JOINT INTELLIGENCE REPORT

The 2017 Heroin Signature Program

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Overview

The Drug Enforcement Administration's (DEA) Heroin Signature Program (HSP) analyzes hundreds of 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 2017:

- Heroin from Mexico accounted for 92 percent (by weight) of the heroin analyzed through the HSP.
- Heroin under the recently established 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 four percent.
- Heroin from South America (SA) accounted for less than two percent.
- Heroin from Southwest Asia (SWA) accounted for less than one percent.
- There were no Southeast Asian (SEA) heroin samples submitted to the program in 2017.

Since the HSP's inception over 40 years ago, it 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 one 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 and is not intended to represent actual market share in the United States.

Year-to-year fluctuations in HSP data in relation to each source area may reflect shifting law enforcement priorities, changes in trafficking patterns, or exceptionally large seizures that may boost a source area's representation in the HSP. HSP chemical analysis data—when combined with DEA's retail-level Heroin Domestic Monitor Program, investigative reporting, seizure patterns, and other types of reporting has over the years, consistently identified 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.

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.

2017 Heroin Signature Program Results

In 2017, heroin from Mexico accounted for 92 percent (by weight) of the heroin analyzed by the HSP. Heroin classified as INC-SA accounted for four percent; SA heroin accounted for less than two percent; and SWA heroin accounted for less than one percent. No SEA heroin samples were submitted to the program in 2017. In 2017, 1,026 HSP samples, representing approximately 2,210

(U) Figure 1: HSP Geographic Source Area Summary.						
Signature	Number of Samples		Weight of Samples (kilograms)		Percentage by Weight	
	2017	2016	2017	2016	2017	2016
MEXICAN ORIGIN	**889**	**626**	**2,034**	**1,364**	**92%**	**86%**
MEX/T (Black Tar)	486	319	821	509	37%	37%
MEX-SA (White Powder)	385	294	1,197	811	54%	59%
MEX/BP(Brown Powder)	16	10	15	27	<1%	2%
MEX	2	3	1	16	<1%	1%
INC-SA	**75**	**58**	**83**	**162**	**4%**	**10%**
SA	**21**	**22**	**33**	**59**	**2%**	**4%**
SWA	**7**	**8**	**5**	**7**	**<1%**	**0%**
SEA	**0**	**0**	**0**	**0**	**0**	**0%**
TOTAL	**992**	**714**	**2,155**	**1,592**	**100%**	**100%**
Source: DEA						

kilograms of heroin, were analyzed by SFL1. Of those samples, 992 (representing approximately 2,155 kilograms) were classified through the HSP (see Figure 1).[a]

In 2017, approximately one percent of the heroin samples submitted for analysis through the HSP were classified as "unknown" (UNK), meaning the signature profiles of the samples were 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 small number of samples whose signature is UNK or undetermined. It should be noted that heroin samples classified as UNK are not included in the HSP Geographic Source Area Summary.

(U) Figure 2: HSP Average Heroin Purity.		
Signature	Average Purity	
	2017	2016
MEX-SA	**74%**	**70%**
SA	**69**	**71**
INC-SA	**45**	**36**
SWA	**39**	**43**
MEX/BP	**38**	**44**
MEX/T	**37**	**37**
MEX	**35**	**47**
SEA	**N/A**	**N/A**
Source: DEA		

Heroin classified as MEX-SA (Mexican White Powder) had the highest purity average in 2017 at 74 percent, followed closely by SA heroin at 69 percent. (See Figure 2).

Mexico

Analysis of 2017 HSP data identified Mexico as the primary source of origin for heroin transported to the United States for the fifth consecutive year. Mexico was identified as the geographic origin of 92 percent (by weight) of samples classified under the HSP during 2017. Of these samples, 38 percent

[a] 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.

were classified as Mexican White Powder (MEX-SA); 47 percent as Mexican Black Tar (MEX/T); and two percent as Mexican Brown Powder (MEX/BP). Less than one 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 2017, the percentage (by weight) of overall Mexican-origin heroin analyzed through the HSP increased six percentage points,[b] from 86 percent in 2016 to 92 percent in 2017. The weight of Mexican-origin heroin samples submitted to the HSP also increased from approximately 1,364 kilograms (626 samples) in 2016 to 2,034 kilograms (889 samples) in 2017.

