



## Special Report: Synthetic Cannabinoids and Synthetic Cathinones Reported in NFLIS, 2013–2015



### Highlights

In 2009, two synthetic cannabinoids and five synthetic cathinones were reported to the National Forensic Laboratory Information System (NFLIS). By comparison, in 2015, 84 different synthetic cannabinoids and 35 different synthetic cathinones were reported to NFLIS.

From January 2013 through December 2015, among the 25 most frequently identified synthetic cannabinoids, a total of 95,143 reports were identified by State and local forensic laboratories and reported to NFLIS. During the same time, among the 20 most frequently identified synthetic cathinones, a total of 51,824 reports were identified by State and local forensic laboratories and reported to NFLIS.

XLR11, AB-FUBINACA, and AB-CHMINACA accounted for 62% of the 25 most frequently identified synthetic cannabinoid reports from January 2013 through December 2015. During the same time, methylone, alpha-PVP, and ethylone accounted for 91% of the 20 most frequently identified synthetic cathinones.

Between 2013 and 2015, XLR11 decreased in all regions. During the same time, AB-FUBINACA decreased in all regions except in the Northeast. Methylone decreased from 2013 to 2015 for all regions, and ethylone increased during the same period for all regions.

## 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. NFLIS continues to serve the forensic and law enforcement communities by providing updated findings on changing trends of drugs submitted to and analyzed by the Nation's forensic laboratories. NFLIS previously published two Special Reports on synthetic cannabinoids and synthetic cathinones reported in NFLIS from 2009 to 2010<sup>1</sup> and from 2010 to midyear 2013.<sup>2</sup> This publication presents updated findings on selected synthetic cannabinoids and synthetic cathinones submitted to State and local laboratories from January 1, 2013, through December 31, 2015, and analyzed within three months of each calendar year.

The publication begins by showing the evolving nature of these drugs by presenting the number of different synthetic cannabinoids and synthetic cathinones reported to NFLIS between 2009 and 2015, a period that coincides with the first Special Report<sup>1</sup> on these two types of substances. National annual estimates are presented, as are regional trends for XLR11, AB-FUBINACA, methylene, and ethylone. Federal data from DEA and U.S. Customs and Border Protection (CBP) laboratories and the synthetic cannabinoids and synthetic cathinones that were first reported to NFLIS in 2015 are also presented. In addition, maps showing State-level reports of synthetic cannabinoid and synthetic cathinone drug categories and selected compounds within each drug category are included. Appendixes A and B list all the chemical names for the synthetic cannabinoids and synthetic cathinones in this publication.

Synthetic cannabinoids can cause acute psychotic episodes, dependence, and withdrawal, whereas synthetic cathinones can cause confusion; acute psychosis; agitation; combativeness; and aggressive, violent, and self-destructive behavior.<sup>3</sup> The abuse of synthetic cannabinoids and synthetic cathinones represents an emerging and ongoing drug problem in the United States, as evidenced by increased seizures of these drugs, changing trends reported in NFLIS,<sup>1,2</sup> adverse effects,<sup>4,5</sup> and deaths associated with these compounds.<sup>6,7,8,9</sup>

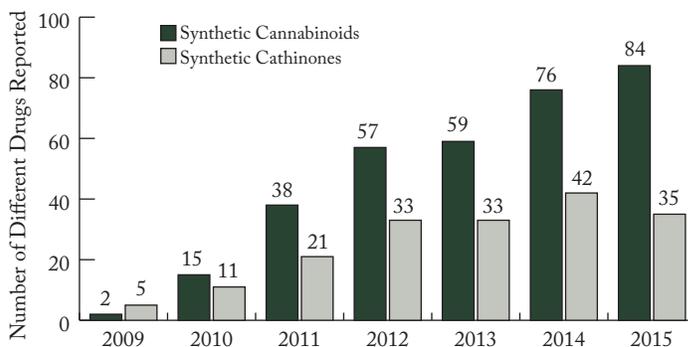
Illicit drug manufacturers modify synthetic cannabinoid and synthetic cathinone structures, creating new compounds in an effort to evade judicial consequences and avoid the compounds' analytical detection.<sup>10</sup> These changing trends in synthetic cannabinoids and synthetic cathinones are captured in NFLIS and published in Special Reports. In a previous report,<sup>2</sup> JWH-018 (1,839 reports), JWH-250 (416 reports), and JWH-073 (234 reports) were the most common synthetic cannabinoids reported to NFLIS in 2010. The most commonly reported synthetic cannabinoids in 2011, 2012, and midyear 2013 were AM-2201 (6,227), AM-2201 (13,396 reports), and XLR11 (11,273 reports), respectively.<sup>2</sup> In 2010, mephedrone (285 reports), MDPV (247 reports), and methylene (55 reports) were the most commonly reported synthetic cathinones.<sup>2</sup> The most commonly reported synthetic cathinones in 2011, 2012, and midyear 2013 were MDPV (3,509 reports), methylene (4,702 reports), and methylene (5,215 reports), respectively.

This publication presents findings on the top 25 synthetic cannabinoids and the top 20 synthetic cathinones reported to NFLIS from 2013 to 2015. It includes 36 new synthetic cannabinoids and 16 new synthetic cathinones not previously reported in NFLIS Special Reports.

## Number of Synthetic Cannabinoids and Synthetic Cathinones Reported to NFLIS, 2009–2015

NFLIS data provide a window into the evolving nature of synthetic cannabinoids and synthetic cathinones. Since 2009, the numbers of different synthetic cannabinoids and synthetic cathinones reported to NFLIS have shown remarkable, concurrent increases. [Figure 1](#) shows that in 2009, two synthetic cannabinoids and five synthetic cathinones were reported to NFLIS. By comparison, in 2015, 84 different synthetic cannabinoids and 35 different synthetic cathinones were reported to NFLIS.

