

# The 2015 Heroin Signature Program Report

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REPORT



(U) This product was prepared by the DEA Intelligence Programs Section. Comments and questions may be addressed to the Chief, Analysis and Production Section at [dea.onsi@usdoj.gov](mailto:dea.onsi@usdoj.gov). For media/press inquiries call (202) 307-7977.

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# Overview

The Drug Enforcement Administration's (DEA) Heroin Signature Program (HSP) analyzes several hundred wholesale-level heroin samples each year to identify the geographic area—Mexico, South America (SA), Southwest Asia (SWA), or Southeast Asia (SEA)—where the samples were manufactured. In 2015:

- Heroin from Mexico accounted for 93 percent (by weight) of the heroin analyzed through the HSP.
- Heroin from SA accounted for 3 percent.
- Heroin under the new formal HSP classification of “Inconclusive Origin-South American” processing method (INC-SA), which is assigned to heroin where either Mexico or South America could be the origin, but is produced or refined using South American processing methods, accounted for 3 percent.
- Heroin from SWA accounted for 1 percent.

There were no SEA heroin samples submitted to the program in 2015. Since its inception more than 35 years ago, the HSP has proven to be a valuable indicator of changes in the supply of heroin by providing insight into the wholesale-level of heroin trafficking to the United States.

## Background

The HSP is one essential component of the ability of DEA's Intelligence Program to identify trends in heroin trafficking and distribution in the United States. The objective of the program is to identify and quantify the chemical components of heroin seized at U.S. ports of entry (POEs), all non-POE heroin seizures weighing more than 1 kilogram, randomly chosen samples, and special requests for analysis. Samples submitted to the HSP undergo in-depth chemical analysis at the DEA Special Testing and Research Laboratory (SFL1). This chemical analysis allows SFL1 to associate the heroin samples with a production process, or “signature,” which is indicative of a particular geographic source area and processing method. The proportion of heroin associated with each geographic source area is measured in terms of the net weight of heroin seized and analyzed in the program from each source area that year.

Signature analysis conducted under the HSP is currently the only scientifically based source of information available to determine the origin of wholesale-level quantities of heroin encountered in the U.S. drug market. HSP chemical analysis data—combined with the retail-level Heroin Domestic Monitor Program, investigative, and other types of reporting—allow for the identification of possible changes in the geographic source and purity of heroin in the United States, as well as changes in trafficking routes and methods. The HSP continually undergoes quality assurance by analyzing authentic samples obtained from the primary heroin production regions.

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**2015 Heroin Signature Program Results**

In 2015, heroin from Mexico accounted for 93 percent (by weight) of the heroin analyzed by the HSP. SA and INC-SA heroin both accounted for 3 percent; and SWA heroin accounted for 1 percent. No SEA heroin samples were submitted to the program in 2015. Over 905 HSP samples, representing approximately 1,951 kilograms of heroin, were analyzed in 2015 by SFL1. Of those 905 samples, 872 (representing approximately 1,907 kilograms) were classified through the HSP (see Figure 1).<sup>a</sup>

**(U) Figure 1: HSP Geographic Source Area Summary.**

Signature	Number of Samples		Weight of Samples (kilograms)		Percentage by Weight	
	2015	2014	2015	2014	2015	2014
Mexican-Origin	747	508	1,771	1,332	93%	79%
MEX-SA	393	209	1,060	777	60	58
MEX/BP	14	24	33	68	2	5
MEX/T	336	271	672	482	38	36
MEX	4	4	6	5	0	1
SA	46	153	58	288	3	17
INC-SA	54	55	63	47	3	3
SWA	25	16	15	9	1	1
SEA	0	0	0	0	0	0
<b>Total</b>	<b>872</b>	<b>732</b>	<b>1,907</b>	<b>1,676</b>	<b>100%</b>	<b>100%</b>

Source: DEA

<sup>a</sup> Since all heroin seized in the United States is not submitted for analysis through the HSP, the source area proportions reported through the HSP should not be characterized as market share. Fluctuations from year to year in source area proportions may reflect shifting law enforcement priorities, changes in trafficking patterns, or exceptionally large seizures that could boost the HSP representation of a particular source area. To achieve a comprehensive assessment of heroin smuggled into and trafficked in the United States, HSP data must be used in conjunction with investigative reporting, drug production estimates, and seizure statistics.

