2016 MIDYEAR REPORT

NFLIS

NATIONAL FORENSIC LABORATORY INFORMATION SYSTEM

U.S. DEPARTMENT OF JUSTICE
DRUG ENFORCEMENT ADMINISTRATION

DIVERSION CONTROL DIVISION

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Highlights

- From January 1, 2016, through June 30, 2016, an estimated 470,250 distinct drug cases were submitted to State and local laboratories in the United States and analyzed by September 30, 2016. From these cases, an estimated 795,871 drug reports were identified.
- Cannabis/THC was the most frequently reported drug (202,647), followed by methamphetamine (155,535), cocaine (108,210), and heroin (86,918). These four most frequently reported drugs accounted for approximately 70% of all drug reports.
- Nationally, alprazolam reports showed an increasing linear trend from 2001 to 2016 ($p < .05$).* Oxycodone reports increased from 2003 to 2011, then decreased from 2012 to 2016. Fentanyl reports remained steady from 2001 to 2005, followed by a noticeable increase in 2006 and dramatic increases from 2014 to 2016. Hydrocodone reports increased dramatically from 2002 to 2010, followed by decreases from 2011 to the second half of 2015, with a slight increase in reports in 2016. Buprenorphine reports increased dramatically from 2005 to 2010, then slowed until making more pronounced increases between the second half of 2013 and 2016. Amphetamine reports decreased from 2001 to 2004, then increased between 2004 and 2016.
- Regionally, alprazolam reports in the West region showed an upward-curving trend, the South region showed an increasing linear trend, and the Northeast and Midwest regions both showed S-shaped trends. For oxycodone, all regions showed S-shaped trends, with dramatic increases occurring from 2002 to 2010 and decreases occurring from 2011 to 2016. For fentanyl, all four regions showed S-shaped trends, with trend lines dramatically increasing from 2014 to 2016. For hydrocodone, reports in the Northeast region increased through 2009, then steadily decreased from 2010 to 2016. In the West, Midwest, and South regions, more dramatic increases in hydrocodone reports occurred from 2002 to 2010, after which reports decreased from 2011 to 2016. For buprenorphine, reports in the West and Northeast regions decreased slightly between 2001 and 2002, then steadily increased through 2012, while the Midwest and South regions had upward-curving trends (with continued increases from 2005 to 2016). For amphetamine, all four regions showed S-shaped trends, with the most significant increases occurring between 2004 and 2012 in the Midwest and South regions and from 2008 to 2010 in the West region.
- Oxycodone, fentanyl, and hydrocodone accounted for 66% of narcotic analgesic reports. Alprazolam accounted for 60% of tranquilizer and depressant reports. Among identified synthetic cannabinoids, FUB-AMB, 5-fluoro-ADB, XLR11, and AB-CHMINACA accounted for 50% of the reports.
- For cannabis/THC reports, the West and Midwest regions showed downward-curving trends, the Northeast region showed a U-shaped trend (with reports increasing from 2001 through 2008 and again in 2016), and the South region showed an S-shaped downward trend (with reports decreasing from 2001 through 2005 and from 2012 to 2016). All regional trends for methamphetamine generally increased since 2010. For cocaine reports, all four regions showed decreases from around 2006 through 2013. For heroin reports, the West, Northeast, and South regions all showed U-shaped trends, with the lowest point of the curve occurring in about 2006 for the West and Northeast regions and in 2008 for the South region; the Midwest region showed an S-shaped trend, with a decrease in reports from 2002 through 2007, an increase in reports from 2008 through the first half of 2015, and a decrease in reports into 2016. All four regions showed downward trends for MDMA reports.
- Cannabis/THC was the most frequently reported drug in the Midwest (32%), Northeast (31%), and South (22%) regions, and methamphetamine was the most frequently reported drug in the West region (44%).
- Nationwide, cannabis/THC reports showed a fluctuating, downward-curving trend, with reports decreasing more steadily beginning in 2010. Methamphetamine reports increased from 2001 through 2004, decreased through 2010, then increased between 2010 and 2016. Cocaine reports gradually increased from 2001 to 2007, then dramatically decreased through 2012 before slowing and leveling off between 2013 and 2016. Heroin reports decreased from 2001 to 2005, followed by a dramatic increase through 2015. MDMA reports increased from 2003 through 2009 and steadily decreased from 2009 through the second half of 2013 before leveling off from 2014 to 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 either 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. NFLIS 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, making NFLIS an important resource in monitoring illicit drug use and trafficking, including the diversion of legally manufactured drugs into illegal markets. NFLIS includes information on the specific substance and the characteristics of drug evidence, such as purity, quantity, and drug combinations. These data are used to support drug scheduling efforts 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%. Currently, NFLIS includes 50 State systems and 101 local or municipal laboratories/laboratory systems, representing a total of 277 individual State and local laboratories. The NFLIS database also includes Federal data from DEA and U.S. Customs and Border Protection (CBP) laboratories.

This publication presents the results of drug cases *submitted* to State and local laboratories from January 1, 2016, through June 30, 2016, which were *analyzed* by September 30, 2016. Data from Federal laboratories are presented separately in this publication. All data presented in this publication include the first, second, and third drugs that were mentioned in laboratories' reported drug items.

Section 1 of this publication provides national and regional estimates for the 25 most frequently identified drugs, as well as national and regional trends for select drugs from January 2001 through June 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).

Appendix A provides details on the methodology used in preparing the data presented in this publication. Appendix B includes a list of NFLIS participating and reporting laboratories. The benefits and limitations of NFLIS are presented in Appendix C.

Participating Laboratories, by U.S. Census Region

Section 1: National and Regional Estimates

This section presents national and regional estimates of drugs *submitted* to State and local laboratories from January 1, 2016, through June 30, 2016, that were *analyzed* by September 30, 2016 (see Table 1.1). National and regional drug estimates include all drug reports (up to three) mentioned in laboratories' reported drug items. National drug case estimates are also presented (see Table 1.2). In addition, semiannual trends are presented for selected drugs from January 2001 through June 2016.

The NEAR approach (National Estimates Based on All Reports) 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.

Table 1.1 *National and Regional Estimates for the 25 Most Frequently Identified Drugs*[1]
Estimated number and percentage of total drug reports submitted to laboratories from January 1, 2016, through June 30, 2016, and analyzed by September 30, 2016

Drug	National		West		Midwest		Northeast		South	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Cannabis/THC	202,647	25.46%	22,902	18.16%	62,101	31.57%	43,004	31.05%	74,641	22.31%
Methamphetamine	155,535	19.54%	55,064	43.66%	28,704	14.59%	2,253	1.63%	69,514	20.78%
Cocaine	108,210	13.60%	8,526	6.76%	24,037	12.22%	27,037	19.52%	48,611	14.53%
Heroin	86,918	10.92%	14,859	11.78%	24,300	12.35%	26,738	19.30%	21,022	6.28%
Alprazolam	25,792	3.24%	2,567	2.04%	5,368	2.73%	3,464	2.50%	14,394	4.30%
Oxycodone	19,493	2.45%	1,667	1.32%	4,244	2.16%	4,131	2.98%	9,451	2.83%
Fentanyl	14,769	1.86%	176	0.14%	5,645	2.87%	5,711	4.12%	3,237	0.97%
Hydrocodone	12,800	1.61%	1,362	1.08%	3,257	1.66%	497	0.36%	7,684	2.30%
Buprenorphine	8,767	1.10%	615	0.49%	1,803	0.92%	2,117	1.53%	4,232	1.27%
Amphetamine	6,379	0.80%	526	0.42%	1,777	0.90%	936	0.68%	3,140	0.94%
Clonazepam	6,099	0.77%	467	0.37%	1,412	0.72%	1,118	0.81%	3,103	0.93%
Morphine	3,226	0.41%	524	0.42%	800	0.41%	330	0.24%	1,572	0.47%
Tramadol	2,984	0.37%	262	0.21%	940	0.48%	376	0.27%	1,407	0.42%
MDMA	2,901	0.36%	1,012	0.80%	863	0.44%	267	0.19%	759	0.23%
Phencyclidine (PCP)	2,695	0.34%	200	0.16%	488	0.25%	1,087	0.78%	920	0.28%
Methadone	2,494	0.31%	363	0.29%	497	0.25%	543	0.39%	1,091	0.33%
Diazepam	2,375	0.30%	306	0.24%	601	0.31%	225	0.16%	1,243	0.37%
FUB-AMB	2,349	0.30%	355	0.28%	602	0.31%	98	0.07%	1,293	0.39%
Noncontrolled, non-narcotic[2]	2,008	0.25%	881	0.70%	33	0.02%	298	0.21%	796	0.24%
Psilocin/psilocibin	1,942	0.24%	559	0.44%	566	0.29%	209	0.15%	607	0.18%
Naloxone	1,798	0.23%	34	0.03%	235	0.12%	641	0.46%	888	0.27%
Hydromorphone	1,763	0.22%	130	0.10%	234	0.12%	72	0.05%	1,328	0.40%
Codeine	1,725	0.22%	231	0.18%	392	0.20%	228	0.16%	874	0.26%
5F-ADB	1,687	0.21%	20	0.02%	105	0.05%	56	0.04%	1,506	0.45%
Lysergic acid diethylamide (LSD)	1,628	0.20%	258	0.20%	631	0.32%	241	0.17%	498	0.15%
Top 25 Total	678,985	85.31%	113,866	90.27%	169,634	86.25%	121,675	87.84%	273,810	81.85%
All Other Drug Reports	116,886	14.69%	12,269	9.73%	27,048	13.75%	16,837	12.16%	60,732	18.15%
Total Drug Reports[3]	795,871	100.00%	126,134	100.00%	196,682	100.00%	138,512	100.00%	334,542	100.00%

