NFLIS

NATIONAL FORENSIC LABORATORY INFORMATION SYSTEM

2016 ANNUAL REPORT

Revised April 2018

U.S. DEPARTMENT OF JUSTICE
DRUG ENFORCEMENT ADMINISTRATION
DIVERSION CONTROL DIVISION

Special NFLIS Announcement

Consistent with the continuing advancement of the utility and functions of the National Forensic Laboratory Information System (NFLIS), the Drug Enforcement Administration (DEA), Diversion Control Division, is pleased to announce enhancements to the methodology for calculating national and regional estimates and presenting data in NFLIS publications.

All Drugs Counted. Since 2010, the first, second, and third drug reported as part of a drug item were counted in NFLIS. Beginning with the 2016 NFLIS Annual Report, *all* drugs reported in an item will be counted. This change ensures that the estimates will take into consideration all reported substances, including emerging drugs of interest that may typically be reported as the fourth or fifth drug within an item. Although this change could not be applied to reporting periods before 2016, the 2016 data showed that 99.97% of drug reports are captured in the first, second, or third drug report for any item; therefore, no statistical adjustments were deemed necessary to maintain the trend with prior years.

Covariance Enhancement. Beginning with the 2016 Annual Report, an improvement to the computation of the variance for the long-term trends was implemented. This change provides more valid statistical inferences and creates consistency in the covariance estimation between these long-term trends and the prior-year comparisons.

For more complete details on the new enhancements, see Appendix A.

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Cover photographs:

Small top left: Heroin powder.
Medium bottom: White heroin bricks.
Large top: A vial containing liquid samples for analysis has been picked up by the autosampler and will be moved across then loaded into the gas chromatograph.

Highlights

- From January 1, 2016, through December 31, 2016, an estimated 906,691 distinct drug cases were submitted to State and local laboratories in the United States and analyzed by March 31, 2017. From these cases, an estimated 1,552,720 drug reports were identified.
- Cannabis/THC was the most frequently identified drug (374,712 reports) in 2016, followed by methamphetamine (314,872 reports), cocaine (214,602 reports), and heroin (173,842 reports).
- Nationally, alprazolam reports showed a steady increase from 2003 to 2010, followed by a decrease in reports through 2013, then increases from 2014 to 2016.* Oxycodone reports had dramatic increases from 2001 to 2010, followed by steady decreases through 2016. Fentanyl reports remained steady from 2001 to 2005, followed by a noticeable increase in 2006. Fentanyl reports continued to remain steady until dramatic increases occurred from 2014 through 2016. Hydrocodone reports had dramatic increases from 2001 to 2010, followed by steady decreases through 2016. Buprenorphine reports showed an S-shaped trend, with steady increases from 2006 through 2010, then more increases from 2013 to 2016. Amphetamine reports also showed an S-shaped trend, with a decrease in 2005, followed by steady increases from 2007 through 2016.
- From 2015 to 2016, national reports of alprazolam and fentanyl increased significantly, while reports of oxycodone and hydrocodone decreased significantly ($p < .05$).
- Regionally, for alprazolam, the West showed a linear-increasing trend. The Midwest, Northeast, and South regions had increasing curved trend lines, with increases from roughly 2003 to 2010, followed by slight decreases through 2013, then continued increases through 2016. For oxycodone, all regions except the Midwest showed S-shaped trends similar to the national trend. For fentanyl, the West region showed a more gradual increase from 2001 to 2014 than the other regions, followed by significant increases in 2015 and 2016. Fentanyl reports remained steady from 2001 through 2013 for the Midwest, Northeast, and South regions until dramatic increases began in 2014. For hydrocodone, all regions showed substantial increases from 2001 through at least 2009, followed by steady decreases through 2016. For buprenorphine, the Midwest and South regions showed upward-curving trends, while the trends in the West and Northeast were S-shaped. For amphetamine, the Northeast region had a linear increasing trend, while the trends in the Midwest and South regions were S-shaped.
- In 2016, oxycodone, fentanyl, and hydrocodone accounted for 66% of narcotic analgesic reports. Alprazolam accounted for 60% of the reports of identified tranquilizers and depressants. Among identified synthetic cannabinoids, FUB-AMB accounted for 26% of reports.
- Nationwide, cannabis/THC reports decreased from 2001 to 2004, slightly increased from 2005 to 2009, and continued to decrease since then through 2016. Methamphetamine reports increased from 2001 through 2005, decreased from 2005 through 2010, and continued to increase since 2011. Cocaine reports gradually increased from 2001 to 2007, then steadily decreased through 2014 until a slight increase in 2015. Heroin reports decreased from 2001 through 2007, then increased until a recent decrease in 2016. MDMA reports decreased from 2001 to 2003, then increased through 2007. A sharp decrease in MDMA reports occurred from 2010 to 2013, followed by a gradual increase through 2016.

* Curved trends are sometimes described as U-shaped (i.e., decreasing in earlier years and increasing in recent years) and S-shaped (i.e., two turns in the trend, roughly increasing-decreasing-increasing or decreasing-increasing-decreasing). See Appendix A for a more detailed methodology discussion.

INTRODUCTION

The National Forensic Laboratory Information System (NFLIS) is a program of the Drug Enforcement Administration (DEA), Diversion Control Division, which systematically collects drug identification results and associated information from drug cases submitted to and analyzed by Federal, State, and local forensic laboratories. These laboratories analyze controlled and noncontrolled substances secured in law enforcement operations across the country. NFLIS represents an important resource in monitoring illicit drug abuse and trafficking, including the diversion of legally manufactured pharmaceuticals into illegal markets. NFLIS data are used to support drug scheduling decisions and to inform drug policy and drug enforcement initiatives nationally and in local communities around the country.

NFLIS is a comprehensive information system that includes data from forensic laboratories that handle the Nation's drug analysis cases. The NFLIS participation rate, defined as the percentage of the national drug caseload represented by laboratories that have joined NFLIS, is currently over 98%. NFLIS includes 50 State systems and 101 local or municipal laboratories/laboratory systems, representing a total of 277 individual laboratories. The NFLIS database also includes Federal data from DEA and U.S. Customs and Border Protection (CBP) laboratories.

The 2016 Annual Report presents the results of drug cases submitted to State and local laboratories from January through December 2016 that were analyzed by March 31, 2017. Section 1 presents national and regional estimates for the 25 most frequently reported drugs, as well as national and regional trends from 2001 through 2016. Section 2 presents estimates of specific drugs by drug category. All estimates are based on the NEAR approach (National Estimates Based on All Reports). See Appendix A for details on the NEAR approach and Appendix B for a list of NFLIS participating and reporting laboratories. Data from Federal laboratories are also included in this publication.

Beginning with this publication, important methodological enhancements were implemented. Previously, all data presented in NFLIS publications included the first, second, and third drugs mentioned in a laboratory's reported drug items. Due to the recent increase in participating NFLIS laboratories reporting more than three drugs per item, and the appearance of emerging drugs of interest being identified as the fourth, fifth, or higher drugs in each item, this publication presents results of *all* drugs mentioned in a laboratory's reported drug items. In addition, an improvement in the computation of the covariance of trends was implemented. These enhancements are explained in detail in Appendix A.

Sections 3 and 4 present actual reported data rather than national and regional estimates; all data reported by NFLIS State and local laboratories are included. Section 3 presents a Geographic Information System (GIS) analysis on alprazolam and fentanyl reports by State and by county for selected States. Section 4 presents drugs reported by selected laboratories in cities across the country. The benefits and limitations of NFLIS are presented in Appendix C. A key area of improvement to NFLIS includes ongoing enhancements to the NFLIS Data Query System (DQS); Appendix D summarizes these DQS enhancement activities.

NORTHEAST
MIDWEST
SOUTH
ME
Augusta
Waterbury
VT
NH
Concord
Sudbury
University of MA Medical Center, Worcester
Providence
RI
MA
Hartford
CT
Suffolk County
Westchester County
Nassau County
New York City
Hudson County
Burlington County
Ocean County
Onondaga County
NY
Albany
Niagara County
Erie County
Port Crane
Newburgh
Olean
Wyoming
Yonkers
Union County
Little Falls
NJ
West Trenton
Bethlehem
Philadelphia
Sea Girt
Hammonton
Media
Harrisburg
Greensburg
Baltimore City
Cape May
Baltimore County
Montgomery County
Pikesville
Hagerstown
DE
Fairfax
Anne Arundel County
Prince George's County
Berlin
MD
VA
Richmond
Norfolk
Roanoke
WV
Highland Heights
Ashland
South Charleston
Lorain County
Cuyahoga County
Erie
Lake County
Richfield
Allegheny County
PA
Grayling
MI
Bridgeport
East Lansing
Sterling Heights
Detroit
Northville
Toledo
Mansfield PD
OH
Canton-Columbus PD
Stark County
Bowling Green
Columbus
London
Newark PD
Miami Valley
Hamilton County
Fort Wayne
Lowell
Chicago
Rockford
Joliet
Northern Illinois
DuPage County
Kenosha County
Madison
Milwaukee
Grand Rapids
Wausau
WI
Marquette
Bemidji
MN
ND
Bismarck
SD
Pierre
Rapid City
St. Paul
Des Moines
IA
Morton
IN
Indianapolis-Marion County
Indianapolis
Macon
IL
Springfield
St. Joseph
KCMO Regional
Johnson County
Topeka
St. Charles County
Belleville
St. Louis
St. Louis County
Hillsboro
Jefferson City
Evansville
Louisville
Frankfort
KY
London
Madisonville
Greensboro
Raleigh
NC
Knoxville
Asheville
Charlotte-Mecklenburg PD
Spartanburg
Wilmington PD
Anderson/Oconee
Columbia
Richland County
SC
Charleston
Nashville
TN
Cleveland
Memphis
Huntsville
Decatur
Birmingham
Tupelo
Batesville
Little Rock
Hope
Macon
Savannah
Midland
GA
Auburn
AL
Montgomery
Jackson PD
MS
Jackson
Meridian
North LA
LA
Moultrie
Jacksonville
Mobile
Gulfport
Pensacola
Baton Rouge
Southwest LA
Acadiana
New Orleans
Jefferson Parish
Orlando
Pinellas County
Tampa
Manatee County
Sarasota County
FL
Indian River
Palm Beach County
Broward County
Miami-Dade PD
Fort Myers
Cheyenne
NE
North Platte
Lincoln
Greely
Denver
Denver
Aurora
Colorado Springs
Pueblo
KS
Great Bend
Sedgwick County
Pittsburg
Springfield
Joplin
MO
SEMO Regional
Willow Springs
Northwest Region
Tulsa
OK
Tahlequah Region
Oklahoma City
Amarillo
Southwest Region
Durant Region
Hobbs
Lubbock
Garland
Fort Worth
Dallas
Abilene
Tyler
Midland
TX
Waco
Austin
Jefferson County
Houston
Houston
Bexar County
Harris County
Pasadena
Brazoria County
Laredo
Corpus Christi
McAllen
Honolulu
HI
AK
Anchorage
San Juan
PR
Mayagüez
Ponce
Reporting State Laboratory System
Participating State Laboratory System
(Not Yet Reporting)
No State Laboratory System
Individual State Laboratory
Reporting Local Laboratory
Participating Local Laboratory
(Not Yet Reporting)

Section 1

NATIONAL AND REGIONAL ESTIMATES

This section describes national and regional estimates for drugs submitted to State and local laboratories from January through December 2016 that were analyzed by March 31, 2017. Trends are presented for selected drugs from 2001 through 2016.

National and regional drug estimates presented in the following section include all drug reports. The NEAR approach was used to produce estimates for the Nation and for the U.S. census regions. The NEAR approach uses all NFLIS reporting laboratories. Appendix A provides a detailed description of the methods used in preparing these estimates.

1.1 Drug Reports

In 2016, a total of 1,552,720 drug reports were identified by State and local forensic laboratories in the United States. This estimate is an increase of less than 1% from the 1,549,466 drug reports identified during 2015. Table 1.1 presents the 25 most frequently identified drugs for the Nation and for each of the U.S. census regions.

The top 25 drugs accounted for 86% of all drugs analyzed in 2016. The majority of all drugs reported in NFLIS were identified as the top four drugs, with cannabis/THC, methamphetamine, cocaine, and heroin representing 69% of all drug reports. Nationally, 374,712 drug reports were identified as cannabis/THC (24%), 314,872 as methamphetamine (20%), 214,602 as cocaine (14%), and 173,842 as heroin (11%).

In addition, nine narcotic analgesics were among the top 25 drugs: oxycodone (37,904 reports), fentanyl (34,199 reports), hydrocodone (24,681 reports), buprenorphine (18,077 reports), morphine (6,201 reports), tramadol (5,675 reports), methadone (4,231 reports), hydromorphone (3,524 reports), and codeine (3,332 reports). Four tranquilizers and depressants were included: alprazolam (51,271 reports), clonazepam (12,274 reports), phencyclidine (PCP) (4,796 reports), and diazepam (4,702 reports). There were also two phenethylamines: amphetamine (12,551 reports) and MDMA (5,726 reports). In addition, there were two synthetic cannabinoids: FUB-AMB (6,602 reports) and 5F-ADB (4,412 reports). Naloxone (3,806 reports), a medication approved by the U.S. Food and Drug Administration (FDA) to prevent opioid overdoses, as well as controlled substances psilocin/psilocibin (3,798 reports) and lysergic acid diethylamide (LSD) (3,475 reports) were also included in the list of the 25 most frequently identified drugs.

Table 1.1 NATIONAL AND REGIONAL ESTIMATES FOR THE 25 MOST FREQUENTLY IDENTIFIED DRUGS[1]

Estimated number and percentage of total drugs submitted to laboratories from January 1, 2016, through December 31, 2016, and analyzed by March 31, 2017

	National		West		Midwest		Northeast		South	
Drug	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Cannabis/THC	374,712	24.13%	45,250	17.93%	109,012	29.07%	78,735	29.07%	141,714	21.65%
Methamphetamine	314,872	20.28%	111,799	44.30%	58,885	15.70%	4,775	1.76%	139,413	21.30%
Cocaine	214,602	13.82%	16,654	6.60%	47,909	12.77%	54,323	20.05%	95,716	14.63%
Heroin	173,842	11.20%	30,658	12.15%	46,229	12.33%	54,698	20.19%	42,257	6.46%
Alprazolam	51,271	3.30%	5,024	1.99%	10,548	2.81%	7,036	2.60%	28,664	4.38%
Oxycodone	37,904	2.44%	3,334	1.32%	7,971	2.13%	8,171	3.02%	18,429	2.82%
Fentanyl	34,199	2.20%	418	0.17%	12,533	3.34%	14,388	5.31%	6,859	1.05%
Hydrocodone	24,681	1.59%	2,993	1.19%	6,237	1.66%	977	0.36%	14,475	2.21%
Buprenorphine	18,077	1.16%	1,335	0.53%	3,571	0.95%	4,743	1.75%	8,427	1.29%
Amphetamine	12,551	0.81%	1,036	0.41%	3,484	0.93%	1,910	0.70%	6,121	0.94%
Clonazepam	12,274	0.79%	953	0.38%	2,840	0.76%	2,381	0.88%	6,100	0.93%
FUB-AMB	6,602	0.43%	494	0.20%	1,247	0.33%	796	0.29%	4,066	0.62%
Morphine	6,201	0.40%	910	0.36%	1,535	0.41%	570	0.21%	3,186	0.49%
MDMA	5,726	0.37%	1,932	0.77%	1,640	0.44%	573	0.21%	1,580	0.24%
Tramadol	5,675	0.37%	490	0.19%	1,788	0.48%	514	0.19%	2,882	0.44%
Phencyclidine (PCP)	4,796	0.31%	364	0.14%	885	0.24%	1,612	0.60%	1,935	0.30%
Diazepam	4,702	0.30%	518	0.21%	1,246	0.33%	453	0.17%	2,484	0.38%
5F-ADB	4,412	0.28%	123	0.05%	202	0.05%	127	0.05%	3,959	0.60%
Methadone	4,231	0.27%	617	0.24%	830	0.22%	858	0.32%	1,924	0.29%
Naloxone	3,806	0.25%	84	0.03%	466	0.12%	1,593	0.59%	1,663	0.25%
Psilocin/psilocibin	3,798	0.24%	980	0.39%	1,186	0.32%	417	0.15%	1,215	0.19%
Hydromorphone	3,524	0.23%	262	0.10%	443	0.12%	125	0.05%	2,694	0.41%
Lysergic acid diethylamide (LSD)	3,475	0.22%	512	0.20%	1,397	0.37%	387	0.14%	1,180	0.18%
Codeine	3,332	0.21%	442	0.17%	761	0.20%	443	0.16%	1,686	0.26%
Noncontrolled, non-narcotic[2]	2,861	0.18%	*	*	47	0.01%	606	0.22%	1,569	0.24%
Top 25 Total	1,332,125	85.79%	227,822	90.27%	322,892	86.10%	241,212	89.05%	540,200	82.55%
All Other Drug Reports	220,594	14.21%	24,570	9.73%	52,128	13.90%	29,673	10.95%	114,223	17.45%
Total Drug Reports[3]	1,552,720	100.00%	252,392	100.00%	375,020	100.00%	270,885	100.00%	654,423	100.00%

FUB-AMB=Methyl 2-({1-[(4-fluorophenyl)methyl]-1H-indazole-3-carbonyl}amino)-3-methylbutanoate
MDMA=3,4-Methylenedioxymethamphetamine
5F-ADB (5F-MDMB-PINACA)=Methyl 2-(1-(5-fluoropentyl)-1H-indazole-3-carboxamido)-3,3-dimethylbutanoate

** The estimate for this drug does not meet the standards of precision and reliability. See Appendix A for a more detailed methodology discussion.*
[1] Sample n's and 95% confidence intervals for all estimates are available on request.
[2] As reported by NFLIS laboratories, with no specific drug name provided.
[3] Numbers and percentages may not sum to totals because of rounding.

