



## Special Report: Synthetic Cannabinoids and Synthetic Cathinones Reported in NFLIS, 2009-2010

### Highlights

An estimated total of 2,977 reports of synthetic cannabinoids were submitted to State and local forensic laboratories in the United States from January 1 through December 31, 2010, and analyzed by March 31, 2011. This is a considerable increase from the estimated 15 synthetic cannabinoid reports identified during 2009. During 2010, synthetic cannabinoids were identified in 32 States. Nearly two-thirds were identified as JWH-018 (63%) and about a quarter as either JWH-250 (14%) or JWH-073 (9%).

In 2010, synthetic cannabinoids in NFLIS were mainly reported from laboratories in the Midwest (50%) or in the South (38%). Only 9% were reported from laboratories in the West and 3% from laboratories in the Northeast.

In 2010, there were an estimated 628 reports of synthetic cathinones in 27 States to NFLIS. Most were either mephedrone (48%) or MDPV (40%). During 2009, NFLIS received an estimated 34 reports of synthetic cathinones from eight States.

In 2010, nearly 6 in 10 synthetic cathinones in NFLIS were reported from laboratories in the South (57%), and a quarter were reported from laboratories in the Midwest (25%). In the Northeast, 16% were reported, while only 2% were reported from the West.

As of August 11, 2011, synthetic cannabinoids were illegal to possess in 38 States, and another 11 States had legislation pending. Synthetic cathinones were controlled in 30 States, and at least nine additional States had legislation pending.



### Introduction

The National Forensic Laboratory Information System (NFLIS) is a program of the Drug Enforcement Administration (DEA), Office of Diversion Control, that systematically collects drug identification results and associated information from drug cases submitted to and analyzed by Federal, State, and local forensic laboratories. This NFLIS special report presents findings on two categories of drugs whose abuse has been increasing: synthetic cannabinoids and synthetic cathinones. National estimates for 2009 and 2010 NFLIS data are presented along with State-level reports to NFLIS of both synthetic cannabinoids and synthetic cathinones. Data are also presented from DEA's System To Retrieve Information from Drug Evidence II (STRIDE) and from the American Association of Poison Control Centers (AAPCC).

Synthetic cannabinoids are drugs often found in herbal incense products (common names include Spice, Spike 99, and K2) that mimic the effects of delta-9-tetrahydrocannabinol (THC), an active central nervous system constituent compound of marijuana. Synthetic cathinones are stimulants related to cathinone, the psychoactive substance found in the shrub *Catha edulis* (khat). These synthetic cathinones, which are  $\beta$ -keto phenethylamine derivatives, produce pharmacological effects similar to methamphetamine. Availability of synthetic cathinones contained in products sold as "research chemicals," "plant food," or "bath salts" has recently surged. The abuse of synthetic cannabinoids and synthetic cathinones has led to an increasing number of calls to poison control centers attributed to individuals primarily snorting and smoking products containing these substances. The abuse of both groups represents an emerging drug problem in the United States.

The DEA and State drug control agencies have recognized the need to monitor and, when necessary, to control these chemicals. In March 2011, five synthetic cannabinoids were temporarily categorized as Schedule I substances under the Controlled Substances Act: JWH-018, JWH-073, JWH-200, CP-47,497, and cannabicyclohexanol. Unless permanently controlled, the ban on these five substances is set to expire in March 2012. In September 2011, the DEA published a notice of intent to temporarily control three synthetic cathinones: mephedrone, 3,4-methylenedioxypyrovalerone (MDPV), and methylone. According to the National Conference of State Legislatures, as of August 11, 2011, 38 States had adopted laws to ban chemical substances related to synthetic cannabinoids, and 11 States had legislation pending (see Table 1). Also, 30 States had enacted laws to control synthetic cathinones, and at least nine States had pending legislation to do so. More than half of the States that had enacted laws to control either synthetic cannabinoids or synthetic cathinones did so during 2011.