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

[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.*

Table 1.2 ***National Case Estimates***
Top 25 estimated number of drug-specific cases and their percentage of distinct cases, January 1, 2016, through June 30, 2016

Drug	Number	Percent
Cannabis/THC	146,357	31.12%
Methamphetamine	119,416	25.39%
Cocaine	85,634	18.21%
Heroin	67,293	14.31%
Alprazolam	21,390	4.55%
Oxycodone	15,310	3.26%
Fentanyl	11,888	2.53%
Hydrocodone	10,895	2.32%
Buprenorphine	7,917	1.68%
Amphetamine	5,364	1.14%
Clonazepam	5,320	1.13%
Morphine	2,780	0.59%
Tramadol	2,507	0.53%
Phencyclidine (PCP)	2,272	0.48%
Methadone	2,230	0.47%
MDMA	2,161	0.46%
Diazepam	2,097	0.45%
FUB-AMB	1,713	0.36%
Psilocin/psilocibin	1,704	0.36%
Naloxone	1,665	0.35%
Hydromorphone	1,564	0.33%
Codeine	1,506	0.32%
Lysergic acid diethylamide (LSD)	1,361	0.29%
5F-ADB	1,292	0.27%
Noncontrolled, non-narcotic[1]	1,278	0.27%
Top 25 Total	522,916	111.20%
All Other Drugs	89,038	18.93%
Total All Drugs[2]	611,954	130.13%[3]

MDMA=3,4-Methylenedioxymethamphetamine

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

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

[1] *As reported by NFLIS laboratories, with no specific drug name provided.*

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

[3] *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 470,250 distinct cases submitted to State and local laboratories from January 1, 2016, through June 30, 2016, and analyzed by September 30, 2016.*

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 located 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, reports from seven U.S. Customs and Border Protection laboratories are also included.

Most Frequently Reported Drugs by Federal Laboratories[1]
Number and percentage of drug reports submitted to laboratories from January 1, 2016, through June 30, 2016, and analyzed by September 30, 2016

Drug	Number	Percent
Methamphetamine	2,536	17.99%
Cocaine	1,904	13.51%
Heroin	1,386	9.83%
Cannabis/THC	1,008	7.15%
Fentanyl	331	2.35%
FUB-AMB	234	1.66%
Oxycodone	163	1.16%
Testosterone	134	0.95%
Phencyclidine (PCP)	99	0.70%
Alprazolam	87	0.62%
All Other Drug Reports	6,214	44.08%
Total Drug Reports	14,096	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 13,012 reports from Drug Enforcement Administration laboratories and 1,084 reports from U.S. Customs and Border Protection laboratories.*

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

National and Regional Drug Trends

The remainder of this section presents semiannual national and regional trends of selected drugs submitted to State and local laboratories during each six-month data reference period and analyzed within three months of the end of each six-month 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. 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 either 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. Estimates include all drug reports (up to three) identified among the NFLIS laboratories' reported drug items. Between the first half of 2001 and the first half of 2016, the total estimated number of drug reports increased approximately 4%, from 767,679 to 795,871.

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. Significant ($p < .05$) results include the following:

- Alprazolam reports showed an overall increasing linear trend.
- Oxycodone, fentanyl, and hydrocodone reports showed S-shaped trends. For oxycodone, increases in reports occurred from 2003 to 2011, followed by a decrease in reports from 2011 through the first half of 2016. For fentanyl, reports remained steady from 2001 to 2005, which was followed by a noticeable increase in 2006. Fentanyl reports then continued to remain fairly steady until dramatic increases occurred beginning in 2014 through the first half of 2016. For hydrocodone, dramatic increases occurred from 2002 to 2010, followed by decreases from 2011 to the second half of 2015, with a slight increase in reports in the first half of 2016.
- Buprenorphine and amphetamine reports also showed S-shaped trends. Buprenorphine reports remained stable from 2001 through 2004 until dramatic increases occurred from 2005 to 2010. The increase in buprenorphine reports then slowed until more pronounced increases occurred from the second half of 2013 through the first half of 2016. Amphetamine reports decreased from 2001 to 2004, but increased between 2004 and the first half of 2016, with the rate of increase slowing down in more recent years.

Significance tests were also performed on differences from the first half of 2015 to the first half of 2016 in order to identify more recent changes. Across these two periods, reports of alprazolam (from 22,781 to 25,792 reports) and fentanyl (from 5,848 to 14,769 reports) increased significantly ($p < .05$), while reports of oxycodone (from 21,306 to 19,493 reports) decreased significantly. There was no significant change in the reports of buprenorphine, hydrocodone, and amphetamine.

Hydrocodone pills

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

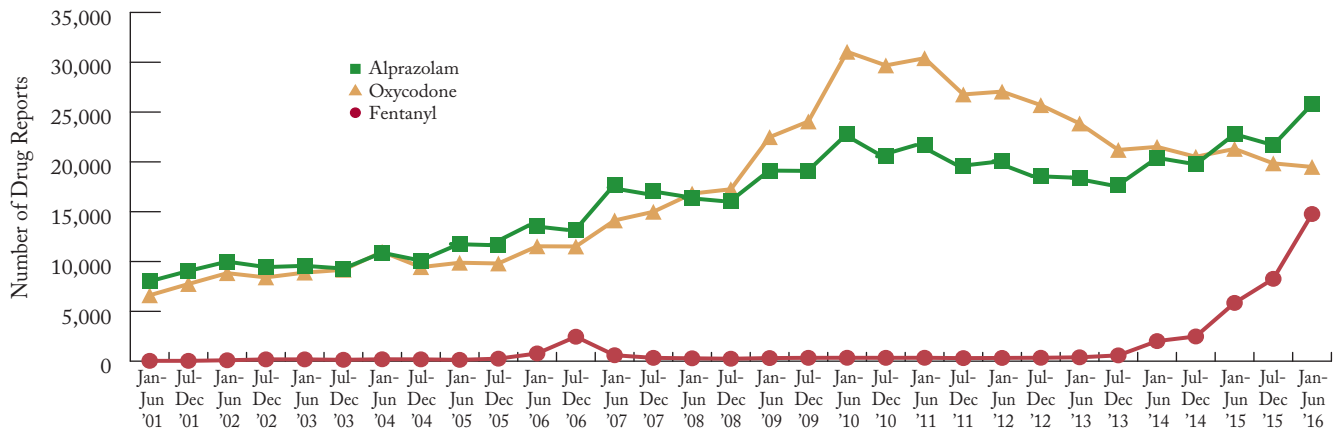
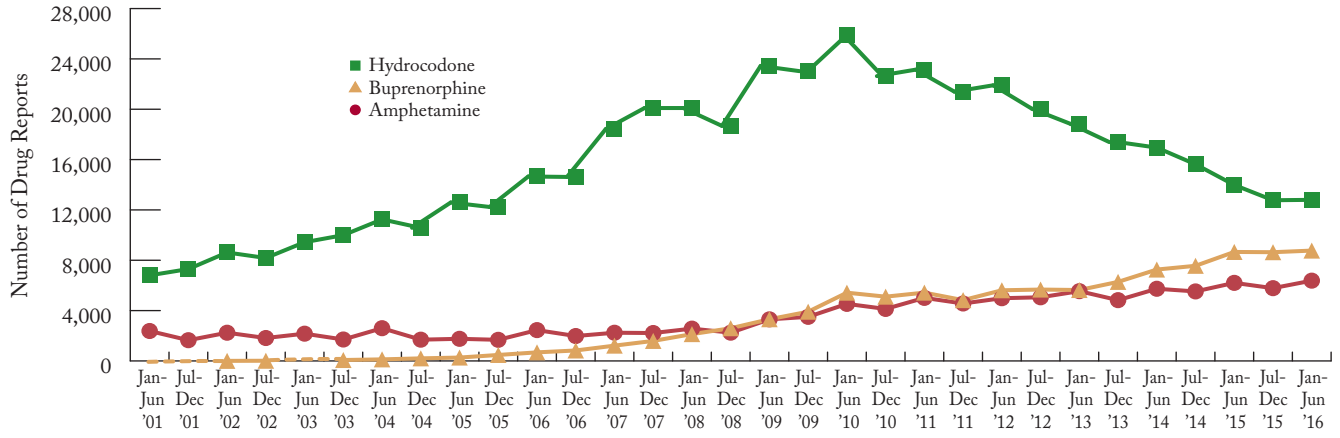