1.2 Drug Cases Analyzed

Drug analysis results are also reported to NFLIS at the case level. These case-level data typically describe all drugs identified within a drug-related incident, although a small proportion of laboratories may assign a single case number to all drug submissions related to an entire investigation. Table 1.2 presents national estimates of the top 25 drug-specific cases. This table illustrates the number of cases that contained one or more reports of the specified drug. In 2016, there were 1,183,436 drug-specific cases submitted to and analyzed by State and local forensic laboratories, representing a 1% decrease from the 1,192,079 drug-specific cases in 2015.

Among all drug cases, cannabis/THC was the most common drug reported during 2016. Nationally, 29% of drug cases contained one or more reports of cannabis/THC, followed by methamphetamine, which was identified in 26% of all drug cases. About 19% of drug cases contained cocaine, and 15% contained heroin. Alprazolam was reported in 5% of cases, and oxycodone and fentanyl each were reported in about 3% of cases.

Seized fentanyl and heroin

Table 1.2 *National Case Estimates*
Top 25 estimated number of drug-specific cases and their percentage of distinct cases, January 1, 2016, through December 31, 2016

Drug	Number	Percent
Cannabis/THC	266,324	29.37%
Methamphetamine	239,531	26.42%
Cocaine	168,783	18.62%
Heroin	132,313	14.59%
Alprazolam	42,312	4.67%
Oxycodone	29,335	3.24%
Fentanyl	26,551	2.93%
Hydrocodone	20,685	2.28%
Buprenorphine	16,128	1.78%
Clonazepam	10,707	1.18%
Amphetamine	10,495	1.16%
Morphine	5,396	0.60%
Tramadol	4,908	0.54%
FUB-AMB	4,812	0.53%
MDMA	4,208	0.46%
Phencyclidine (PCP)	4,195	0.46%
Diazepam	4,161	0.46%
Methadone	3,737	0.41%
Naloxone	3,493	0.39%
5F-ADB	3,426	0.38%
Psilocin/Psilocibin	3,376	0.37%
Hydromorphone	3,087	0.34%
LSD	2,899	0.32%
Codeine	2,893	0.32%
Lorazepam	2,277	0.25%
Top 25 Total	1,016,034	112.06%
All Other Drugs	167,401	18.46%
Total All Drugs[1]	1,183,436	130.52%[2]

FUB-AMB=Methyl 2-({1-[(4-fluorophenyl)methyl]-1H-indazole-3-carbonyl}amino)-3-methylbutanoate

MDMA=3,4-Methylenedioxymethamphetamine

5F-ADB (5F-MDMB-PINACA)=Methyl 2-(1-(5-fluoropentyl)-1H-indazole-3-carboxamido)-3,3-dimethylbutanoate

[1] *Numbers and percentages may not sum to totals because of rounding.*

[2] *Multiple drugs can be reported within a single case, so the cumulative percentage exceeds 100%. The estimated national total of distinct case percentages is based on 906,691 distinct cases submitted to State and local laboratories from January 1, 2016, through December 31, 2016, and analyzed by March 31, 2017.*

Drugs Reported by Federal Laboratories

The majority of drug reports presented in this section are from the eight U.S. Drug Enforcement Administration (DEA) laboratories. The data reflect results of substance evidence from drug seizures, undercover drug buys, and other evidence analyzed at DEA laboratories across the country. DEA data include results for drug cases submitted by DEA agents, other Federal law enforcement agencies, and select local police agencies. Although DEA data capture domestic and international drug cases, the results presented in this section describe only those drugs obtained within the United States. In addition to drug reports from the DEA, drug reports from seven U.S. Customs and Border Protection (CBP) laboratories are included.

A total of 35,829 drugs were submitted to DEA and CBP laboratories in 2016 and analyzed by March 31, 2017, or about 2% of the estimated 1.55 million drugs reported by NFLIS State and local laboratories during this period. In 2016, about half of the drugs reported by DEA and CBP laboratories were identified as methamphetamine (17%), cocaine (13%), heroin (10%), or cannabis/THC (6%). Fentanyl was identified in 3% of the reported drugs.

MOST FREQUENTLY REPORTED DRUGS BY FEDERAL LABORATORIES[1]

Number and percentage of drugs submitted to laboratories from January 1, 2016, through December 31, 2016, and analyzed by March 31, 2017

Drug	Number	Percent
Methamphetamine	6,027	16.82%
Cocaine	4,633	12.93%
Heroin	3,695	10.31%
Cannabis/THC	2,176	6.07%
Fentanyl	925	2.58%
FUB-AMB	544	1.52%
Oxycodone	522	1.46%
Phenacetin	398	1.11%
Testosterone	334	0.93%
Alprazolam	249	0.69%
All Other Drug Reports	16,326	45.57%
Total Drug Reports	35,829	100.00%[2]

FUB-AMB=Methyl 2-({1-[(4-fluorophenyl)methyl]-1H-indazole-3-carbonyl}amino)-3-methylbutanoate

[1] *Federal drug reports in this table include 33,303 reports from Drug Enforcement Administration laboratories and 2,526 reports from U.S. Customs and Border Protection laboratories.*

[2] *Numbers and percentages may not sum to totals because of rounding.*

1.3 National and Regional Drug Trends

The remainder of this section presents annual national and regional trends of selected drugs submitted to State and local laboratories during each annual data reference period and analyzed within three months of the end of each period. The trend analyses test the data for the presence of linear and curved trends using statistical methods described in more detail in Appendix A, including the improvement to the covariance estimation in the long-term analysis newly implemented for 2016. Curved trends are sometimes described as U-shaped (i.e., decreasing in earlier years and increasing in recent years) and S-shaped (i.e., two turns in the trend, roughly increasing-decreasing-increasing or decreasing-increasing-decreasing). Because the trends are determined through regression modeling, the descriptions of the trends detailed in this section may differ slightly from the plotted lines of estimates featured in Figures 1.1 through 1.15. Previously, only the first, second, and third drugs reported as part of a drug item were counted in NFLIS. Beginning with this publication, estimates include all drug reports identified among the NFLIS laboratories' reported drug items.

National prescription drug trends

Figures 1.1 and 1.2 present national trends for the estimated number of prescription drug reports that were identified as alprazolam, oxycodone, fentanyl, hydrocodone, buprenorphine, and amphetamine. Trend results include the following:

- Alprazolam reports showed a steady increase from 2003 to 2010, followed by a decrease in reports from 2011 to 2013. Reports significantly increased from 2014 to 2016.
- Oxycodone reports had dramatic increases from 2001 to 2010, followed by steady decreases through 2016. The number of oxycodone reports in 2016 was comparable with the number of reports in 2008.

Figure 1.1 National trend estimates for alprazolam, oxycodone, and fentanyl, January 2001–December 2016

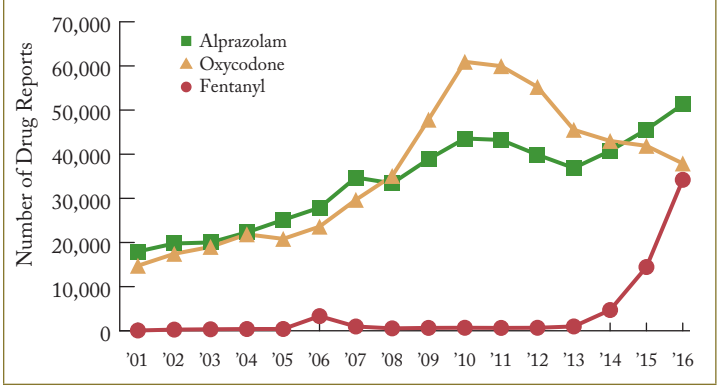
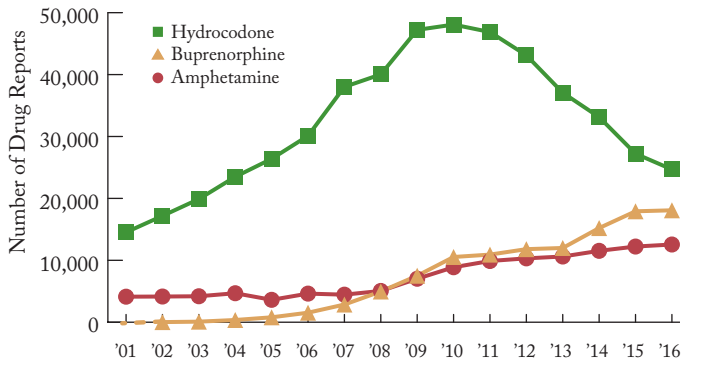


Figure 1.2 National trend estimates for hydrocodone, buprenorphine, and amphetamine, January 2001–December 2016[1]



[1] *A dashed trend line indicates that estimates did not meet the criteria for precision or reliability. See Appendix A for a more detailed methodology discussion.*

- Fentanyl reports remained steady from 2001 to 2005, followed by a noticeable increase in 2006. Fentanyl reports continued to remain steady until dramatic increases occurred from 2014 through 2016.
- Hydrocodone reports had dramatic increases from 2001 to 2010, followed by steady decreases through 2016. The number of hydrocodone reports in 2016 was similar to the number of reports in 2004.
- Buprenorphine and amphetamine reports showed S-shaped trends. Buprenorphine reports had a steady increase from 2006 through 2010, then a more substantial increase from 2013 to 2016. Amphetamine reports were steady from 2001 through 2004, followed by a decrease in 2005; reports then steadily increased from 2007 through 2016.

Significance tests were also performed on differences from 2015 to 2016 to identify more recent changes. Across these two periods, reports of alprazolam (from 45,584 to 51,271 reports) and fentanyl (from 14,440 to 34,199 reports) increased significantly ($p < .05$). Reports of oxycodone (from 41,894 to 37,904 reports) and hydrocodone (from 27,219 to 24,681 reports) decreased significantly. The increases in buprenorphine (from 17,917 to 18,077 reports) and amphetamine (from 12,222 to 12,551 reports) were not statistically significant.

Other national drug trends

Figures 1.3 and 1.4 present national trends for reports of cannabis/THC, methamphetamine, cocaine, heroin, and MDMA. Results include the following:

- Cannabis/THC reports decreased from 2001 to 2004, slightly increased from 2005 to 2009, and decreased since 2009.
- Methamphetamine reports increased from 2001 through 2005, decreased from 2005 through 2010, and continued to increase since 2011.
- Cocaine reports gradually increased from 2001 to 2007, then steadily decreased through 2014 until a slight increase in 2015.
- Heroin reports decreased from 2001 through 2006, then increased through 2015 until a recent decrease in 2016.
- MDMA reports decreased from 2001 to 2003, then increased through 2007. A sharp decrease in reports occurred from 2010 to 2013, followed by a gradual increase through 2016.

More recently, from 2015 to 2016, reports of cannabis/THC (from 395,767 to 374,712 reports) and heroin (from 187,868 to 173,842 reports) decreased significantly, while reports of methamphetamine (from 272,823 to 314,872 reports) and MDMA (from 5,188 to 5,726 reports) increased significantly ($p < .05$). The decrease in cocaine (from 216,129 to 214,602 reports) was not statistically significant.

Figure 1.3 National trend estimates for cannabis/THC and methamphetamine, January 2001–December 2016

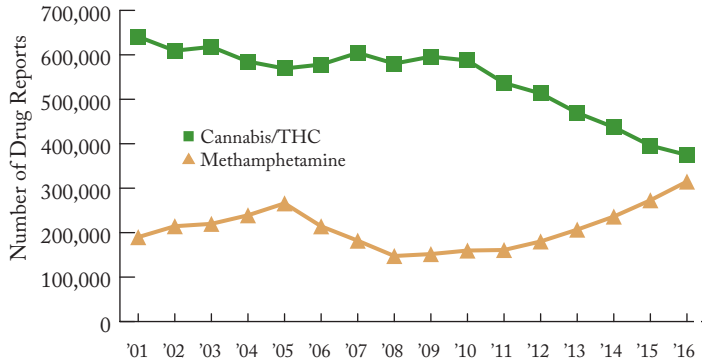
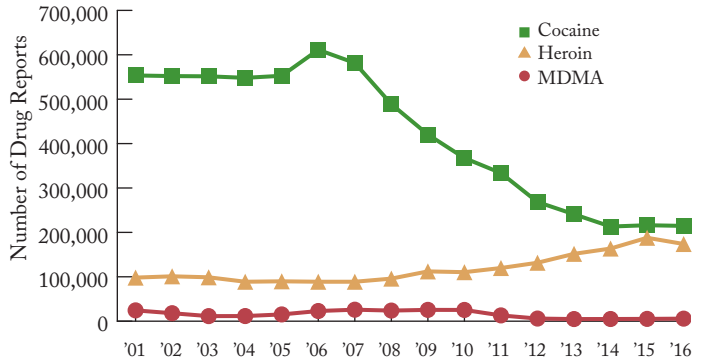


Figure 1.4 National trend estimates for cocaine, heroin, and MDMA, January 2001–December 2016



Regional prescription drug trends

Figures 1.5 through 1.10 show regional trends per 100,000 persons aged 15 or older for reports of alprazolam, oxycodone, fentanyl, hydrocodone, buprenorphine, and amphetamine from 2001 to 2016. These figures illustrate changes in prescription drugs reported over time, taking into account the population aged 15 years or older in each U.S. census region. Regional trend results include the following:

- For alprazolam, the West showed a linear-increasing trend. The Midwest, Northeast, and South regions had increasing curved trend lines, with increases from roughly 2003 to 2010, followed by slight decreases through 2013, then continued increases through 2016.
- For oxycodone, all regions except the Midwest showed S-shaped trends similar to the national trend. The Midwest trend had a slower rate of decrease from 2011 through 2016 than the other regions.
- For fentanyl, the West region showed a more gradual increase from 2001 to 2014 than the other regions, followed by significant increases in 2015 and 2016 ($p < .05$). Reports remained fairly steady from 2001 through 2013 for the Midwest, Northeast, and South regions until significant increases began in 2014. The Midwest and Northeast regions had noticeable increases in 2006 as reflected in the national trend.
- For hydrocodone, all regions showed significant increases from 2001 through at least 2009, followed by steady decreases through 2016.
- For buprenorphine, the Midwest and South regions showed upward-curving trends. The West and Northeast had S-shaped trends. The Northeast experienced continued increases from 2003 to 2011, after which the trend began to turn downward. The trend in the West began to turn downward in 2016.
- For amphetamine, the Northeast region had a linear-increasing trend. The Midwest and South regions had S-shaped trends, with a steady increase in the South from 2008 to 2015, and a similar increase in the Midwest through 2016. Because of the variable nature of the amphetamine reports in the West region, no discernible trend could be identified.

More recently, from 2015 to 2016, alprazolam reports increased significantly in all regions except the West, while fentanyl reports increased significantly in all regions ($p < .05$). Oxycodone reports decreased significantly in all regions except the Midwest, while hydrocodone reports decreased significantly in all regions. Buprenorphine reports increased significantly in the Midwest and decreased significantly in the West. Amphetamine reports increased significantly in the Northeast and Midwest regions and decreased significantly in the West.

