)	Net Cultivation (ha)	Net Mature Cultivation (ha)	Air-dried Leaf production (mt)	Potential pure cocaine production (mt)
Chapare	23,500	14,300	38,600	105	7,500	3,400	9,000	25
Yungas - Other	14,500	14,300	14,300	45	14,300	13,800	13,800	45
Totals	**38,000**	**28,600**	**52,900**	**150**	**21,800**	**17,200**	**22,800**	**70**

Table 1- 14 Total Pure Cocaine Production for Bolivia, 1996-1997

GROWING AREA	1996				1997			
	Net Cultivation (ha)	Net Mature Cultivation (ha)	Air-dried Leaf production (mt)	Potential pure cocaine production (mt)	Net Cultivation (ha)	Net Mature Cultivation (ha)	Air-dried Leaf production (mt)	Potential pure cocaine production (mt)
Chapare	33,000	22,700	61,300	165	31,500	20,800	56,200	150
Yungas - Other	15,100	13,800	13,800	45	14,300	13,900	13,900	45
Totals	**48,100**	**36,500**	**75,100**	**210 (215)**	**45,800**	**34,700**	**70,100**	**195 (200)**

Table 1- 15 Andean Cultivation and Potential Pure Cocaine Production, 1995-2001

	1995	1996	1997	1998	1999	2000	2001
Bolivia							
Net cultivation (ha)	48,600	48,100	45,800	38,000	21,800	19,600	19,900
Potential pure cocaine production (mt)	240	215	200	150	70	80**	60**
Colombia							
Net cultivation (ha)	50,900	67,200	79,500	101,800	122,500	136,200	169,800
Potential pure cocaine production (mt)	230	300	350	435	520	580	730
*Potential pure cocaine production (mt)**					537*	622*	
Peru							
Net cultivation (ha)	115,300	94,400	68,800	51,000	38,700	34,200	34,000
Potential pure cocaine production (mt)	460	435	325	240	175	145	140
Andean Total							
Net cultivation (ha)	214,800	209,700	194,100	190,800	183,000	190,000	223,700
Potential pure cocaine production (mt)	930	950	875	825	765	805	930
*Potential pure cocaine production (mt)**	930	950	875	825	782*	847*	930
Potential pure cocaine production Two-year average (mt)		940	913	850	804*	820*	879

* including the Narino adjustment for 1999 and 2000
** Bolivia 2000 and 2001 estimates are mid-year estimates.

Appendix 1-B: Wholesale Cocaine Purity Trends

The purpose of this appendix is to explain the four-year declining trend in purity of wholesale-level cocaine. We have discovered that the explanation for the decrease is complex. Fundamentally, the cumulative effect of increasing world demand on a changing but stable supply of cocaine has pressured traffickers to decrease purities to bridge the gap. Other factors have also been at play: interdiction of precursor chemicals and taxes imposed on coca growers by insurgents. In the absence of aggressive demand reduction efforts, especially in expanding markets, cocaine purities will probably continue to fall marginally overtime as eradication and interdiction prevent supply from matching demand.

Wholesale Cocaine Purity Estimates

Wholesale-level purity refers to cocaine leaving HCl labs in South America, typically in one-kilogram bricks or larger, that is transiting to various world markets, but has not yet been subdivided for sale at the local retail level. Purity is an important variable in a complex system of product supply and market demand.

Wholesale cocaine purity calculations based on chemical analysis of seized cocaine indicate a steadily declining trend for the past four years, from an average of 86% pure in 1998 to 78% pure in 2001 and to 76% pure during the first quarter of 2002. These purity figures are calculated by the DEA Cocaine Signature Program (CSP) in their STRL. Purity calculations have been available since the beginning of 1998. The quarterly reports are calculated by averaging the purity of hundreds of samples, about two thirds of them taken from cocaine bricks (1 kilogram or larger) seized in the United States and the remaining third from foreign locations, mostly South America[1].

The most recent DEA CSP report (1st quarter 2002) indicates that over one half of all cocaine bricks leaving source zone labs are now being cut with diluents. At the end of 2000, about a third of all samples were diluted, which at that time was a significant increase from previous years. In addition to the deliberate adulteration of the cocaine, DEA chemical analysis of samples revealed that illicit cocaine laboratories in Colombia are using significantly reduced amounts of the required essential solvents for processing, often skipping the use of one of the two key solvents in the final step of cocaine HCl processing. Traffickers are also increasingly beginning the cocaine HCl processing phase with unpurified cocaine base, skipping or minimizing the oxidation of the cocaine base and beginning HCl processing with a lower purity.

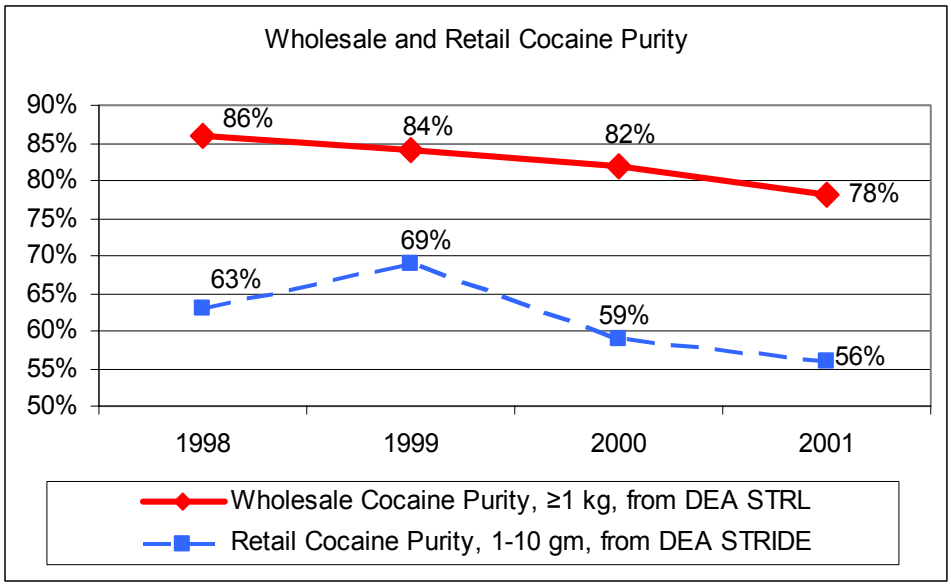
According to DEA System to Retrieve Drug Evidence (STRIDE) data, retail purity of cocaine in the United States has decreased during the same time period as wholesale purity. The declining trend in retail purity appears to be consistent with the declining trend in wholesale purity.

Possible Explanations of Decreased Cocaine Purity

We assess that the fundamental cause for decreased cocaine purity is that Andean cocaine supplies have failed to keep up with expanding international demand. As a result of competition for limited supplies, traffickers have been motivated to "stretch" their product and/or maximize profits by adding diluents at cocaine HCl labs. Two primary dynamics are assessed to be at play. First, traffickers are operating in the face of a very complex balancing act in dealing with supply-related changes in coca growth patterns, plant varieties, and cocaine processing that has been taking place throughout the Andean region since at least 1996. Secondly, at the same time, traffickers are accommodating a growing non-U.S. and net global market, which, in conjunction with the first dynamic, is resulting in an insufficient global

supply. The pressures of increasing demand on a constrained and adapting supply have ultimately resulted in lower purity.

Figure 1-3 - Purity of Wholesale Cocaine destined to the U.S. and Retail Cocaine in the U.S., 1998-2001



Supply Flat

Over the past ten years, the total amount of coca supply in the system has been relatively stable because of aggressive supply-reduction measures only partially offset by higher cocaine processing efficiencies in Colombia. Despite stable production, however, there have been dramatic changes within the supply system, dating back to at least 1995. Eradication and abandonment have resulted in significantly less coca grown in Peru and Bolivia, but similar policies have failed to slow the expansion of coca cultivation in Colombia. In Colombia, moreover, there has also been a change in the type of coca plant grown, from a single variety grown in the lowlands to two varieties, one grown in the upland areas and the other in the lowland areas with the upland variety allowing traffickers to expand cultivation over a greater geographic area and a wider variety of terrain. More importantly, changes in cocaine base processing in Colombia have also taken place -- from a largely manual effort to a more efficient, machine-assisted process using wet leaves -- which has had the effect of increasing production, but not necessarily altering purity.

Demand Increasing

Beginning in 1990 and continuing to the present, changes in the global cocaine market have taken place, both in market locations and total demand. Consumption has increased most notably in South America and Europe. In 1990, global consumption was probably around 500 metric tons, of which the United States consumed about 400 metric tons. By 2001, global consumption had increased to more than 600 metric tons, while U.S. consumption had dropped to about 260 metric tons.