**Figure 1** Number of different synthetic cannabinoids and synthetic cathinones reported in NFLIS, 2009–2015



## National Estimates

Table 1 presents national annual estimates of the 25 most frequently identified synthetic cannabinoids that were submitted to State and local laboratories from January 2013 through December 2015 and analyzed within three months of the calendar year reporting period. From 2013 to 2015, among the 25 most frequently identified synthetic cannabinoids, State and local laboratories identified a total of 95,143 reports. XLR11, AB-FUBINACA, and AB-CHMINACA were the most commonly reported compounds during this period, accounting for 62%. Table 1 illustrates the rapidly changing trends

of synthetic cannabinoids by the variability of the top three reported synthetic cannabinoids by year. XLR11, AB-FUBINACA, and UR-144 were the most commonly reported in 2013. XLR11, AB-FUBINACA, and AB-PINACA were the most commonly reported in 2014, but by 2015, AB-CHMINACA, XLR11, and AB-PINACA were the top three reported. AB-FUBINACA (159%) and AB-PINACA (413%) increased in 2014, followed by decreases of 62% and 50% in 2015, respectively.

**Table 1**
*NATIONAL ANNUAL ESTIMATES OF THE 25 MOST FREQUENTLY REPORTED SYNTHETIC CANNABINOIDS IN NFLIS, 2013–2015<sup>1</sup>*

Synthetic Cannabinoid	2013		2014		2015		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
XLR11	19,243	60.32%	11,001	32.69%	6,973	23.57%	37,217	39.12%
AB-FUBINACA	2,426	7.60%	6,293	18.70%	2,402	8.12%	11,121	11.69%
AB-CHMINACA	0	0.00%	2,788	8.28%	7,571	25.59%	10,359	10.89%
AB-PINACA	965	3.02%	4,954	14.72%	2,493	8.43%	8,412	8.84%
PB-22	1,800	5.64%	1,932	5.74%	237	0.80%	3,969	4.17%
5F-PB-22	1,952	6.12%	1,067	3.17%	408	1.38%	3,426	3.60%
UR-144	2,077	6.51%	987	2.93%	227	0.77%	3,292	3.46%
5F-AMB	0	0.00%	280	0.83%	2,258	7.63%	2,538	2.67%
MAB-CHMINACA	0	0.00%	484	1.44%	1,711	5.78%	2,195	2.31%
NM-2201	0	0.00%	512	1.52%	1,332	4.50%	1,844	1.94%
AM-2201	1,256	3.94%	333	0.99%	141	0.48%	1,730	1.82%
5F-AKB48	860	2.69%	326	0.97%	313	1.06%	1,498	1.57%
5F-AB-PINACA	36	0.11%	310	0.92%	538	1.82%	884	0.93%
5F-ADB	0	0.00%	18	0.05%	805	2.72%	823	0.86%
FUB-PB-22	7	0.02%	421	1.25%	343	1.16%	772	0.81%
THJ-2201	0	0.00%	472	1.40%	227	0.77%	699	0.73%
ADB-FUBINACA	0	0.00%	233	0.69%	450	1.52%	683	0.72%
ADB-PINACA	67	0.21%	367	1.09%	190	0.64%	625	0.66%
JWH-018	364	1.14%	133	0.39%	89	0.30%	586	0.62%
FUB-AMB	0	0.00%	29	0.09%	534	1.81%	563	0.59%
AKB48 (APINACA)	363	1.14%	165	0.49%	34	0.11%	562	0.59%
MAM-2201	148	0.46%	155	0.46%	121	0.41%	424	0.45%
FUB-144	0	0.00%	222	0.66%	129	0.43%	350	0.37%
JWH-122	185	0.58%	92	0.27%	41	0.14%	318	0.33%
JWH-210	154	0.48%	77	0.23%	20	0.07%	251	0.26%
<b>Total<sup>2</sup></b>	<b>31,901</b>	<b>100.00%</b>	<b>33,653</b>	<b>100.00%</b>	<b>29,588</b>	<b>100.00%</b>	<b>95,143</b>	<b>100.00%</b>

<sup>1</sup> Includes drugs submitted to laboratories from January 1, 2013, through December 31, 2015, that were analyzed within three months of the calendar year reporting period.

<sup>2</sup> Numbers and percentages may not sum to totals because of rounding.

Table 2 presents national annual estimates of the 20 most frequently reported synthetic cathinones that were submitted to State and local laboratories from January 2013 through December 2015 and analyzed within three months of the calendar year reporting period. From 2013 to 2015, among the 20 most frequently identified synthetic cathinones, State and local laboratories identified a total of

51,824 reports. Methylone, alpha-PVP, and ethylone were the most commonly reported compounds during this period, accounting for 91%. Many synthetic cathinones such as methylone, MDPV, and 4-MEC decreased in reports to NFLIS from 2013 to 2015, while ethylone increased.