Figure 1.5 Regional trends in alprazolam reported per 100,000 persons aged 15 or older, January 2001–December 2016[1]

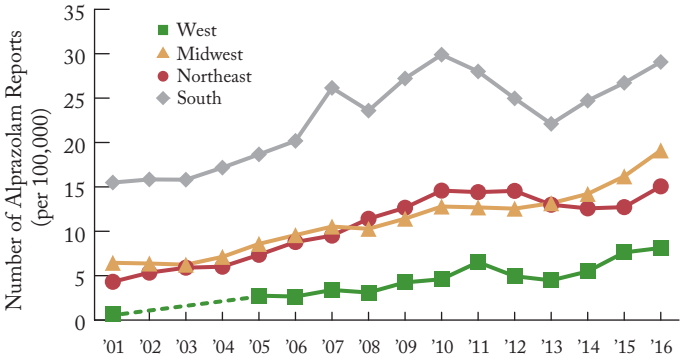


Figure 1.6 Regional trends in oxycodone reported per 100,000 persons aged 15 or older, January 2001–December 2016

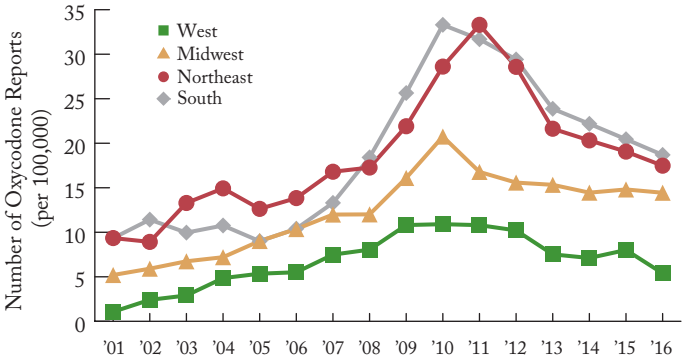
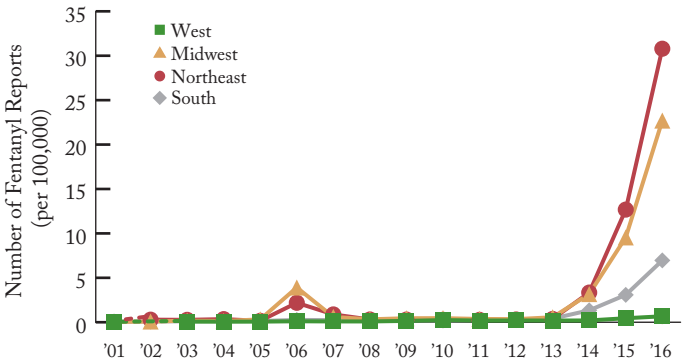


Figure 1.7 Regional trends in fentanyl reported per 100,000 persons aged 15 or older, January 2001–December 2016[1]



Note: U.S. census 2016 population data by age were not available for this publication. Population data for 2016 were imputed.

[1] *A dashed trend line indicates that estimates did not meet the criteria for precision or reliability. See Appendix A for a more detailed methodology discussion.*

Figure 1.8 Regional trends in hydrocodone reported per 100,000 persons aged 15 or older, January 2001–December 2016

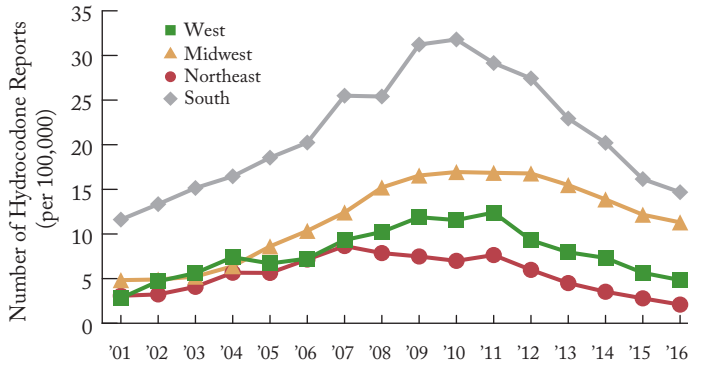


Figure 1.9 Regional trends in buprenorphine reported per 100,000 persons aged 15 or older, January 2001–December 2016[1]

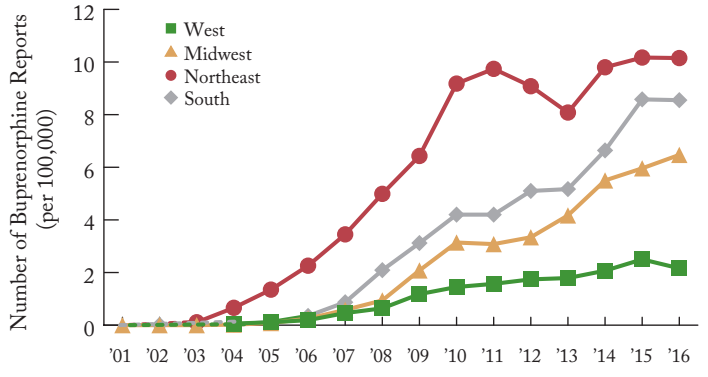
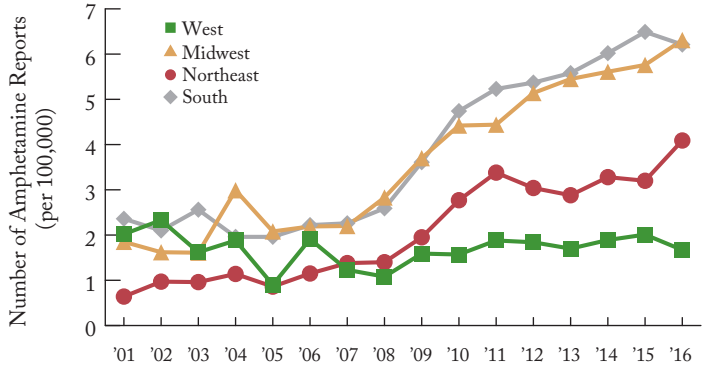


Figure 1.10 Regional trends in amphetamine reported per 100,000 persons aged 15 or older, January 2001–December 2016



Note: U.S. census 2016 population data by age were not available for this publication. Population data for 2016 were imputed.

[1] *A dashed trend line indicates that estimates did not meet the criteria for precision and reliability. See Appendix A for a more detailed methodology discussion.*

Other regional drug trends

Figures 1.11 through 1.15 present regional trends per 100,000 persons aged 15 or older for cannabis/THC, methamphetamine, cocaine, heroin, and MDMA reports from 2001 through 2016. Notable trends include the following:

- For cannabis/THC reports, the Northeast region had the most significant periods of increase (2003 through 2008) and decrease (2009 through 2015). The other three regions had more rolling decreasing trend lines from 2001 through 2016.
- For methamphetamine reports, the trends for the Northeast and South regions were S shaped. The West and Midwest regions had more pronounced decreases than the other two regions from around 2005 through 2010. All regions showed increases beginning around 2010 and 2011 and continuing through 2016, except that the West region had a slight decrease in reports in 2016.
- For cocaine, the West region had a linear-decreasing trend. The South region had a rolling decreasing trend. The Midwest and Northeast regions had increases from 2001 through 2007, followed by more substantial decreases in reports until increases occurred in 2015 and 2016.
- For heroin, all regions showed upward-facing U-shaped trends except for the Midwest. The lowest point occurred in 2006 for the West region, in 2007 for the Northeast region, and in 2010 for the South region. The largest increase in heroin reports in the Midwest region occurred from 2007 through 2015.
- For MDMA, the trend lines for all four regions showed a decrease from 2001 through 2004, followed by an increase through 2009. The West and Midwest regions had much steeper increases during this time. The regional trend lines decreased through 2014, followed by increases in 2015 and 2016 for all regions except the West.

Between 2015 and 2016, cannabis/THC reports decreased significantly in the Midwest and West regions, and heroin reports decreased significantly in the Northeast and Midwest regions ($p < .05$). Methamphetamine reports increased significantly in the Midwest and South regions, while MDMA reports increased significantly in the Northeast and South regions. Cocaine reports increased significantly in the Midwest region and decreased significantly in the West region.

Figure 1.11 Regional trends in cannabis/THC reported per 100,000 persons aged 15 or older, January 2001–December 2016

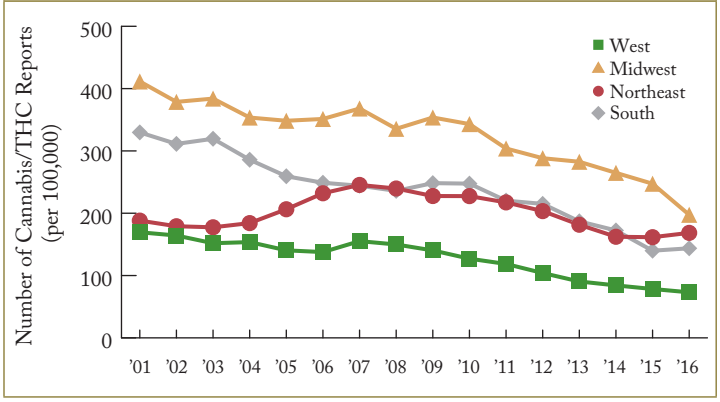


Figure 1.12 Regional trends in methamphetamine reported per 100,000 persons aged 15 or older, January 2001–December 2016[1]

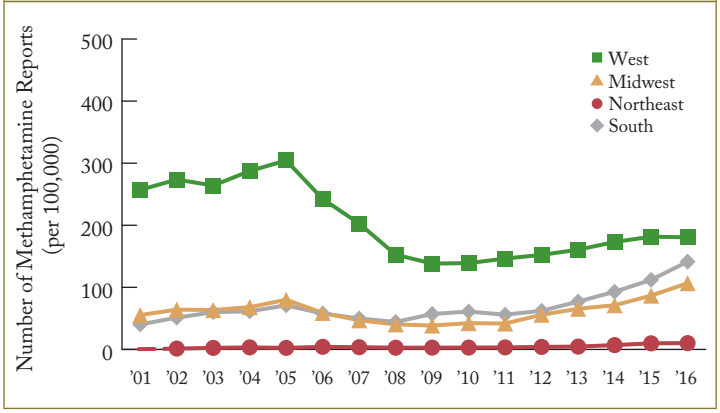
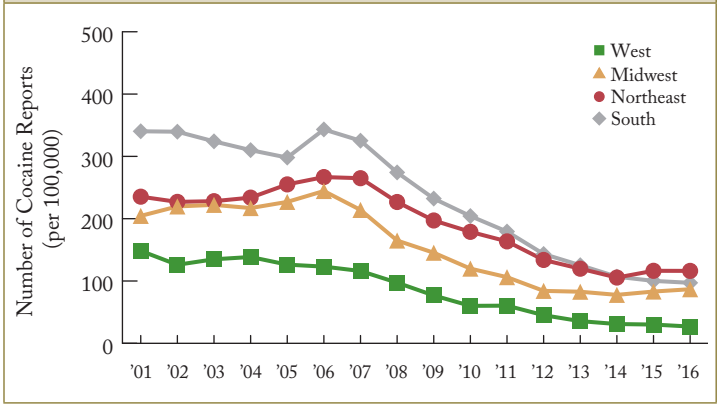


Figure 1.13 Regional trends in cocaine reported per 100,000 persons aged 15 or older, January 2001–December 2016



Note: U.S. census 2016 population data by age were not available for this publication. Population data for 2016 were imputed.

[1] *A dashed trend line indicates that estimates did not meet the criteria for precision or reliability. See Appendix A for a more detailed methodology discussion.*

Figure 1.14 Regional trends in heroin reported per 100,000 persons aged 15 or older, January 2001–December 2016

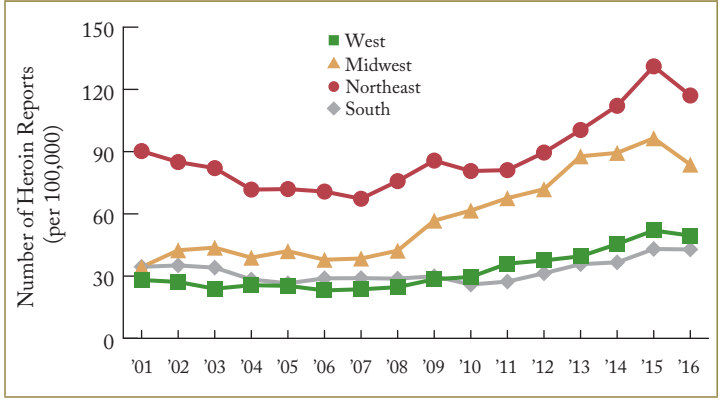
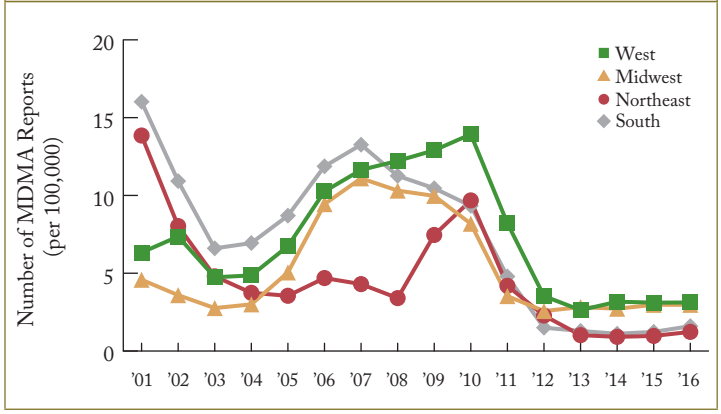


Figure 1.15 Regional trends in MDMA reported per 100,000 persons aged 15 or older, January 2001–December 2016



Section 2

MAJOR DRUG CATEGORIES

Section 2 presents national and regional estimates of specific drugs by drug category using the NEAR approach (see Appendix A for a description of the methodology). All drugs mentioned in laboratories' drug items are included. An estimated 1,552,720 drugs were submitted to State and local laboratories during 2016 and were analyzed by March 31, 2017.

2.1 Narcotic Analgesics

Among narcotic analgesics, the use and abuse of opioids continue to be a serious public health problem. Used to treat pain, opioids are highly addictive and dangerous when misused. In 2015, opioids accounted for 63% of all drug overdose deaths in the United States. From 2014 to 2015, the opioid death rate increased by nearly 16%. Among specific opioids, the death rate from synthetic opioids other than methadone, including fentanyl, increased by 72%.[i]

A total of 145,909 narcotic analgesic reports were identified by NFLIS laboratories in 2016, representing 9% of all drug reports (Table 2.1). Oxycodone (26%), fentanyl (23%), and hydrocodone (17%) accounted for most of the narcotic analgesic reports. Other narcotic analgesics reported included buprenorphine (12%), morphine (4%), tramadol (4%), and methadone (3%). The types of narcotic analgesics reported varied considerably by region (Figure 2.1). In comparison with reports from other regions in the country, the West and South regions reported the highest percentage of oxycodone (30% and 29%, respectively) and hydrocodone (27% and 23%, respectively). The Northeast (43%) and Midwest (33%) regions reported the highest percentage of fentanyl. Buprenorphine accounted for 14% of narcotic analgesics in the Northeast region, 13% in the South region, and 12% in the West region.

Table 2.1 *Narcotic Analgesics*
Number and percentage of narcotic analgesic reports in the United States, 2016[1]

Narcotic Analgesic Reports	Number	Percent
Oxycodone	37,904	25.98%
Fentanyl	34,199	23.44%
Hydrocodone	24,681	16.92%
Buprenorphine	18,077	12.39%
Morphine	6,201	4.25%
Tramadol	5,675	3.89%
Methadone	4,231	2.90%
Hydromorphone	3,524	2.42%
Codeine	3,332	2.28%
Furanyl fentanyl	2,273	1.56%
Oxymorphone	2,120	1.45%
Acetylfentanyl	1,669	1.14%
U-47700	533	0.37%
3-Methylfentanyl	427	0.29%
Mitragynine	257	0.18%
Other narcotic analgesics	807	0.55%
Total Narcotic Analgesic Reports[2]	145,909	100.00%
Total Drug Reports	1,552,720	

[i] Rudd, R. A., Seth, P., David, F., & Scholl, L. (2016, December 30). Increases in drug and opioid-involved overdose deaths — United States, 2010–2015. *Morbidity and Mortality Weekly Report, 65,* 1445–1452. Retrieved from https://www.cdc.gov/mmwr/volumes/65/wr/mm655051e1.htm

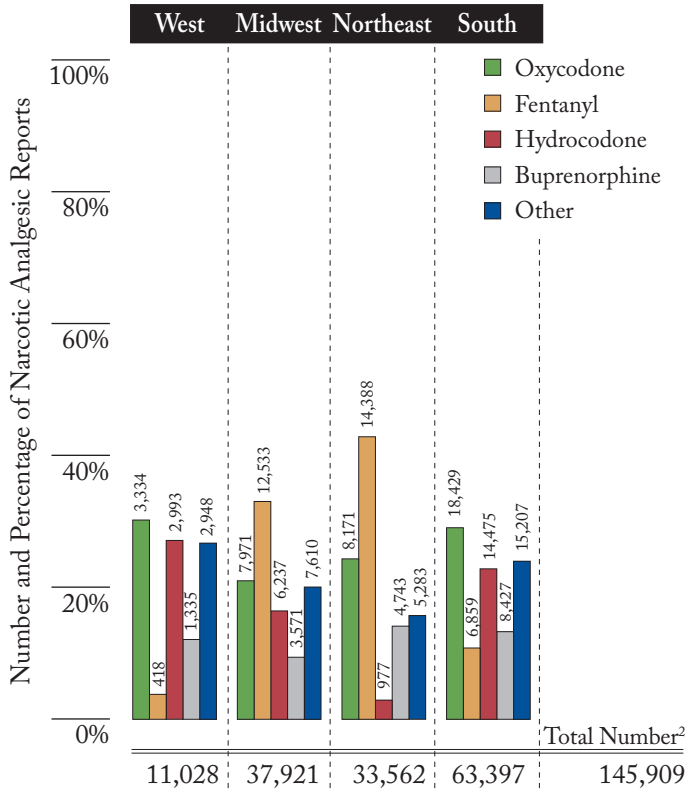
Table 2.1 Notes:

U-47700=3,4-Dichloro-N-[2-(dimethylamino)cyclohexyl]-N-methylbenzamide

[1] *Includes drugs submitted to laboratories from January 1, 2016, through December 31, 2016, that were analyzed by March 31, 2017.*

[2] *Numbers and percentages may not sum to totals because of rounding.*

Figure 2.1 Distribution of narcotic analgesic reports within region, 2016[1]



2.2 Tranquilizers and Depressants

Tranquilizers and depressants slow brain function and are prescribed to treat a variety of issues, including anxiety and sleep problems. Long-term use and misuse can cause dependence.[ii] Admissions to substance abuse treatment for tranquilizers increased annually from 2005 through 2011, then decreased annually through 2015 to 14,217 treatment admissions.[iii]

Approximately 5% of all drug reports in 2016, or 84,905 reports, were identified by NFLIS laboratories as tranquilizers and depressants (Table 2.2). Alprazolam accounted for 60% of reported tranquilizers and depressants. Approximately 14% of tranquilizers and depressants were identified as clonazepam. Alprazolam was identified in more than one-half of the tranquilizers and depressants reported across all regions, with the highest percentage reported in the South region (64%) (Figure 2.2). Clonazepam accounted for 18% of tranquilizers and depressants identified in the Northeast region and 16% identified in the Midwest region. The Northeast region reported the highest percentage of PCP (12%), while the Midwest region reported the highest percentage of diazepam (7%).