**Table 1** STATE CONTROLS OF SYNTHETIC CANNABINOIDS AND SYNTHETIC CATHINONES  
Current as of August 11, 2011

| Controlled                    | Yes  | No  | Pending                                    |
|-------------------------------|--|---|--|
| <b>Synthetic cannabinoids</b> | AL, AK, AZ, AR, CO, CT, DE, FL, GA, HI, ID, IL, IN, IA, KS, KY, LA, ME, MI, MN, MS, MO, MT, NE, NM, NC, ND, OH, OK, PA, SD, TN, TX, UT, VA, WV, WI, WY | DC, MD, NV, NH, OR, SC, VT, WA  | CA, IL, MA, MI, NJ, NY, NC, OH, PA, RI, WI |
| <b>Synthetic cathinones</b>   | AR, FL, GA, HI, ID, IL, IN, IA, KS, KY, LA, ME, MI, MN, MO, MS, NM, NY, NC, ND, OH, OK, PA, TN, TX, UT, VA, WV, WI, WY                                 | AL, <sup>1</sup> AK, AZ, CA, CO, CT, DE, DC, MD, MA, MT, NE, NH, NV, OR, <sup>1</sup> SC, SD, VT, WA <sup>1</sup> | IL, MI, NJ, NY, NC, OH, PA, RI, WI         |

Note: States vary in the number and type of substances controlled within these categories. In addition, States appearing in both the "yes" and "pending" columns for synthetic cathinones have approved legislation to control specific compounds and pending legislation to control other compounds within the same category.

<sup>1</sup> State is not controlling the substance with legislation; however, there are bans in place via other means (i.e., via the State Pharmacy Board).

Source: National Conference of State Legislatures. (2011, August 12). Enacted legislation. Retrieved on August 16, 2011, from <http://www.ncsl.org/?TabId=22431> (synthetic cannabinoids) and <http://www.ncsl.org/?TabId=22432> (synthetic cathinones).

**The DEA's System To Retrieve Information from Drug Evidence II (STRIDE)**

collects the results of drug evidence analyzed at DEA laboratories. STRIDE reflects evidence submitted by the DEA, other Federal law enforcement agencies, and some local law enforcement agencies that was obtained during drug seizures, undercover drug buys, and other activities. STRIDE captures data on both domestic and international drug cases; however, the following results describe those drugs seized in the United States.

During 2010, a total of 76,857 drugs were submitted to STRIDE and analyzed by March 31, 2011. Of these, there were 27 reports of synthetic cannabinoids. Most of the synthetic cannabinoid reports were identified as JWH-018 (25 reports or 93%), and two drug reports were identified as JWH-073. In 2009, there were only two reports of JWH-018. A total of 35 synthetic cathinones were submitted to STRIDE during 2010. These were most commonly identified as MDPV (27 reports or 77%), while others were identified as mephedrone (five reports) or methylone (three reports). No synthetic cathinones were reported in 2009.

**National and Regional Estimates**

This section presents national and regional estimates for reports of synthetic cannabinoids and synthetic cathinones that were submitted to State and local forensic laboratories during 2009 and 2010, and analyzed within three months of the calendar year reporting period. According to NFLIS, synthetic cannabinoids represented an estimated 2,977 drug reports in 2010 (Table 2). Prior to 2010, synthetic cannabinoids were not controlled by any State or at the Federal level. Half of the synthetic cannabinoid reports (50%) in 2010 were from the Midwest, 38% from the South, 9% from the West, and 3% from the Northeast (data not shown).

The vast majority of the synthetic cannabinoid reports in 2010 were identified as JWH-related varieties. More than half of the synthetic cannabinoids were identified as JWH-018 (63%) and nearly a quarter as either JWH-250 (14%) or JWH-073 (9%). In addition, 5% were identified as JWH-081 and about 2% as JWH-200. A small number of the estimated drug reports (fewer than 25) were reported for JWH-019, JWH-210, and JWH-251. Other synthetic cannabinoid reports in 2010 included RCS-4; AM-2201; AM-694; CP-47,497; and AM-356 (each of which was under 20 total reports).

In 2010, there were 628 reports of synthetic cathinones from 27 States to NFLIS compared with 2009 when there were 34 reports from eight States. Among the synthetic cathinone reports in 2010, nearly nine in 10 were for either mephedrone (48%) or MDPV (40%), and about 10% were for methylone. The majority of synthetic cathinones were reported in the South (57%), followed by the Midwest (25%) and the Northeast (16%). Only 2% were reported from the West.