Figure 1.2 National trend estimates for hydrocodone, buprenorphine, and amphetamine, January 2001–June 2016[1]



[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.*

Other national drug trends

Figures 1.3 and 1.4 present national trends for reports of cannabis/THC, methamphetamine, cocaine, heroin, and MDMA. Significant ($p < .05$) results include the following:

- Cannabis/THC reports showed a downward-curving trend. Continued rate fluctuations occurred from 2001 through the first half of 2016, with reports decreasing more steadily beginning in 2010.
- Methamphetamine reports showed an S-shaped trend, with significant increases in recent years. Methamphetamine reports increased from 2001 through 2004, decreased from 2004 through 2010, and increased between 2010 and the first half of 2016.
- Cocaine reports also showed an S-shaped trend, with slower rates of decrease in recent years. Cocaine reports gradually increased from 2001 to 2007, then dramatically decreased through 2012, with the rate of decrease slowing considerably from 2013 and leveling off through the first half of 2016.
- Heroin reports showed a U-shaped trend, with significant increases in recent years. Heroin had a decrease in reports from 2001 to 2005, followed by a more dramatic increase through the second half of 2015.
- MDMA reports showed a downward-facing U-shaped trend. They fluctuated semiannually from 2001 through 2009, with an increase from 2003 through 2009, followed by a steady decrease from 2009 through the second half of 2013. MDMA reports then leveled off through the first half of 2016.

More recently, from the first half of 2015 to the first half of 2016, reports of methamphetamine (from 133,374 to 155,535 reports) and MDMA (from 2,421 to 2,901 reports) increased significantly ($p < .05$), while reports of heroin (from 91,465 to 86,918 reports) decreased significantly. There were no significant changes in reports of cannabis/THC and cocaine.

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

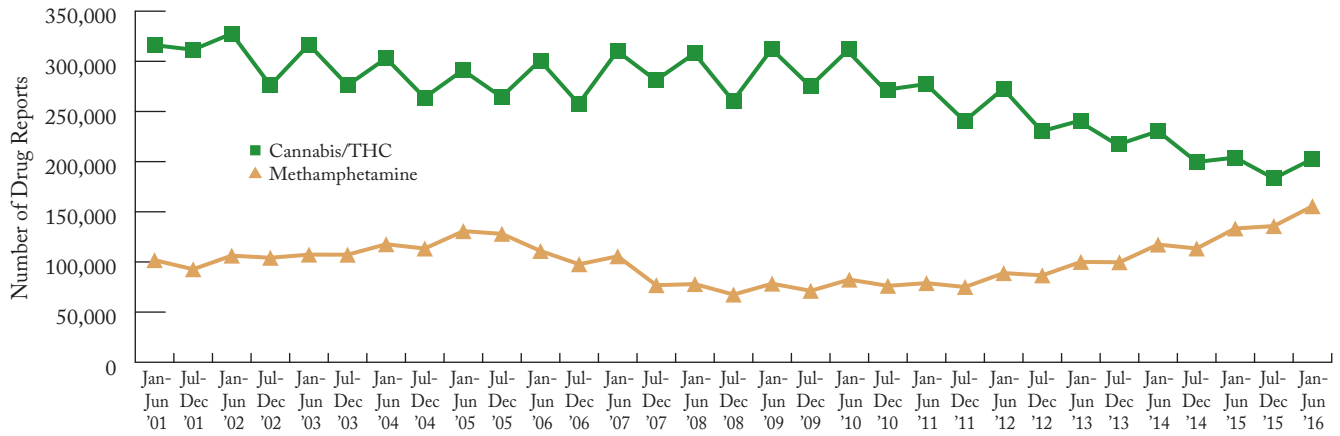
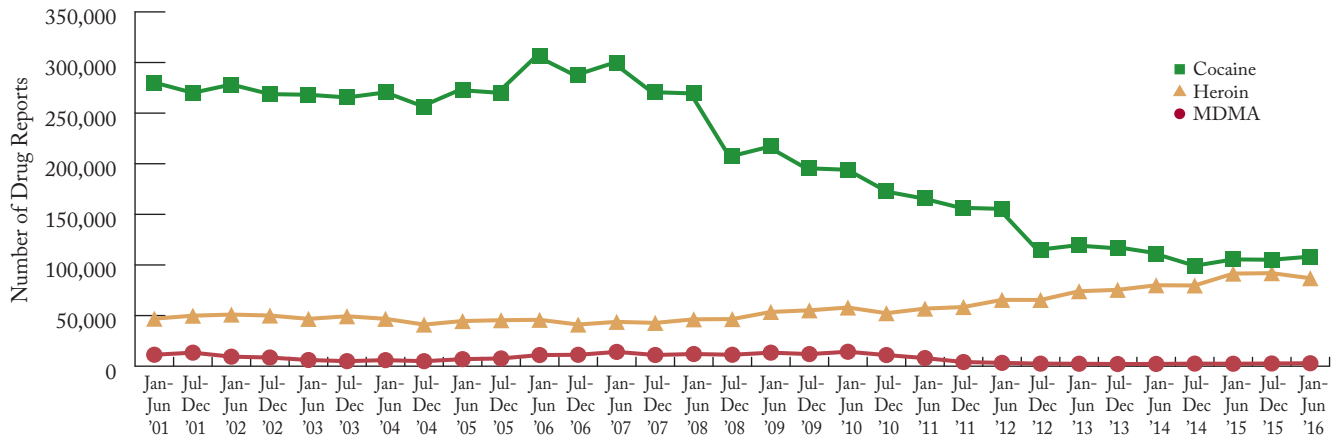


Figure 1.4 National trend estimates for cocaine, heroin, and MDMA, January 2001–June 2016



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 the first half of 2001 through the first half of 2016. These figures illustrate changes in prescription drugs reported over time, taking into account the population aged 15 or older within each U.S. census region. Significant ($p < .05$) trend results include the following:

- For alprazolam reports, the West region showed an upward-curving trend, while the South region showed an increasing linear trend. The Northeast and Midwest regions both showed S-shaped trends. In the Northeast region, the rate of increase slowed after 2010 and began to reverse in 2012 until a more recent increase in reports in the first half of 2016. The Midwest region had an increase in reports from 2001 through 2007, followed by a fluctuation in reports through 2010 and a continued increase in reports from 2011 through the first half of 2016.
- For oxycodone reports, all four regions showed S-shaped trends that were similar to the national trend. Dramatic increases generally occurred from 2002 to 2010, followed by decreases in reports from 2011 to the first half of 2016.
- For fentanyl reports, all four regions showed S-shaped trends, with trend lines dramatically increasing from 2014 through the first half of 2016. Both the Northeast and Midwest regions showed a noticeable increase in reports in 2006; these two regions had higher numbers of reports (per 100,000) than did the West and South regions.
- For hydrocodone reports, all regions except the Northeast region showed S-shaped trends. In the Northeast region, reports showed an upside-down U-shaped trend, with increases in reports through 2009, followed by a steady decrease in reports through the first half of 2016. In the West, Midwest, and South regions, the largest increase in reports occurred from 2005 to 2010, after which reports decreased from 2011 to the first half of 2016.
- For buprenorphine reports, the West and Northeast regions showed S-shaped trends, with reports decreasing slightly between 2001 and 2002, then steadily increasing through 2012 until the rate of increase slowed, most noticeably in the Northeast region. The Midwest and South regions had upward-curving trends, with a similar number of reports from 2001 through 2005, followed by a continued increase in reports through the first half of 2016.
- For amphetamine reports, all four regions showed S-shaped trends. Reports in the Midwest and South regions showed the most significant increases occurring between 2004 and 2012. The trend in the West region had a more pronounced decrease in reports from 2001 to 2007, followed by a slower rate of increase through the first half of 2016. In the Northeast region, the most dramatic increase occurred from 2008 to 2010.