In 2015, approximately 3 percent of the heroin samples submitted for analysis through the HSP were classified as “unknown” (UNK), which represents a decrease of 5 percentage points from 2014 when 8 percent of HSP heroin samples were classified UNK. According to SFL1, heroin samples are classified as UNK when the signature profiles of the samples are not consistent with the signature profiles of authentic heroin samples collected from any of the four geographic source regions. Since heroin is manufactured through a series of chemical processing steps, signature analysis is expected to result in a certain number of samples whose signature is UNK or undetermined. Generally, a range of 4 to 7 percent of heroin samples classified as UNK is considered to be normal. The decrease in the number of 2015 HSP heroin samples classified as UNK is due in large part to new forensic protocols introduced by SFL1 in May 2015. These protocols allow chemists to better differentiate and isolate the origin of heroin samples previously classified as UNK to either Mexico or South America. Heroin samples classified as UNK are not included in the HSP Geographic Source Area Summary.

Heroin classified as MEX-SA (new formal signature for Mexican white powder heroin, indicating Mexican-origin with South American processing methods) had the highest purity average in 2015 at 70 percent, followed by SA heroin at 63 percent (see Figure 2).

**(U) Figure 2: HSP Average Heroin Purity.**

Signature	Average Purity	
	2015	2014
MEX-SA	70%	74%
SA	63%	61%
SWA	54%	35%
INC-SA	51%	39%
MEX/BP	43%	43%
MEX	41%	44%
MEX/T	41%	39%
SEA	N/A	N/A

Source: DEA

## Mexico

Analysis of 2015 HSP data identified Mexico as the primary source of origin for heroin transported to the United States for the third consecutive year. Mexico was identified as the geographic origin of 93 percent (by weight) of samples classified under the HSP during 2015. Of these samples, 60 percent were classified as Mexican-South American (MEX-SA); 38 percent as Mexican-Black Tar (MEX/T); and 2 percent as Mexican-Brown Powder (MEX/BP). Less than 1 percent was classified as MEX, which is the classification assigned to refined or crudely manufactured heroin from Mexico. This classification is assigned when MEX/T, MEX/BP, or MEX-SA are not applicable. In 2015, the percentage (by weight) of Mexican-origin heroin analyzed through the HSP increased 14 percentage points, from 79 percent in 2014 to 93 percent in 2015. The weight of Mexican-origin heroin samples submitted to the HSP also increased, from approximately 1,332 kilograms (508 samples) in 2014, to 1,771 kilograms (747 samples) in 2015.

The average overall purity of Mexican-origin heroin analyzed through the HSP in 2015 increased 12 percentage points, from 44 percent in 2014 to 56 percent in 2015. Within Mexican signatures, MEX-SA heroin had the highest purity level at 70 percent in 2015, followed by MEX/BP at 43 percent, and MEX/T at 41 percent. In 2015, 26 percent of MEX-SA heroin was adulterated, with caffeine being the primary adulterant

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followed by quinine.<sup>b</sup> Four MEX-SA samples were found to contain fentanyl hydrochloride (HCl). In 2015, inositol and mannitol were the most common diluents found in MEX-SA heroin samples.<sup>c</sup> Forensic analysis of 2015 HSP heroin samples also revealed that previously detected cutting patterns for MEX-SA shipments continue, in that the heroin becomes heavily adulterated with additional caffeine and other adulterants once the heroin crosses the U.S. Southwest Border (SWB). MEX-SA heroin is also further diluted inside the United States with the same previously detected diluents—mannitol, inositol, and lactose. The majority of MEX/T and MEX/BP samples analyzed under the HSP in 2015 were unadulterated; however, of the adulterated samples, lidocaine was the most detected adulterant with mannitol as the most common diluent, followed by lactose, sucrose, dextrose, and inositol.