In 2017, the purity levels of Mexican origin heroin varied within Mexican signatures. MEX-SA heroin remained highly refined with an average purity level of 74 percent, followed by MEX/BP at 38 percent; and MEX/T at 37 percent. Heroin classified as MEX had the lowest average purity at 35 percent.

In 2017, 18 percent of MEX-SA heroin samples were adulterated, with caffeine being the primary adulterant followed by quinine, procaine, and lidocaine.[c] In 2017, mannitol, inositol, sucrose and lactose were the primary diluents found in MEX-SA heroin samples.[d] Twenty-eight MEX-SA samples were found to contain fentanyl and/or fentanyl-related compounds. These samples were obtained in the following states:

- Arizona (1)
- California (2)
- Connecticut (5)
- Florida (1)
- Georgia (1)
- Massachusetts (2)
- Maryland (1)
- Michigan (1)
- New Mexico (1)
- New York (9)
- Pennsylvania (1)
- Rhode Island (3)

Forensic analysis of 2017 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 it 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. In 2017, approximately 96 percent of black tar heroin HSP samples were unadulterated. However, of the adulterated samples, caffeine and lidocaine was the most detected adulterants with lactose, mannitol, sucrose, dextrose, and inositol as the most common diluents. Furthermore, fentanyl was detected in only one of the 486 Mexican black tar samples submitted to the HSP in 2017.

In 2017, the number of Mexican-origin heroin samples seized at California POEs and submitted to the HSP for analysis increased to 232 from 142 in 2016, a 63 percent increase. The majority of these heroin samples were seized at the San Ysidro and Otay Mesa POEs. Mexican-origin heroin samples seized at POEs in Texas and submitted to the HSP for analysis also increased from 9 in 2016 to 36

[b] A percentage point is a unit expressing the arithmetic difference between two percentages, e.g., a decline of one percentage point would be a decrease from 10 percent to 9 percent.

[c] Adulterants are pharmacologically active substances that are added to heroin to enhance or mimic the effect of heroin. An 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.

[d] Diluents are inert ingredients (pharmacologically inactive compounds) used to increase the bulk of a finished product. Typical diluents include sugars, starches, and inorganic salts.

in 2017. Heroin samples seized at POEs in Arizona and submitted to the HSP for analysis decreased from 54 in 2016 to 39 in 2017. Only one SA heroin sample submitted to the HSP for analysis was obtained at a SWB POE in 2017 (see Figure 3).

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 2017. As noted in Figure 4 below, MEX-SA heroin exhibits seized at the U.S. POEs in 2017 and analyzed through the HSP were highly refined, with an average purity of 83 percent. Furthermore, according to SFL1 forensic analysis, most Mexican-origin heroin border seizures (both powder and tar) remained fentanyl-free indicating that fentanyl cutting or lacing at the wholesale level was minimal.

HSP data indicates that Mexican-origin heroin—both MEX-SA and MEX/T—are widely available and dominate markets throughout the United States. In 2017, MEX-SA heroin samples were submitted by 33 states with the largest number of samples obtained in the following states:

- New York: (58)
- Illinois: (34)
- Connecticut: (13)
- Maryland: (13)
- Pennsylvania: (10)
- Kentucky: (10)
- Alabama: (8)

While the majority of MEX/T heroin samples were obtained from SWB POE seizures in California, Arizona, and Texas, 2017 HSP data indicates that MEX/T heroin was available in 26 other states throughout the United States, with the largest number of samples obtained in: Washington (16), New Mexico (16), Oregon (9), Nevada (9), Ohio (8), Oklahoma (7), Utah (7) and Alaska (6).

(U) Figure 3: Mexican and South American Heroin.

Seized at Southwest Border Ports of Entry by State and Analyzed through the DEA Heroin Signature Program

SWB State	Mexican-Origin Heroin (Number of Exhibits)		SA Heroin (Number of Exhibits)	
	2017	2016	2017	2016
Arizona	39	54	0	2
California	232	142	1	2
New Mexico	0	0	0	0
Texas	36	9	0	0

Source: DEA

(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
2017	211 (MEX/T)	42.0%
	94 (MEX-SA)	83.0%
	2 (MEX/BP)	61.0%
2016	132 (MEX/T)	43.6%
	74 (MEX-SA)	81.2%
	3 (MEX/BP)	52.7%
2015	163 (MEX/T)	42.2%
	101 (MEX-SA)	72.0%
	10 (MEX/BP)	44.1%
2014	125 (MEX/T)	43.0%
	63 (MEX-SA)	82.0%
	12 (MEX/BP)	54.0%
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