**Table 2** ESTIMATED SYNTHETIC CANNABINOID AND SYNTHETIC CATHINONE REPORTS IN NFLIS, 2009-2010

| Drug   | 2009      |                | 2010         |                |
|--|-----------|----------------|--------------|----------------|
|  | Number    | Percent        | Number       | Percent        |
| <b>Synthetic Cannabinoids<sup>1</sup></b>          |           |                |              |                |
| JWH-018 (AM-678)                                   | 13        | 86.67%         | 1,887        | 63.39%         |
| JWH-250  | 0         | 0.00%          | 418          | 14.04%         |
| JWH-073  | 2         | 13.33%         | 261          | 8.77%          |
| Synthetic cannabinoids (not distinctly identified) | 0         | 0.00%          | 151          | 5.07%          |
| JWH-081  | 0         | 0.00%          | 149          | 5.01%          |
| JWH-200  | 0         | 0.00%          | 55           | 1.85%          |
| RCS-4  | 0         | 0.00%          | 16           | 0.54%          |
| JWH-019  | 0         | 0.00%          | 11           | 0.37%          |
| JWH-210  | 0         | 0.00%          | 9            | 0.30%          |
| AM-2201  | 0         | 0.00%          | 8            | 0.27%          |
| AM-694   | 0         | 0.00%          | 4            | 0.13%          |
| CP 47,497 C8 homologue (cannabicyclohexanol)       | 0         | 0.00%          | 4            | 0.13%          |
| JWH-251  | 0         | 0.00%          | 3            | 0.10%          |
| AM-356 (methanandamide)                            | 0         | 0.00%          | 1            | 0.03%          |
| <b>Total Synthetic Cannabinoids<sup>2</sup></b>    | <b>15</b> | <b>100.00%</b> | <b>2,977</b> | <b>100.00%</b> |
| <b>Synthetic Cathinones<sup>1</sup></b>            |           |                |              |                |
| Mephedrone (4-MMC)                                 | 20        | 58.82%         | 303          | 48.25%         |
| MDPV   | 2         | 5.88%          | 253          | 40.29%         |
| Methylone (MDMC)                                   | 3         | 8.82%          | 63           | 10.03%         |
| Methcathinone                                      | 9         | 26.47%         | 6            | 0.96%          |
| 4-MEC  | 0         | 0.00%          | 3            | 0.48%          |
| <b>Total Synthetic Cathinones<sup>2</sup></b>      | <b>34</b> | <b>100.00%</b> | <b>628</b>   | <b>100.00%</b> |

<sup>1</sup> For further information on these drugs, see the DEA's [http://www.deadiversion.usdoj.gov/drugs\\_concern/index.html](http://www.deadiversion.usdoj.gov/drugs_concern/index.html) and a forensic cheminformatic database at <https://www.forensicdb.org/>. See this report's appendix for the chemical names of these drugs.

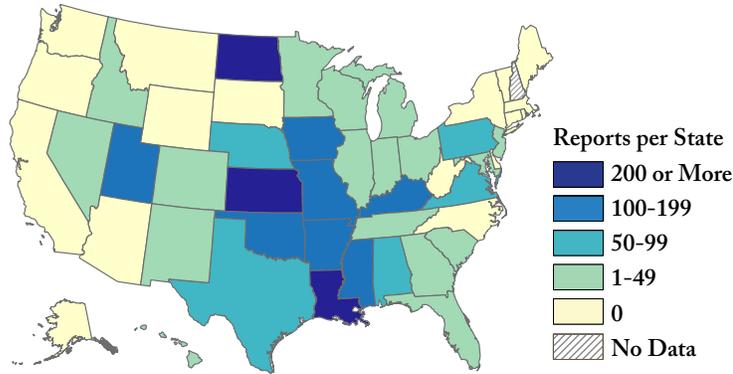
<sup>2</sup> Percentages may not sum to 100% due to rounding.