More recently, from the first half of 2015 to the first half of 2016, alprazolam reports increased significantly in all regions except the South region. Oxycodone reports increased significantly in the Midwest region while decreasing in the South and West regions. Fentanyl reports increased significantly across all regions. Hydrocodone reports decreased significantly in the Northeast and West regions. Buprenorphine reports increased significantly in the Midwest region while decreasing significantly in the West region. Amphetamine reports increased significantly in the Northeast and Midwest regions, but decreased significantly in the West region.

Oxycodone, 40 mg pills

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

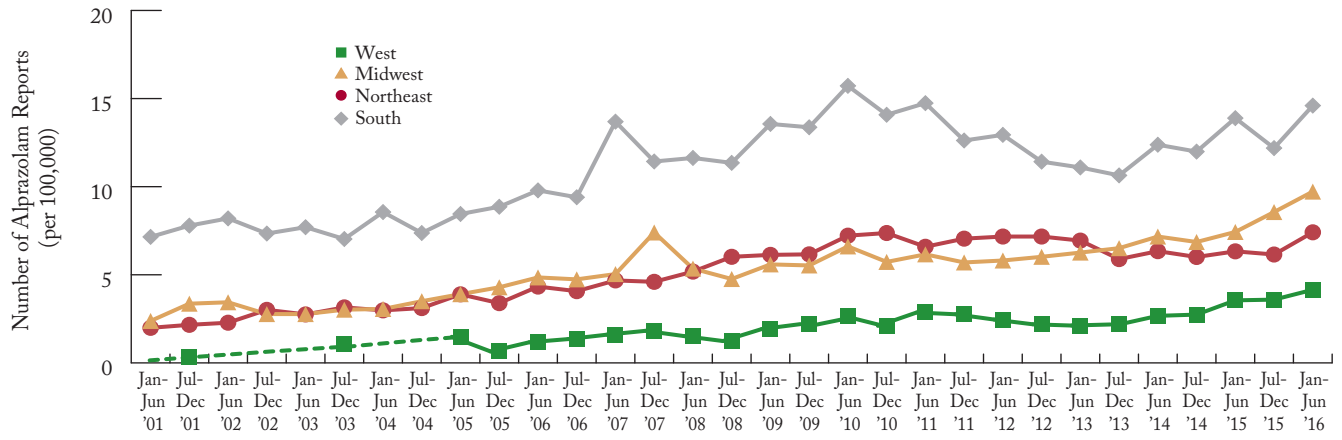


Figure 1.6 Regional trends in oxycodone reported per 100,000 persons aged 15 or older, January 2001–June 2016[1]

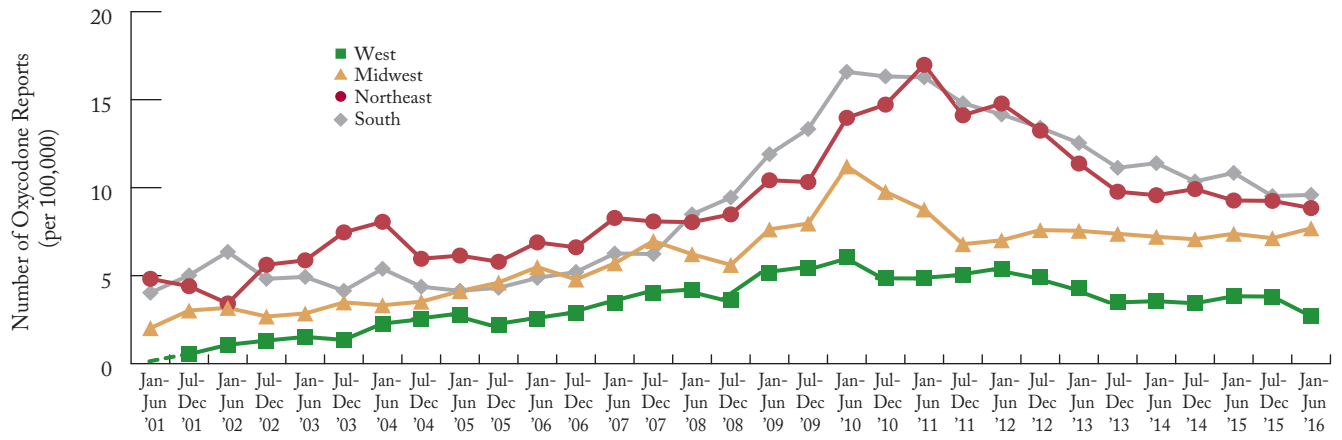
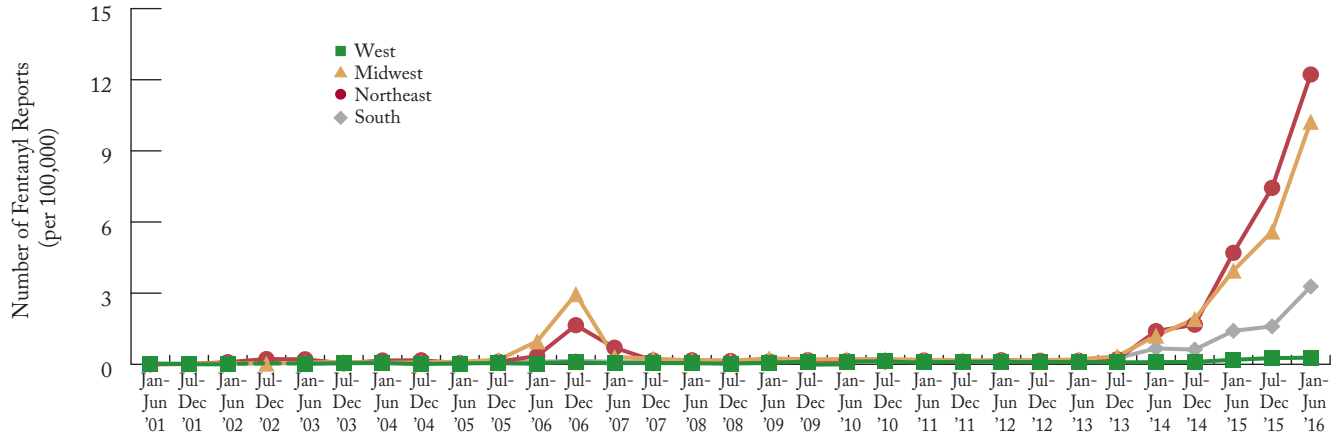


Figure 1.7 Regional trends in fentanyl reported per 100,000 persons aged 15 or older, January 2001–June 2016[1]



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–June 2016

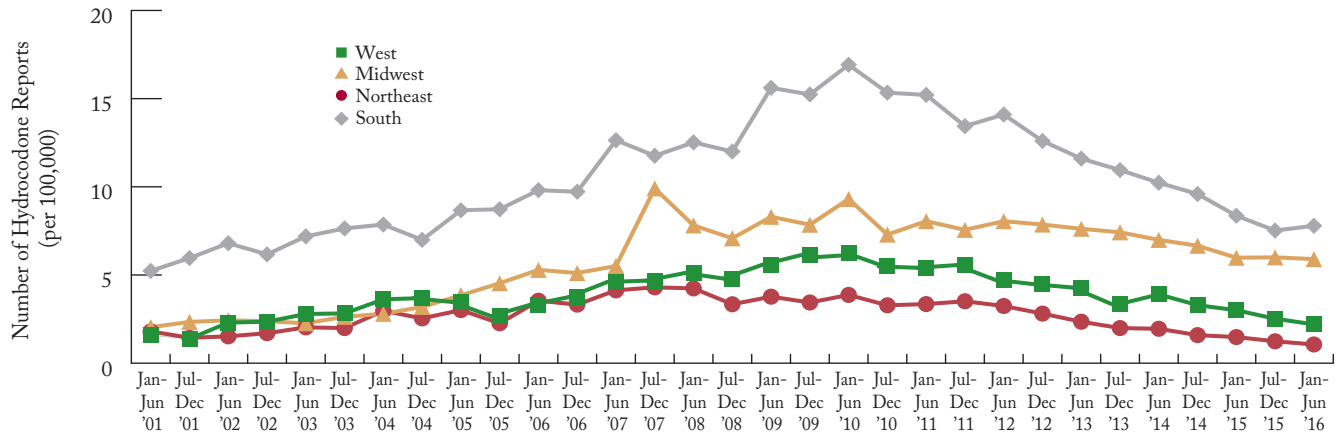


Figure 1.9 Regional trends in buprenorphine reported per 100,000 persons aged 15 or older, January 2001–June 2016[1]