South America

South America (SA) was identified as the geographic source area of two percent (by weight) of heroin samples classified under the HSP during 2017. This represents a decrease from 2016, when SA heroin accounted for 4 percent (by weight) of the heroin analyzed through the HSP. The weight of SA heroin samples submitted to the HSP also decreased significantly from 60 kilograms in 2016 to 33 kilograms in 2017. From 1995 to 2013, South America (primarily Colombia) accounted for the majority of the heroin analyzed through the HSP; however, 2017 HSP results indicate that SA heroin has reached an all-time low in terms of sample size and the amount analyzed under the HSP.

In 2017, the average purity of SA heroin was 69 percent, a two percentage point decrease from 71 percent in 2016. According to SFL1 forensic analysis, approximately 57 percent of SA heroin samples were found to be adulterated. Caffeine continued to be the most common adulterant for SA heroin, followed by diltiazem, lidocaine, aminopyrine, methorphan, meprobamate, and thiamine. Lactose, mannitol, and inositol were the only identified diluents detected in SA heroin samples submitted to the HSP in 2017.

(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
2017	11	73%
2016	9	67.1%
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

SA heroin continues to be smuggled into the United States by couriers on commercial flights and overland from Mexico. In 2017, 11 SA heroin samples obtained from seizures at U.S. POEs (both air and land) were submitted to the HSP for analysis (compared to 9 samples in 2016). These included five seizures at Miami International Airport; four at JFK Airport in New York; and one at Boston Logan International Airport. One SA heroin seizure sample was also obtained at the Otay Mesa, CA land POE.

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 (See Figure 5). The decline in the amount of SA heroin seized at POEs is consistent with reports of significant decreases in Colombian poppy cultivation in recent years. The reduction in SA heroin production, coupled with continuing high levels of heroin production in Mexico and transportation activities across the SWB, has noticeably impacted SA heroin availability in the United States.

In 2017, a total of 10 non-POE SA heroin samples were obtained in the following locations: Arkansas (1); Florida (3); Maryland (2); New Jersey (1); New York (1); Pennsylvania (1); and Puerto Rico (1).

Heroin Classified as Inconclusive - South America (INC-SA)

The recent HSP signature classification of INC-SA, which was formally established in 2015 by SFL1, is assigned to heroin samples 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 and other issues, signature analysis conducted under the HSP is unable to confirm the geographic origin of these heroin samples.

Heroin classified as INC-SA accounted for approximately four percent (by weight) of the heroin analyzed through the HSP in 2017. This is a decrease from the 10 percent noted in 2016. The weight of INC-SA heroin samples analyzed in 2017 through the HSP decreased to 83 kilograms from the 162 kilograms analyzed in 2016. However, the average purity of INC-SA heroin increased from 36 percent in 2016 to 45 percent in 2017. HSP data revealed that INC-SA heroin samples were obtained from 24 states, with New York—one of the most prominent white heroin destination and distribution centers in the United States—submitting the largest number of samples (See Figure 6). Of note, seven of the 75 heroin samples classified as INC-SA were obtained from five POE seizures at JFK Airport in New York, and two coming from Miami International Airport. SFL1 classified these samples as INC-SA as the geographic origin of the samples could not be confirmed. It is suspected however, that the actual geographic origin of the seized heroin was likely South America as both of the aforementioned airports are traditional entry points for SA heroin.

(U) Figure 6: Heroin Classified as Inconclusive - South America (INC-SA) Seized by State.

INC-SA-Samples	2017	2016
Alabama	3	0
Arkansas	1	0
Arizona	1	4
California	10	1
Connecticut	1	2
Delaware	1	0
Florida	3	3
Illinois	4	4
Indiana	1	0
Louisiana	4	0
Massachusetts	4	0
Maryland	1	5
Minnesota	1	0
Mississippi	2	0
Missouri	1	1
New Jersey	4	2
New Mexico	1	0
New York	18	21
Pennsylvania	4	1
Puerto Rico	1	0
Rhode Island	3	0
Texas	1	1
Vermont	2	2
Wisconsin	3	1
TOTAL	75	48