## Synthetic Cannabinoids and Synthetic Cathinones, by State in NFLIS, 2010

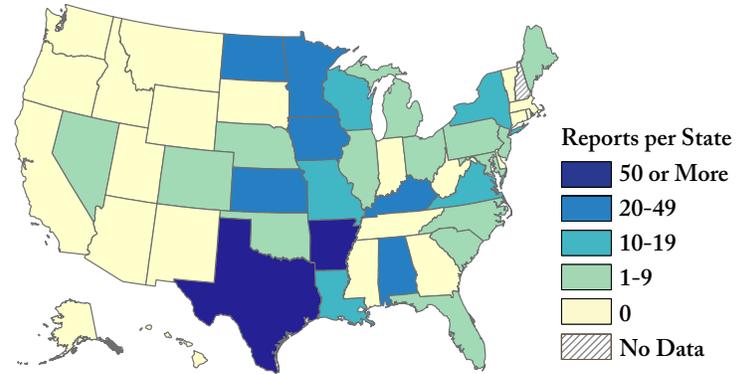
This section presents NFLIS data at the State level on the number of synthetic cannabinoids and synthetic cathinones submitted during 2010 and analyzed by March 31, 2011. As shown in Figure 1, a total of 32 States reported synthetic cannabinoids during 2010. Three States had synthetic cannabinoid reports of 200 or more (Kansas, Louisiana, and North Dakota), and seven States had between 100 and 199 reports (Arkansas, Iowa, Kentucky, Mississippi, Missouri, Oklahoma, and Utah). All of these States that reported 100 or more drug counts moved

to control synthetic cannabinoids in either 2010 or 2011. As shown in Figure 2, a total of 27 States reported synthetic cathinones to NFLIS in 2010. Two States reported cathinone counts of 50 or greater (Arkansas and Texas), and six States reported counts of 20 to 49 (Alabama, Iowa, Kansas, Kentucky, Minnesota, and North Dakota). Seven of these eight States passed legislation to control synthetic cathinones in 2010 or 2011; Alabama has a ban in place via its State Board of Pharmacy, but has no legislation that controls the substance.

**Figure 1. Synthetic cannabinoid reports in NFLIS, by State, 2010**



**Figure 2. Synthetic cathinone reports in NFLIS, by State, 2010**



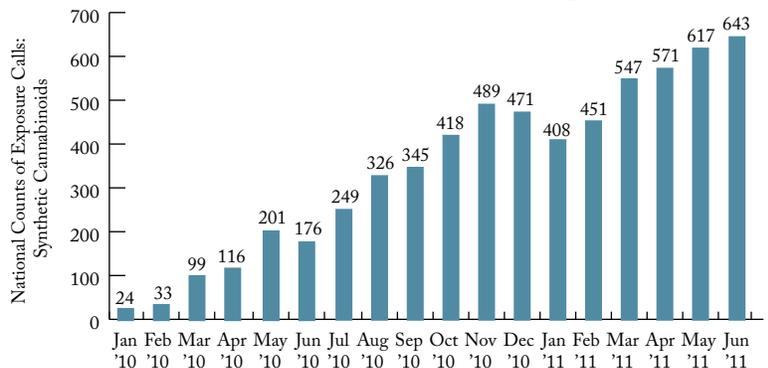
## National Poison Control Center Data

American Association of Poison Control Centers (AAPCC) data from January 2010 through June 2011 were also analyzed to obtain information on “exposures” to synthetic cannabinoids and synthetic cathinones that were reported to poison control centers across the United States. The term “exposure” refers to instances in which an individual had contact with the substance (e.g., ingested, inhaled, absorbed by the skin or eyes), but does not necessarily signify a poisoning or overdose. The data presented here may differ from AAPCC data presented in other publications because of differences in when cases were updated and when a data file was prepared and finalized for use.

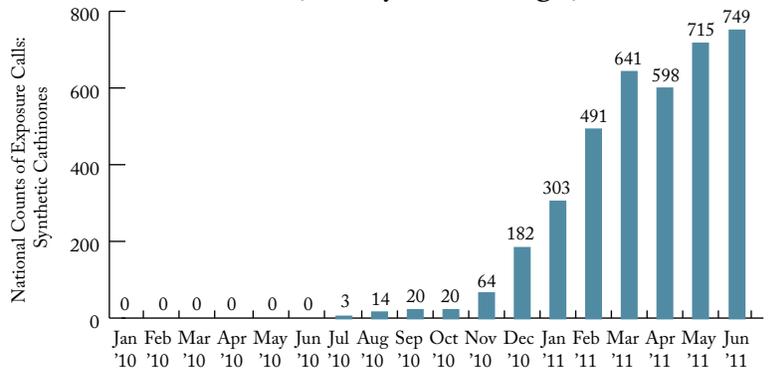
Poison control centers received a larger number of exposure calls for synthetic cannabinoids in the first six months of 2011 (January to June) than they did for the entire calendar year of 2010 (3,237 vs. 2,947 reports; Figure 3). The increase in calls related to synthetic cathinones has been even more pronounced, with the number of calls increasing steadily each month since mid-July 2010 (Figure 4). Synthetic cathinones reported to the AAPCC increased almost tenfold from 2010 through just the first six months of 2011 (303 vs. 3,497 reports).