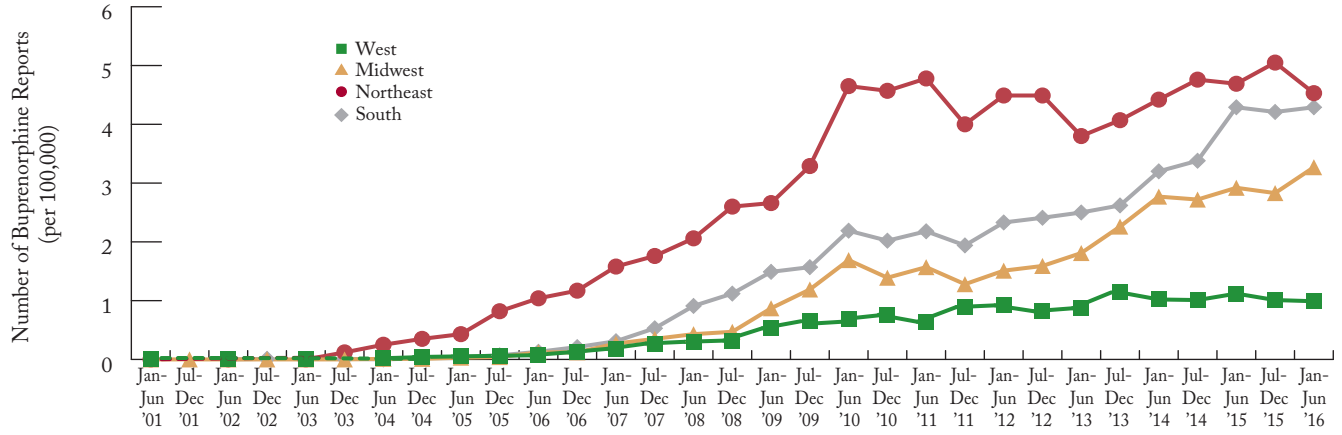
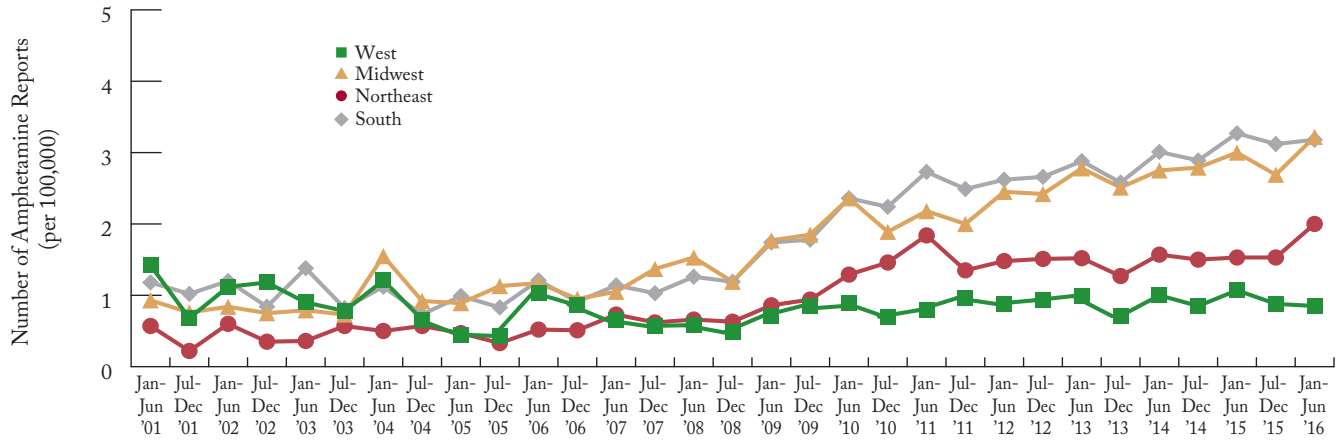


Figure 1.10 Regional trends in amphetamine reported per 100,000 persons aged 15 or older, January 2001–June 2016



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.*

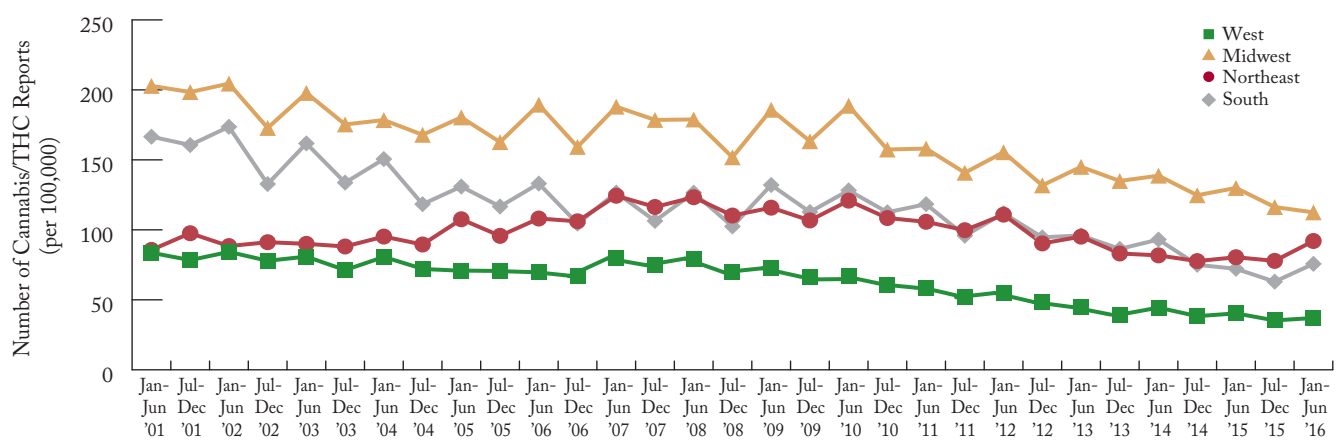
Other regional drug trends

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 the first half of 2001 through the first half of 2016. Significant ($p < .05$) trends include the following:

- For cannabis/THC reports, the West and Midwest regions showed downward-curving trends. In the Northeast region, the trend was U-shaped, with reports increasing from 2001 through 2008, followed by a steady decrease in reports through the second half of 2015, then by a significant increase in reports in the first half of 2016. In the South region, the trend was S-shaped and downward, with a decrease in reports from 2001 through 2005 and a steadier decrease in reports from 2012 through the first half of 2016.
- For methamphetamine and cocaine reports, the regional trends were all S-shaped and similar to the corresponding national trend. For methamphetamine, all four regions showed increases between 2010 and the first half of 2016. For cocaine, the most dramatic decrease in reports occurred from 2006 through 2013.
- For heroin reports, the West, Northeast, and South regions all showed U-shaped trends. The lowest point of the curve occurred in about 2006 for the West and Northeast regions and in 2008 for the South region. The Midwest region had an S-shaped trend, with a decrease in reports from 2002 through 2007, followed by an increase in reports from 2008 through the first half of 2015 and a decrease in reports through the first half of 2016.
- For MDMA reports, the West and Midwest regions showed upside-down U-shaped trends, with reports increasing through 2008, then steadily decreasing through 2011. The South region showed a linear-decreasing trend, while the Northeast region showed a downward S-shaped trend. All four regions showed slower rates of decrease between the second half of 2012 and the first half of 2016.

Between the first half of 2015 and the first half of 2016, cannabis/THC reports decreased significantly in the West and Midwest regions, but significantly increased in the Northeast region ($p < .05$). Methamphetamine reports increased significantly in the Northeast, Midwest, and South regions, but decreased significantly in the West region. Cocaine reports increased significantly in the Northeast and Midwest regions, while MDMA reports increased significantly in the South and West regions. Heroin reports decreased significantly in all regions except the South region.