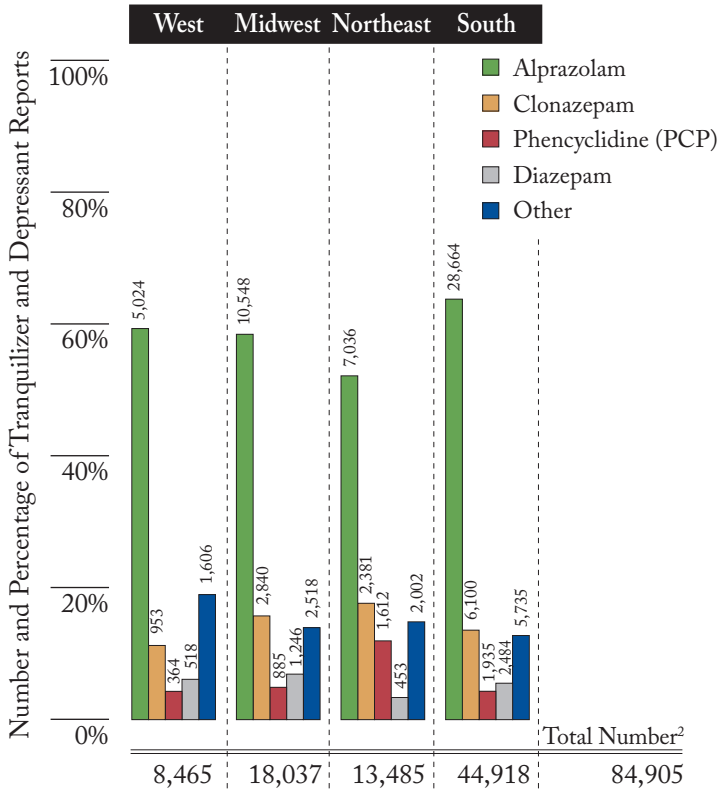
[ii] U.S. Drug Enforcement Administration. (2015). *Drugs of abuse: A DEA resource guide* (2015 ed.). Retrieved from https://www.dea.gov/pr/multimedia-library/publications/drug_of_abuse.pdf

[iii] Center for Behavioral Health Statistics and Quality. (2017, February). *Treatment Episode Data Set (TEDS): 2005-2015. National admissions to substance abuse treatment services* (HHS Publication No. SMA 17-5037, BHSIS Series S-91). Rockville, MD: Substance Abuse and Mental Health Services Administration. Retrieved from https://wwwdasis.samhsa.gov/dasis2/teds.htm

Table 2.2 *Tranquilizers and Depressants*
Number and percentage of tranquilizer and depressant reports in the United States, 2016[1]

Tranquilizer and Depressant Reports	Number	Percent
Alprazolam	51,271	60.39%
Clonazepam	12,274	14.46%
Phencyclidine (PCP)	4,796	5.65%
Diazepam	4,702	5.54%
Lorazepam	2,563	3.02%
Carisoprodol	2,176	2.56%
Zolpidem	1,446	1.70%
Ketamine	1,247	1.47%
Cyclobenzaprine	1,083	1.28%
Etizolam	573	0.67%
Pregabalin	464	0.55%
Hydroxyzine	394	0.46%
Temazepam	295	0.35%
Butalbital	257	0.30%
Gamma-hydroxybutrate (GHB)	180	0.21%
Other tranquilizers and depressants	1,183	1.39%
Total Tranquilizer and Depressant Reports[2]	84,905	100.00%
Total Drug Reports	1,552,720	

Figure 2.2 Distribution of tranquilizer and depressant reports within region, 2016[1]



[1] *Includes drugs submitted to laboratories from January 1, 2016, through December 31, 2016, that were analyzed by March 31, 2017.*

[2] *Numbers and percentages may not sum to totals because of rounding.*

2.3 Anabolic Steroids

Anabolic steroids are different from other drugs because they are initially taken to improve appearance or performance and not for the euphoria or "high" associated with other drugs used illicitly. However, use of anabolic steroids can lead to addiction for which opioids and antidepressants are often prescribed to help alleviate withdrawal symptoms.[iv]

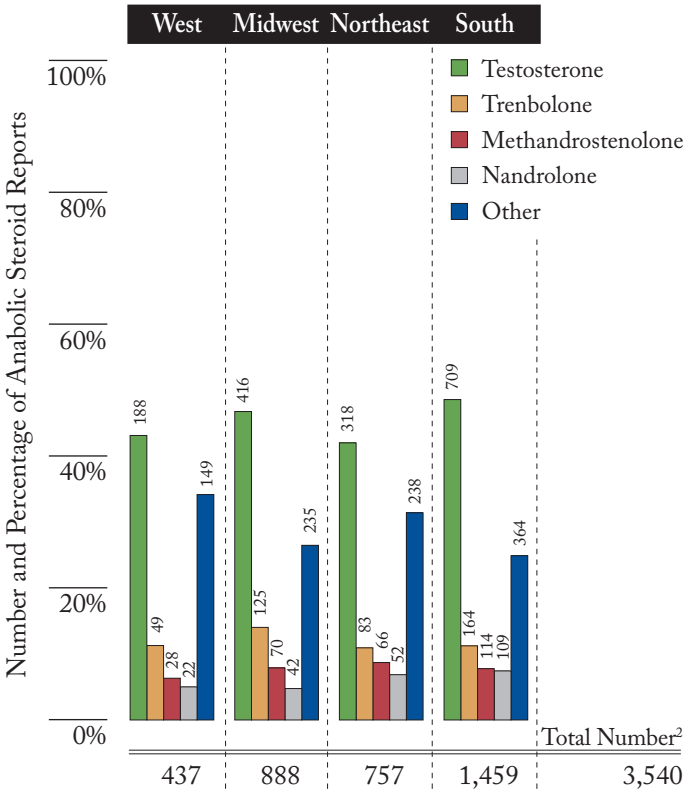
During 2016, a total of 3,540 drug reports were identified as anabolic steroids (Table 2.3), representing less than 1% of all drug reports. The most commonly identified anabolic steroid was testosterone (46%), followed by trenbolone (12%), methandrostenolone (8%), nandrolone (6%), and stanozolol (6%). Testosterone accounted for 49% of anabolic steroids reported in the South region, 47% in the Midwest region, 43% in the West region, and 42% in the Northeast region (Figure 2.3). The Midwest region reported the highest percentage of trenbolone (14%), the Northeast region reported the highest percentage of methandrostenolone (9%), and the Northeast and South regions reported the highest percentage of nandrolone (7% each).

Anabolic steroids

Table 2.3 *Anabolic Steroids*
Number and percentage of anabolic steroid reports in the United States, 2016[1]

Anabolic Steroid Reports	Number	Percent
Testosterone	1,631	46.08%
Trenbolone	421	11.89%
Methandrostenolone	277	7.83%
Nandrolone	225	6.35%
Stanozolol	224	6.31%
Drostanolone	147	4.15%
Oxandrolone	146	4.13%
Boldenone	132	3.74%
Oxymetholone	92	2.59%
Mesterolone	26	0.72%
Methenolone	17	0.47%
Mestanolone	12	0.34%
Dehydrochlormethyltestosterone	10	0.28%
Methyltestosterone	6	0.18%
Methandriol	5	0.14%
Other steroids	170	4.81%
Total Anabolic Steroid Reports[2]	3,540	100.00%
Total Drug Reports	1,552,720	

Figure 2.3 Distribution of anabolic steroid reports within region, 2016[1]



[1] *Includes drugs submitted to laboratories from January 1, 2016, through December 31, 2016, that were analyzed by March 31, 2017.*

[2] *Numbers and percentages may not sum to totals because of rounding.*

[iv] National Institute on Drug Abuse. (2016, March). *What are anabolic steroids?* Retrieved from https://www.drugabuse.gov/publications/drugfacts/anabolic-steroids

2.4 Phenethylamines

Phenethylamines are synthetic drugs ingested for their stimulant- and hallucinogen-like effects on the central nervous system. They are most commonly sold in a powder form or as a powder-filled capsule but are usually consumed through injection. Synthetic phenethylamines (and more specifically, synthetic cathinones) are associated with severe side effects, including violent behavior and often death.[v]

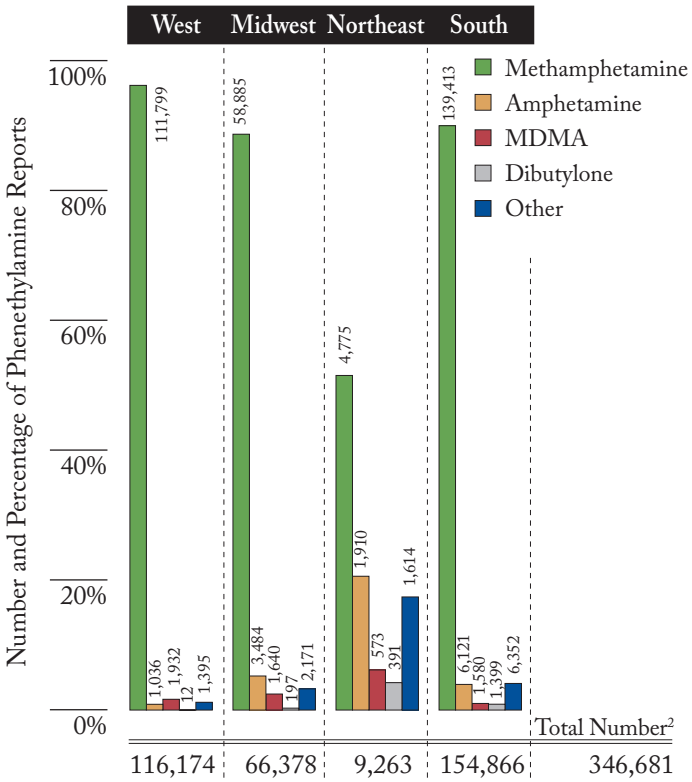
NFLIS laboratories identified 346,681 phenethylamine reports in 2016, representing 22% of all drug reports (Table 2.4). Of these, 91% were identified as methamphetamine. Among the other phenethylamine reports, 4% were identified as amphetamine and 2% as MDMA. Methamphetamine accounted for 96% of phenethylamine reports in the West region, 90% in the South region, 89% in the Midwest region, and 52% in the Northeast region (Figure 2.4). Approximately 21% of the phenethylamines reported in the Northeast region were amphetamine. The Northeast region also reported the highest percentages of MDMA (6%) and dibutylone (4%).

Table 2.4 *Phenethylamines*
Number and percentage of phenethylamine reports in the United States, 2016[1]

Phenethylamine Reports	Number	Percent
Methamphetamine	314,872	90.82%
Amphetamine	12,551	3.62%
MDMA	5,726	1.65%
Dibutylone	2,000	0.58%
Lisdexamfetamine	1,821	0.53%
N-Ethylpentylone	1,720	0.50%
MDA	1,478	0.43%
Ethylone	1,230	0.35%
alpha-PVP	1,036	0.30%
Pentylone	627	0.18%
Phentermine	560	0.16%
25I-NBOMe	395	0.11%
Methylone	189	0.05%
4-chloromethcathinone	162	0.05%
Benzphetamine	151	0.04%
Other phenethylamines	2,162	0.62%
Total Phenethylamine Reports[2]	346,681	100.00%
Total Drug Reports	1,552,720	

MDMA=3,4-Methylenedioxymethamphetamine
MDA=3,4-Methylenedioxyamphetamine
alpha-PVP=alpha-Pyrrolidinopentiophenone
25I-NBOMe=2-(4-Iodo-2,5-dimethoxyphenyl)-N-(2-methoxybenzyl) ethanamine

Figure 2.4 Distribution of phenethylamine reports within region, 2016[1]



[1] *Includes drugs submitted to laboratories from January 1, 2016, through December 31, 2016, that were analyzed by March 31, 2017.*

[2] *Numbers and percentages may not sum to totals because of rounding.*

[v] American College of Emergency Physicians. (n.d.). *Synthetic drugs fact sheet.* Retrieved from http://newsroom.acep.org/fact_sheets?item=29936

2.5 Synthetic Cannabinoids

Synthetic cannabinoids contain chemicals related to those found in the marijuana plant, leading them to be referred to as "synthetic marijuana" or "fake weed." The side effects of using synthetic cannabinoids can be unpredictable and life-threatening. They are often mixed with marijuana and smoked, vaporized in e-cigarettes, or brewed as tea. Side effects include agitation, anxiety, tachycardia, high blood pressure, seizures, hallucinations, and suicidal thoughts.[vi]

A total of 25,350 synthetic cannabinoid reports were identified during 2016, accounting for about 2% of all drugs reported (Table 2.5). FUB-AMB (26%), 5F-ADB (17%), and XLR11 (7%) were the most commonly identified synthetic cannabinoids. FUB-AMB accounted for one-quarter or more of all synthetic cannabinoid reports across all four regions, with 28% in the West region, 27% in the Midwest region, 26% in the South region, and 25% in the Northeast region (Figure 2.5). 5F-ADB accounted for a quarter of all synthetic cannabinoids reported in the South region (25%). The Northeast region reported the highest percentage of XLR11 (16%), and the Midwest region reported the highest percentage of AB-FUBINACA (12%).

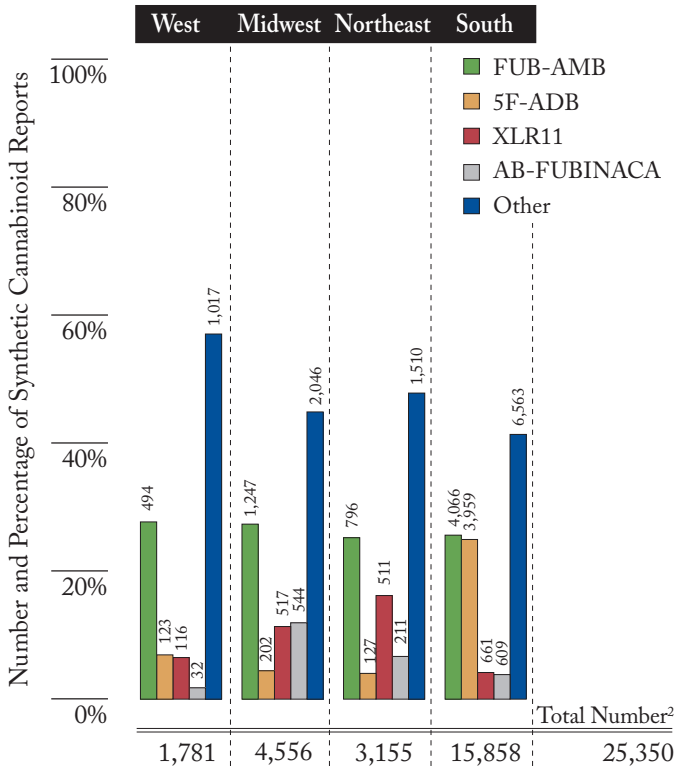
Table 2.5 ***Synthetic Cannabinoids***
Number and percentage of synthetic cannabinoid reports in the United States, 2016[1]

Synthetic Cannabinoid Reports	Number	Percent
FUB-AMB	6,602	26.05%
5F-ADB	4,412	17.40%
XLR11	1,805	7.12%
AB-FUBINACA	1,395	5.50%
5F-AMB	1,285	5.07%
AB-CHMINACA	1,274	5.03%
MAB-CHMINACA	1,132	4.47%
ADB-FUBINACA	934	3.69%
NM2201	537	2.12%
MDMB-FUBINACA	346	1.37%
AB-PINACA	342	1.35%
UR-144	243	0.96%
5F-AB-PINACA	222	0.88%
AKB48 N-(5-fluorpentyl)	201	0.79%
MDMB-CHMICA	190	0.75%
Other synthetic cannabinoids	4,430	17.47%
Total Synthetic Cannabinoid Reports[2]	25,350	100.00%
Total Drug Reports	1,552,720	

[1] Includes drugs submitted to laboratories from January 1, 2016, through December 31, 2016, that were analyzed by March 31, 2017.