**Table 2**

*NATIONAL ANNUAL ESTIMATES OF THE 20 MOST FREQUENTLY REPORTED SYNTHETIC CATHINONES IN NFLIS, 2013–2015<sup>1</sup>*

Synthetic Cathinone	2013		2014		2015		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Methylone	12,067	71.78%	4,768	30.72%	447	2.29%	17,282	33.35%
alpha-PVP	2,240	13.32%	3,905	25.16%	*	*	14,995	28.93%
Ethylone	17	0.10%	5,425	34.95%	9,237	47.40%	14,679	28.33%
MDPV	1,051	6.25%	409	2.64%	148	0.76%	1,608	3.10%
4-MEC	986	5.87%	197	1.27%	49	0.25%	1,233	2.38%
Dimethylone	0	0.00%	271	1.75%	49	0.25%	320	0.62%
Butylone	64	0.38%	185	1.19%	49	0.25%	298	0.57%
Pentedrone	156	0.93%	52	0.34%	26	0.13%	235	0.45%
alpha-PHP	0	0.00%	15	0.10%	163	0.83%	178	0.34%
alpha-PBP	61	0.36%	60	0.39%	42	0.21%	163	0.31%
Dibutylone	0	0.00%	57	0.37%	98	0.50%	156	0.30%
PV8	1	0.01%	74	0.48%	79	0.41%	154	0.30%
Brephedrone (4-BMC)	0	0.00%	42	0.27%	84	0.43%	126	0.24%
Clephedrone (4-CMC)	0	0.00%	0	0.00%	122	0.63%	122	0.24%
Pentylone	49	0.29%	6	0.04%	18	0.09%	73	0.14%
Fluoromethcathinone	29	0.17%	13	0.09%	20	0.10%	62	0.12%
4-EMC	19	0.11%	23	0.15%	3	0.02%	45	0.09%
Mephedrone (4-MMC)	28	0.17%	10	0.06%	3	0.02%	40	0.08%
Buphedrone	24	0.14%	3	0.02%	3	0.02%	30	0.06%
4-MePPP	19	0.12%	6	0.04%	0	0.00%	25	0.05%
<b>Total<sup>2</sup></b>	<b>16,811</b>	<b>100.00%</b>	<b>15,523</b>	<b>100.00%</b>	<b>19,490</b>	<b>100.00%</b>	<b>51,824</b>	<b>100.00%</b>

<sup>1</sup> Includes drugs submitted to laboratories from January 1, 2013, through December 31, 2015, that were analyzed within three months of the calendar year reporting period.

<sup>2</sup> Numbers and percentages may not sum to totals because of rounding.

\*The estimate for this drug does not meet the standards of precision and reliability.

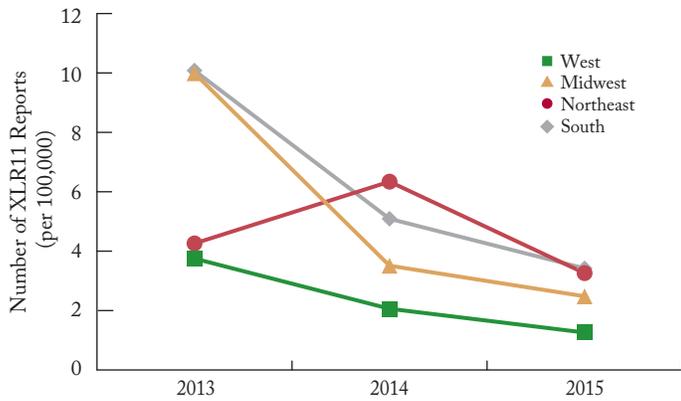
## Regional Trends

This section presents NFLIS data for annual regional trends for XLR11, AB-FUBINACA, methylene, and ethylene per 100,000 persons aged 15 or older. The estimated number of XLR11 reports in the Northeast increased from a rate of 4.26 reports per 100,000 persons (1,965 reports) in 2013 to a rate of 6.34 reports per 100,000 persons (2,935 reports) in 2014, followed by a decrease to a rate of 3.26 reports per 100,000 persons (1,520 reports) in 2015 (Figure 2). The estimated number of XLR11 reports decreased in all other regions during the same period. The estimated number of AB-FUBINACA reports in the West, Midwest, and South peaked in

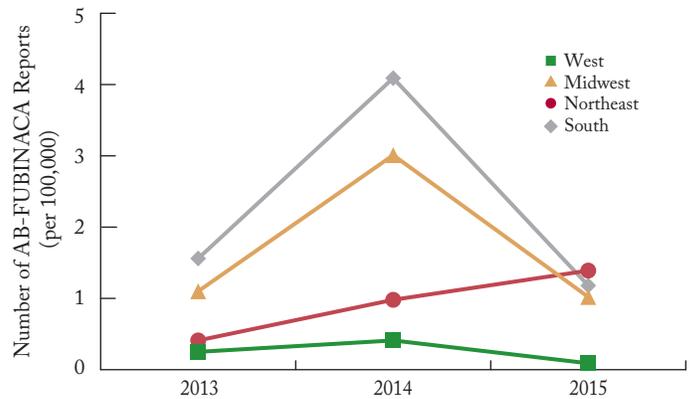
2014 at 0.41 reports per 100,000 persons (249 reports), 3.01 reports per 100,000 persons (1,647 reports), and 4.09 reports per 100,000 persons (3,942 reports), respectively (Figure 3). AB-FUBINACA reports decreased in all regions except the Northeast in 2015.

By region, the highest rates of methylene and ethylene were reported in the South from 2013 to 2014 and 2014 to 2015, respectively (Figures 4 and 5). Methylene decreased from 2013 to 2015 for all regions, and ethylene increased during the same period for all regions.