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



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

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

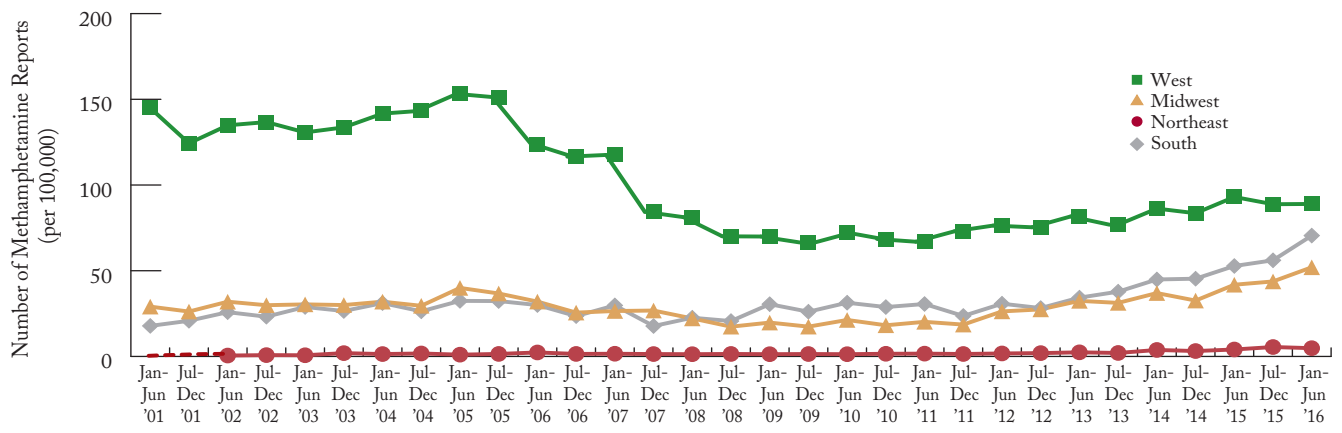
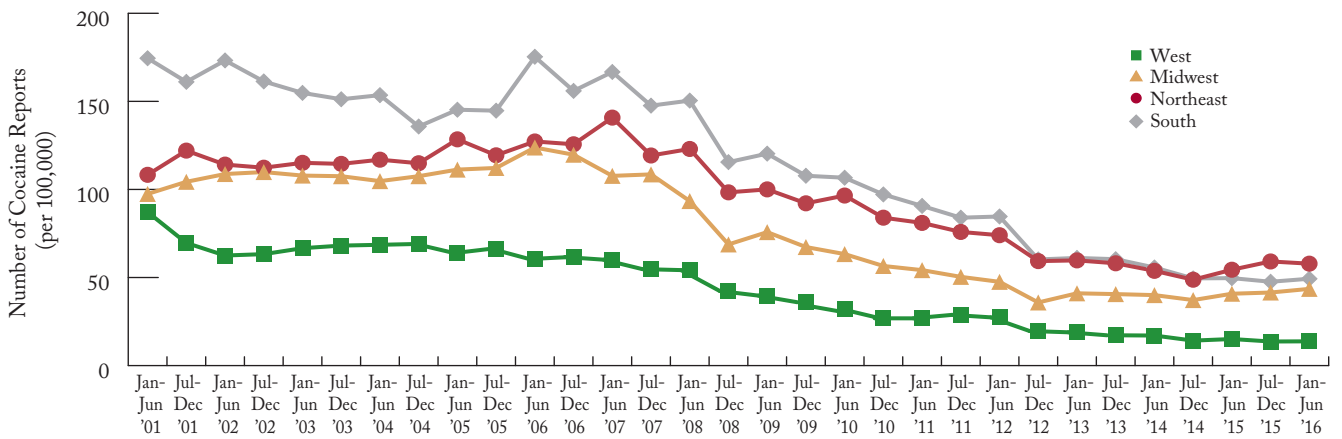


Figure 1.13 Regional trends in cocaine reported per 100,000 persons aged 15 or older, January 2001–June 2016



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–June 2016

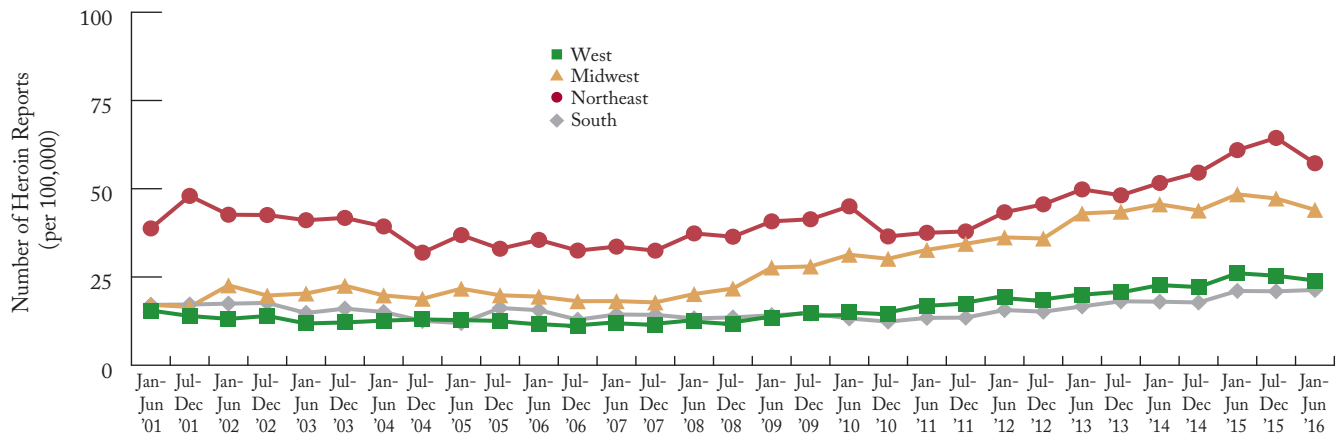
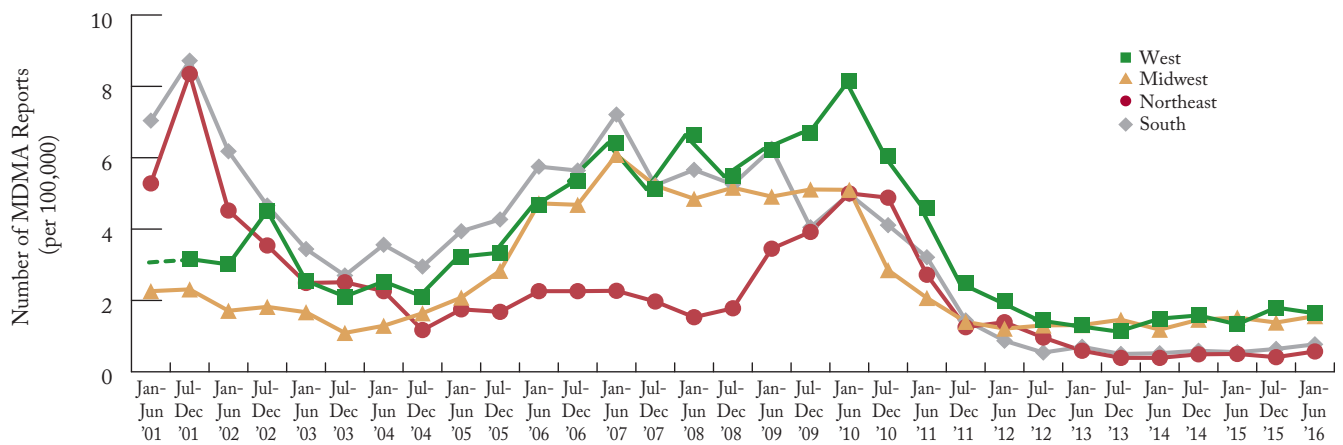


Figure 1.15 Regional trends in MDMA reported per 100,000 persons aged 15 or older, January 2001–June 2016[1]



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.

Section 2: Major Drug Categories

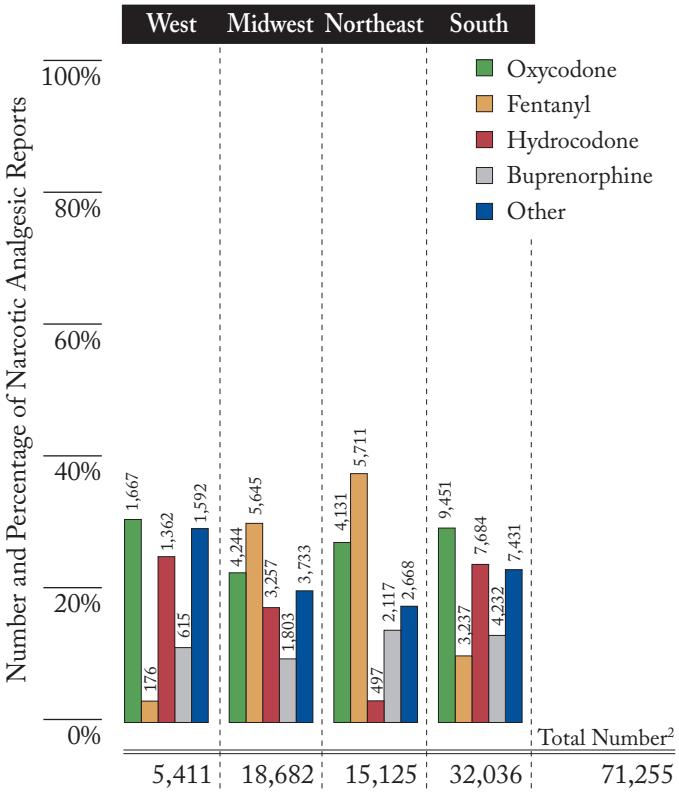
This section presents results for major drug categories. Specifically, this section presents estimates of specific drugs by drug category using the NEAR approach. The first, second, and third drugs mentioned in laboratories' drug items are included in the counts. Drug categories presented in this section include narcotic analgesics, tranquilizers and depressants, anabolic steroids, phenethylamines, and synthetic cannabinoids. A total of 795,871 drug reports were submitted to State and local laboratories from January 1, 2016, through June 30, 2016, and analyzed by September 30, 2016.