[2] Numbers and percentages may not sum to totals because of rounding.

Figure 2.5 Distribution of synthetic cannabinoid reports within region, 2016[1]



FUB-AMB=Methyl 2-({1-[(4-fluorophenyl)methyl]-1H-indazole-3-carbonyl}amino)-3-methylbutanoate

5F-ADB (5F-MDMB-PINACA)=Methyl 2-(1-(5-fluoropentyl)-1H-indazole-3-carboxamido)-3,3-dimethylbutanoate

XLR11=[1-(5-Fluoro-pentyl)1H-indol-3-yl],(2,2,3,3-tetramethylcyclopropyl)methanone

AB-FUBINACA=(N-(1-Amino-3-methyl-1-oxobutan-2-yl)-1-(4-fluorobenzyl)-1H-indazole-3-carboxamide)

5F-AMB=methylN-{[1-(5-fluoropentyl)-1H-indazol-3-yl]carbonyl} valinate

AB-CHMINACA=(N-(1-Amino-3-methyl-1oxobutan-2-yl)-1-(cyclohexylmethyl)1H-indazole-3-carboxamide)

MAB-CHMINACA=N-(1-Amino-3,3-dimethyl-1-oxobutan-2-yl)-1-(cyclohexylmethyl)-1H-indazole-3-carboxamide

ADB-FUBINACA=N-(1-Amino-3,3-dimethyl-1-oxobutan-2-yl)-1-(4-fluorobenzyl)-1H-indazole-3-carboxamide

NM2201=Naphthalene-1-yl 1-(5-fluoropentyl)-1H-indole-3-carboxylate

MDMB-FUBINACA=Methyl (S)-2-(1-(4-fluorobenzyl)-1H-indazole-3-carboxamido)-3,3-dimethylbutanoate

AB-PINACA=(N-(1-Amino-3-methyl1-oxobutan-2-yl)-1-pentyl-1H-indazole3-carboxamide)

UR-144=(1-Pentyl-1H-indol-3-yl)(2,2,3,3-tetramethylcyclopropyl) methanone

5F-AB-PINACA=N-(1-Amino-3-methyl-1-oxobutan-2-yl)-1-(5-fluoropentyl)-1H-indazole-3-carboxamide

AKB48 N-(5-fluoropentyl)=N-(1-adamantyl)-1-(5-fluoropentyl)-1H-indazole-3-carboxamide

MDMB-CHMICA=Methyl (S)-2-(1-(cyclohexylmethyl)-1H-indole-3-carboxamido)-3,3-dimethylbutanoate

[vi] National Institute on Drug Abuse. (2015, November). *What are synthetic cannabinoids?* Retrieved from https://www.drugabuse.gov/publications/drugfacts/synthetic-cannabinoids

Section 3

GIS ANALYSIS: ALPRAZOLAM AND FENTANYL COMPARISONS, BY LOCATION, 2012 AND 2016

One of the unique features of NFLIS is the ability to analyze and monitor, by the county of origin, variation in drugs reported by laboratories. By using Geographic Information System (GIS) analyses, NFLIS can provide information on drug seizure locations.

This section presents data at the State and county levels for the percentage of drug reports identified as alprazolam and fentanyl at two points in time—2012 and 2016. Reports of alprazolam and fentanyl increased in NFLIS in recent years. In 2016, both drugs appeared in the NFLIS list of the top 25 most frequently identified drugs. Alprazolam was the most reported tranquilizer and depressant and was the fifth most frequently reported drug. Fentanyl was the second most reported narcotic analgesic and was the seventh most frequently reported drug.

The GIS data presented here are based on information provided to NFLIS forensic laboratories by the submitting law enforcement agencies (Figures 3.1 to 3.8). The information submitted by law enforcement includes the ZIP Code or county of origin associated with the drug seizure incident or the name of the submitting law enforcement agency. When a ZIP Code or county of origin is unavailable, the drug seizure or incident is assigned to the same county as the submitting law enforcement agency. If the submitting agency is unknown, the seizure or incident is assigned to the county in which the laboratory completing the analyses is located.

It is important to note that these data may not include all drug items seized at the State and county levels. Instead, these data represent only those drugs that were submitted to and analyzed by NFLIS forensic laboratories. In addition, some laboratories within several States are not currently reporting data to NFLIS, and their absence may affect the relative distribution of drugs seized and analyzed. Nevertheless, these data can serve as an important source for identifying abuse and trafficking trends and patterns across and within States.

Figure 3.1 Percentage of total drug reports identified as alprazolam, by State, 2012[1]

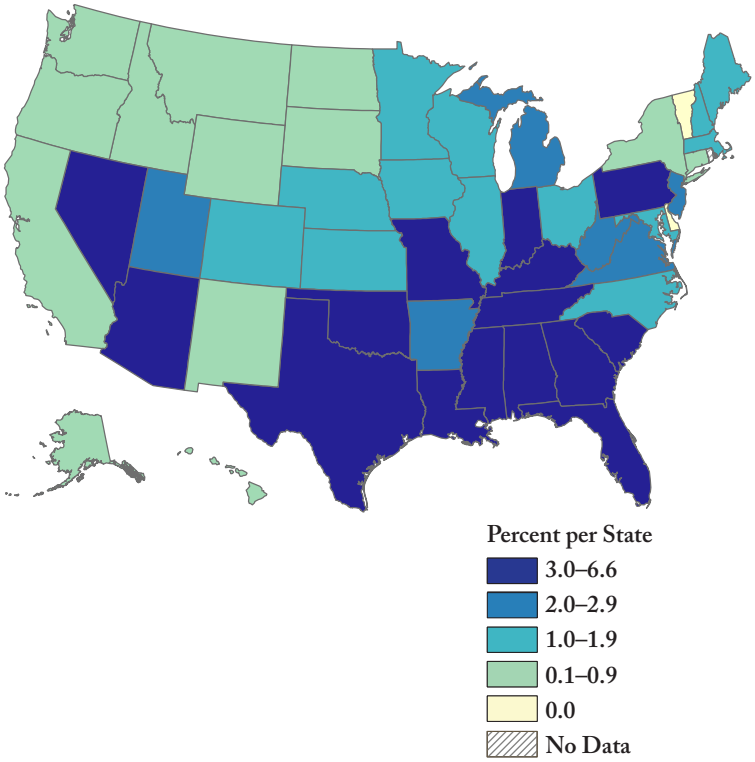


Figure 3.2 Percentage of total drug reports identified as alprazolam, by State, 2016[1]

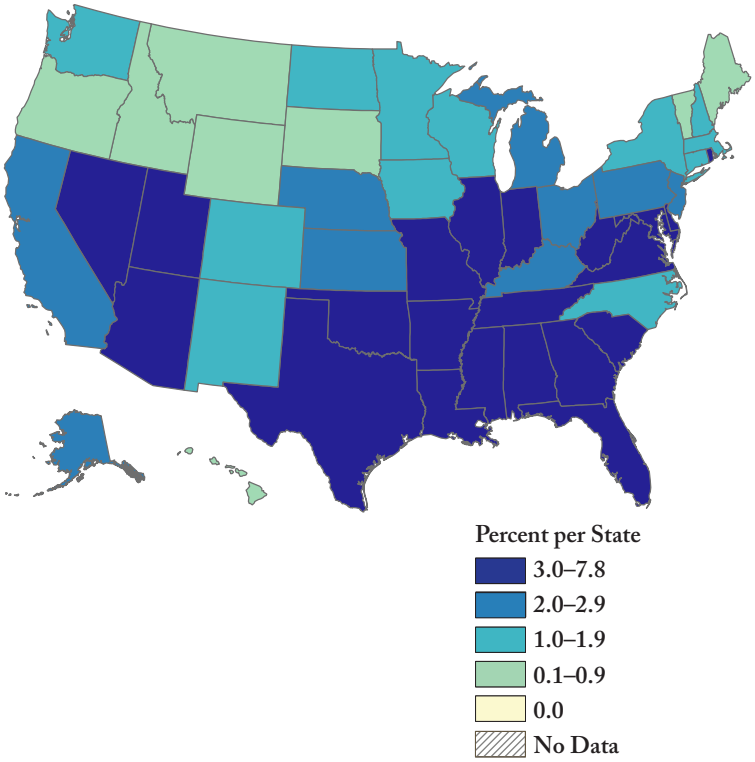


Figure 3.3 Percentage of total drug reports identified as fentanyl, by State, 2012[1]

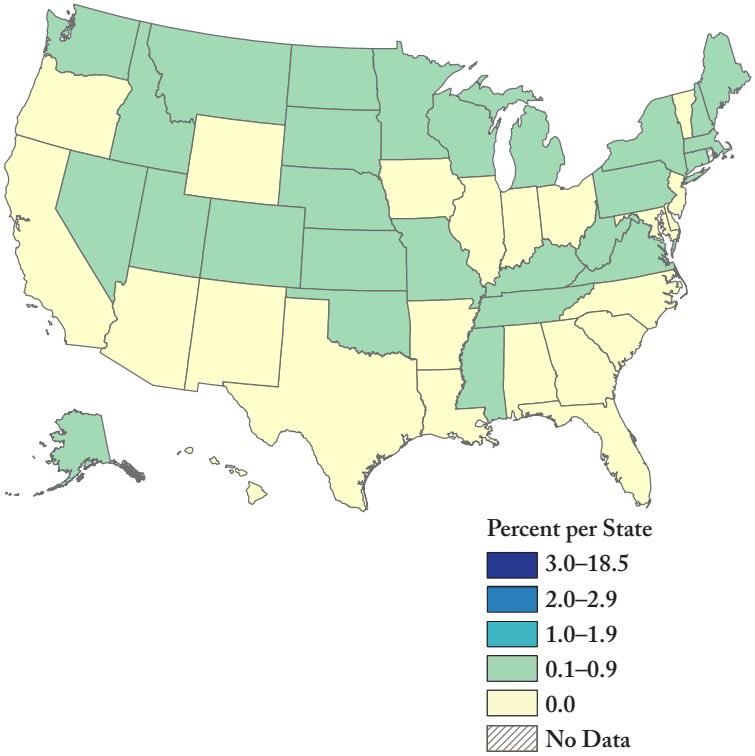
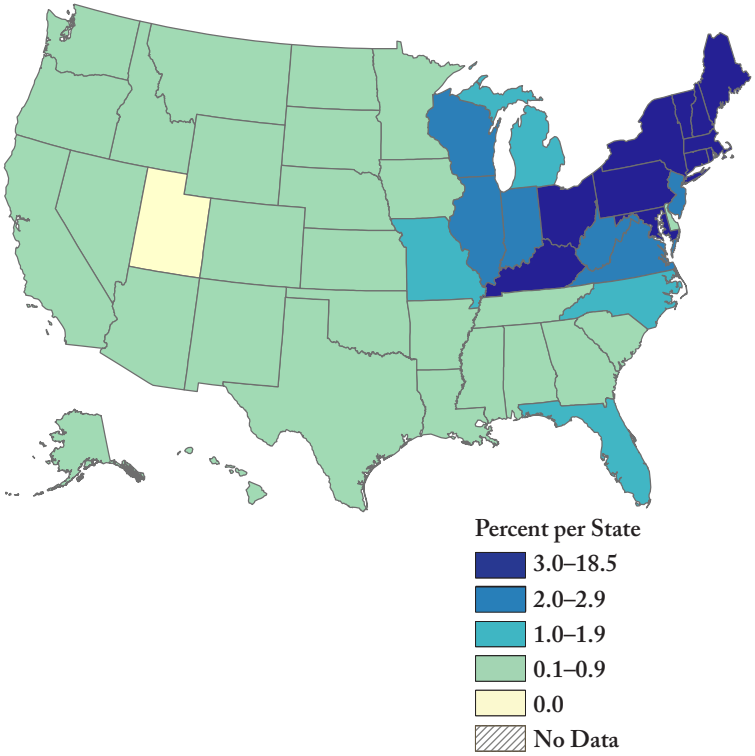


Figure 3.4 Percentage of total drug reports identified as fentanyl, by State, 2016[1]



[1] *Includes drugs submitted to State and local laboratories during the calendar year that were analyzed within three months of the reporting period.*

Figure 3.5 Percentage of total drug reports identified as alprazolam in California, by county, 2012[1]

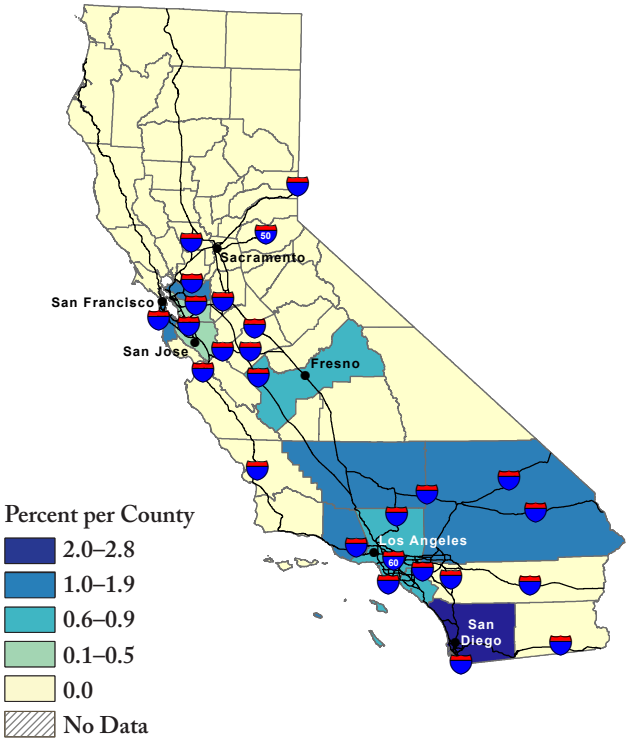


Figure 3.6 Percentage of total drug reports identified as alprazolam in California, by county, 2016[1]

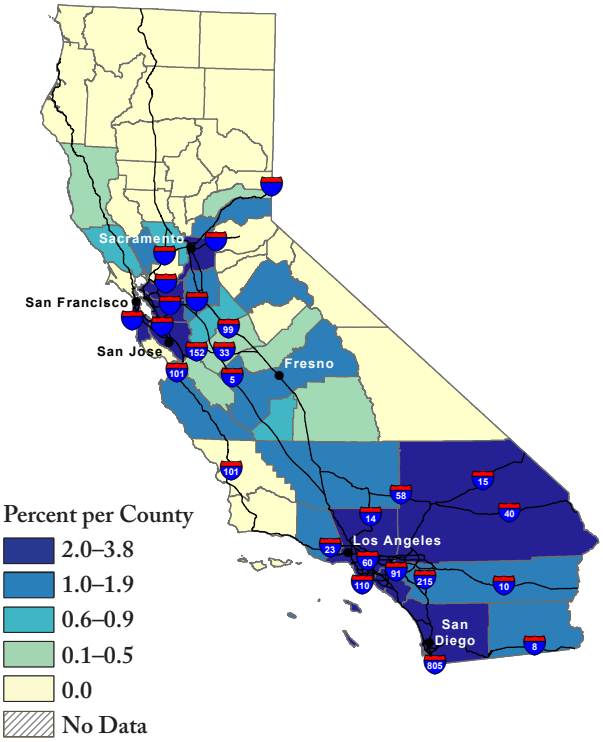


Figure 3.7 Percentage of total drug reports identified as fentanyl in Ohio, by county, 2012[1]