The number of Mexican-origin heroin samples seized at Arizona POEs and submitted to the HSP for analysis increased from 32 in 2014 to 50 in 2015, while Mexican-origin heroin seizures at POEs in Texas decreased from 19 in 2014 to 13 in 2015. Heroin seizures at POEs in California rose from 147 in 2014 to 211 in 2015 (see Figure 3). A significant number of the POE seizures in California were made at the San Ysidro POE (107 samples).

**(U) Figure 3: Mexican and South American Heroin Seized at Southwest Border Ports of Entry by State.**

SWB State	Mexican Origin Heroin (Number of Exhibits)		SA Heroin (Number of Exhibits)	
	2015	2014	2015	2014
Arizona	50	32	2	2
California	211	147	3	14
New Mexico	0	0	0	0
Texas	13	19	0	4

Source: DEA

The number of Mexican-origin heroin samples seized at U.S. POEs has increased steadily since 2001, and clearly demonstrates the increased smuggling of Mexico-produced heroin through Mexico toward the SWB. Figure 4 summarizes the number and purity of Mexican-origin heroin samples seized at U.S. POEs and analyzed through the HSP from 2001 to 2015.

Although the availability of Mexican-origin heroin, especially MEX/T and MEX/BP, remains strong in markets west of the Mississippi River, 2015 HSP data indicates that increasing amounts of Mexican-origin heroin

<sup>b</sup> Adulterants are pharmacologically active substances that are added to heroin to enhance or mimic the effect of heroin. A good example of an adulterant is acetaminophen, an analgesic compound often found with heroin. That said, many current heroin adulterants do not meet this criteria, as they may have an adverse effect, or possibly no effect, to the heroin. Adulterants can be added to heroin shipments immediately after production, in transit, or prior to distribution. Although dextromethorphan for Southwest Asian heroin and diltiazem for South American heroin are examples of adulterants that are added immediately after production, xylazine for Puerto Rico and quinine for Washington, DC-Baltimore are examples of city-specific adulteration prior to distribution.

<sup>c</sup> Diluents are inert ingredients (pharmacologically inactive compounds) used to increase the bulk of a finished product. Typical diluents include sugars, starches, and inorganic salts.

have moved into Eastern and Midwestern U.S. markets. In 2015, for example, the HSP received a total of 165 Mexican-origin heroin samples obtained from the following areas that are predominately SA white heroin markets: Connecticut (6 samples), Florida (6 samples), Illinois (30 samples - 28 classified as MEX-SA), Michigan (13 samples - 10 classified as MEX-SA), New York (74 samples - 72 classified as MEX-SA), North Carolina (6 samples), Ohio (13 samples - 6 classified as MEX-SA), Pennsylvania (8 samples – all classified as MEX-SA), Rhode Island (1 sample), and Virginia (4 samples). These samples represent a 65 percent increase in the total number of Mexican-origin heroin samples obtained in these same markets in 2014. Of particular importance is that the majority of Mexican-origin HSP heroin samples obtained from Illinois, Michigan, New York, and Pennsylvania in 2015 were classified as MEX-SA. This is an indication that Mexican drug trafficking organizations are producing white heroin for distribution in the eastern United States and continue to expand their operations in order to gain a larger share of these lucrative, historically white heroin markets.

### South America

South America (SA) was identified as the geographic source area of 3 percent (by weight) of heroin samples classified under the HSP during 2015. This represents a significant decrease from 2014, when SA heroin accounted for 17 percent (by weight) of the heroin analyzed through the HSP. The weight of SA heroin samples submitted to the HSP also decreased dramatically, from

288 kilograms in 2014 to only 58 kilograms in 2015. From 1995 to 2013, South America (primarily Colombia) accounted for the majority of the heroin analyzed through the HSP; however, HSP results since 2013 indicate that South America is now the second most common source of the heroin available in the United States.