Table 2.1 *NARCOTIC ANALGESICS*
Number and percentage of narcotic analgesic reports in the United States, January 2016–June 2016[1]

Narcotic Analgesic Reports	Number	Percent
Oxycodone	19,493	27.36%
Fentanyl	14,769	20.73%
Hydrocodone	12,800	17.96%
Buprenorphine	8,767	12.30%
Morphine	3,226	4.53%
Tramadol	2,984	4.19%
Methadone	2,494	3.50%
Hydromorphone	1,763	2.47%
Codeine	1,725	2.42%
Oxymorphone	1,073	1.51%
Acetylfentanyl	873	1.23%
Furanyl fentanyl	535	0.75%
U-47700	202	0.28%
3-Methylfentanyl	168	0.24%
Mitragynine	129	0.18%
Other narcotic analgesics	251	0.35%
Total Narcotic Analgesic Reports[2]	71,255	100.00%
Total Drug Reports	795,871	

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

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



[1] *Includes drug reports submitted to laboratories from January 1, 2016, through June 30, 2016, that were analyzed by September 30, 2016.*
[2] *Numbers and percentages may not sum to totals because of rounding.*

Table 2.2 *TRANQUILIZERS AND DEPRESSANTS*
Number and percentage of tranquilizer and depressant reports in the United States, January 2016–June 2016[1]

Tranquilizer and Depressant Reports	Number	Percent
Alprazolam	25,792	59.53%
Clonazepam	6,099	14.08%
Phencyclidine (PCP)	2,695	6.22%
Diazepam	2,375	5.48%
Lorazepam	1,316	3.04%
Carisoprodol	1,185	2.74%
Zolpidem	755	1.74%
Ketamine	706	1.63%
Cyclobenzaprine	525	1.21%
Etizolam	386	0.89%
Pregabalin	236	0.54%
Hydroxyzine	202	0.47%
Gamma-hydroxybutyrate (GHB)	147	0.34%
Temazepam	141	0.32%
Butalbital	123	0.28%
Other tranquilizers and depressants	644	1.49%
Total Tranquilizer and Depressant Reports[2]	43,325	100.00%
Total Drug Reports	795,871	

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

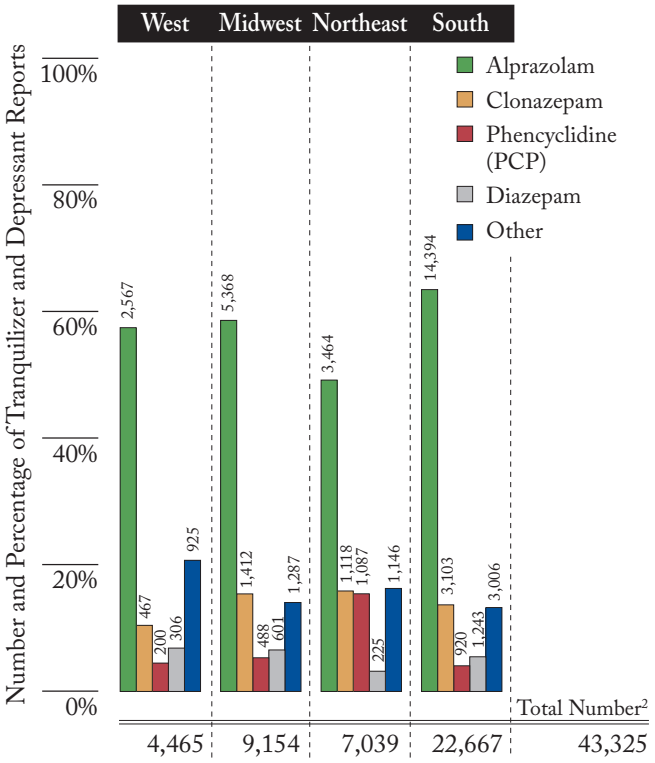
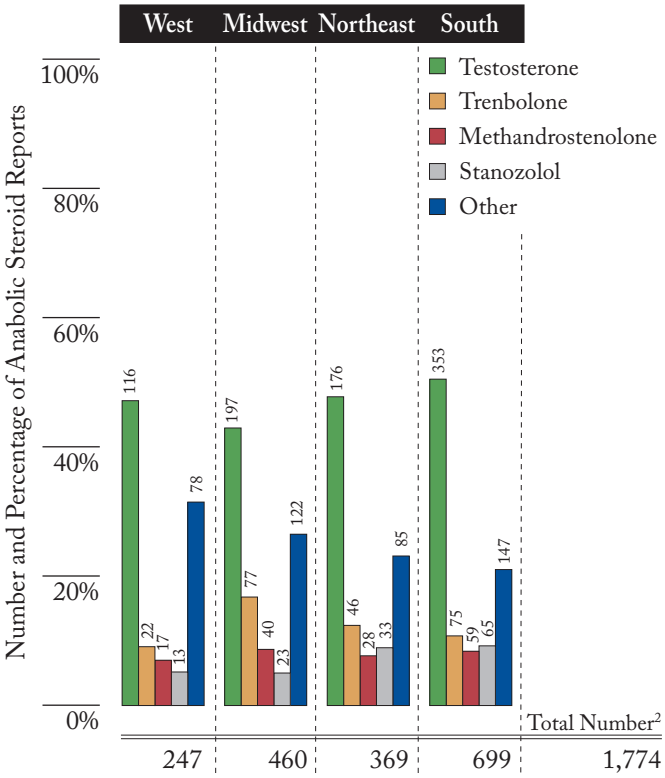


Table 2.3 *ANABOLIC STEROIDS*
Number and percentage of anabolic steroid reports in the United States, January 2016–June 2016[1]

Anabolic Steroid Reports	Number	Percent
Testosterone	843	47.53%
Trenbolone	221	12.45%
Methandrostenolone	144	8.14%
Stanozolol	134	7.53%
Nandrolone	99	5.59%
Drostanolone	72	4.06%
Oxandrolone	67	3.78%
Boldenone	57	3.19%
Oxymetholone	51	2.86%
Mesterolone	15	0.86%
Mestanolone	6	0.34%
Other anabolic steroids	65	3.68%
Total Anabolic Steroid Reports[2]	1,774	100.00%
Total Drug Reports	795,871	

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



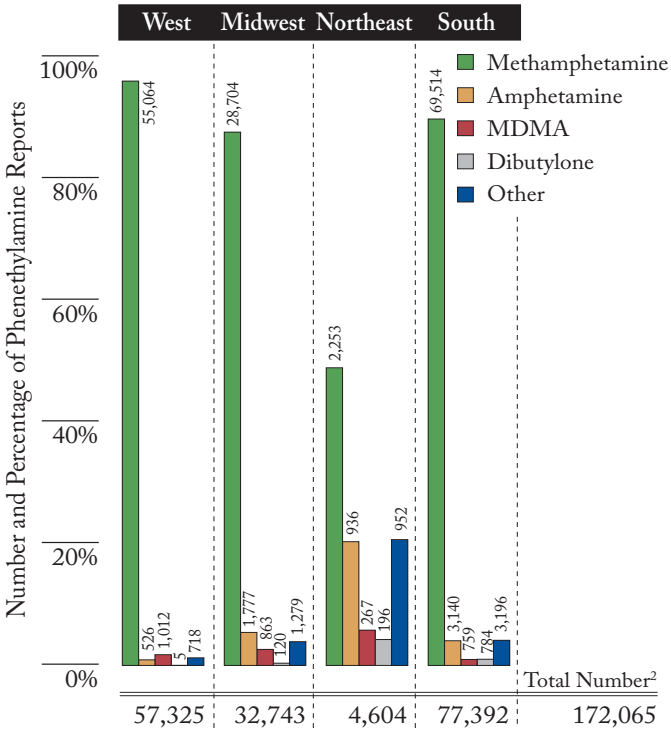
[1] *Includes drug reports submitted to laboratories from January 1, 2016, through June 30, 2016, that were analyzed by September 30, 2016.*
[2] *Numbers and percentages may not sum to totals because of rounding.*