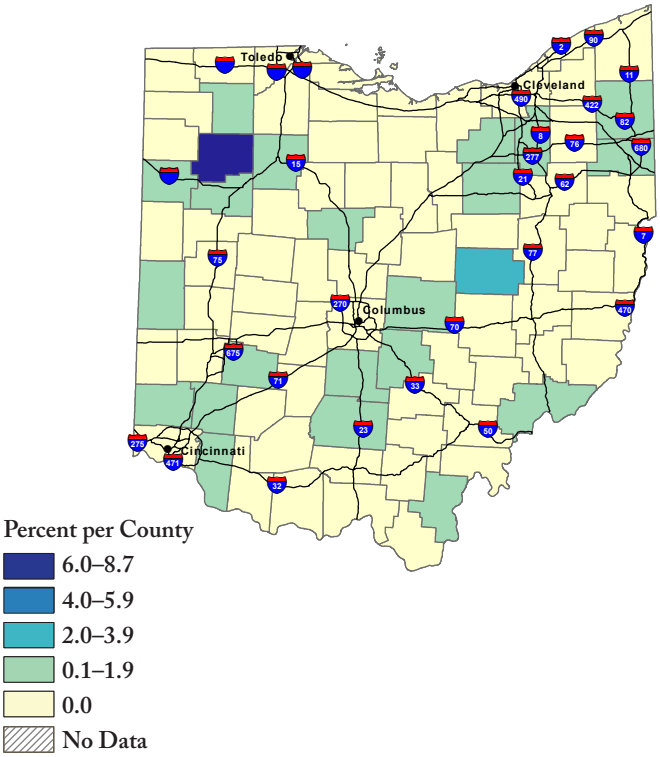
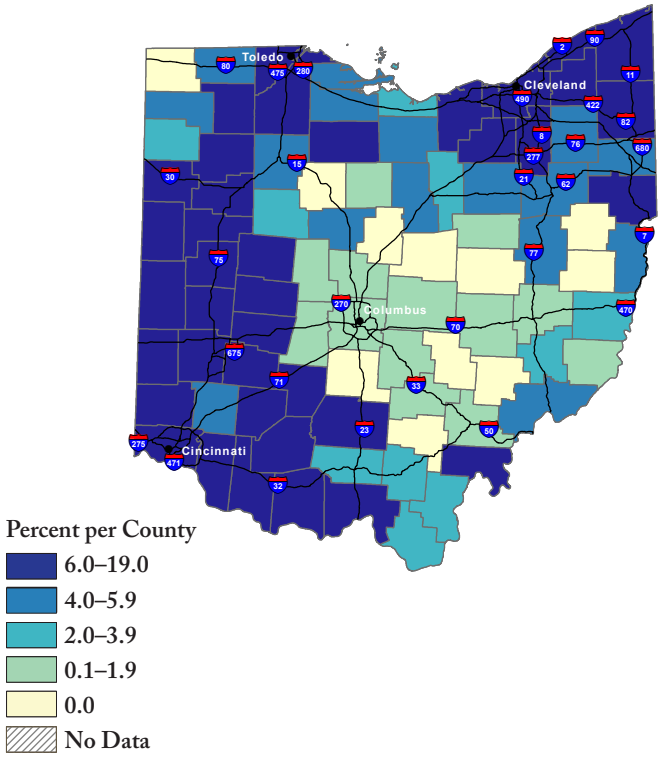


Figure 3.8 Percentage of total drug reports identified as fentanyl in Ohio, by county, 2016[1]



[1] *Includes drugs submitted to State and local laboratories during the calendar year that were analyzed within three months of the reporting period.*

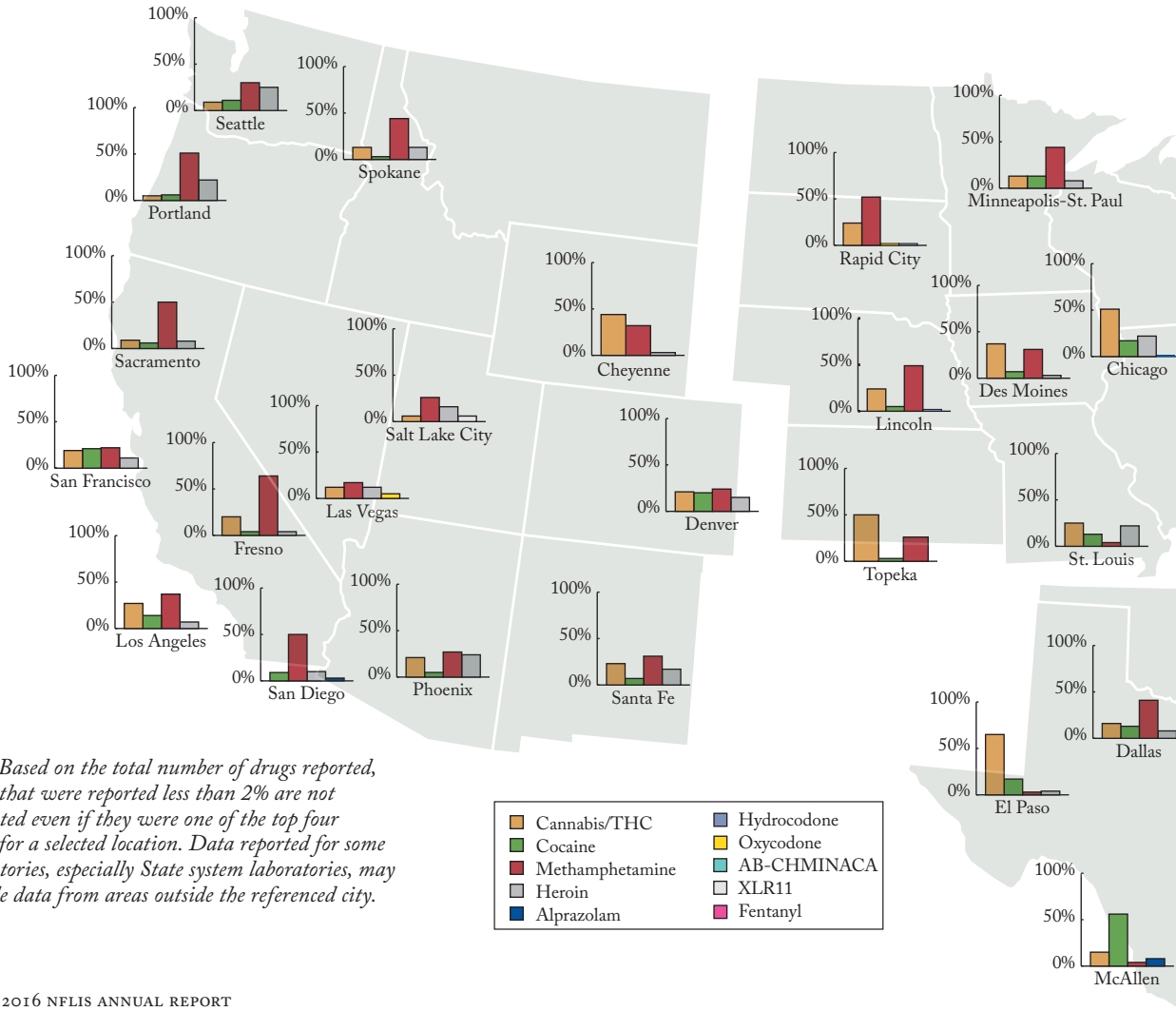
Section 4

DRUGS IDENTIFIED BY LABORATORIES IN SELECTED U.S. CITIES

NFLIS can be used to monitor drugs reported by forensic laboratories across the country, including laboratories in large U.S. cities. This section presents drug analysis results of all drugs submitted to State and local laboratories during 2016 and analyzed by March 31, 2017.

This section presents data for the four most common drugs reported by NFLIS laboratories located in selected cities. The laboratories representing selected cities are presented in the summary table on the next page. The following results highlight geographic differences in the types of drugs abused and trafficked, such as the higher levels of cocaine reporting on the East Coast and methamphetamine reporting on the West Coast.

Nationally, 20% of all drugs in NFLIS were identified as methamphetamine (Table 1.1). The highest percentages of methamphetamine were reported by laboratories representing cities in the West and Midwest, such as Fresno (61%), San Diego (56%), Rapid City (55%), Portland (53%), Sacramento (51%), Minneapolis-St. Paul (45%), Lincoln (45%), Spokane (45%), Los Angeles (39%),



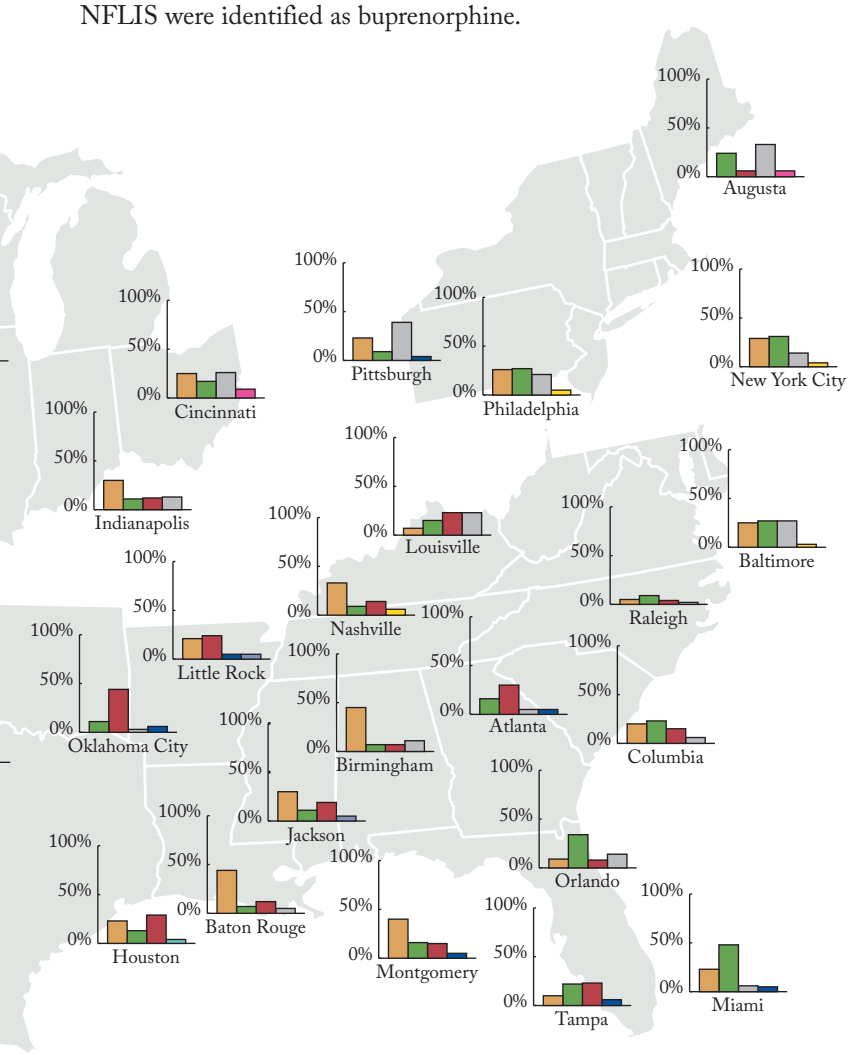
Note: Based on the total number of drugs reported, drugs that were reported less than 2% are not presented even if they were one of the top four drugs for a selected location. Data reported for some laboratories, especially State system laboratories, may include data from areas outside the referenced city.

Seattle (35%), Des Moines (34%), and Phoenix (33%). Cities in the South, such as Dallas (42%), Houston (42%), Oklahoma City (38%), and Atlanta (31%), also reported a high percentage of drugs identified as methamphetamine.

Laboratories representing cities in the South and Northeast reported the highest levels of cocaine, including McAllen (64%), Miami (49%), Orlando (31%), New York City (29%), Philadelphia (29%), Baltimore (28%), Tampa (24%), Columbia (23%), and Augusta (19%). Cities in the West, such as San Francisco (25%) and Denver (19%), and Midwest, such as Cincinnati (19%) and Chicago (19%), also reported a high percentage of cocaine. Nationally, 14% of drugs in NFLIS were identified as cocaine.

The highest percentages of heroin were reported by laboratories representing the Northeastern cities of Pittsburgh (34%) and Augusta (27%); the Midwestern cities of Chicago (25%), Cincinnati (24%), and St. Louis (20%); the Southern cities of Baltimore (24%) and Louisville (19%); and the Western cities of Seattle (24%), Portland (22%), and Phoenix (20%). Nationally, 11% of all drugs in NFLIS were identified as heroin.

Among controlled prescription drugs, Atlanta (8%) and McAllen (8%) reported the highest percentages of alprazolam. Nationally, 3% of drugs in NFLIS were identified as alprazolam. Augusta (16%) and Cincinnati (12%) reported the highest percentages of fentanyl, while Nashville (6%) reported the highest percentage of oxycodone, and Little Rock (5%) reported the highest percentages of hydrocodone. Nationally, 2% of drugs in NFLIS were identified each as fentanyl, oxycodone, or hydrocodone. Santa Fe (7%) reported the highest percentage of buprenorphine. Nationally, 1% of drugs in NFLIS were identified as buprenorphine.



Selected Laboratories
Atlanta (Georgia State Bureau of Investigation—Decatur Laboratory)
Augusta (Maine Department of Health and Human Services)
Baltimore (Baltimore City Police Department)
Baton Rouge (Louisiana State Police)
Birmingham (Alabama Department of Forensic Sciences—Birmingham Laboratory)
Cheyenne (Wyoming State Crime Laboratory)
Chicago (Illinois State Police—Chicago Laboratory)
Cincinnati (Hamilton County Coroner's Office)
Columbia (South Carolina Law Enforcement Division—Columbia Laboratory)
Dallas (Texas Department of Public Safety—Garland Laboratory)
Denver (Denver Police Department Crime Laboratory)
Des Moines (Iowa Division of Criminal Investigations)
El Paso (Texas Department of Public Safety—El Paso Laboratory)
Fresno (California Department of Justice—Fresno Laboratory and Fresno County Sheriff's Forensic Laboratory)
Houston (Texas Department of Public Safety—Houston Laboratory and Harris County Institute of Forensic Sciences Crime Laboratory)
Indianapolis (Indianapolis-Marion County Forensic Laboratory)
Jackson (Mississippi Department of Public Safety—Jackson Laboratory and Jackson Police Department Crime Laboratory)
Las Vegas (Las Vegas Metropolitan Police Crime Laboratory)
Lincoln (Nebraska State Patrol Criminalistics Laboratory—Lincoln Laboratory)
Little Rock (Arkansas State Crime Laboratory)
Los Angeles (Los Angeles Police Department and Los Angeles County Sheriff's Department)
Louisville (Kentucky State Police—Louisville Laboratory)
McAllen (Texas Department of Public Safety—McAllen Laboratory)
Miami (Miami-Dade Police Department Crime Laboratory)
Minneapolis-St. Paul (Minnesota Bureau of Criminal Apprehension—Minneapolis Laboratory)
Montgomery (Alabama Department of Forensic Sciences—Montgomery Laboratory)
Nashville (Tennessee Bureau of Investigation—Nashville Laboratory)
New York City (New York City Police Department Crime Laboratory)
Oklahoma City (Oklahoma State Bureau of Investigation—Oklahoma City Laboratory)
Orlando (Florida Department of Law Enforcement—Orlando Laboratory)
Philadelphia (Philadelphia Police Department Forensic Science Laboratory)
Phoenix (Phoenix Police Department)
Pittsburgh (Allegheny Office of the Medical Examiner Forensic Laboratory)
Portland (Oregon State Police Forensic Services Division—Portland Laboratory)
Rapid City (Rapid City Police Department)
Raleigh (North Carolina State Bureau of Investigation—Raleigh Laboratory)
Sacramento (Sacramento County District Attorney's Office)
Salt Lake City (Utah Department of Public Safety—Salt Lake City State Crime Laboratory)
San Diego (San Diego Police Department)
San Francisco (San Francisco Police Department)
Santa Fe (New Mexico Department of Public Safety—Santa Fe Laboratory)
Seattle (Washington State Patrol—Seattle Laboratory)
Spokane (Washington State Patrol—Spokane Laboratory)
St. Louis (St. Louis Police Department)
Tampa (Florida Department of Law Enforcement—Tampa Laboratory)
Topeka (Kansas Bureau of Investigation—Topeka Laboratory)

Appendix A Statistical Methodology

Overview

Since 2001, NFLIS publications have included national and regional estimates for the number of drug reports and drug cases analyzed by State and local forensic laboratories in the United States. This appendix discusses the methods used for producing these estimates, including sample selection, weighting, imputation, and trend analysis procedures. RTI International, under contract to the DEA, began implementing NFLIS in 1997. Results from a 1998 survey (updated in 2002, 2004, 2008, and 2013) provided laboratory-specific information, including annual caseloads, which was used to establish a national sampling frame of all known State and local forensic laboratories that routinely perform drug chemistry analyses. A probability proportional to size (PPS) sample was drawn on the basis of annual cases analyzed per laboratory, resulting in a NFLIS national sample of 29 State laboratory systems and 31 local or municipal laboratories, and a total of 168 individual laboratories (see Appendix B for a list of sampled NFLIS laboratories).

Estimates appearing in this publication are based on cases and items *submitted* to laboratories between January 1, 2016, and December 31, 2016, and analyzed by March 31, 2017. Analysis has shown that approximately 95% of cases submitted during an annual period are analyzed within three months of the end of the annual period (not including the approximately 30% of cases that are never analyzed).