Source: DEA

Southwest Asia

Despite continued high levels of heroin production in Afghanistan, 2017 HSP—results along with investigative and other information—confirm that the presence and availability of SWA heroin in U.S. markets is minimal. SWA heroin accounted for less than one percent of the heroin analyzed (by weight) under the HSP in 2017. This is virtually unchanged from the less than one percent analyzed under the HSP in 2016. The average purity of SWA heroin decreased from 41 percent in 2016 to 39 percent in 2017. The primary adulterants noted in SWA heroin samples analyzed under the HSP in 2017 were caffeine, methorphan, acetaminophen, and quinine while the diluents included lactose, mannitol, and inositol. In 2017, only seven SWA heroin samples, representing a total weight of five kilograms, were submitted for analysis under the HSP. The purities of these samples ranged from a low of 11 percent to a high of 57 percent and were obtained in the following locations:

- Michigan (1)
- Minnesota (1)
- New Jersey (2)
- New York (1)
- Virginia (1)
- Washington, DC (1)

Based on DEA reporting and seizure data, it is apparent that SWA heroin is not shipped to the United States in the bulk (wholesale) quantities that would be necessary to successfully compete with Mexican white powder heroin on

the basis of either price or quality. Although there are a few small heroin distribution organizations in the Northeast (including West African and some native Middle Eastern DTOs) and mid-Atlantic states that source SWA heroin, their shipments tend to be small and arrive via air courier or air freight. Of the five SWA heroin samples submitted to the HSP in 2017, one was obtained from a seizure made at JFK Airport in New York while two others represented seizures made at Newark Liberty International Airport in Newark, New Jersey. The combined weight of these three heroin seizures was less than two kilograms. SWA heroin traffickers do not maintain or have access to, an elaborate drug distribution pipeline that can compete with the Mexican transnational criminal organization/drug trafficking organizations (TCOs/DTOs). Therefore, the volume and domestic distribution infrastructure of SWA trafficking organizations will likely continue to be far outstripped by that of Mexican TCOs/DTOs in the near term.

Southeast Asia

For the ninth consecutive year, no Southeast Asian (SEA) heroin samples were analyzed in 2017 through the HSP. Current reports indicate opium cultivation in Southeast Asia has declined and that the majority of SEA opium remains in Asia to meet local and regional market demand.

Fentanyl in 2017 HSP Samples

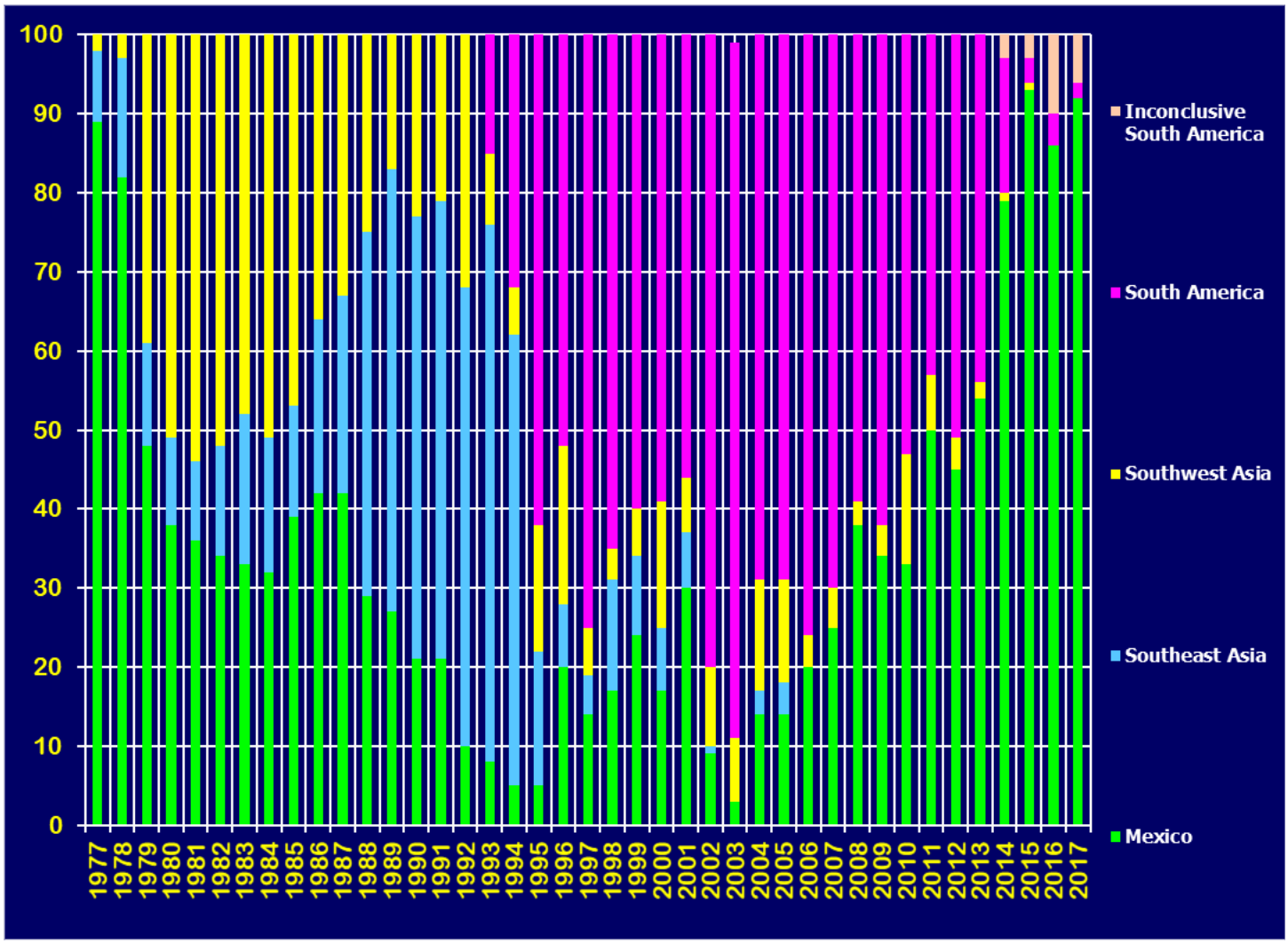
In 2017, of the 522 powder heroin samples seized and analyzed under the HSP, 72 samples (approximately 14 percent) contained fentanyl. This demonstrates that fentanyl cutting or lacing at the wholesale level was minimal. Twenty-one percent of the 75 INC-SA samples analyzed contained fentanyl; while 7.5 percent of the 385 Mexican white powder samples contained fentanyl. Fentanyl was not detected in any of the SA or SWA heroin HSP samples in 2017.