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

Phenethylamine Reports	Number	Percent
Methamphetamine	155,535	90.39%
Amphetamine	6,379	3.71%
MDMA	2,901	1.69%
Dibutylone	1,105	0.64%
Lisdexamfetamine	1,051	0.61%
Ethylone	975	0.57%
MDA	726	0.42%
alpha-PVP	666	0.39%
N-Ethylpentylone	457	0.27%
Pentylone	367	0.21%
Phentermine	258	0.15%
25I-NBOMe	221	0.13%
4-chloromethcathinone	134	0.08%
Methylone	123	0.07%
25C-NBOMe	85	0.05%
Other phenethylamines	1,082	0.63%
Total Phenethylamine Reports[2]	172,065	100.00%
Total Drug Reports	795,871	

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

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



[1] *Includes drug reports submitted to laboratories from January 1, 2016, through June 30, 2016, that were analyzed by September 30, 2016.*
[2] *Numbers and percentages may not sum to totals because of rounding.*

Powder methamphetamine in foil

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

Synthetic Cannabinoid Reports	Number	Percent
FUB-AMB	2,349	18.63%
5F-ADB	1,687	13.38%
XLR11	1,409	11.18%
AB-CHMINACA	874	6.93%
5F-AMB	821	6.51%
AB-FUBINACA	771	6.12%
MAB-CHMINACA	601	4.77%
ADB-FUBINACA	418	3.31%
NM2201	309	2.45%
MDMB-FUBINACA	253	2.00%
AB-PINACA	243	1.93%
5F-AB-PINACA	185	1.47%
AKB48 N-(5-fluoropentyl)	124	0.98%
MDMB-CHMICA	102	0.81%
FUB-PB-22	77	0.61%
Other synthetic cannabinoids	2,382	18.90%
Total Synthetic Cannabinoid Reports[2]	12,605	100.00%
Total Drug Reports	795,871	

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

5F-ADB=Methyl (R)-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-CHMINACA=(N-(1-Amino-3-methyl-1oxobutan-2-yl)-1-(cyclohexylmethyl)1H-indazole-3-carboxamide

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

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

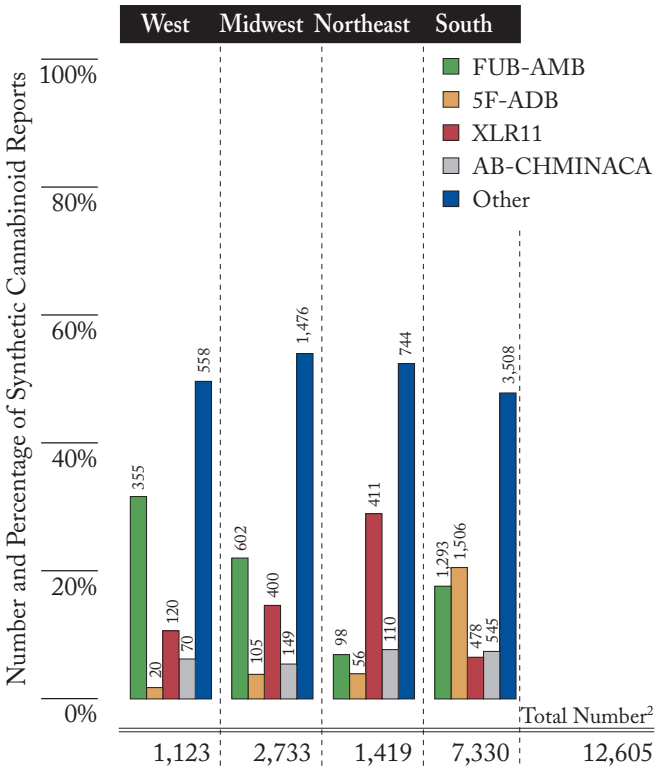
5F-AB-PINACA=N-(1-Amino-3-methyl-1-oxobutan-2-yl)-1-(5-fluoropentyl)-1H-indazole-3-carboxamide

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

FUB-PB-22=Quinolin-8-yl 1-(4-fluorobenzyl)-1H-indole-3-carboxylate

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



[1] *Includes drug reports submitted to laboratories from January 1, 2016, through June 30, 2016, that were analyzed by September 30, 2016.*

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

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 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 June 30, 2016, and *analyzed* by September 30, 2016. 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).

For each drug item (or exhibit) analyzed by a laboratory in the NFLIS program, up to three drugs can be reported to NFLIS and counted in the estimation process. A drug-specific case is one for which the specific drug was identified as the first, second, or third drug report for any item associated with the case. A drug-specific report is the total number of reports of the specific drug.

Currently, laboratories representing more than 97% of the national drug caseload participate in NFLIS, with about 96% of the national caseload reported during 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.[i] However, as the number of nonsampled laboratories reporting to NFLIS increased,[ii] it began to make sense to consider ways to use 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. Imputation 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.

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

[ii] In the current reporting period, for example, out of 106 nonsampled laboratories and laboratory systems, 83 (or 78%) 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 were produced for the similarly sized laboratories, and these drug-specific ratios were then used to adjust the drug report counts for the relevant laboratories.

NEAR weighting procedures

Each NFLIS reporting laboratory was assigned a weight to be used in calculating design-consistent, nonresponse-adjusted estimates. Two weights were created: one for estimating cases and one for estimating drug reports. The weight used for case estimation was based on the caseload for every laboratory in the NFLIS population, and the weight used for drug reports' estimation was based on the item load for every laboratory in the NFLIS population. For reporting laboratories, the caseload and item load used in weighting were the reported totals. For nonreporting laboratories, the caseload and item load used in weighting were obtained from an updated laboratory survey administered in 2013.

When the NFLIS sample was originally drawn, two stratifying variables were used: (1) type of laboratory (State system or municipal or county laboratory) and (2) determination of "certainty" laboratory status. 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. These laboratories are called "certainty laboratories." 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).

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[iii] 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.[iv]

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.

Certainty laboratories were assigned a design weight of one.[v]

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

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

[v] 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.

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 were sampled and reporting.

Because volunteer laboratories represent only themselves, they were 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.[vi] 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, unsampled 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. 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.

[vi] See footnote v.

Statistical Techniques for Trend Analysis

Two types of analyses to compare estimates across years were used. The first is called *prior-year comparisons* and compared national and regional estimates from January 2015 through June 2015 with those from January 2016 through June 2016. The second is called *long-term trends* and examined trends in the semiannual national and regional estimates from January 2001 through June 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 were 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 compared estimates in Table 1.1 of this publication with estimates in Table 1.1 of the 2015 Midyear Report. The specific test examined whether the difference between any two estimates was significantly different from zero. A standard *t*-test was 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 June 2016;

$\hat{T}_{2015}$ = estimated total number of reports for the given drug for January 2015 through June 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 determined whether the prior-year comparison was statistically significant (a two-tailed test at $\alpha = .05$).

Long-term trends

A long-term regression trends analysis was performed on the January 2001 through June 2016 semiannual 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,

$$\mathbf{Y}^T \equiv (Y_1, Y_2, \ldots, Y_{31}),$$

and for the estimates,

$$\hat{\mathbf{Y}}^T \equiv (\hat{Y}_1, \hat{Y}_2, \ldots, \hat{Y}_{31})$$

the regression model is

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

where

$\eta = \hat{\mathbf{Y}} - \mathbf{Y}$ is a 31 × 1 vector of errors due to the probability sample, and

$\varepsilon = 31 \times 1$ 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

$$Y_t = \alpha_0 + \alpha_1 t + \alpha_2 t^2 + \alpha_3 t^3 + \varepsilon_t \qquad t = 1, \ldots, T,$$

where

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

ε_t = one of a set of 31 independent normal variates with a mean of zero and a variance of σ^2.

The model allows for a variety of trend types: linear (straight-line), quadratic (U-shaped), and cubic (S-shaped). 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 were obtained for all 31 semiannual periods beginning with the January to June 2001 period and ending with the January to June 2016 period. Sampling standard errors were estimated as the full sampling variance-covariance matrix $\mathbf{S}$ over these 31 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.

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

$$Y_t = \beta_0 X_0(t) + \beta_1 X_1(t) + \beta_2 X_2(t) + \beta_3 X_3(t) + \varepsilon_t,$$

where

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

$X_1(t), X_2(t), X_3(t)$ provide contributions for the first-order (linear), second-order (quadratic), and third-order (cubic) polynomials, respectively.

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 was further constrained to have regression residuals sum to zero, a constraint that is not guaranteed by theory for these models but was considered to improve model fit due to an approximation required to estimate $\mathbf{S}$. Standard errors of the regression trend estimates were obtained by simulation.

Final models were selected after testing for the significance of coefficients at the $\alpha = 0.05$ level ($p < .05$), which means that if the trend of interest (linear, quadratic, cubic) 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	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 (7 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	✓
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 January 31, 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.

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