Since 2011, the estimation procedures have accounted for multiple drugs per item. For each drug item (or exhibit) analyzed by a laboratory in the NFLIS program, up to three drugs were reported to NFLIS and counted in the estimation process. A further enhancement to account for multiple drugs per item was introduced in 2017 for the 2016 Annual Report. All drugs reported in an item are now counted in the estimation process. This change ensures that the estimates will take into consideration all reported substances, including emerging drugs of interest that may typically be reported as the fourth or fifth drug within an item. This change was implemented in the 2016 data processing cycle and for future years. Although this change could not be applied to reporting periods before 2016, the 2016 data showed that 99.97% of drug reports are captured in the first, second, or third drug report for any item; therefore, no statistical adjustments were deemed necessary to maintain the trend with prior years.

Currently, laboratories representing more than 98% of the national drug caseload participate in NFLIS, with about 97% of the national caseload reported for the current reporting period. Because of the continued high level of reporting among laboratories, the NEAR (National Estimates Based on All Reports) method, which has strong statistical advantages for producing national and regional estimates, continues to be implemented.

NEAR Methodology

In NFLIS publications before 2011, data reported by nonsampled laboratories were not used in national or regional estimates.[vii] However, as the number of nonsampled laboratories reporting to NFLIS increased,[viii] it began to make sense to consider ways to utilize the data they submitted. Under NEAR, the "volunteer" laboratories (i.e., the reporting nonsampled laboratories) represent themselves and are no longer represented by the reporting sampled laboratories. The volunteer laboratories are assigned weights of one; hence, the weights of the sampled and responding laboratories are appropriately adjusted downward. The outcome is that the estimates are more precise, especially for recent years, which include a large number of volunteer laboratories. More precision allows for more power to detect trends and fewer suppressed estimates in Tables 1.1 and 1.2 of the NFLIS Annual and Midyear Reports.

NEAR imputations and adjusting for missing monthly data in reporting laboratories

Because of technical and other reporting issues, some laboratories do not report data for every month during a given reporting period, resulting in missing monthly data. If a laboratory reports fewer than six months of data for the annual estimates (fewer than three months for the semiannual estimates), it is considered nonreporting, and its reported data are not included in the estimates. Otherwise, imputations are performed separately by drug for laboratories that are missing monthly data, using drug-specific proportions generated from laboratories that are reporting all months of data. This imputation method is used for cases, items, and drug-specific reports and accounts for the typical month-to-month variation and the size of the laboratory requiring imputation. The general idea is to use the nonmissing months to assess the size of the laboratory requiring imputation and then to apply the seasonal pattern exhibited by all laboratories with no missing data. Imputations of monthly case counts are created using the following ratio (r_L):

$$r_L = \frac{\sum_{m \in R_L} c_{L,m}}{\sum_{m \in R_L} c_{.,m}},$$

where

R_L = set of all nonmissing months in laboratory L,
$c_{L,m}$ = case count for laboratory L in month m, and
$c_{.,m}$ = mean case counts for all laboratories reporting complete data.

[vii] The case and item loads for the nonsampled laboratories were used in calculating the weights.

[viii] In the current reporting period, for example, out of 108 nonsampled laboratories and laboratory systems, 86 (or 80%) reported.

Monthly item counts are imputed for each laboratory using an estimated item-to-case ratio (s_L) for nonmissing monthly item counts within the laboratory. The imputed value for the missing monthly number of items in each laboratory is calculated by multiplying $c_{L,m}$ by s_L.

$$s_L = \frac{\sum_{m \in R_L} i_{L,m}}{\sum_{m \in R_L} c_{L,m}},$$

where

R_L = set of all nonmissing months in laboratory L,
$i_{L,m}$ = item count for laboratory L in month m, and
$c_{L,m}$ = case count for laboratory L in month m.

Drug-specific case and report counts are imputed using the same imputation techniques presented above for the case and item counts. The total drug, item, and case counts are calculated by aggregating the laboratory and laboratory system counts for those with complete reporting and those that require imputation.

NEAR imputations and drug report-level adjustments

Most forensic laboratories classify and report case-level analyses consistently in terms of the number of vials of a particular pill. A small number, however, do not produce drug report-level counts in the same way as those submitted by the vast majority. Instead, they report as items the count of the individual pills themselves. Laboratories that consider items in this manner also consider drug report-level counts in this same manner. Drug report-to-case ratios for each drug are produced for the similarly sized laboratories, and these drug-specific ratios are then used to adjust the drug report counts for the relevant laboratories.

NEAR weighting procedures

Each NFLIS reporting laboratory is assigned a weight to be used in calculating design-consistent, nonresponse-adjusted estimates. Two weights are created: one for estimating cases and one for estimating drug reports. The weight used for case estimation is based on the caseload for every laboratory in the NFLIS population, and the weight used for drug reports' estimation is based on the item load for every laboratory in the NFLIS population. For reporting laboratories, the caseload and item load used in weighting are the reported totals. For nonreporting laboratories, the caseload and item load used in weighting are based on completion-based data obtained from an updated laboratory survey administered in 2013, or, in some cases, via direct communication with laboratories or other external sources.

When the NFLIS sample was originally drawn, state systems (and the multilaboratory local systems known to exist) were treated as a single laboratory; so, if a State system was selected, all laboratories in the system were selected. The sampling frame of laboratories was divided into four strata by two stratifiers: (1) type of laboratory (State system or municipal or county laboratory) and (2) determination of "certainty" laboratory status. The criteria used in selecting the certainty laboratories included (1) size, (2) region, (3) geographical location, and (4) other special considerations (e.g., strategic importance of the laboratory). To ensure that the NFLIS sample had strong regional representation, U.S. census regions were used as the geographical divisions to guide the selection of certainty laboratories and systems. Some large laboratories were automatically part of the original NFLIS sample because they were deemed critically important to the calculation of reliable estimates.

Each weight has two components, the design weight and the nonresponse adjustment factor, the product of which is the final weight used in estimation. After imputation, the final item weight is based on the item count, and the final case weight is based on the case count of each laboratory or laboratory system. The final weights are used to calculate national and regional estimates. The first component, the design weight, is based on the proportion of the caseload and item load of the NFLIS universe[ix] represented by the individual laboratory or laboratory system. This step takes advantage of the original PPS sample design and provides precise estimates as long as the drug-specific case and report counts are correlated with the overall caseload and item load.[x]

During the weighting process, laboratories are further categorized into 16 strata by region (Northeast, Midwest, South, and West), in addition to type of laboratory (State system or municipal or county laboratory) and certainty status, which were both used in defining the sampling strata. For noncertainty reporting laboratories in the sample (and reporting laboratories in the certainty strata with nonreporting laboratories), the design-based weight for each laboratory is calculated as follows:

$$\text{Design Weight}_i = A/(B \times \text{Case [item] Count for Laboratory or Laboratory System } i),$$

where

i = ith laboratory or laboratory system;
A = sum of the case (item) counts for all of the laboratories and laboratory systems (sampled and nonsampled) within a specific stratum, excluding certainty strata and the volunteer stratum; and
B = number of sampled laboratories and laboratory systems within the same stratum, excluding certainty strata and the volunteer stratum.

[ix] See the Introduction of this publication for a description of the NFLIS universe.

[x] Lohr, S. L. (2010). *Sampling: Design and analysis* (2nd ed., pp. 231-234). Boston, MA: Brooks/Cole.

Certainty laboratories are assigned a design weight of one.[xi]

The second component, the nonresponse adjustment factor, adjusts the weights of the reporting and sampled laboratories to account for the nonreporting and sampled laboratories. The nonresponse (*NR*) adjustment, for certainty and noncertainty laboratories, is calculated as follows:

$$NR_j = C/D,$$

where

j = stratum;

C = number of sampled laboratories and laboratory systems in the stratum, excluding the volunteer stratum; and

D = number of laboratories and laboratory systems in the stratum that are sampled and reporting.

Because volunteer laboratories represent only themselves, they are automatically assigned a final weight of one.

NEAR estimation

The estimates in this publication are the weighted sum of the counts from each laboratory. The weighting procedures make the estimates more precise by assigning large weights to small laboratories and small weights to large laboratories.[xii] Because most of the values being estimated tend to be related to laboratory size, the product of the weight and the value to be estimated tend to be relatively stable across laboratories, resulting in precise estimates.

A finite population correction is also applied to account for the high sampling rate. In a sample-based design, the sampling fraction, which is used to create the weights, equals the number of sampled laboratories divided by the number of laboratories in the NFLIS universe. Under NEAR, the sampling fraction equals the number of sampled laboratories divided by the sum of the number of sampled laboratories and the number of nonreporting, nonsampled laboratories. Volunteer laboratories are not included in the sampling fraction calculation. Thus, the NEAR approach makes the sampling rate even higher because volunteer laboratories do not count as nonsampled laboratories.

Suppression of Unreliable Estimates

For some drugs, such as cannabis/THC and cocaine, thousands of reports occur annually, allowing for reliable national prevalence estimates to be computed. For other drugs, reliable and precise estimates cannot be computed because of a combination of low report counts and substantial variability in report counts between laboratories. Thus, a suppression rule was established.

[xi] With respect to the design weight, reporting laboratories and laboratory systems in certainty strata with nonreporting laboratories and laboratory systems are treated the same way as reporting noncertainty sampled laboratories and laboratory systems. This is done to reduce the variance; otherwise, all reporting laboratories and laboratory systems in these strata would get the same weight regardless of their size.

[xii] See footnote x.

Precision and reliability of estimates are evaluated using the relative standard error (RSE), which is the ratio between the standard error of an estimate and the estimate. Drug estimates with an RSE > 50% are suppressed and not shown in the tables.

Statistical Techniques for Trend Analysis

Two types of analyses to compare estimates across years are used. The first is called *prior-year comparisons* and compares national and regional estimates from January 2015 through December 2015 with those from January 2016 through December 2016. The second is called *long-term trends* and examines trends in the annual national and regional estimates from January 2001 through December 2016. The long-term trends method described below was implemented beginning with the 2012 Midyear Report. The new method offers the ability to identify linear and curved trends, unlike the method used in previous NFLIS publications. Both types of trend analyses are described below. For the region-level prior-year comparisons and long-term trends, the estimated drug reports are standardized to the most recent regional population totals for persons aged 15 years or older.

Prior-year comparisons

For selected drugs, the prior-year comparisons statistically compare estimates in Table 1.1 of this publication with estimates in Table 1.1 of the 2015 Annual Report. The specific test examines whether the difference between any two estimates is significantly different from zero. A standard t test is completed using the statistic,

$$t_{df} = \frac{a\hat{T}_{2016} - b\hat{T}_{2015}}{\sqrt{a^2\,\mathrm{var}(\hat{T}_{2016}) + b^2\,\mathrm{var}(\hat{T}_{2015}) - 2ab\,\mathrm{cov}(\hat{T}_{2015}, \hat{T}_{2016})}},$$

where

df = appropriate degrees of freedom (number of laboratories minus number of strata);

$\hat{T}_{2016}$ = estimated total number of reports for the given drug for January 2016 through December 2016;

$\hat{T}_{2015}$ = estimated total number of reports for the given drug for January 2015 through December 2015;

$\mathrm{var}(\hat{T}_{2016})$ = variance of $\hat{T}_{2016}$;

$\mathrm{var}(\hat{T}_{2015})$ = variance of $\hat{T}_{2015}$; and

$\mathrm{cov}(\hat{T}_{2015}, \hat{T}_{2016})$ = covariance between $\hat{T}_{2015}$ and $\hat{T}_{2016}$.

For the national prior-year comparisons, $a = b = 1$. For the regional prior-year comparisons, a = 100,000 divided by the regional population total for 2016, and b = 100,000 divided by the regional population total for 2015.

The percentile of the test statistic in the t distribution determines whether the prior-year comparison is statistically significant (a two-tailed test at α = .05).

Long-term trends

A long-term trend analysis is performed on the January 2001 through December 2016 annual national estimates of totals and regional estimates of rates for selected drug reports. The models allow for randomness in the totals and rates due to the sample and the population. That is, for the vector of time period totals over that time,

$$\mathbf{Y}^T \equiv (Y_1, Y_2, \ldots, Y_{16}),$$

and for the estimates,

$$\hat{\mathbf{Y}}^T \equiv (\hat{Y}_1, \hat{Y}_2, \ldots, \hat{Y}_{16}),$$

the regression model is

$$\hat{\mathbf{Y}} = \mathbf{X}\beta + \eta + \varepsilon,$$

where

$\eta = \hat{\mathbf{Y}} - \mathbf{Y}$ is a 16 × 1 vector of errors due to the probability sample, and

$\varepsilon =$ 16 × 1 vector of errors due to the underlying model.

Randomness due to the sample exists because only a sample of all eligible laboratories has been randomly selected to be included. Randomness due to the population exists because many factors that can be viewed as random contribute to the specific total reported by a laboratory in a time period. For example, not all drug seizures that could have been made were actually made, and there may have been some reporting errors. If rates (per 100,000 persons aged 15 years or older) and not totals are of interest, the above model can be applied to $\hat{\mathbf{Y}}^* = c\hat{\mathbf{Y}}$, where c equals 100,000 divided by the 15-or-older regional population size as given by the U.S. Census Bureau.

The regression model used to perform the analysis is

$$Y_t = \alpha_0 + \alpha_1 t + \alpha_2 t^2 + \cdots + \alpha_m t^m + \varepsilon_t \qquad t = 1, \ldots, T,$$

where

Y_t = the population total value, considered to be a realization of the underlying model; and

ε_t = one of a set of 16 independent normal variates with a mean of zero and a variance of σ^2.

The model allows for a variety of trend types, depending on the maximal polynomial degree m of the analysis, such as the following: linear (straight line; $m = 1$), quadratic (U-shaped; $m = 2$), cubic (S-shaped; $m = 3$), and quartic (higher-order shape; $m = 4$). Because it is a model for Y_t but the sample estimates $\hat{Y}_t$ differ by the sampling error, estimation was performed by restricted maximum likelihood (REML), allowing for the two sources of error.

To implement the regression model, point estimates of totals $\hat{Y}_t$ and their standard errors are obtained for all 16 annual periods beginning with the January to December 2001 period and ending with the January to December 2016 period. Sampling standard errors are estimated as the full sampling variance-covariance matrix $\mathbf{S}$ over these 16 time periods. The $\mathbf{S}$ matrix contains variances in totals at any time period and covariances in totals between any two time periods, thus giving a very general modeling of the sampling variance structure. The variance-covariance matrix of the totals is then $V[\hat{\mathbf{Y}}] = \sigma^2 \boldsymbol{I} + \mathbf{S}$, where $\boldsymbol{I}$ is the identity matrix.

Before the 2016 Annual Report, the variance and covariance components of the $\mathbf{S}$ matrix for the means were estimated simultaneously. The variance-covariance matrix for the means was then converted into a variance-covariance matrix for the totals. A change was introduced in 2017 in which the covariances of the totals are directly estimated, and the estimation of the covariance of the means is no longer necessary. This change in the computation of the covariance of totals provides an incremental improvement over the old approach and theoretically provides more valid statistical inferences. In addition, it creates consistency in the covariance estimation between these long-term trends and the prior-year comparisons.

Regression coefficients are estimated using the REML method. Because higher-order polynomial regression models generally show strong collinearity among predictor variables, the model is reparameterized using orthogonal polynomials. The reparameterized model is

$$Y_t = \beta_0 X_0(t) + \beta_1 X_1(t) + \beta_2 X_2(t) + \cdots + \beta_m X_m(t) + \varepsilon_t \qquad t = 1, \ldots, T,$$

where

$X_0(t) = 1/\sqrt{T}$ for all t, and

$X_1(t), \ldots, X_m(t)$ provide contributions for the first-order (linear), second-order (quadratic), and higher-order polynomials.

Note that the error term is the same in the original model and the reparameterized model because the fitted surface is the same for both models. The model is further constrained to have regression residuals sum to zero, a constraint that is not guaranteed by theory for these models but is considered to improve model fit because of an approximation required to estimate $\mathbf{S}$. Standard errors of the regression trend estimates are obtained by simulation.

Final models are selected after testing for the significance of coefficients at the α = 0.05 level ($p < .05$), which means that if the trend of interest (linear, quadratic, or other higher-order polynomial) was in fact zero, then there would be a 5% chance that the trend would be detected as statistically significant when in fact it is not. Final fitted models are most easily interpreted using graphical plots.