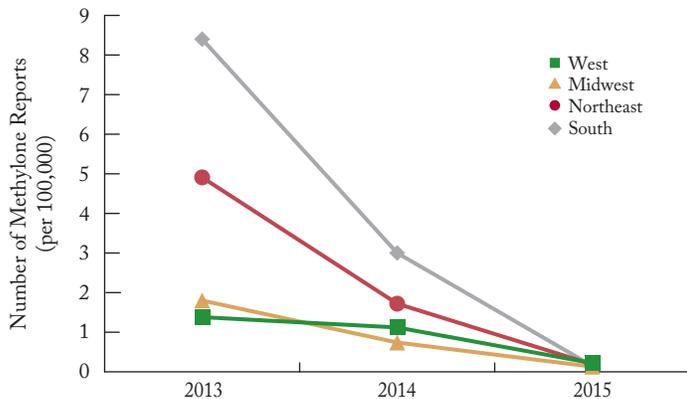
**Figure 2** NFLIS regional trends in XLR11 reported per 100,000 persons aged 15 or older, January 2013–December 2015



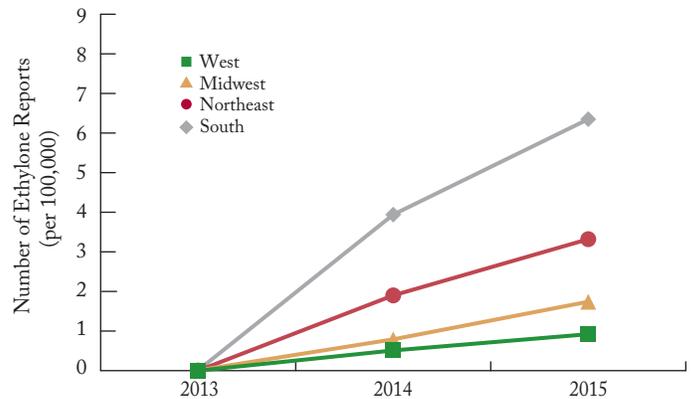
**Figure 3** NFLIS regional trends in AB-FUBINACA reported per 100,000 persons aged 15 or older, January 2013–December 2015



**Figure 4** NFLIS regional trends in methylene reported per 100,000 persons aged 15 or older, January 2013–December 2015



**Figure 5** NFLIS regional trends in ethylene reported per 100,000 persons aged 15 or older, January 2013–December 2015



## Selected Synthetic Cannabinoids and Synthetic Cathinones Reported by Federal Laboratories

NFLIS collects the results of drug evidence from DEA and CBP laboratories. The data reflect the results of evidence from drug seizures, undercover drug buys, targeted operations, and other evidence analyzed at DEA and CBP laboratories across the country. Although DEA data capture domestic and international drug cases, the results presented in this section describe only those drugs obtained within the United States. Similarly, the CBP data represent seizures at U.S. points of entry and domestic drug cases.

A total of 30,388 drugs were identified by the DEA and CBP during 2015 and analyzed within three months of the calendar year reporting period. Of these, 1,568 reports were synthetic cannabinoids and 606 reports were synthetic cathinones. The most commonly identified synthetic cannabinoid was XLR11, which accounted for about 1% of Federal drug reports (282 reports), followed by AB-CHMINACA (278 reports), AB-FUBINACA (174 reports), and AB-PINACA (137 reports). Among synthetic cathinones reported by Federal laboratories during 2015, 336 reports were ethylone, which accounted for a little more than 1% of all reports, and 170 reports were alpha-PVP.

### Emerging Synthetic Cannabinoids and Synthetic Cathinones

The purpose of this section is to highlight synthetic cannabinoids and synthetic cathinones that were reported in the NFLIS database for the first time in 2015 that were not shown in the most frequently identified drugs presented in Tables 1 and 2. The list of synthetic cannabinoids and synthetic cathinones includes drugs at the base drug level that first occurs in the NFLIS database among items submitted by reporting laboratories in 2015. In 2015, 22 synthetic cannabinoids were first reported, accounting for 823 counts (Table 3). The most

common synthetic cannabinoids by count in 2015 were MDMB-FUBINACA (292 counts) and MDMB-CHMICA (118 counts). Synthetic cannabinoid class butaldehydeamidoindole (127 counts) and its nitrogen heterocyclic analog (82 counts) were reported in NFLIS in 2015. Eight synthetic cathinones first reported in NFLIS in 2015 and not reported in Table 2 accounted for 23 counts (Table 4). Of these, flephedrone accounted for 8 counts and 3-CMC accounted for 5 counts.

**Table 3** NEWLY REPORTED EMERGING SYNTHETIC CANNABINOIDS, BY COUNT IN NFLIS, JANUARY–DECEMBER 2015<sup>1</sup>

Synthetic Cannabinoid	Total Count 2015
MDMB-FUBINACA	292
Butaldehydeamidoindole	127
MDMB-CHMICA (MMB-CHMINACA)	118
Butaldehydeamidoindole nitrogen heterocyclic analog	82
EG-018	30
PX 2	30
SDB-005	30
PX 3	28
FUB-JWH-018	24
XLR11 N-(2-fluoropentyl) isomer	20
MMB-2201	7
PX 1	7
MA-CHMINACA	6
AMB	5
EG-2201	4
MN-18	4
5Cl-AKB48	2
5F-SDB-005	2
MMB-CHMICA	2
5F-SDB-006	1
5F-NNEI	1
AB-005	1
<b>Total</b>	<b>823</b>

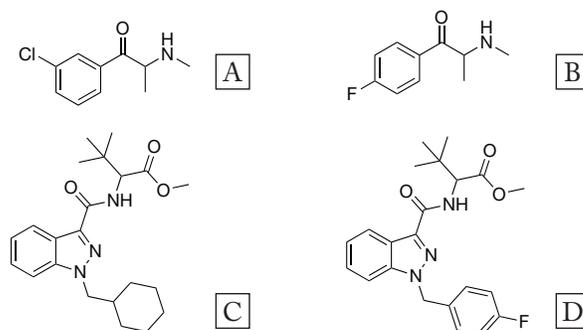
<sup>1</sup> Includes drugs submitted to laboratories from January 1, 2015, through December 31, 2015, that were analyzed by March 31, 2016.