The average purity of SA heroin increased from 61 percent in 2014 to 63 percent in 2015. According to SFL 1 forensic analysis, approximately 66 percent of SA heroin samples were found to be adulterated. Caffeine continued to be the most common adulterant for SA heroin, followed by diltiazem. Adulterants such as quinine, lidocaine, benzocaine, and diltiazem were also detected in many samples. In addition, controlled substances were also identified in SA heroin samples analyzed by the HSP, including cocaine (6 samples) and fentanyl (1 sample). Lactose, mannitol, and inositol were the most commonly used diluents for SA heroin.

**(U) Figure 4: Characteristics of Mexican Heroin Seized at U.S. Ports of Entry and Analyzed through the DEA Heroin Signature Program.**

Calendar Year	Number of Exhibits	Average Purity
2015	10 (MEX/BP)	44.1%
	101 (MEX-SA)	72.0%
	163 (MEX/T)	42.2%
2014	12 (MEX/BP)	54.0%
	63 (MEX-SA)	82.0%
	125 (MEX/T)	43.0%
2013	165	46.9%
2012	146	42.3%
2011	145	40.4%
2010	88	38.1%
2009	55	39.6%
2008	61	44.0%
2007	49	38.6%
2006	32	44.6%
2005	40	49.4%
2004	24	41.5%
2003	20	37.9%
2002	26	32.8%
2001	34	31.0%

Source: DEA

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**(U) Figure 5: Characteristics of South American Heroin Seized at U.S. Ports of Entry and Analyzed through the DEA Heroin Signature Program.**

Calendar Year	Number of Exhibits	Average Purity
2015	17	70.0%
2014	32	77.4%
2013	76	71.8%
2012	138	68.2%
2011	150	61.8%
2010	128	54.5%
2009	134	61.9%
2008	141	64.7%
2007	126	64.3%
2006	138	62.0%
2005	185	68.0%
2004	237	72.5%
2003	350	77.1%
2002	376	76.9%
2001	412	81.2%

Source: DEA

**Is it possible for SWA heroin to be misclassified as SA, MEX-SA, or INC-SA heroin?**

SWA heroin has a unique chemical signature that displays no similarities to the chemical signatures of the heroin types produced in either South America or Mexico. Due to the distinct signature differences, it is not possible to misclassify SWA heroin as either South American or Mexican origin.

DEA's SFL1 continues to monitor SWA heroin production and finds its signatures remaining consistent since the inception of the HSP.

Over the last 40 years, SFL1 has used thousands of authentic samples to establish the signature profiles of heroin produced in various regions of the world. Currently, about 7,000 authentic samples are employed to classify a heroin sample at a 95 percent confidence level with four independent signature methods.

Source: DEA

Although SA heroin continues to be smuggled into the United States by couriers on commercial flights and over land from Mexico, 2015 HSP data continues to show a significant decline in the number of SA heroin samples seized at U.S. POEs in comparison to 2014.

In 2015, only 17 SA heroin samples obtained from seizures at U.S. POEs (both air and land) were analyzed under the HSP (compared to 32 samples in 2014). Of the 17 SA heroin samples obtained in 2015, 9 were airport seizures with the major airports in New York and Florida continuing as the primary arrival points for SA heroin couriers. SFL1 forensic analysis further indicated that SA heroin shipments transported into the United States via air couriers contained the adulterants diltiazem and caffeine.

The number of SA heroin samples seized at U.S. POEs and analyzed through the HSP since 2001 has steadily decreased, while the purity has remained relatively stable during the same timeframe. The decline in the amount of SA heroin seized at U.S. POEs is consistent with reports of significant decreases in Colombian poppy cultivation in recent years. The reduction in SA heroin production, coupled with increasing levels of heroin production in Mexico and transportation activities across the SWB, has had a noticeable impact on SA heroin availability in the United States. Figure 5 summarizes the number and purity of SA heroin samples seized and analyzed through the HSP at U.S. POEs from 2001 through 2015.