Appendix B Participating and Reporting Forensic Laboratories

State	Lab Type	Laboratory Name	Reporting
AK	State	Alaska Department of Public Safety	✓
AL	State	Alabama Department of Forensic Sciences (5 sites)	✓
AR	State	Arkansas State Crime Laboratory (2 sites)	✓
AZ	State	Arizona Department of Public Safety, Scientific Analysis Bureau (4 sites)	✓
	Local	Mesa Police Department	✓
	Local	Phoenix Police Department	✓
	Local	Scottsdale Police Department	✓
	Local	Tucson Police Department Crime Laboratory	✓
CA	State	California Department of Justice (10 sites)	✓
	Local	Alameda County Sheriff's Office Crime Laboratory (San Leandro)	✓
	Local	Contra Costa County Sheriff's Office (Martinez)	✓
	Local	Fresno County Sheriff's Forensic Laboratory	✓
	Local	Kern County District Attorney's Office (Bakersfield)*	✓
	Local	Long Beach Police Department	✓
	Local	Los Angeles County Sheriff's Department (4 sites)	✓
	Local	Los Angeles Police Department (2 sites)	✓
	Local	Oakland Police Department Crime Laboratory	✓
	Local	Orange County Sheriff's Department (Santa Ana)	✓
	Local	Sacramento County District Attorney's Office	✓
	Local	San Bernardino County Sheriff's Department	✓
	Local	San Diego County Sheriff's Department	✓
	Local	San Diego Police Department	✓
	Local	San Francisco Police Department*	✓
	Local	San Mateo County Sheriff's Office (San Mateo)	✓
	Local	Santa Clara District Attorney's Office (San Jose)	✓
	Local	Solano County District Attorney Bureau of Forensic Services	
	Local	Ventura County Sheriff's Department	✓
CO	State	Colorado Bureau of Investigation (4 sites)	✓
	Local	Aurora Police Department	
	Local	Colorado Springs Police Department	✓
	Local	Denver Police Department Crime Laboratory	✓
	Local	Jefferson County Sheriff's Office (Golden)	✓
CT	State	Connecticut Department of Public Safety	✓
DE	State	Chief Medical Examiner's Office*	✓
FL	State	Florida Department of Law Enforcement (5 sites)	✓
	Local	Broward County Sheriff's Office (Fort Lauderdale)	✓
	Local	Indian River Crime Laboratory (Fort Pierce)	✓
	Local	Manatee County Sheriff's Office (Bradenton)	✓
	Local	Miami-Dade Police Department Crime Laboratory	✓
	Local	Palm Beach County Sheriff's Office Crime Laboratory (West Palm Beach)	✓
	Local	Pinellas County Forensic Laboratory (Largo)	✓
	Local	Sarasota County Sheriff's Office	✓
GA	State	Georgia State Bureau of Investigation (6 sites)	✓
HI	Local	Honolulu Police Department	✓
IA	State	Iowa Division of Criminal Investigations	✓
ID	State	Idaho State Police (3 sites)	✓
IL	State	Illinois State Police (6 sites)	✓
	Local	DuPage County Forensic Science Center (Wheaton)	✓
	Local	Northern Illinois Police Crime Laboratory (Chicago)	✓
IN	State	Indiana State Police Laboratory (4 sites)	✓
	Local	Indianapolis-Marion County Forensic Laboratory (Indianapolis)	✓
KS	State	Kansas Bureau of Investigation (3 sites)	✓
	Local	Johnson County Sheriff's Office (Mission)	✓
	Local	Sedgwick County Regional Forensic Science Center (Wichita)	✓
KY	State	Kentucky State Police (6 sites)	✓
LA	State	Louisiana State Police	✓
	Local	Acadiana Criminalistics Laboratory (New Iberia)	✓
	Local	Jefferson Parish Sheriff's Office (Metairie)	✓
	Local	New Orleans Police Department Crime Laboratory	
	Local	North Louisiana Criminalistics Laboratory System (3 sites)	✓
	Local	Southwest Louisiana Criminalistics Laboratory (Lake Charles)	✓
MA	State	Massachusetts State Police	✓
	Local	University of Massachusetts Medical School (Worcester)	✓
MD	State	Maryland State Police Forensic Sciences Division (3 sites)	✓
	Local	Anne Arundel County Police Department (Millersville)	✓
	Local	Baltimore City Police Department	✓
	Local	Baltimore County Police Department (Towson)	✓
	Local	Montgomery County Police Department Crime Laboratory (Rockville)	✓
	Local	Prince George's County Police Department (Landover)	
ME	State	Maine Department of Health and Human Services	✓
MI	State	Michigan State Police (8 sites)*	✓
MN	State	Minnesota Bureau of Criminal Apprehension (2 sites)	✓
MO	State	Missouri State Highway Patrol (8 sites)	✓
	Local	KCMO Regional Crime Laboratory (Kansas City)	✓
	Local	St. Charles County Police Department Criminalistics Laboratory (O'Fallon)	✓
	Local	St. Louis County Police Department Crime Laboratory (Clayton)	✓
	Local	St. Louis Police Department	✓
MS	State	Mississippi Department of Public Safety (4 sites)	✓
	Local	Jackson Police Department Crime Laboratory	✓
	Local	Tupelo Police Department	✓
MT	State	Montana Forensic Science Division	✓
NC	State	North Carolina State Bureau of Investigation (3 sites)	✓
	Local	Charlotte-Mecklenburg Police Department	✓
	Local	Wilmington Police Department	
ND	State	North Dakota Crime Laboratory Division	✓
NE	State	Nebraska State Patrol Criminalistics Laboratory (2 sites)	✓
NH	State	New Hampshire State Police Forensic Laboratory	✓
NJ	State	New Jersey State Police (4 sites)	✓
	Local	Burlington County Forensic Laboratory (Mt. Holly)	✓
	Local	Cape May County Prosecutor's Office	✓
	Local	Hudson County Prosecutor's Office (Jersey City)	✓
	Local	Ocean County Sheriff's Department (Toms River)	✓
	Local	Union County Prosecutor's Office (Westfield)	✓
NM	State	New Mexico Department of Public Safety (3 sites)	✓
	Local	Albuquerque Police Department	✓
NV	Local	Henderson City Crime Laboratory	
	Local	Las Vegas Metropolitan Police Crime Laboratory	✓
	Local	Washoe County Sheriff's Office Crime Laboratory (Reno)	✓
NY	State	New York State Police (4 sites)	✓
	Local	Erie County Central Police Services Laboratory (Buffalo)	✓
	Local	Nassau County Office of Medical Examiner (East Meadow)	
	Local	New York City Police Department Crime Laboratory**	✓
	Local	Niagara County Sheriff's Office Forensic Laboratory (Lockport)	✓
	Local	Onondaga County Center for Forensic Sciences (Syracuse)	✓
	Local	Suffolk County Crime Laboratory (Hauppauge)	✓
	Local	Westchester County Forensic Sciences Laboratory (Valhalla)	✓
	Local	Yonkers Police Department Forensic Science Laboratory	✓
OH	State	Ohio Bureau of Criminal Identification & Investigation (3 sites)	✓
	State	Ohio State Highway Patrol	✓
	Local	Canton-Stark County Crime Laboratory (Canton)	✓
	Local	Columbus Police Department	✓
	Local	Cuyahoga County Regional Forensic Science Laboratory (Cleveland)	✓
	Local	Hamilton County Coroner's Office (Cincinnati)	✓
	Local	Lake County Regional Forensic Laboratory (Painesville)	✓
	Local	Lorain County Crime Laboratory (Elyria)	✓
	Local	Mansfield Police Department	✓
	Local	Miami Valley Regional Crime Laboratory (Dayton)	✓
	Local	Newark Police Department Forensic Services	✓
	Local	Toledo Police Forensic Laboratory	✓
OK	State	Oklahoma State Bureau of Investigation (5 sites)	✓
	Local	Tulsa Police Department Forensic Laboratory	✓
OR	State	Oregon State Police Forensic Services Division (5 sites)	✓
PA	State	Pennsylvania State Police Crime Laboratory (6 sites)	✓
	Local	Allegheny Office of the Medical Examiner Forensic Laboratory (Pittsburgh)	✓
	Local	Philadelphia Police Department Forensic Science Laboratory	✓
RI	State	Rhode Island Forensic Sciences Laboratory	✓
SC	State	South Carolina Law Enforcement Division	✓
	Local	Anderson/Oconee Regional Forensics Laboratory	✓
	Local	Charleston Police Department	✓
	Local	Richland County Sheriff's Department Forensic Sciences Laboratory (Columbia)	✓
	Local	Spartanburg Police Department	✓
SD	State	South Dakota Department of Public Health Laboratory	
	Local	Rapid City Police Department	✓
TN	State	Tennessee Bureau of Investigation (3 sites)	✓
TX	State	Texas Department of Public Safety (13 sites)	✓
	Local	Austin Police Department	✓
	Local	Bexar County Criminal Investigations Laboratory (San Antonio)	✓
	Local	Brazoria County Sheriff's Office Crime Laboratory (Angleton)	✓
	Local	Dallas Institute of Forensic Sciences	✓
	Local	Fort Worth Police Department Criminalistics Laboratory	✓
	Local	Harris County Institute of Forensic Sciences Crime Laboratory (Houston)	✓
	Local	Houston Forensic Science Local Governance Corporation	✓
	Local	Jefferson County Sheriff's Regional Crime Laboratory (Beaumont)	✓
UT	State	Utah Department of Public Safety (3 sites)	✓
VA	State	Virginia Department of Forensic Science (4 sites)	✓
VT	State	Vermont Forensic Laboratory	✓
WA	State	Washington State Patrol (6 sites)	✓
WI	State	Wisconsin Department of Justice (3 sites)	✓
	Local	Kenosha County Division of Health Services	✓
WV	State	West Virginia State Police	✓
WY	State	Wyoming State Crime Laboratory	✓
PR	Territory	Institute of Forensic Science of Puerto Rico Criminalistics Laboratory (3 sites)	✓

This list identifies laboratories that are participating in and reporting to NFLIS as of July 14, 2017.

*This laboratory is not currently conducting drug chemistry analysis. Cases for the agencies it serves are being analyzed via contracts or agreements with other laboratories.

**The New York City Police Department Crime Laboratory currently reports summary data.

Appendix C NFLIS Benefits and Limitations

Benefits

The systematic collection and analysis of drug analysis data aid our understanding of the Nation's illicit drug problem. NFLIS serves as a resource for supporting drug scheduling policy and drug enforcement initiatives nationally and in specific communities around the country.

Specifically, NFLIS helps the drug control community achieve its mission by

- providing detailed information on the prevalence and types of controlled substances secured in law enforcement operations;
- identifying variations in controlled and noncontrolled substances at the national, State, and local levels;
- identifying emerging drug problems and changes in drug availability in a timely fashion;
- monitoring the diversion of legitimately marketed drugs into illicit channels;
- providing information on the characteristics of drugs, including quantity, purity, and drug combinations; and
- supplementing information from other drug sources, including the National Survey on Drug Use and Health (NSDUH) and the Monitoring the Future (MTF) study.

NFLIS is an opportunity for State and local laboratories to participate in a useful, high-visibility initiative. Participating laboratories regularly receive reports that summarize national and regional data. In addition, the Data Query System (DQS) is a secure website that allows NFLIS participants—including State and local laboratories, the DEA, and other Federal drug control agencies—to run customized queries on the NFLIS data. Enhancements to the DQS provide a new interagency exchange forum that will allow the DEA, forensic laboratories, and other members of the drug control community to post and respond to current information.

Limitations

NFLIS has limitations that must be considered when interpreting findings generated from the database.

- Currently, NFLIS includes data from Federal, State, and local forensic laboratories. Federal data are shown separately in this publication. Efforts are under way to enroll additional Federal laboratories.
- NFLIS includes drug chemistry results from completed analyses only. Drug evidence secured by law enforcement but not analyzed by laboratories is not included in the database.
- National and regional estimates may be subject to variation associated with sample estimates, including nonresponse bias.
- State and local policies related to the enforcement and prosecution of specific drugs may affect drug evidence submissions to laboratories for analysis.
- Laboratory policies and procedures for handling drug evidence vary. Some laboratories analyze all evidence submitted to them, whereas others analyze only selected case items. Many laboratories do not analyze drug evidence if the criminal case was dismissed from court or if no defendant could be linked to the case.
- Laboratories vary with respect to the records they maintain. For example, some laboratories' automated records include the weight of the sample selected for analysis (e.g., the weight of one of five bags of powder), whereas others record total weight.

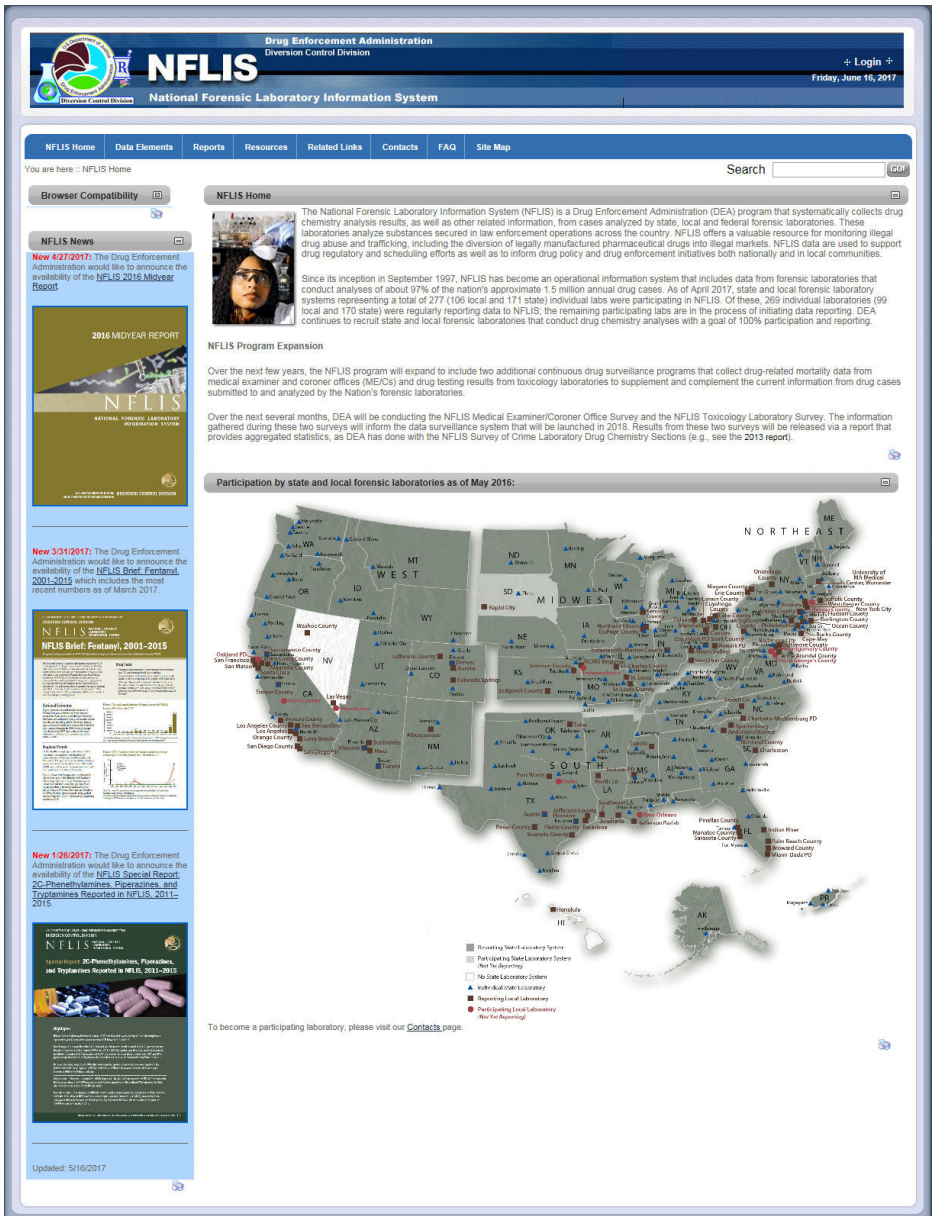
Appendix D NFLIS Website and Data Query System (DQS)

The NFLIS website (https://www.nflis.deadiversion.usdoj.gov/) is an important feature of the NFLIS program. It is the key resource to provide NFLIS-related information, through a public site and through a private site, which gives secure access to the NFLIS DQS.

The public site is frequently updated with NFLIS-related news, including information relevant to drug control efforts and DEA participation in conferences. Also available are downloadable versions of published NFLIS reports, links to other websites, and contact information for key NFLIS staff. Public features include a link to the Scientific Working Group for the Analysis of Seized Drugs (SWGDRUG) mass spectral library at http://www.swgdrug.org/.

The private site requires user accounts, and security roles are assigned to manage access to its features, including the Map Library, NFLIS Data Entry Application, and DQS. The DQS is a distinct resource for NFLIS reporting laboratories to run customizable queries on their own case-level data and on aggregated metropolitan, State, regional, and national data. Features include the drug category queries for synthetic cannabinoids and synthetic cathinones.

To obtain information about NFLIS participation or the DQS, please visit the NFLIS website at https://www.nflis.deadiversion.usdoj.gov/.



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Errata: A previous version of this publication included national estimate errors. The Drug Enforcement Administration has corrected these errors in the updated version of this publication.

Obtaining Copies of This Publication

Electronic copies of this publication can be downloaded from the NFLIS website at **https://www.nflis.deadiversion.usdoj.gov**.

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