Andean coca price trends seem to corroborate the conclusion that eradication and interdiction have helped prevent cocaine supplies from matching increased international demand. In Peru and

Bolivia, where eradication and interdiction have been most effective, licit and illicit coca prices have risen to record levels – more than twice the norm. In turn, the record prices are encouraging coca farmers in Peru and Bolivia to try to expand cultivation to match demand. In Colombia, the rapid expansion of cultivation – in the face of aggressive eradication and interdiction efforts – is clear evidence that prices there have remained high and that supply there also lags demand.

Other Causes

Other factors have also been at play: interdiction of precursor chemicals and taxes imposed on coca growers by insurgents. During the past several years, Colombian traffickers have faced aggressive efforts to restrict and intercept essential chemicals used in cocaine processing. Although we lack reporting on the impact of interdiction efforts on the supply of chemicals, significant amounts of chemicals have been seized. Efforts to restrict potassium permanganate have been especially aggressive. Increased difficulty in obtaining this oxidizing agent – which is highly efficient in precipitating non-cocaine alkaloids – may have contributed to traffickers' increased use of unpurified cocaine base. As a result, traffickers appear to have lowered their standards for refined cocaine and in some cases are exporting cocaine without the benefit of the total package of traditional purifying solvents.

The deliberate adulteration (cutting) of product by traffickers may also be an attempt to maintain profits in the face of rising costs in recent years. For example, the total revenue from taxes and fees paid to guerrilla forces has probably expanded continually as both the FARC and AUC aggressively move to control markets. The implementation of Plan Colombia has almost surely increased security-related operating costs. Finally, Colombia's ongoing recession has probably encouraged some traffickers to boost trafficking profits to offset losses elsewhere.

Looking Ahead

In the absence of aggressive demand reduction efforts, especially in expanding markets, cocaine purities will probably continue to fall marginally overtime as eradication and interdiction prevent supply from matching demand. Assuming growers and traffickers are concerned about the potential effects of declining purity trends on their profits, the most viable strategy for them will be to make every effort to increase the global coca supply. As long as supplies remain constrained, local prices are likely to remain near record levels for Andean coca, motivating growers and traffickers to continue to expand cultivation in Colombia and also expand cultivation in Peru and Bolivia.

On the demand side, we expect consumers to react to a continuing marginal decline in purity levels the same as they would to a more explicit price increase. Our lack of a clear understanding of market dynamics and demand elasticities, however, complicates our ability to predict overall demand changes and consequent trafficker adaptations. That said, we expect the impact of declining purity would be felt differently in the various world markets. Lower purities would have most impact on potential first-time or recreational users. In contrast, hardcore addicts would be more likely to try to boost purchases to satisfy their needs.

[1] Although CSP data is the best available at the present time, it is important to note the limitations of estimates that are based on this data. Because samples are only available when seizures are made, the sampling technique is not statistically random. Thus, the estimates derived from the average of these samples may not be a precisely accurate indicator of the purity of all wholesale cocaine. We know, for example, from DEA's System to Retrieve Drug Evidence (STRIDE) database that purity varies significantly by size of sample and location of seizure. Despite these concerns, the large number of samples (over 2,000 per year) likely provides an accurate depiction of the trends in cocaine purity over time.

Appendix 1-C: Cocaine Seizure Data

The seizure figures used in this study come from the CCDB, an interagency classified database maintained by the USIC. The only exception to the CCDB data is Internal US Federal seizures, which are calculated by subtracting CCDB from the FDSS, an interagency law enforcement database which is maintained by the DEA.

Because the structure of the CCDB is designed to describe drug movement rather than seizure trends, some specific reorganization and additional coding are necessary to present seizure data so that the amounts are consistent from one query to the next. A list of the steps performed on the CCDB and FDSS to extract and calculate the seizure data is provided below, followed by a tabular breakdown by country within the respective categories.

Procedure for extracting cocaine seizure data from the Transit Zone events in the CCDB

1. The most current copy of the annual CCDB transit zone excel file is retrieved from the WebShare CCDB Forum located on a classified network environment.

2. Sort the spreadsheet by the field "cocaine base amount seized." For any non-zero amount in "cocaine base amount seized, copy the number into the "cocaine amount seized" field. (Leave the "cocaine total amount" field blank) If there is already a number in the "cocaine amount seized" field, add both numbers together.

3. Sort the spreadsheet by the field "cocaine amount seized" and delete all events with null and zero entries in this field.

4. Copy the fields "Corridor" and "Interdiction Country" and insert them into columns A and B respectively. Rename these fields "Seizure Corridor" and "Seizure Country" respectively. Sort on Seizure Corridor; sub-sort on Seizure Country.

5. Begin at the top of the Seizure Country field. As you move down the column, identify any Seizure Country that is not physically located in the Seizure Corridor to its left (e.g. a Seizure Country of HA in the US corridor or a Seizure Country of RQ in the Carib Corridor). Change the Seizure Corridor to coincide with the Seizure Country (e.g. Seizure Country HA should be in Seizure Corridor CARIB and Seizure Country RQ should be in Seizure Corridor US). If the Seizure Corridor is other than MXCA, CARIB, US or Non-US (e.g. UNK or blank), place it in the correct corridor. If the Seizure Country is in the source zone (South America), enter "SZ" in the Seizure Corridor field.

6. Any Seizure Country codes beginning with MX (e.g. MXSO) should be replaced with MX only.

7. Identify any Seizure Country fields that are blank. These should be filled in with "high seas" to identify seizure that did not occur in the sovereign territory of any nation.

8. For the Non-US corridor, for each seizure country, determine whether it is in the Non-US Arrival Zone (all except LATAM, MX, Carib and high seas) or Transit Zone to Non-US (LATAM, MX, Carib and high seas). If it is Non-US Arrival Zone, change the Seizure Corridor to "Non-US AZ." If it is Transit Zone to Non-US, change the Seizure Corridor to "Non-US TZ."

9. For the US Corridor, review the Seizure Country and place each event into one of four new Seizure Corridor categories: US_SWB, US_EC, US_RQVQ or US. US_SWB includes the states of CA, AZ, NM, and TX; US_EC includes all states that have an Atlantic coast; US_RQVQ includes RQ and VQ; and US includes all else.

10. At this point, there are two options for calculating the totals.
    a. Pivot Table: Construct a pivot table using Seizure Corridor and Seizure Country as the two vertical fields. Put "Cocaine Amount Seized" in the data label area and select "sum". You can click on any total in the pivot table to view a worksheet with the events displayed.
    b. Subtotals: Sort the main data worksheet on Seizure Corridor and then on Seizure Country. Select subtotals from the data menu and choose Seizure Corridor, sum and the Cocaine Amount Seized fields. Next, select subtotal again. Choose Seizure Country, sum and Cocaine Amount Seized fields and deselect replace subtotals. You will have to scroll to the Cocaine Amount Seized field to view the subtotals.

Table 1- 16 Seizures in Transit Zone to the United States: Seizure Totals (in kilograms) by Corridor and Country, CY2001

	Aruba	10.796
	Anguilla	846
	Barbados	10
	Bermuda	60
	Bahamas	2116.569
	Cuba	0.9
	Curacao	4.18
	Dominica	0.5
	Dominican Republic	1132.266
	Dutch Saint Martin	134.74
	French Saint Martin	6
	Grenada	33
	Haiti	327
	High Seas	11014.95
	Jamaica	2445.017
	Netherlands Antilles	11
	St. Kitts and Nevis	19.34
	St. Lucia	23
	Trinidad and Tobago	714.8
	St. Vincent and Grenadines	273.5
	British Virgin Islands	1276
Caribbean Total		20459.56
Mexico*		11222.15
MX/CA High Seas		61855.9
	Belize	4997.714
	Costa Rica	1406.363
	El Salvador	5
	Guatemala	3814.5
	Honduras	170
	Nicaragua	3392
	Panama	3269.62
Central America Total		17055.2
Transit Zone Total**		110592.8

* This total is 1 MT larger than an earlier published figure because a 1.2 MT seizure was discovered in the CCDB that had not previously been assigned an "interdiction country" value and thus was not counted. The seizure occurred in Mexico.

** This total is higher than an earlier published figure for the same reason noted above regarding the Mexico figure. Also, when the subtotals are rounded for the table and then summed, they add up to 110 MT, which is different than if you rounded the total using after adding figures to three decimal places.

Table 1- 17 Seizures in Transit Zone to Non-US Destinations: Seizure Totals (kilograms) by Country, CY2001

	Aruba	3.5
	Barbados	20.3
	Bermuda	585
	Costa Rica	30.42
	Cuba	3.047
	Curacao	23
	Cape Verde	7.1
	Dominican Republic	9
	Grenada	24.85
	Guatemala	8
	Haiti	8
	High Seas	16522.6
	Jamaica	318.61
	Martinique	9.17
	Nicaragua	1069
	Panama	118.2
	St. Lucia	31.15
	Trinidad and Tobago	38.7
	St. Vincent and Grenadines	1.5
Transit Zone to Non-US Total***		18831.15

*** A more accurate division of countries between the Non-US Arrival Zone and the Transit Zone to Non-US resulted in 1 MT of seizures that were previously counted in the Non-US Arrival Zone being moved to the Transit Zone to Non-US.