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## ***Inconclusive - South America***

The new HSP signature classification of INC-SA is assigned to heroin where either Mexico or South America could be the origin, but is produced or refined using South American processing methods. Due to the heavy presence of adulterants or other issues, signature analysis conducted under the HSP is unable to confirm the geographic origin of the heroin.

Heroin classified as INC-SA accounted for 3 percent (by weight) of the heroin analyzed through the HSP in both 2014 and 2015. The weight of INC-SA heroin samples analyzed through the HSP increased from 47 kilograms (55 samples) in 2014 to 63 kilograms (54 samples) in 2015. The average purity of INC-SA heroin increased significantly, from 39 percent in 2014 to 51 percent in 2015. HSP data revealed that these INC-SA heroin samples were obtained from 19 states, the majority of which were in the Eastern United States, primarily New York (12 samples), Maryland (5 samples), and Pennsylvania (4 samples). In addition, one INC-SA heroin sample submitted to the HSP in 2015 was obtained at the seaport POE in San Juan, Puerto Rico, and was transported into Puerto Rico via ferry from the Dominican Republic.

## ***Southwest Asia***

Southwest Asian (SWA) heroin accounted for 1 percent of the heroin analyzed (by weight) under the HSP in both 2014 and 2015. The average purity of SWA heroin increased from 35 percent in 2014 to 54 percent in 2015. The primary adulterants identified in SWA heroin samples analyzed under the HSP in 2015 were acetaminophen, caffeine, and dextromethorphan; diluents included sucrose, mannitol, and lactose.

SWA heroin continues to be smuggled into the United States primarily via couriers on international flights and through international mail delivery services. Air couriers generally arrive at John F. Kennedy International Airport in New York on flights originating in Western Europe or West Africa. SWA heroin seized at U.S. airports from couriers and analyzed through the HSP in 2015 ranged in weight from approximately 23.8 grams to 6.5 kilograms.

The HSP continues to document the presence of SWA heroin in the United States even though the quantities for this heroin type are limited. Record levels of opium and heroin production in Afghanistan have not led to a corresponding rise in SWA heroin availability in the United States. Based on DEA reporting and seizure data, SWA heroin is not shipped to the United States in the bulk (wholesale) quantities needed to sufficiently challenge or supplant well-entrenched Mexican heroin distribution networks. As noted in Figure 1, the total weight of SWA heroin samples submitted to the HSP in 2015 increased slightly, from 9 kilograms (16 samples) in 2014 to 15 kilograms (25 samples) in 2015, though the percentage by weight remained constant at 1 percent for both years. Until SWA trafficking networks can ensure a consistent flow of high-purity, competitively priced heroin while simultaneously expanding their U.S. distribution networks, it is unlikely that SWA heroin will significantly increase its presence in the United States in the near term.

## ***Southeast Asia***

For the seventh consecutive year, no Southeast Asian (SEA) heroin samples were analyzed in 2015 through the HSP. Although reports indicate opium cultivation in Burma is once again on the rise after a decade of decline, this increased level of opium production has not resulted in a concurrent rise in SEA heroin availability in the United States. The majority of SEA opium remains in Asia to meet the demand for opiates in local and regional markets.