At the State level, 10 States accounted for just over 50% of the exposure calls to poison control centers for synthetic cannabinoids during 2010 and 2011. These States (in order of frequency) were Texas, Florida, North Carolina, Indiana, Virginia, Louisiana, Arizona, Missouri, Illinois, and Georgia. In comparison, 10 States accounted for nearly 60% of the poison control calls for synthetic cathinones during this period. These States (in order of frequency) were Ohio, North Carolina, Indiana, West Virginia, Louisiana, Missouri, Texas, Tennessee, Illinois, and Pennsylvania.

**Figure 3. National counts of exposure calls to poison control centers, by month: Synthetic cannabinoids, January 2010 through June 2011**



**Figure 4. National counts of exposure calls to poison control centers, by month: Synthetic cathinones, January 2010 through June 2011**



## Appendix: Chemical Names of Synthetic Cannabinoids and Synthetic Cathinones

| Synthetic Cannabinoids                          |  |
|---|--|
| Common Name                                     | Chemical Name  |
| JWH-018 (AM-678)                                | 1-pentyl-3-(1-naphthoyl)indole                               |
| JWH-250   | 1-pentyl-3-(2-methoxyphenylacetyl)indole                     |
| JWH-073   | 1-butyl-3-(1-naphthoyl)indole                                |
| JWH-081   | 1-pentyl-3-(4-methoxy-1-naphthoyl)indole                     |
| JWH-200   | 1-[2-(4-morpholinyl)ethyl]-3-(1-naphthoyl)indole             |
| RCS-4   | 1-pentyl-3-(4-methoxybenzoyl)indole                          |
| JWH-019   | 1-hexyl-3-(1-naphthoyl)indole                                |
| JWH-210   | 1-pentyl-3-(4-ethyl-1-naphthoyl)indole                       |
| AM-2201   | 1-(5-fluoropentyl)-3-(1-naphthoyl)indole                     |
| AM-694  | 1-(5-fluoropentyl)-3-(2-iodobenzoyl)indole                   |
| CP 47,497 C8 homologue<br>(cannabicyclohexanol) | 5-(1,1-dimethyloctyl)-2-[(1R,3S)-3-hydroxycyclohexyl]-phenol |
| JWH-251   | 1-pentyl-3-(2-methylphenylacetyl)indole                      |
| AM-356 (methanandamide)                         | arachidonyl-1'-hydroxy-2'-propylamide                        |

| Synthetic Cathinones |                                      |
|----------------------|--------------------------------------|
| Common Name          | Chemical Name                        |
| Mephedrone (4-MMC)   | 4-methylmethcathinone                |
| MDPV                 | 3,4-methylenedioxypropylvalerone     |
| Methylone (MDMC)     | 3,4-methylenedioxy-N-methylcathinone |
| Methcathinone        | N-methylcathinone                    |
| 4-MEC                | 4-methyl-N-ethylcathinone            |

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

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### American Association of Poison Control Centers (AAPCC) Disclaimer and Statement on AAPCC Data

The content of this report does not necessarily reflect the opinions or conclusions of the American Association of Poison Control Centers.

The American Association of Poison Control Centers (AAPCC; <http://www.aapcc.org>) maintains the national database of information logged by the country's 57 Poison Control Centers (PCCs). Case records in this database are from self-reported calls; they reflect only information provided when the public or healthcare professionals report an actual or potential exposure to a substance (e.g., an ingestion, inhalation, or topical exposure, etc.), or request information/educational materials. Exposures do not necessarily represent a poisoning or overdose. The AAPCC is not able to completely verify the accuracy of every report made to member centers. Additional exposures may go unreported to PCCs and data referenced from the AAPCC should not be construed to represent the complete incidence of national exposures to any substance(s).

## Special Report:

# Synthetic Cannabinoids and Synthetic Cathinones Reported in NFLIS, 2009-2010



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