Outlook

Mexico remains the primary geographic source of the heroin samples submitted to the HSP for the fifth consecutive year, and will likely remain the primary source in the near term. In 2017, U.S. Government estimates of opium poppy cultivation in Mexico increased to record levels for the fourth consecutive year. Potential pure heroin production has also quadrupled since 2013.

Mexican TCOs/DTOs, through their extensive infrastructure in Mexico and the United States, control the heroin “pipeline” from manufacture in Mexico to at least mid-level wholesale in the United States. Once Mexican TCOs developed the capability to manufacture high quality white heroin, they were able to enter and supply the lucrative East Coast white heroin markets by using their pre-existing trafficking infrastructure in the United States. As such, they had no need to purchase white powder heroin from outside sources or transshipment areas whether from Afghanistan, Africa, South America or Canada to meet U.S. demand. Although SA heroin remains available in the United States, HSP results for 2017 clearly illustrate that SA heroin has reached an all-time low in terms of sample size and the amount analyzed under the HSP. 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. 2017 HSP results indicate that heroin from both Southwest Asia and Southeast Asia continues to have minimal impact on the U.S. heroin market.

(U) Appendix A: Heroin Source Area Distribution: 1977-2017



Source: DEA

(U) APPENDIX B: 1977-2016 HEROIN SIGNATURE PROGRAM RESULTS.

Geographic Source Area Distribution (in percent)*

Based on Net Weight of Heroin Seized and Analyzed. Heroin samples classified as UNK are not included in HSP Geographic Source Area Distribution.

Year	Mexico	Southeast Asia	Southwest Asia	South America	Inconclusive-South America
2017	92	0	<1	2	4
2016	86	0	<1	4	10
2015	93	0	1	3	3
2014	79		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
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
Source: DEA					

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.)

*** Although the new HSP classification of “Inconclusive Origin-South American” processing method (INC-SA) was formally launched in May 2015, this new classification was applied retroactively to 2014 HSP data.

(U) This product was prepared by the DEA Intelligence Program-Indicator Programs Section and the DEA Office of Forensic Sciences. Comments and questions may be addressed to the DEA Indicator Programs Section at: DEA.IntelligenceProducts@usdoj.gov. For media/press inquiries call (202) 307-7977.

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