Table 1- 18 U.S. Arrival Zone Seizure Totals (kilograms) by Region and State, CY2001

	IL	20.836
	IN	1.996
	KY	4
	LA	7
	OH	27.627
	OR	31.7
	TN	207.299
	WA	35.19
Other US Total		335.648
	US	35
	DC	14.858
	DE	2.7
	FL	6859.28
	GA	520.565
	MA	1.705
	MD	172.475
	NC	16.271
	NJ	360.114
	NY	721.728
	PA	26.09
	SC	49.5
US East Coast Total		8780.286
	Puerto Rico	4842.874
	USVI	779.37
Puerto Rico/USVI Total		5622.244
	AZ	2772.67
	CA	4370.831
	NM	157.558
	TX	12356.79
US Southwest Border Total		19657.85
US Arrival Zone Total		34396.02

Table 1- 19 Non-U.S. Arrival Zone Seizure Totals (kilograms) by Country, CY 2001

	Angola	9
	Austrailia	1296.9
	Austria	51.5
	Belgium	1670
	Benin	30
	Belarus	3
	Bulgaria	12.61
	Canada	909.2
	China	2
	Denmark	4.952
	Ireland	4
	Czech Republic	2.8
	Fiji	2.1
	France	1526.765
	Germany	723.723
	Greece	246.4
	Hong Kong	26.3
	Hungary	2
	Indonesia	15
	Israel	9
	Italy	248.365
	Japan	17.3
	Macedonia	3.815
	Morocco	8
	Malta	2.2
	Montenegro	1
	Nigeria	81.353
	Netherlands	1270.737
	Norway	4
	Poland	4
	Portugal	3502.22
	Philippines	2
	Russia	1.15
	South Africa	319.2
	Spain	20774.82
	Serbia	1.136
	Sweden	34.6
	Switzerland	3.6
	United Arab Emirates	3
	Thailand	1.5
	Tonga	100
	United Kingdom	1895.827
NON-US Arrival Zone Total***		34827.07

Procedure for extracting cocaine seizure data from the Source Zone CCDB

1. The most current copy of the annual CCDB source zone excel file is retrieved from the WebShare CCDB Forum.

2. Sort the spreadsheet by the fields "cocaine paste amount seized" and "cocaine amount seized" and delete all events with null and zero entries in both of these fields. Then sort on date and delete all events not made in the year in question.

3. Copy the field "Interdiction Country" and insert in into column A. Rename this field "Seizure Country". Sort on Seizure Country.

4. At this point, there are two options for calculating the totals.
    a. Pivot Table: Construct a pivot table using Seizure Country as the vertical field. Put "Cocaine Paste Amount Seized" and "Cocaine Amount Seized" in the data label area and select "sum" for both. You can click on any total in the pivot table to view a worksheet with the events displayed. On the right of the pivot table, you can enter formulas so that the spreadsheet will add the base and HCl amounts. You can also enter a column for amounts from the TZ spreadsheet and sum them in the spreadsheet.
    b. Subtotals: Sort the main data worksheet on Seizure Country. Select subtotals from the data menu and choose Seizure Country, sum and the Cocaine Paste Amount Seized and Cocaine Amount Seized fields. You will have to scroll to the Cocaine Paste Amount Seized and Cocaine field to view the subtotals. Totals from the TZ spreadsheet will have to be added in manually.

Table 1- 20 Source Zone Seizure Totals (kilograms) by Country, CY2001

Seizure Country	Cocaine Base	Cocaine HCl	Total
Argentina	3	372.427	375.427
Bolivia	520.718	431.13	951.848
Brazil	7.9	2640.86	2648.76
Chile	391.047	798.74	1189.787
Colombia	7035.351	29177.79	36213.14
(from SZ Data)	7035.351	25191.79	
(from TZ Data)		3986	
Ecuador	1061.871	10124.998	11186.87
Guyana		37.486	37.486
Suriname		1484.39	1484.39
Paraguay		342.642	342.642
Peru	4227.893	3059.514	7287.407
Uruguay		4.5	4.5
Venezuela		13787.3	13787.3
Unknown		305	305
Total	13247.78	62566.777	75814.56

Procedure for calculating internal US Federal cocaine seizure data from the FDSS and CCDB

1. The formula for calculating Internal US Federal seizures is: FDSS total* minus FDSS at-sea total minus CCDB Arrival Zone total equals Internal US Federal Total.

*Note: The FDSS is a living database that is updated as seizures occur. Thus, data extracted from the FDSS for CY 2001 may yield different results depending on the date of retrieval. For this report, data was retrieved on 12 Feb 2002.

   a. The FDSS total is calculated by summing the amount column for all events for the given year.
   b. The FDSS at-sea total is calculated by adding all amounts with a numeric state code (assigned to USCG Districts).
   c. The CCDB Arrival Zone total comes from the TZ database and is derived as stated above.
   d. A state-by-state comparison will be done during the calculation. If the CCDB amount for any state or territory (e.g. RQ) exceeds the amount in the FDSS for that same state or territory, the category result will be a negative number. In any of these cases, the negative numbers will be added back to the final number to avoid understating the internal seizures. (e.g., In 2001, the FDSS total for VQ was 0 kgs and the CCDB total was 779 kgs, resulting in 779 kgs added back to the total).

Table 1- 21 Internal Federal Seizure Totals (metric tons), CY2001

109 MT in FDSS (a/o 12 Feb 2002)
-60 MT at sea seizures
49 MT not at sea seizures
-34 MT Arrival Zone Seizures (CCDB)
+1 MT VQ seizures not counted in FDSS (see 1d above)
16 MT Internal Federal seizures

*FDSS total for this calculation counts only the events for which a Federal Drug Identification Number (FDIN) number was assigned (over 500 grams). Non-FDIN assigned seizures in the FDSS are numerous, but amount to only a small quantity of cocaine. For example, in CY 2001, there were about twice as many Non-FDIN entries than FDIN entries but their total weight was only about 2-3 percent the weight of FDIN entries.

Table 1- 22 FDSS Cocaine Seizure Totals (kilograms) by State or Coast Guard District, CY2001

State/District	Kilograms						
District 7	7585	FL	7747	MO	1077	PR	5113
District 11	50135	GA	787	MS	74	RI	3
District 13	2408	HI	28	NB	423	SC	85
AK	22	ID	1	NC	136	TN	443
AL	353	IL	914	NH	0	TX	14890
AR	7	IN	51	NJ	1055	UT	17
AZ	3327	KS	299	NM	369	VA	61
CA	6011	KY	52	NV	8	VT	2
CO	58	LA	541	NY	3035	WA	162
CT	10	MA	92	OH	293	WI	63
DC	12	MD	377	OK	29	WV	1
DE	14	MI	223	OR	46	WY	8
		MN	21	PA	117		
Grand Total	**108585**						

Table 1- 23 Worldwide* Cocaine Seizure Totals (kilograms), CY2001

Source Zone Total		**75815**
Caribbean	20460	
Mexico	11222	
MX/CA High Seas	61856	
Central America	17055	
Transit Zone Total		**110593**
Transit Zone to Non-US Total		**18831**
US Arrival Zone Total		**34396**
Internal US Federal		**16000**
Non-US Arrival Zone Total		**34827**
Worldwide Total		**290462**

* No estimates are available for US state and local seizures, which probably constitute a relatively small but not insignificant amount.

Appendix 1-D: Foreign Cocaine Consumption

Cocaine Consumption Estimate for non-US Countries (1998 and 2000)

The following regional-level cocaine consumption figures for 1998 and 2000, are based on country-by-country calculations. US consumption is taken from estimates done by Abt Associates under contract with ONDCP. Non-US figures are based on estimated country-by-country prevalence and daily-use rates. The prevalence estimates are based in part on country survey reports over the period 1996-2000. Extensive national surveys have only been undertaken in approximately 30 countries, mostly in Latin America. Where official estimates are not available, prevalence rates are estimated using anecdotal information correlating prevalence data from a similar country. Average use data for Latin America and other developing markets (including Asia and Africa) is based on detailed national surveys in Peru, Bolivia, and Mexico. Average use data for Europe was determined mostly from detailed reporting provided in the Spanish national surveys. Point estimates and ranges outside the United States (plus or minus twenty percent to indicate relative uncertainties) are provided. For this study, the amount of cocaine that could be processed from coca leaf consumed in Latin America (37 metric tons in both 1998 and 2000) is included.

Table 1- 24 Regional Cocaine Consumption, in metric tons (includes leaf)

Region	**1998**	**2000**
Latin America	159 (127-191)	183 (146-220)
US	267	259
Canada	16 (13-19)	17 (14-20)
Western Europe	97 (78-116)	116 (93-139)
Eastern Europe	10 (8-12)	13 (10-16_
Mideast, Africa, Asia	29 (23-35)	36 (29-43)
WORLD total	*578 (516-640)*	*624 (551-697)*

Methodology

To determine total cocaine consumption (including equivalent coca use), each country's cocaine consumption during any given year equals the sum of its consumption of cocaine HCl, cocaine base/crack, and leaf (in HCl equivalents). For each country (a), cocaine consumption (C_a) is the sum of HCl, base/crack, and leaf (in HCl equivalents). This can be written as:

$$C_a = T_{Ca} + T_{Ba} + T_{La} \qquad (1)$$

Where:
- T_{Ca} = total HCl consumption
- T_{Ba} = total base/crack consumption
- T_{La} = total leaf consumption (measured in metric tons of cocaine equivalence)

For our purposes, cocaine HCl consumption is assumed to be the sum of the consumption from three types of users: hardcore, moderate, and recreational. Cocaine base/crack consumption is the sum of consumption from those three user types also. (Note: National cocaine base prevalence estimates have

been published for most of the larger Latin American countries-notably for Peru, Bolivia, Colombia, Chile, and Argentina. Crack use has not been well documented, but national data are published for a number of European countries-notably the UK and Spain. As a result, most crack estimates have been assumed based mostly on anecdotal reporting.) Leaf consumption is based on country studies carried out in each particular country.

- Hardcore cocaine consumption is based on a fraction of past month cocaine users, multiplied by the adult population, multiplied by a hardcore user's annual consumption figure.

- Moderate cocaine consumption is based on the remaining fraction of past month cocaine users (those who are not hardcore), multiplied by population, multiplied by a moderate user's annual consumption figure.

- Recreational cocaine consumption is based on the difference between the number of past year users and the number of past month cocaine users, multiplied by population, multiplied by a recreational user's annual consumption figure.

The total HCl consumption in country a (T_{Ca}) is the sum of that consumed by heavy, moderate, and recreational users in that country, such that:

$$T_{Ca} = t_{CHa} + t_{CMa} + t_{CRa} \qquad (2)$$

Where:
t_{CHa} = HCl consumption by hardcore users in country a
t_{CMa} = HCl consumption by moderate users in country a
t_{CRa} = HCl consumption by recreational users in country a

Similarly for base/crack users, the total base/crack consumption (T_{Ba}) is

$$T_{Ba} = t_{BHa} + t_{BMa} + t_{BRa} \qquad (3)$$

Where:
t_{BHa} = base/crack use by hardcore users in that country
t_{BMa} = base/crack use by moderate users in that country
t_{BRa} = base/crack use by recreational users in that country

Leaf users are not subdivided by user type in this work.

The amount of cocaine HCl consumption by a hardcore user in each country (t_{CHa}) is calculated by multiplying: 1) the adult population of that country, 2) the prevalence of cocaine use among the adult population in the past month, 3) the fraction of past month users which are hardcore users, and 4) the annual HCl dosage of a hardcore user,

$$t_{CHa} = P_a \times u_{CMa} \times f_{Ca} \times c_{CHa} \qquad (4)$$

Where:
P_a = adult population (15 to 64) of country a
u_{CMa} = prevalence of cocaine HCl use in the past month
f_{Ca} = fraction of past month cocaine users which are hardcore users
c_{CHa} = the annual HCl dosage of a hardcore user

It is assumed that the number of past month users consists of hardcore and moderate users, and so the fraction of moderate users s calculated as $(1 - f_{Ca})$. The equation for the consumption by moderate users can therefore be written as:

$$t_{CMa} = P^a \times u_{CMa} \times (1 - f_{Ca}) \times c_{CMa} \quad (5)$$

Where:
- P_a = adult population (15 to 64) in country a
- u_{CMa} = prevalence of cocaine users in the past month
- f_{Ca} = fraction of past month cocaine users which are hardcore users
- c_{CMa} = the annual HCl dosage of a moderate user

The number of recreational users is assumed to be the difference between the past year prevalence and the past month prevalence. The equation for the consumption by recreational users can therefore be written as:

$$t_{CRa} = P_a \times (u_{CYa} - u_{CMa}) \times c_{CRa} \quad (6)$$

Where:
- P_a = adult population (15 to 64) in country a
- u_{CYa} = prevalence of cocaine users in the past year
- u_{CMa} = prevalence of cocaine users in the past month
- c_{CRa} = the annual HCl dosage of a recreational user

Similar equations can be written for base/crack consumption, such that:

$$t_{BHa} = P_a \times u_{BMa} \times f_{Ba} \times c_{BHa} \quad (7)$$
$$t_{BMa} = P_a \times u_{BMa} \times (1 - f_{Ba}) \times c_{BMa} \quad (8)$$
$$t_{BRa} = P_a \times (u_{BYa} - u_{BMa}) \times c_{BRa} \quad (9)$$

Where:
- P_a = adult population (15 to 64) in country a
- u_{BMa} = prevalence of base/crack users in the past month
- u_{BYa} = prevalence of cocaine users in the past year
- f_{Ba} = fraction of past month base/crack users which are hardcore users
- c_{BHa} = the annual base/crack dosage of a hardcore user
- c_{BMa} = the annual base/crack dosage of a moderate user
- c_{BRa} = annual base/crack dosage of a recreational user

User consumption figures

Estimates for cocaine HCl

Based on cocaine use patterns in Peru, Bolivia, and Mexico, we estimate that HCl consumption estimates for each user in Latin America were estimated at 0.5 grams a day for the hardcore users, 0.5 grams a week for the moderate users, and 1 gram a quarter for the recreational user. This same estimate was also applied to users in Eastern Europe, the Mideast, Africa, and Asia.

Consumption of HCl in the US and Canada is estimated to be 0.750 grams a day for the hardcore user, 0.750 grams a week for moderate users, and 1.5 grams a quarter for recreations users.

Based on Spanish use-rates and other anecdotal information, HCl consumption estimates for each user in Western Europe are estimated to be the average of the US/Canada figure and the Latin American figure. That is 0.625 grams per day for hardcore users, 0.625 grams a week for moderate users, and 1.25 gram a quarter for recreational users.

Estimates for cocaine base/crack

Based on national surveys in Peru, Bolivia, and Mexico, we estimate that base/crack users in Latin America, Eastern Europe, the Mideast, Africa, and Asia consume 0.750 grams a day for the hardcore user, 0.750 grams a week for moderate users, and 1.5 grams a quarter for recreations users.

Cocaine base/crack consumption in the US and Canada is estimated to be 1.0 grams a day for the hardcore user, 1.0 grams a week for moderate users, and 2.25 grams a quarter for recreational users.

The annual base/crack consumption estimates for each user in the Western Europe are estimated to be the average of the Latin and US use levels.

- Comparison of US and Latin American cocaine use estimates indicate that US/Canadian HCl and cocaine base/crack users consume substantially more than do their Latin American counterparts. In this analysis, it is assumed that on average some 50 percent more cocaine than do their counterparts in Latin America and about 20 percent more than their counterparts in Europe. Two of the reasons these empirical observations could be true are because of generally higher disposable incomes and the fact that the average US cocaine consumer has have been using cocaine longer than the average user elsewhere, and consequently may have developed a somewhat higher tolerance for its use. The West European market generally uses more cocaine than Latin America or the rest of the world in part because of the greater disposable income. We assess that cocaine daily cocaine use in West Europe is lower than in the US in large part because the average period of cocaine use per addict is lower in Europe mostly because Europe is a much newer market.

These figures are summarized as annualized estimates in Table 1-25 below.

Table 1- 25 Annual consumption figures for various users types, in grams per year

Drug	**Region**	**Type of User**		
		Hardcore	**Moderate**	**Recreational**
Cocaine HCl	**U.S. & Canada**	274	39	6
	Western Europe	228	32.5	5
	Rest of world	182.5	26	4
Base/crack	U.S. & Canada	365	52	9
	Western Europe	319	45.5	7.5
	Rest of world	274	39	6

Fraction of past month users which are hardcore users

National survey data from Peru and Mexico indicated that approximately 20 percent of all past month cocaine HCl consumers consumed the drug three or more times a week—or more than 10 times per month. We categorized these consumers hardcore, and note from the same data that these Latin American cocaine HCl users consume on average a little more than one pure gram of cocaine each day at least four days a week—or at least 0.5 grams of HCl each day on average.

- The same monthly data indicate that non-hardcore past month cocaine HCl consumers used on average about two grams a month, or about 0.5 grams each week Almost 20 percent of those that had consumed cocaine HCl in the past month did so only one time.

National survey data from Peru and Mexico indicated that about 30 percent of all past month cocaine base users consumed cocaine base three or more times a week—or more than 10 times a month. From the same national surveys, we note that cocaine base users on average consumed almost 1.5 grams of pure cocaine base/crack each day for about 4 days a week—or about 0.75 gram of cocaine base each week.

- The same monthly data indicate that non-hardcore past month cocaine base/crack consumers used on average about three grams a month, or about 0.75 grams each week Only around 10 percent of those that had consumed cocaine base/crack in the past month did so only one time.

Abt associates has tracked what they call chronic cocaine consumers since 1988. They define chronic use as more than 10 times a month—the same definition that is referred to here (and elsewhere) as hardcore use. Abt data indicates that overall chronic cocaine use (for both cocaine HCL and crack) has increased from less than forty percent of total use to almost fifty percent of total in 2000. As a conservative estimate, we assume that 30 percent of all past-month US and Canadian cocaine HCl consumers are chronic are hardcore users and that 40 percent of all past-month crack cocaine users are hardcore.

Again, we assume that the relative shares of hardcore and moderate users in Western Europe can be estimated by averaging those in US and the rest of the world. These fractions are shown in table 1-26:

Table 1- 26 Fraction of past month cocaine users which are hardcore users

Drug	**Region**	**Fraction of past month HCl users (f)**
Cocaine HCl	U.S. & Canada	30%
	Western Europe	25%
	Rest of world	20%
Base/crack	U.S. & Canada	40%
	Western Europe	35%
	Rest of world	30%

Comparisons with overall use rates

This model disaggregates cocaine users into three distinct groups, hardcore, moderate, and recreational. Summing the three groups, indicates that "on average" every cocaine user in Latin America during the year 2000 used almost exactly 100 milligrams of cocaine HCl or base each day. In the US, the model indicates that "on average" all cocaine consumers used almost 180 milligrams per day, while in West Europe it indicates that "on average" each consumer used about 120 milligrams a day.

Table 1- 27 Largest cocaine consuming countries, 2000, including coca leaf in cocaine equivalence

	Adult Population (Millions, ages 15 to 64)	Total HCl Consumption, metric tons	Total Base/crack Consumption, metric tons	Total Cocaine Consumption, metric tons	Coca leaf, HCl equivalence	Consumption Cocaine and HCl equivalence
United States	182.17	180.42	78.66	259.08		259.08
Brazil	113.39	27.65	19.64	47.30		47.30
United Kingdom	38.85	19.62	6.13	25.75		25.75
Peru	16.35	3.49	6.62	10.11	15.00	25.11
Bolivia	4.60	1.96	3.22	5.17	17.00	22.17
Colombia	25.06	6.14	14.17	20.32	1.00	21.32
Germany	56.33	15.81	4.61	20.42		20.42
Spain	27.32	15.68	4.06	19.74		19.74
Canada	21.31	12.30	4.16	16.46		16.46
Italy	39.01	12.64	3.19	15.83		15.83
Argentina	23.24	6.07	4.17	10.24	4.00	14.24
Mexico	62.09	8.28	5.38	13.66		13.66
France	38.67	8.35	2.88	11.23		11.23
Venezuela	14.76	2.71	5.12	7.83		7.83
Chile	9.88	3.58	3.79	7.37		7.37
Australia	12.78	3.83	2.58	6.42		6.42
Russia	101.12	3.20	2.86	6.06		6.06
South Africa	27.25	3.45	2.36	5.81		5.81
Nigeria	65.83	4.39	1.01	5.40		5.40
Ecuador	7.68	1.65	3.55	5.19		5.19
Netherlands	10.80	2.67	2.05	4.72		4.72
Guatemala	6.83	1.73	2.37	4.09		4.09
Dominican Republic	5.13	2.01	2.07	4.08		4.08
Portugal	6.79	2.05	1.01	3.06		3.06

Note: Table 1-27 lists the largest consuming countries, however eight of those countries, including Brazil, have estimated use amounts based on various fragments of information. The other 16 countries have country surveys which document the cocaine use.

Example calculation

To calculate the cocaine consumption of the United Kingdom, begin by gathering the relevant data from table 1-24 and table 1-25, as follows**:**

P (population from appendix)	= 38.85 M
U_{CY} (past year use of HCl, from appendix)	= 1.7%
u_{BY} (past year use of base/crack, from appendix)	= 0.32%
u_{CM} (past month use of HCl, from appendix)	= 0.55%
u_{BM} (past month use of base/crack, from appendix)	= 0.1%
c_{CH} (annual HCl dosage of a hardcore user in W Eur, table 1)	= 228 gm/yr
c_{CM} (annual HCl dosage of a moderate user in W Eur, table 1)	= 32.5 gm/yr
c_{CR} (annual HCl dosage of a recreational user in W Eur, table 1)	= 5 gm/yr
c_{BH} (annual base/crack dosage of a hardcore user in W Eur, table 1)	= 319 gm/yr
c_{BM} (annual base/crack dosage of a moderate user in W Eur, table 1)	= 45.5 gm/yr
c_{BR} (annual base/crack dosage of a recreational user in W Eur, table 1)	= 7.5 gm/yr
f_C (fraction of past month HCl users which are hardcore users, table 2)	= 25%
f_B (fraction of past month base/crack users which are hardcore, table 2)	= 35%

Equations 4-9 can be used to calculate the amount of HCl and base/crack consumed by each of the user types, as follows:

$$t_{CH} = P \times u_{CM} \times f_C \times c_{CH} \quad (4)$$
$$= 38.85M \times 0.55\% \times 25\% \times 228gm/yr$$
$$= 12.2 \text{ mt}$$

$$t_{CM} = P \times u_{CM} \times (1 - f_C) \times c_{CM} \quad (5)$$
$$= 38.85M \times 0.55\% \times (1-25\%) \times 32.5gm/yr$$
$$= 5.2 \text{ mt}$$

$$t_{CR} = P \times (u_{CY} - u_{CM}) \times c_{CR} \quad (6)$$
$$= 38.85M \times (1.70\% - 0.55\%) \times 5 \text{ gm/yr}$$
$$= 2.2 \text{ mt}$$

$$t_{BH} = P \times u_{BM} \times f_B \times c_{BH} \quad (7)$$
$$= 38.85M \times 0.10\% \times 35\% \times 319gm/yr$$
$$= 4.3 \text{ mt}$$

$$t_{BM} = P \times u_{BM} \times (1 - f_B) \times c_{BM} \quad (8)$$
$$= 38.85M \times 0.10\% \times (1-35\%) \times 45.5gm/yr$$
$$= 1.15 \text{ mt}$$

$$t_{BR} = P \times (u_{BY} - u_{BM}) \times c_{BR} \quad (9)$$
$$= 38.85M \times (0.32\% - 0.10\%) \times 7.5 \text{ gm/yr}$$
$$= 0.65 \text{ mt}$$

Equations 2 and 3 can be used to calculate the amount of HCl and base/crack consumed, respectively:

$$T_C = t_{CH} + t_{CM} + t_{CR} \quad (2)$$
$$= 12.2 + 5.2 + 2.2$$
$$= 19.6 \text{ mt}$$

$$T_B = t_{BH} + t_{BM} + t_{BR} \quad (3)$$
$$= 4.3 + 1.15 + 0.65$$
$$= 6.1 \text{ mt}$$

Equation 1 can be used to calculate the total cocaine consumed in the United Kingdom, as:

$$C = T_C + T_B + T_L \quad (1)$$
$$= 19.6 + 6.1 + 0 \text{ (no leaf consumption)}$$
$$= 25.7 \text{ mt}$$

Country Estimates

For each country, the appendix provides official population estimates from the US Census International Department. Estimates of the prevalence of past year users of HCl (U_{CY}), the prevalence of past year users of base/crack (U_{BY}), the prevalence of past month users of HCl (U_{CM}), and the prevalence of past month users of base/crack (U_{BM}) were described in the body of this appendix. Note, while prevalence estimates for most of the larger cocaine base/crack-using and cocaine HCl-using countries are based on official estimates, the majority of the smaller countries have not done surveys and in many cases do not have national estimates or estimates made by the UNDCP.

Where:

- P = population of adults (age 15-64) in millions in 2000
- u_{CY} = prevalence of HCl users in the past year
- u_{BY} = prevalence of base/crack users in the past year
- u_{CM} = prevalence of HCl users in the past month
- u_{BM} = prevalence of base/crack users in the past month

Table 1- 28 Country Population and Prevalence Estimates for 2000

Country	Population	U_{CY}	U_{BY}	U_{CM}	U_{BM}
Afghanistan	14.20	0.010%	0.002%	0.003%	0.001%
Albania	2.20	0.100%	0.020%	0.050%	0.010%
Algeria	18.96	0.040%	0.010%	0.010%	0.005%
Andorra	0.05	0.200%	0.050%	0.050%	0.015%
Angola	5.49	0.040%	0.010%	0.010%	0.005%
Anguilla	0.01	0.200%	0.200%	0.100%	0.100%
Antigua and Barbuda	0.04	0.200%	0.200%	0.100%	0.100%
Argentina	23.24	1.200%	0.400%	0.400%	0.150%
Armenia	2.22	0.030%	0.010%	0.015%	0.005%
Auba	0.05	0.200%	0.200%	0.100%	0.100%

Australia	12.78	1.500%	0.350%	0.450%	0.175%
Austria	5.52	0.600%	0.100%	0.300%	0.050%
Azerbaijan	4.92	0.030%	0.010%	0.015%	0.005%
Bahrain	0.43	0.040%	0.010%	0.010%	0.005%
Bangladesh	77.92	0.010%	0.002%	0.003%	0.001%
Barbados	0.19	0.100%	0.100%	0.050%	0.050%
Belarus	7.03	0.125%	0.040%	0.050%	0.025%
Belgium	6.72	0.600%	0.100%	0.300%	0.050%
Belize	0.13	0.400%	0.300%	0.200%	0.150%
Benin	3.11	0.100%	0.020%	0.050%	0.005%
Bhutan	1.12	0.010%	0.002%	0.003%	0.001%
Bolivia	4.60	1.300%	1.300%	0.700%	0.600%
Bosnia and Herzegovina	2.73	0.100%	0.020%	0.050%	0.010%
Botswana	0.87	0.100%	0.010%	0.030%	0.005%
Brazil	113.39	1.100%	0.300%	0.375%	0.150%
British Virgin Islands	0.01	0.100%	0.100%	0.050%	0.050%
Brunei	0.22	0.010%	0.002%	0.003%	0.001%
Bukina Faso	5.91	0.040%	0.010%	0.010%	0.005%
Bulgaria	5.30	0.100%	0.020%	0.050%	0.010%
Burundi	3.13	0.040%	0.010%	0.010%	0.005%
Cambodia	6.68	0.010%	0.002%	0.003%	0.001%
Cameroon	8.34	0.100%	0.020%	0.050%	0.005%
Canada	21.31	1.000%	0.300%	0.500%	0.100%
Cape Verde	0.20	0.040%	0.010%	0.010%	0.005%
Cayman Islands	0.02	0.100%	0.100%	0.050%	0.050%
Centrla African Republic	1.86	0.040%	0.010%	0.010%	0.005%
Chad	4.17	0.010%	0.005%	0.005%	0.001%
Chile	9.88	1.460%	0.700%	0.570%	0.330%
China	853.19	0.010%	0.002%	0.003%	0.001%
China (Hong Kong SAR)	5.08	0.150%	0.060%	0.060%	0.030%
Colombia	25.06	0.800%	0.800%	0.400%	0.500%
Comoros	0.31	0.040%	0.010%	0.010%	0.005%
Congo, Democratic Rep.	25.54	0.010%	0.005%	0.005%	0.001%
Congo, the Republic	1.53	0.010%	0.005%	0.005%	0.001%
Cook Islands	0.01	0.010%	0.002%	0.003%	0.001%
Costa Rica	2.33	0.400%	0.250%	0.200%	0.125%
Cote d'Ivoire	8.21	0.100%	0.010%	0.030%	0.005%
Croatia	2.87	0.130%	0.030%	0.065%	0.015%
Cuba	7.68	0.100%	0.100%	0.050%	0.050%
Cyprus	0.50	0.100%	0.020%	0.050%	0.010%
Czech Republic	7.16	0.050%	0.010%	0.025%	0.005%
Denmark	3.56	1.000%	0.100%	0.500%	0.050%
Djibouti	0.25	0.040%	0.010%	0.010%	0.005%
Dominica	0.05	0.100%	0.100%	0.050%	0.050%
Dominican Republic	5.13	1.800%	0.700%	0.600%	0.350%
Ecuador	7.68	0.700%	0.800%	0.350%	0.400%
Egypt	41.83	0.040%	0.010%	0.010%	0.005%
El Salvador	3.49	0.500%	0.300%	0.200%	0.150%

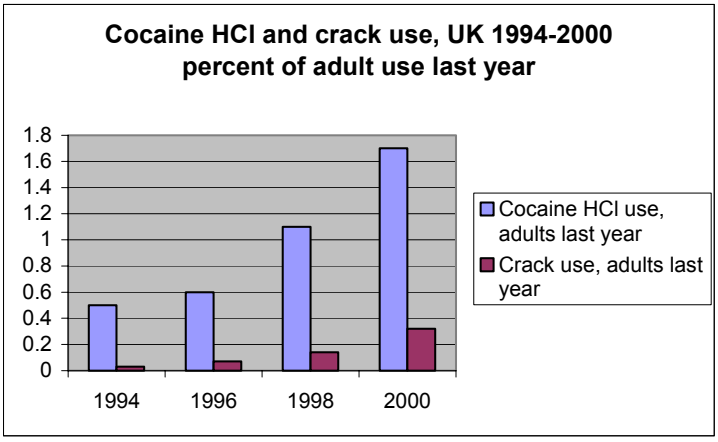
Equatorial Guinea	0.25	0.040%	0.010%	0.010%	0.005%
Eritea	2.23	0.040%	0.010%	0.010%	0.005%
Estonia	0.97	0.035%	0.015%	0.018%	0.010%
Ethiopoia	32.18	0.040%	0.010%	0.010%	0.005%
Fiji	0.53	0.010%	0.002%	0.003%	0.001%
Finland	3.46	0.300%	0.020%	0.150%	0.010%
France	38.67	0.500%	0.100%	0.250%	0.050%
French Guiana	0.11	0.300%	0.300%	0.150%	0.150%
Gabon	0.74	0.100%	0.010%	0.030%	0.005%
Gambia	0.71	0.040%	0.010%	0.010%	0.005%
Gaza Strip	0.54	0.030%	0.010%	0.015%	0.005%
Georgia	3.39	0.125%	0.040%	0.050%	0.025%
Germany	56.33	0.650%	0.110%	0.325%	0.055%
Ghana	10.68	1.100%	0.040%	0.060%	0.010%
Greece	7.16	0.600%	0.100%	0.250%	0.050%
Greenland	0.04	0.200%	0.020%	0.100%	0.010%
Grenada	0.05	0.200%	0.200%	0.100%	0.100%
Guadeloupe	0.28	0.400%	0.300%	0.200%	0.150%
Guatemala	6.83	1.000%	0.600%	0.400%	0.300%
Guinea	4.03	0.040%	0.010%	0.010%	0.005%
Guinea-Bissau	0.71	0.040%	0.010%	0.010%	0.005%
Guyana	0.46	0.300%	0.300%	0.150%	0.150%
Haiti	3.76	0.150%	0.150%	0.050%	0.075%
Honduras	3.37	1.000%	1.000%	0.400%	0.400%
Hungary	6.94	0.100%	0.020%	0.050%	0.010%
Iceland	0.18	0.200%	0.020%	0.100%	0.010%
India	626.52	0.010%	0.002%	0.003%	0.001%
Indonesia	146.01	0.010%	0.002%	0.003%	0.001%
Iran	40.03	0.030%	0.010%	0.015%	0.005%
Iraq	12.40	0.030%	0.010%	0.015%	0.005%
Ireland	2.54	2.000%	0.200%	1.000%	0.100%
Israel	3.65	0.700%	0.350%	0.350%	0.225%
Italy	39.01	0.750%	0.110%	0.375%	0.055%
Jamaica	1.67	0.500%	0.500%	0.250%	0.250%
Japan	86.34	0.050%	0.025%	0.020%	0.010%
Jordan	2.94	0.030%	0.010%	0.015%	0.005%
Kazakstan	10.96	0.030%	0.010%	0.015%	0.005%
Kenya	16.52	0.100%	0.010%	0.030%	0.005%
Kiribati	0.05	0.010%	0.002%	0.003%	0.001%
Korea, North	14.73	0.010%	0.002%	0.003%	0.001%
Korea, South	33.82	0.010%	0.002%	0.003%	0.001%
Kuwait	1.35	0.030%	0.010%	0.015%	0.005%
Kyrgyzstan	2.73	0.030%	0.010%	0.015%	0.005%
Laos	2.95	0.010%	0.002%	0.003%	0.001%
Latvia	1.63	0.030%	0.010%	0.015%	0.005%
Lebanon	2.34	0.100%	0.050%	0.030%	0.010%
Lesotho	1.20	0.100%	0.010%	0.030%	0.005%
Liberia	1.69	0.100%	0.010%	0.030%	0.005%

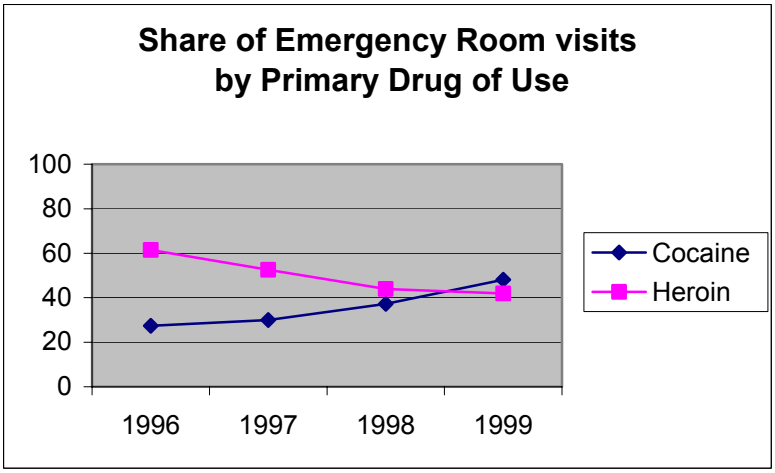
Libya	3.08	0.040%	0.010%	0.010%	0.005%
Liechtenstein	0.02	0.200%	0.050%	0.050%	0.015%
Lithuania	2.44	0.035%	0.015%	0.018%	0.010%
Luxembourg	0.29	0.400%	0.050%	0.200%	0.015%
Macau	0.31	0.010%	0.002%	0.003%	0.001%
Macedonia	1.36	0.030%	0.010%	0.015%	0.005%
Madagascar	8.02	0.040%	0.010%	0.010%	0.005%
Malawi	5.44	0.040%	0.010%	0.010%	0.005%
Malaysia	13.30	0.010%	0.002%	0.003%	0.001%
Maldives	0.15	0.010%	0.002%	0.003%	0.001%
Mali	5.31	0.040%	0.010%	0.010%	0.005%
Malta	0.26	0.100%	0.020%	0.050%	0.010%
Marshall Island	0.03	0.010%	0.002%	0.003%	0.001%
Martinique	0.28	0.400%	0.300%	0.200%	0.150%
Mauritania	1.37	0.040%	0.010%	0.010%	0.005%
Mauritius	0.80	0.040%	0.010%	0.010%	0.005%
Mexico	62.09	0.470%	0.150%	0.215%	0.075%
Micronesia	0.06	0.010%	0.002%	0.003%	0.001%
Moldova	2.97	0.030%	0.010%	0.015%	0.005%
Monaco	0.02	0.100%	0.020%	0.050%	0.010%
Mongolia	1.63	0.010%	0.002%	0.003%	0.001%
Montenegro	0.45	0.100%	0.020%	0.050%	0.010%
Montserrat	0.00	0.100%	0.100%	0.050%	0.050%
Morocco	18.19	0.040%	0.010%	0.010%	0.005%
Mozambique	10.39	0.040%	0.010%	0.010%	0.005%
Myanmar (Burma)	27.33	0.010%	0.002%	0.003%	0.001%
Namibia	0.94	0.200%	0.050%	0.100%	0.003%
Nauru	0.01	0.010%	0.002%	0.003%	0.001%
Nepal	13.80	0.010%	0.002%	0.003%	0.001%
Netherlands	10.80	0.750%	0.300%	0.275%	0.125%
Netherlands Antilles	0.14	0.200%	0.200%	0.100%	0.100%
New Caldonia	0.13	0.010%	0.002%	0.003%	0.001%
New Zealand	2.52	0.050%	0.010%	0.017%	0.005%
Nicaragua	2.77	0.400%	0.300%	0.200%	0.150%
Niger	5.01	0.040%	0.010%	0.010%	0.005%
Nigeria	65.83	1.000%	0.040%	0.050%	0.013%
Norway	2.90	0.300%	0.050%	0.150%	0.020%
Oman	1.43	0.040%	0.010%	0.010%	0.005%
Pakistan	77.73	0.010%	0.002%	0.003%	0.001%
Panama	1.78	1.100%	0.600%	0.500%	0.350%
Papua New Guinea	2.84	0.010%	0.002%	0.003%	0.001%
Paraguay	3.14	0.400%	0.300%	0.200%	0.150%
Peru	16.35	0.900%	0.900%	0.600%	0.600%
Philippines	48.06	0.030%	0.020%	0.010%	0.005%
Poland	26.56	0.125%	0.040%	0.050%	0.025%
Portugal	6.79	0.700%	0.200%	0.350%	0.100%
Qatar	0.53	0.040%	0.010%	0.010%	0.005%
Romania	15.31	0.030%	0.010%	0.015%	0.005%

Russia	101.12	0.125%	0.040%	0.050%	0.025%
Rwanda	3.91	0.040%	0.010%	0.010%	0.005%
Saint Kitts and Nevis	0.02	0.200%	0.200%	0.100%	0.100%
Saint Lucia	0.10	0.200%	0.200%	0.100%	0.100%
Saint Vincent and the Grenadines	0.07	0.100%	0.100%	0.050%	0.050%
Samoa	0.11	0.010%	0.002%	0.003%	0.001%
San Marino	0.02	0.100%	0.020%	0.050%	0.010%
Sao Tome and Principe	0.08	0.020%	0.010%	0.010%	0.005%
Saudi Arabia	12.06	0.040%	0.010%	0.010%	0.005%
Senegal	5.23	0.020%	0.010%	0.010%	0.005%
Serbia	6.51	0.100%	0.020%	0.050%	0.010%
Seychelles	0.05	0.040%	0.010%	0.010%	0.005%
Sierra Leone	2.73	0.020%	0.010%	0.010%	0.005%
Singapore	3.11	0.010%	0.002%	0.003%	0.001%
Slovenia	1.34	0.100%	0.020%	0.050%	0.010%
Solomon Islands	0.25	0.010%	0.002%	0.003%	0.001%
Solvakia	3.74	0.100%	0.020%	0.050%	0.010%
Somalia	3.83	0.040%	0.010%	0.010%	0.005%
South Africa	27.25	0.500%	0.150%	0.200%	0.075%
Spain	27.32	1.550%	0.200%	0.650%	0.100%
Sri Lanka	12.89	0.010%	0.002%	0.003%	0.001%
Sudan	18.59	0.040%	0.010%	0.010%	0.005%
Suriname	0.27	0.300%	0.300%	0.150%	0.150%
Swaziland	0.56	0.200%	0.050%	0.030%	0.020%
Sweden	5.71	0.200%	0.020%	0.100%	0.010%
Switzerland	4.92	0.500%	0.100%	0.250%	0.030%
Syria	9.16	0.030%	0.010%	0.015%	0.005%
Taiwan	15.50	0.030%	0.020%	0.010%	0.005%
Tajikistan	3.45	0.030%	0.010%	0.015%	0.005%
Tanzania	18.44	0.100%	0.020%	0.030%	0.005%
Thailand	42.82	0.020%	0.010%	0.005%	0.005%
The Bahamas	0.19	0.300%	0.300%	0.150%	0.150%
Togo	2.58	1.100%	0.100%	0.200%	0.050%
Tonga	0.06	0.010%	0.002%	0.003%	0.001%
Trinidad and Tobago	0.80	0.100%	0.100%	0.050%	0.050%
Tunisia	6.17	0.040%	0.010%	0.010%	0.005%
Turkey	42.64	0.100%	0.020%	0.030%	0.010%
Turkmenistan	2.60	0.030%	0.010%	0.015%	0.005%
Turks and Caicos Islands	0.01	0.100%	0.100%	0.050%	0.050%
Tuvalu	0.01	0.010%	0.002%	0.003%	0.001%
Uganda	10.89	0.040%	0.010%	0.010%	0.005%
Ukraine	33.53	0.125%	0.040%	0.050%	0.025%
United Arab Emirates	1.61	0.030%	0.010%	0.015%	0.005%
United Kingdom	38.85	1.700%	0.320%	0.550%	0.100%
United States	182.17	1.690%	0.364%	0.700%	0.200%
Uruguay	2.09	0.400%	0.300%	0.200%	0.150%

Uzbekistan	14.42	0.030%	0.010%	0.015%	0.005%
Vanuatu	0.11	0.010%	0.002%	0.003%	0.001%
Venezuela	14.76	0.600%	0.600%	0.300%	0.300%
Viet Nam	48.64	0.010%	0.002%	0.003%	0.001%
West Bank	1.04	0.030%	0.010%	0.015%	0.005%
Western Sahara	0.12	0.040%	0.010%	0.010%	0.005%
Yemen	8.64	0.030%	0.010%	0.015%	0.005%
Zambia	4.78	0.040%	0.010%	0.010%	0.005%
Zimbabwe	6.45	0.040%	0.010%	0.010%	0.005%

Figure 1-4 - Indications of Increasing Cocaine Consumption in Europe





Sources of prevalence information

Prevalence information for this study came principally from three separate sources: national surveys, European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) reporting, and UNDCP reporting.

National surveys

These are by far the most valuable, but unfortunately the least available on a comprehensive basis. The following have been consulted for this study:

- **United States**: The Department of Health and Human Services (most recently via its SAMHSA program) has been publishing annual household surveys on drug use since 1979. That data has the disadvantage of not covering non-household populations, but provides a consistent set of data that allows trend analysis. The most recently reported US survey was done in 2000, and published in August of 2001.

- **United Kingdom:** Since 1994, the Home Office has been publishing its British Crime Survey (BCS) every two years. It's latest publication is "Home Office Research Study 224, Drug misuse declared in 2000: results from the British Crime Survey," published in September, 2001.

- **Spain**: Spain's Interior Ministry has been publishing its biannual household survey on drug use since 1995. Its latest survey was carried out in 1999 and published as Informe #4, "Observatorio Espanol Sobre Drogas," in March 2001. The Department of Interior's Delegacion del Gobierno para el Plan Nacional de Drogas also supports substantial research including a recent 49 page monograph on cocaine, entitled, "Monografia Cocaine," in Adicciones, Vol. 13, suplemento 2, 2001; that monograph details recent trends, as well as describes in depth Spain's growing cocaine problem.

- **Chile**: Chile has perhaps Latin America's premier drug survey organization. The Interior Ministry's National Council for Drug Control (CONACE) has published extensive biannual surveys since 1994. The most recent survey is "The Fourth National Study on Drug Consumption in Chile." The research was done during September through December of 2000, and published in May of 2001. All four national surveys on Chile were consulted for this study.

- **Peru**: Peru has done three national drug surveys, in 1998, 1995, and 1997. These studies were done by CEDRO, an non-governmental organization (NGO) supported in large part by the US Embassy. The proposed 1999 study was not funded in part because of a dispute over who would be in charge of the survey. NAS, however, is working with the Peruvian drug czar to reinstitute the program. The Peruvian data including very detailed reporting on past-month drug use, allowing us to estimate the share of past-month user who are addicts and how much they use.

- **Bolivia**: Bolivia has relied on CELIN, an NGO supported mostly by the US Embassy to carry out its national drug surveys every two years since 1992. The last published survey was completely in 1998 and published in 2000. The Bolivia NGO has also done substantial research on coca leaf use, publishing a full survey and book analysis in 1997.

- **Argentina**: The Office of the President's National Drug Control Secretariat carried out an national survey in March of 1999. That survey was published in June of 1999, and indicated that drug use in Argentina on a per capita basis was worse than in the US.

- **Colombia**: Colombia's National Drug Control Office carried out national surveys in 1996 and 1998. The Health Ministry did a much more comprehensive national survey in 1997. Since that time, two national youth surveys have been carried out in 1999 and 2001 by Rumbos, the Office of the President's Demand Reduction Czar.

- **Mexico**: Mexico carried out extensive national drug surveys in 1988, 1993, and 1998. Its next national survey is scheduled for 2003. In addition, Mexican researchers have carried out periodic youth (school) surveys and has an active epidemiological reporting program monitoring drug treatment trends throughout the country.

- **Brazil**: Brazil is just now planning it's first national drug survey with a million dollars from the US Embassy. It has done, however, youth (school) surveys every two years since the late 1980s. In addition, it has done state surveys on Sao Paulo and Florianopolis in recent years.

- **EMCDDA Reporting**: The EMCDDA carries out an aggressive drug prevalence program. Their most recent publication is it's 2001 annual report of the state of the drugs problem in the European Union. That report summarizes European prevalence data through 1999.

  The most valuable EMCDDA program is its annual country reports. The most recent such are for 2000 and were published last year. Those reports are each a hundred pages are more and summarize all drug trends by individual countries. As a special feature, for 2000, the reports all had special sections detailing cocaine trends. Consensus of virtually each one of these reports was that increased availabilities of cocaine had substantially lower prices during 1999-2000, which had resulted in large increased in cocaine use in those countries. In contrast, virtually each country reported that other drugs, notably Ecstasy and heroin had seen decline use. For 2000, country reports were available and consulted on for virtually every West European country and most East European countries.

- **United Nations**: Our final source of information of prevalence trends is the "Global Illicit Drug Trends 2001, published last year by the UNDCP. That report summarizes other information, and provides unique reporting on several African, Caribbean, and Asian-Pacific countries.

Appendix 1-E: U.S. Cocaine Consumption Estimate

Domestic cocaine consumption estimates[4] were developed through contracted Policy Research. The 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 that expenditure total by an estimate of retail cocaine prices[5]. Table 1-29 below summarizes the figures used in calculation of consumption, and table 1-30 summarizes the price data.

Table 1- 29 Calculation of domestic cocaine consumption, 1996-2000

Description	Reference	Units	Variable	1996	1997	1998	1999	2000
# Occasional users	Ref A, table 3	thousands	U1	3,425	3,487	3,216	3,216	3,035
# Chronic users	Ref A, table 3	thousands	U2	2,828	2,847	2,800	2,755	2,707
Weekly expenditure by occasional users	Ref A, text	2000 dollars	E1	$35	$35	$35	$35	$35
Weekly expenditure by chronic users	Ref A, table 4	2000 dollars	E2	$220	$188	$197	$206	$212
CPI adjustment			Y	1.10	1.07	1.06	1.03	1.00
Total Expenditures for occasional users	Ref A, table 5	2000 billion dollars	E1=U1*E1*Y*52 /1,000,000	$6.9	$6.8	$6.2	$6.0	$5.5
Total Expenditures for chronic users	Ref A, table 5	2000 billion dollars	E2=U2*E2*52 /1,000,000	$32.4	$27.9	$28.7	$29.5	$29.8
Total Expenditures for all users	Ref A, table 5	2000 billion dollars	E=E1+E2	$39.2	$34.7	$34.9	$35.6	$35.3
Retail Prices	Ref A, table 6	2000 dollars per pure g	P	$144	$140	$145	$145	$152
Barter purchases	Ref A, text	percentage	R	11%	11%	11%	11%	11%
Total consumption	Ref A, table 7	metric tons	C=E/P*1000 *(1+R)	301	275	267	272	259

[4] *What America's Users Spend on Illegal Drugs, 1988-2000*, ONDCP, December 2001, in-publication
[5] *The Price of Illicit Drugs, 1981-2000*, ONDCP, October 2001

Table 1- 30 Estimation of street-level cocaine prices

Year	Quarter	Quarterly Price ($/pure g)	Frequency	Annual Price ($/pure g)	3-yr Average Annual Price ($/pure g)
1987	1q87	$321.91	189		
1987	2q87	$291.53	203		
1987	3q87	$206.21	241		
1987	4q87	$174.50	251	$241.54	
1988	1q88	$152.33	259		
1988	2q88	$173.08	368		
1988	3q88	$162.41	386		
1988	4q88	$130.44	387	$154.51	$180
1989	1q89	$134.28	380		
1989	2q89	$139.46	539		
1989	3q89	$137.32	421		
1989	4q89	$171.93	336	$144.26	$171
1990	1q90	$194.62	466		
1990	2q90	$230.43	285		
1990	3q90	$227.42	486		
1990	4q90	$203.32	351	$213.01	$174
1991	1q91	$174.18	544		
1991	2q91	$164.20	482		
1991	3q91	$159.20	443		
1991	4q91	$153.86	371	$163.86	$178
1992	1q92	$132.54	355		
1992	2q92	$191.21	305		
1992	3q92	$155.91	317		
1992	4q92	$157.04	225	$158.18	$160
1993	1q93	$163.35	232		
1993	2q93	$175.99	230		
1993	3q93	$145.47	216		
1993	4q93	$149.37	226	$158.80	$151
1994	1q94	$139.10	199		
1994	2q94	$129.18	195		
1994	3q94	$147.43	272		
1994	4q94	$121.60	155	$136.20	$147
1995	1q95	$120.96	167		
1995	2q95	$136.73	194		
1995	3q95	$141.07	266		
1995	4q95	$185.18	205	$146.89	$139
1996	1q96	$135.58	174		
1996	2q96	$137.26	238		
1996	3q96	$142.23	209		
1996	4q96	$119.14	259	$132.78	$144
1997	1q97	$125.47	252		
1997	2q97	$192.69	274		
1997	3q97	$154.44	259		

1997	4q97	$131.80	167	$153.81	$140
1998	1q98	$119.63	196		
1998	2q98	$120.56	245		
1998	3q98	$139.74	261		
1998	4q98	$147.97	260	$132.98	$145
1999	1q99	$183.12	360		
1999	2q99	$154.39	334		
1999	3q99	$128.76	489		
1999	4q99	$135.81	371	$148.54	$145
2000	1q00	$165.64	362		
2000	2q00	$205.82	304	$154.57	$152