## Outlook

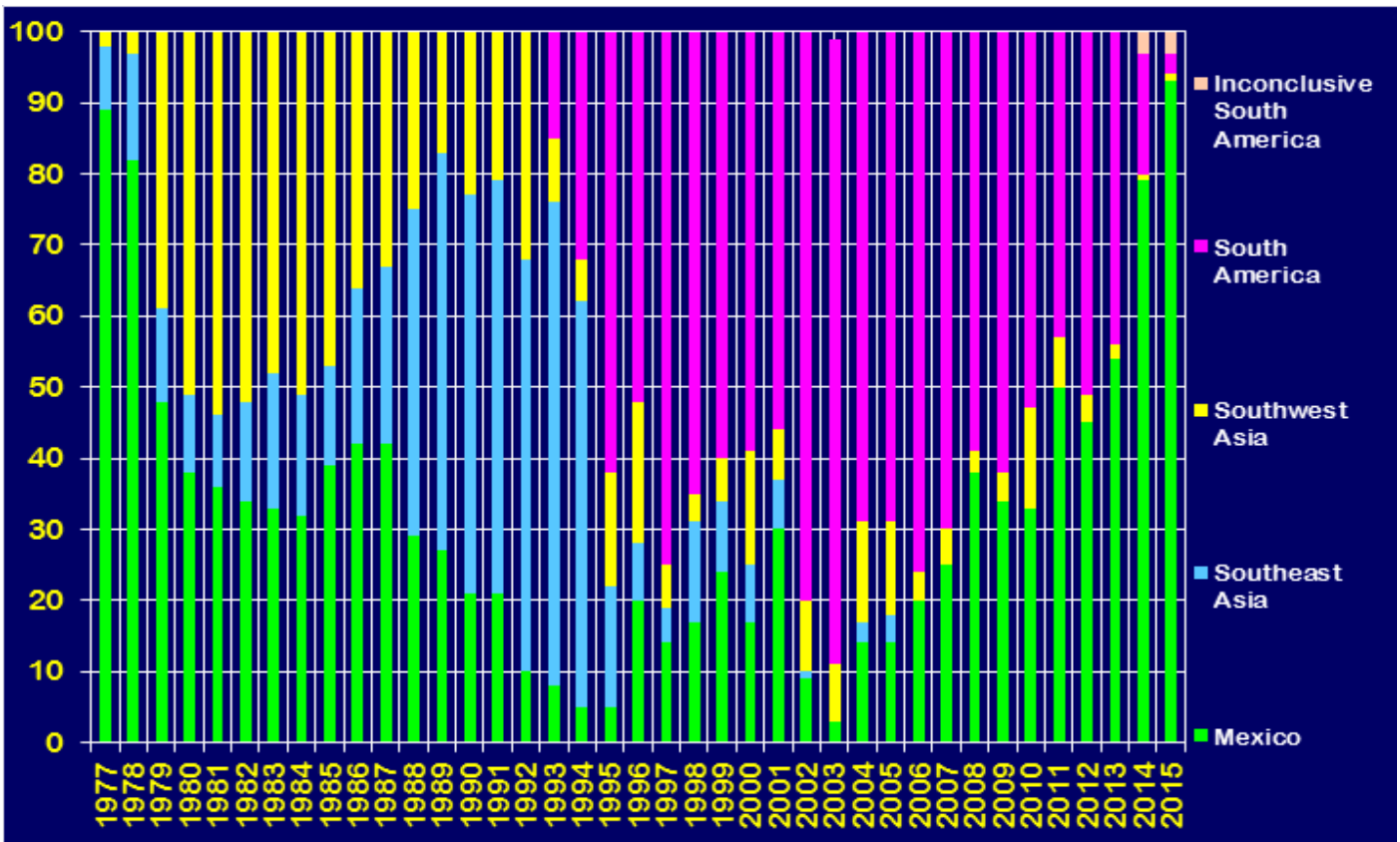
Mexico was the primary geographic source of heroin samples submitted to the HSP in 2015, and will likely remain the primary source in the near term. HSP statistics for 2015 revealed that both the purity and weight of Mexican-origin heroin seizures increased, and is a strong indicator that Mexican traffickers are aggressively expanding and taking greater control of the U.S. heroin market. They are now producing their own white powder heroin and becoming more active in Eastern white powder heroin markets historically supplied by Colombian traffickers since the mid-1990s. Seizures of Mexican-origin heroin at the SWB continue to grow and are an indication that Mexican traffickers are increasing their level of heroin production and transportation to meet rising demand in the United States.

Although SA heroin remains available in the United States, HSP results for both 2014 and 2015 clearly illustrate that South America has become a secondary source of heroin for the U.S. market. Diminished levels of SA heroin in the United States are likely the result of decreased levels of opium poppy production in Colombia and steadily increasing levels of heroin production in Mexico and subsequent transportation activities.