**Table 4** NEWLY REPORTED EMERGING SYNTHETIC CATHINONES, BY COUNT IN NFLIS, JANUARY–DECEMBER 2015<sup>1</sup>

Synthetic Cathinone	Total Count 2015
Flephedrone (4-FMC)	8
3-CMC	5
4Cl-alpha-PVP	3
3-MeOMC	2
TH-PVP	2
4-MeO-alpha-PVP	1
Dipentylone	1
N-ethylpentylone	1
<b>Total</b>	<b>23</b>

<sup>1</sup> Includes drugs submitted to laboratories from January 1, 2015, through December 31, 2015, that were analyzed by March 31, 2016.

Structures of 3-CMC (A), Flephedron (B), MDMB-CHMICA (C), and MDMB-FUBINACA (D)



## NFLIS Reports of Synthetic Cannabinoids and Synthetic Cathinones, by State

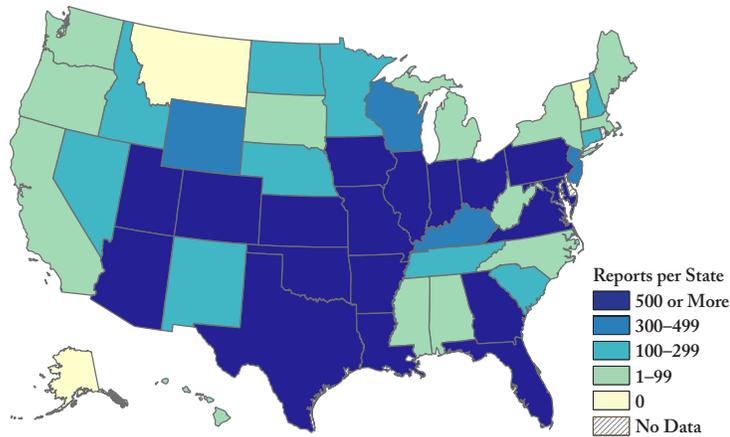
This section presents NFLIS data at the State level for the number of drug reports identified as synthetic cannabinoids and synthetic cathinones during 2013 and 2015. The geographic data presented here are based on information provided to the forensic laboratories by the submitting law enforcement agencies in the county of origin associated with the drug seizure incident. It is important to note that these data represent only those items that were submitted to and analyzed by forensic laboratories. In addition, a small number of laboratories within a few States were not reporting data to NFLIS, and their absence may affect the relative distribution of drugs seized and analyzed.

As shown in Figure 6, a total of 45 States reported synthetic cannabinoids during 2013. During that time, 13 States had between 1 and 99 reports, 10 States had between 100 and 299 reports, and 4 States had between 300 and 499 reports. During 2013, 18 States had 500 or more synthetic cannabinoid reports. By 2015, 47 States reported synthetic cannabinoids, although the number of States reporting 500 or more synthetic cannabinoid reports decreased to 15 (Figure 7). The States with the highest numbers of synthetic

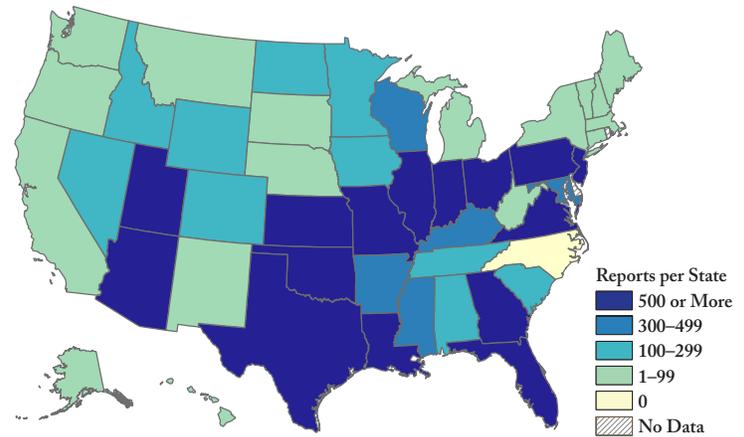
cannabinoid reports during 2015 were mainly in the South and Midwest. Most States in these two regions had 100 or more reports, and most States in the West and Northeast had 99 or fewer reports during the same period.

A total of 46 States reported synthetic cathinones during 2013 (Figure 8). Of these, 21 States had between 1 and 99 reports, 14 States had between 100 and 299 reports, and 3 States had between 300 and 499 reports. During 2013, 8 States had 500 or more synthetic cathinone reports. By 2015, the number of States reporting synthetic cathinones increased to 48, and the number of States reporting 500 or more reports remained the same (Figure 9). More than half of States in 2015 had between 1 and 99 synthetic cathinone reports. The States with the highest numbers of synthetic cathinone reports during 2015 were mainly in the Midwest and South. States in these two regions were the only States to have 300 or more reports, although most still had 100 or fewer reports during 2015. In comparison, only three States in the West had 100 or more synthetic cathinone reports, and no States in this region reported 300 or more synthetic cathinones during this time.

**Figure 6** Synthetic cannabinoid reports in NFLIS, by State, 2013\*

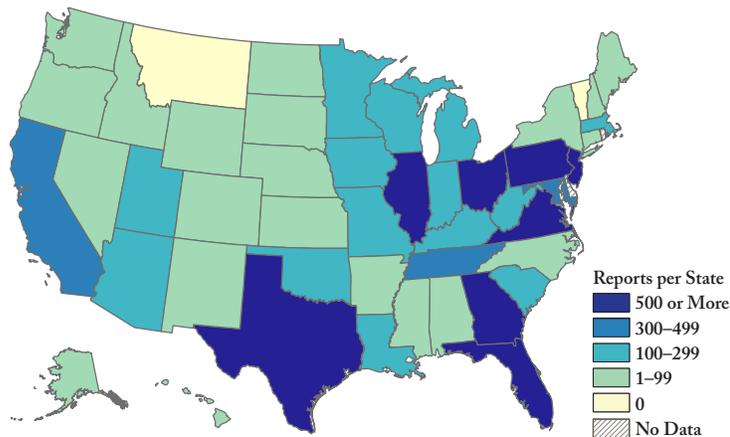


**Figure 7** Synthetic cannabinoid reports in NFLIS, by State, 2015\*

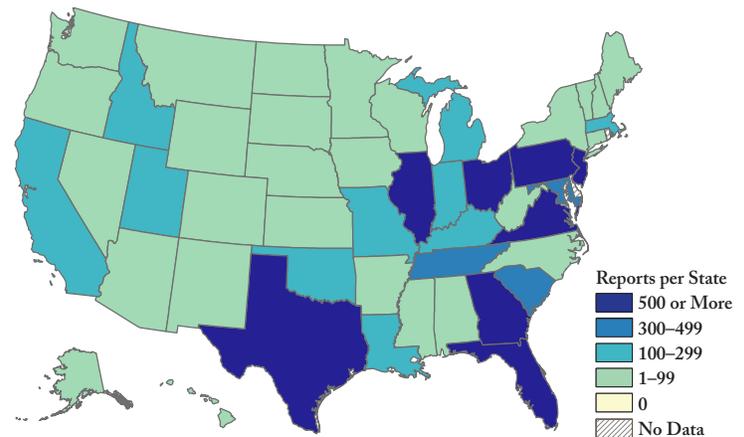


\* Includes synthetic cannabinoids submitted from January through December and analyzed by March 31 of the referenced year.

**Figure 8** Synthetic cathinone reports in NFLIS, by State, 2013\*



**Figure 9** Synthetic cathinone reports in NFLIS, by State, 2015\*



\* Includes synthetic cathinones submitted from January through December and analyzed by March 31 of the referenced year.

## NFLIS Reports of AB-FUBINACA and Methylone, by State

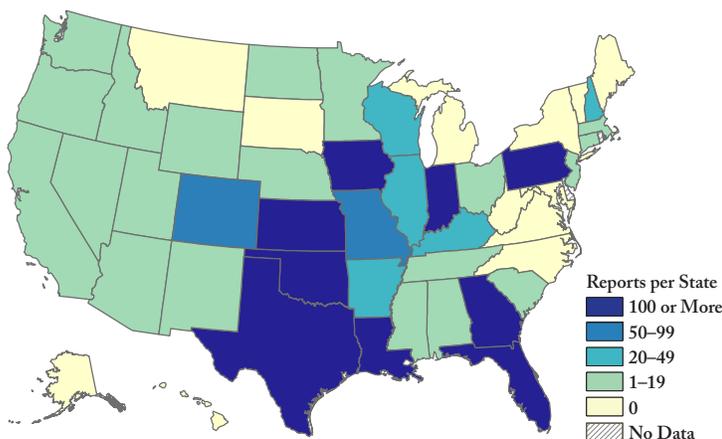
In addition to the overall number of synthetic cannabinoid and synthetic cathinone reports, this section presents NFLIS data at the State level for the number of drug reports identified as AB-FUBINACA and methylone during 2013 and 2015. The geographic data presented here are based on information provided to the forensic laboratories by the submitting law enforcement agencies in the county of origin associated with the drug seizure incident. It is important to note that these data represent only those items that were submitted to and analyzed by forensic laboratories. In addition, a small number of laboratories within a few States were not reporting data to NFLIS, and their absence may affect the relative distribution of drugs seized and analyzed.

As shown in Figure 10, a total of 36 States reported AB-FUBINACA during 2013. During that time, 20 States had between 1 and 19 reports, 5 States had between 20 and 49 reports,

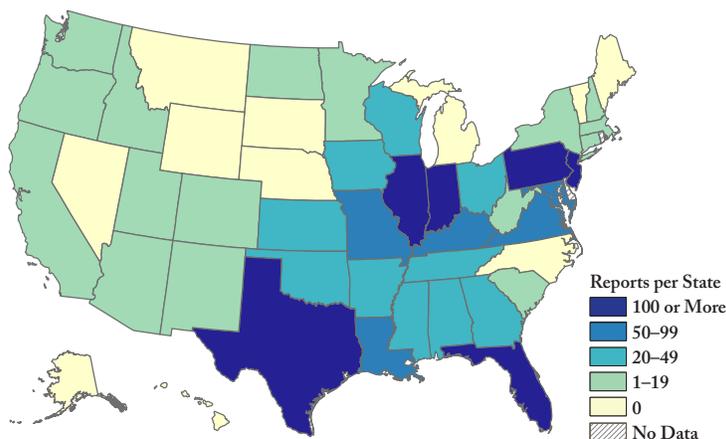
and 2 States had between 50 and 99 reports. During 2013, 9 States had 100 or more AB-FUBINACA reports. By 2015, the number of States reporting 100 or more AB-FUBINACA reports decreased to six (Figure 11). The States with the highest numbers of AB-FUBINACA reports during 2015 were mainly in the South and Midwest. Most States in these two regions had 20 or more reports. In comparison, only two States in the Northeast and none in the West had 20 or more AB-FUBINACA reports during the same period.

Methylone was reported in 45 States during 2013 (Figure 12). During that time, most States had 50 or more methylone reports. By 2015, the number of States reporting methylone decreased to 35, with most States reporting between 1 and 19 reports. During 2015, only three States reported 20 or more methylone reports, including two in the South and one in the West (Figure 13).

**Figure 10** AB-FUBINACA reports in NFLIS, by State, 2013\*

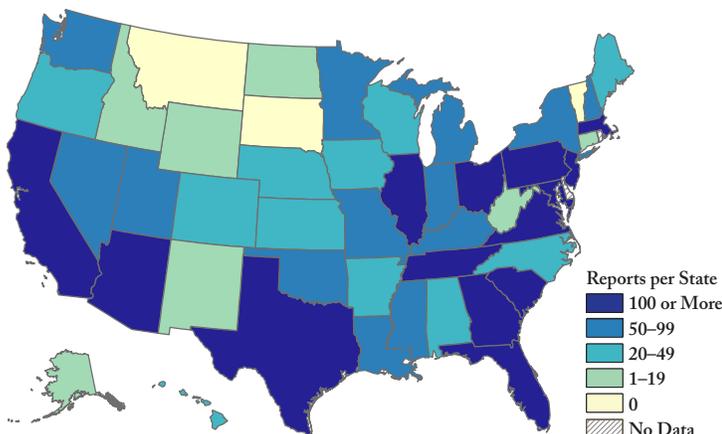


**Figure 11** AB-FUBINACA reports in NFLIS, by State, 2015\*

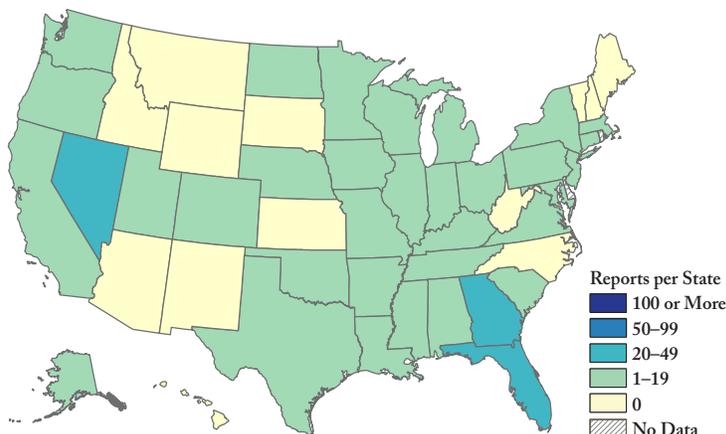


\* Includes drug reports identified as AB-FUBINACA submitted from January through December and analyzed by March 31 of the referenced year.

**Figure 12** Methylone reports in NFLIS, by State, 2013\*



**Figure 13** Methylone reports in NFLIS, by State, 2015\*



\* Includes drug reports identified as methylone submitted from January through December and analyzed by March 31 of the referenced year.

## Appendix A: Synthetic Cannabinoids

Common Name	Chemical Name
5CI-AKB48	N-(1-Adamantyl)-1-(5-chloropentyl)-1H-indazole-3-carboxamide
5F-AB-PINACA	N-(1-Amino-3-methyl-1-oxobutan-2-yl)-1-(5-fluoropentyl)-1H-indazole-3-carboxamide
5F-ADB	Methyl 2-([1-(5-fluoropentyl)-1H-indazol-3-yl]carbonyl)amino]-3,3-dimethylbutanoate
5F-AKB48	N-(1-Adamantyl)-1-(5-fluoropentyl)-1H-indazole-3-carboxamide
5F-AMB	Methyl 2-([1-(5-fluoropentyl)-1H-indazol-3-yl]carbonyl)amino]-3-methylbutanoate
5F-NNEI	1-(5-Fluoropentyl)-N-(naphthalen-1-yl)-1H-indole-3-carboxamide
5F-PB-22	Quinolin-8-yl 1-(5-fluoropentyl)-1H-indole-3-carboxylate
5F-SDB-005	Naphthalen-1-yl 1-(5-fluoropentyl)-1H-indazole-3-carboxylate
5F-SDB-006	N-Benzyl-1-(5-fluoropentyl)-1H-indole-3-carboxamide
AB-005	{1-[(1-Methylpiperidin-2-yl)methyl]-1H-indol-3-yl}(2,2,3,3-tetramethylcyclopropyl)methanone
AB-CHMINACA	N-(1-amino-3-methyl-1-oxobutan-2-yl)-1-(cyclohexylmethyl)-1H-indazole-3-carboxamide
AB-FUBINACA	N-(1-amino-3-methyl-1-oxobutan-2-yl)-1-(4-fluorobenzyl)-1H-indazole-3-carboxamide
AB-PINACA	N-(1-amino-3-methyl-1-oxobutan-2-yl)-1-pentyl-1H-indazole-3-carboxamide
ADB-FUBINACA	N-[(1S)-1-(Aminocarbonyl)-2,2-dimethylpropyl]-1-[(4-fluorophenyl)methyl]-1H-indazole-3-carboxamide
ADB-PINACA	N-(1-amino-3,3-dimethyl-1-oxobutan-2-yl)-1-pentyl-1H-indazole-3-carboxamide
AKB48 (APINACA)	N-(1-Adamantyl)-1-pentyl-1H-indazole-3-carboxamide
AM-2201	1-(5-Fluoropentyl)-3-(1-naphthoyl)indole
AMB	methyl 3-methyl-2-(1-pentyl-1H-indazole-3-carboxamido
EG-018	Naphthalen-1-yl(9-pentyl-9H-carbazol-3-yl)methanone
EG-2201	(9-(5-fluoropentyl)-9H-carbazol-3-yl)(naphthalen-1-yl)methanone
FUB-144	[1-(4-Fluorobenzyl)-1H-indol-3-yl](2,2,3,3-tetramethylcyclopropyl)methanone
FUB-AMB	Methyl 2-([1-(4-fluorobenzyl)-1H-indazol-3-yl]carbonyl)amino]-3-methylbutanoate
FUB-JWH-018	(1-(4-fluorobenzyl)-1H-indol-3-yl)(naphthalen-1-yl)methanone
FUB-PB-22	Quinolin-8-yl 1-(4-fluorobenzyl)-1H-indole-3-carboxylate
JWH-018	1-Pentyl-3-(1-naphthoyl)indole
JWH-122	1-Pentyl-3-(4-methyl-1-naphthoyl)indole
JWH-210	1-Pentyl-3-(4-ethyl-1-naphthoyl)indole
MA-CHMINACA	Methyl 2-(1-(cyclohexylmethyl)-1H-indazole-3-carboxamido)3-methylbutanoate
MAB-CHMINACA	N-(1-amino-3,3dimethyl-1-oxobutan-2-yl)-1-(cyclohexylmethyl)-1H-indazole-3-carboxamide
MAM-2201	1-(5-Fluoropentyl)-3-(4-methyl-1-naphthoyl)indole
MDMB-CHMICA (MMB-CHMINACA)	Methyl 2-[[1-(cyclohexylmethyl)indole-3-carbonyl]amino]-3,3-dimethylbutanoate
MDMB-FUBINACA	Methyl 2-[[1-(4-fluorophenyl)methyl]indazole-3-carbonyl]amino]-3,3-dimethyl-butanoate
MMB-2201	Methyl 2-([1-(3-fluoropropyl)-1H-indol-3-yl]carbonyl)amino]-3-methylbutanoate
MN-18	N-(Naphthalen-1-yl)-1-pentyl-1H-indazol-3-carboxamide
NM-2201	Naphthalen-1-yl 1-(5-fluoropentyl)-1H-indol-3-carboxylate
PB-22	Quinolin-8-yl 1-pentyl-1H-indole-3-carboxylate
PX 1	N-(1-Amino-1-oxo-3-phenylpropan-2-yl)-1-(3-fluoropentyl)-1H-indole-3-carboxamide
PX 2	N-(1-Amino-1-oxo-3-phenylpropan-2-yl)-1-(5-fluoropentyl)-1H-indazole-3-carboxamide
PX 3	N-[(1S)-2-amino-2-oxo-1-(phenylmethyl)ethyl]-1-(cyclohexylmethyl)-1H-indazole-3-carboxamide
SDB-005	Naphthalen-1-yl 1-pentyl-1H-indazole-3-carboxylate
THJ-2201	[1-(5-fluoropentyl)-1H-indazol-3-yl](naphthalen-1-yl)methanone
UR-144	(1-Pentyl-1H-indol-3-yl)-(2,2,3,3-tetramethylcyclopropyl)methanone
XLR11	[1-(5-Fluoro-pentyl)-1H-indole-3-yl](2,2,3,3-tetramethylcyclopropyl)methanone

## Appendix B: Synthetic Cathinones

Common Name	Chemical Name
3-CMC	3-Chloro-N-methylcathinone
3-MeOMC	3-Methoxy-N-methylcathinone
4-EMC	4-Ethyl-N-methylcathinone
4-MEC	4-Methyl-N-ethylcathinone
4-MeO-alpha-PVP	4-Methoxy-alpha-pyrrolidinopropiophenone
4-MePPP	4-Methyl-alpha-pyrrolidinopropiophenone
4Cl-alpha-PVP	4-Chloro-alpha-pyrrolidinopentiophenone
alpha-PBP	Alpha-pyrrolidinobutiophenone
alpha-PHP	Alpha-pyrrolidinohexanophenone
alpha-PVP	Alpha-pyrrolidinopentiophenone
Brephedrone (4-BMC)	4-Bromo-N-methylcathinone
Buphedrone	2-(methylamino)-1-phenylbutan-1-one
Butylone	1-(1,3-benzodioxol-5-yl)-2-(methylamino)butan-1-one
Clephedrone (4-CMC)	4-Chloro-N-methylcathinone
Dibutylone	1-(1,3-benzodioxol-5-yl)-2-(dimethylamino)butan-1-one
Dimethylone	1-(1,3-benzodioxol-5-yl)-2-(dimethylamino)propan-1-one
Dipentylone	1-(1,3-benzodioxol-5-yl)-2-(dimethylamino)pentan-1-one
Ethylone	3,4-Methylenedioxy-N-ethylcathinone
Flephedrone (4-FMC)	4-Fluoro-N-methylcathinone
Fluoromethcathinone	Fluoro-N-methylcathinone
MDPV	3,4-Methylenedioxypropylvalerone
Mephedrone (4-MMC)	4-Methyl-N-methylcathinone
Methylone	3,4-Methylenedioxy-N-methylcathinone
N-ethylpentylone	1-(1,3-benzodioxol-5-yl)-2-(ethylamino)pentan-1-one
Pentredone	2-(methylamino)-1-phenylpentan-1-one
Pentylone	1-(1,3-benzodioxol-5-yl)-2-(methylamino)pentan-1-one
PV8	Alpha-pyrrolidinoheptiophenone
TH-PVP	2-(Pyrrolidin-1-yl)-1-(5,6,7,8-tetrahydronaphthalen-2-yl)pentan-1-one



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**Methodology:** A summary of the NFLIS estimation methodology can be found in the *NFLIS Statistical Methodology* publication at <https://www.nflis.deadiversion.usdoj.gov/Reports.aspx>.

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