Despite record estimates of opium and heroin production in Afghanistan, and increasing levels of opium production in Southeast Asia, HSP statistics indicate that heroin from both of these geographic source regions continue to have minimal impact on the U.S. heroin market.

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(U) Appendix A: Heroin Source Area Distribution: 1977-2015.



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**(U) APPENDIX B: 1977-2015 HEROIN SIGNATURE PROGRAM RESULTS**  
**Geographic Source Area Distribution (in percent\*)**  
**Based on Net Weight of Heroin Seized and Analyzed.**

Year	Mexico	Southeast Asia	Southwest Asia	South America	Inconclusive South America
2015	93	0	1	3	3
2014	79	0	1	17	3
2013	54	0	2	44	N/A
2012	45	0	4	51	N/A
2011	50	0	7	43	N/A
2010	33	0	14	53	N/A
2009	34	0	4	62	N/A
2008	38	<1	3	59	N/A
2007	25	<1	5	70	N/A
2006	20	0	4	76	N/A
2005	14	4	13	69	N/A
2004	14	3	14	69	N/A
2003	3	<1	8	88	N/A
2002	9	1	10	80	N/A
2001	30	7	7	56	N/A
2000	17	8	16	59	N/A
1999	24	10	6	60	N/A
1998	17	14	4	65	N/A
1997	14	5	6	75	N/A
1996	20	8	20	52	N/A
1995	5	17	16	62	N/A
1994	5	57	6	32	N/A
1993	8	68	9	15**	N/A
1992	10	58	32	---	N/A
1991	21	58	21	---	N/A
1990	21	56	23	---	N/A

Source: DEA

**(U) APPENDIX B: 1977-2015 HEROIN SIGNATURE PROGRAM RESULTS**  
**Geographic Source Area Distribution (in percent\*)**  
**Based on Net Weight of Heroin Seized and Analyzed, continued.**

Year	Mexico	Southeast Asia	Southwest Asia	South America	Inconclusive South America
1989	27	56	17	---	N/A
1988	29	46	25	---	N/A
1987	42	25	33	---	N/A
1986	42	22	36	---	N/A
1985	39	14	47	---	N/A
1984	32	17	51	---	N/A
1983	33	19	48	---	N/A
1982	34	14	52	---	N/A
1981	36	10	54	---	N/A
1980	38	11	51	---	N/A
1979	48	13	39	---	N/A
1978	82	15	3	---	N/A
1977	89	9	2	---	N/A

Source: DEA

\* Percentage based on samples for which a signature was identified. From 1977 through 1991, percentages were based on the number of samples tested. Since 1992, percentages have been based on the net weight of the heroin seized and analyzed.

\*\* The signature for heroin from South America was developed in July 1993; therefore, this figure represents only partial-year data. (DEA reporting indicates that heroin from South America first was noted in the US in 1991 and that its availability increased during the latter half of 1992 as well as in early 1993.)



# DEA Intelligence Product Feedback Database



Name of Organization: \_\_\_\_\_  
 Point of Contact: \_\_\_\_\_ Telephone Number: \_\_\_\_\_  
 Email: \_\_\_\_\_

DEA Product #: DEA- \_\_\_\_\_  
 Title: \_\_\_\_\_

	Very Satisfied	Somewhat Satisfied	Neither Satisfied nor Dissatisfied	Somewhat Dissatisfied	Very Dissatisfied
Overall satisfaction with DEA Product	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Readability/Understanding of DEA Product	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Value/Usefulness of NNP Product	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Report Increased my Understanding or Knowledge of the report subject	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Product Relevance to my agency's mission	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How will you use this report? (Check all that apply)	<input type="checkbox"/> Policy Formulation <input type="checkbox"/> Situational Awareness <input type="checkbox"/> Operational Planning <input type="checkbox"/> Training <input type="checkbox"/> Resource Allocation <input type="checkbox"/> Other				

Additional Comments: