



Special Report: ADD/ADHD Stimulants in NFLIS, 2007-2011

Highlights

An estimated total of 13,697 reports of attention deficit disorder (ADD) and attention deficit hyperactivity disorder (ADHD) stimulants were submitted to State and local forensic laboratories in the United States from January 1 through December 31, 2011, and analyzed by March 31, 2012.

Reports for ADD/ADHD drugs more than doubled from 2007 to 2011. Lisdexamfetamine increased significantly from 4 reports in 2007 to 1,097 reports in 2011; amphetamine more than doubled from 4,451 to 9,890 reports; and methylphenidate increased from 1,776 to 2,710 reports. Overall, amphetamine accounted for the vast majority (72%) of ADD/ADHD stimulants, followed by methylphenidate (20%) and lisdexamfetamine (8%).

In 2011, ADD/ADHD stimulants in NFLIS were mainly reported from laboratories in the South (6,651 reports; 49%) and in the Midwest (3,468 reports; 25%). Only 15% were reported from laboratories in the Northeast and 11% from laboratories in the West.

Nationally, the number of ADD/ADHD stimulant prescriptions dispensed annually increased 39% between 2007 (34.8 million) and 2011 (48.4 million). Similar to NFLIS national reports, the States with ADD/ADHD stimulant prescription distributions greater than 5.0 kilograms per 100,000 population occurred mainly in the South (43%) and Midwest (35%), followed by the Northeast (17%) and West (4%).



Introduction

The National Forensic Laboratory Information System (NFLIS) is a program of the Drug Enforcement Administration (DEA), Office of Diversion Control, which systematically collects drug identification results from drug cases analyzed by Federal, State, and local forensic laboratories. This NFLIS special report presents findings on stimulants used to treat attention deficit disorder (ADD) and attention deficit hyperactivity disorder (ADHD), including methylphenidate (trade names: Ritalin, Metadate, Methylin, Concerta), dexamethylphenidate (trade name: Focalin), dextroamphetamine and levoamphetamine (trade names: Adderall, Spansule, DextroStat), and lisdexamfetamine (trade name: Vyvanse). National and regional estimates from 2007 to 2011 NFLIS data are presented along with State-level reports of ADD/ADHD stimulants. Data are also presented from other data systems.

ADD/ADHD prescription medications stimulate the central nervous system (CNS), with effects similar to but more potent than caffeine. These drugs are most often taken orally as an immediate release or extended release formulation (see the Appendix). ADD/ADHD stimulants act on the dopamine receptors of the brain to elicit a calming and “focusing” effect, particularly in children. The prototype for these ADD/ADHD stimulants, amphetamine, is also used for the treatment of narcolepsy and historically as an appetite suppressant. In 2007, nearly 10% of U.S. children aged 4 to 17 were diagnosed with ADHD, a more than 20% increase from four years earlier, and two-thirds of the children diagnosed were treated for ADHD (Visser, Bitsko, Danielson, Perou, & Blumberg, 2010). Furthermore, an estimated 4% of the U.S. adult population has diagnosed ADHD symptoms of inattention, hyperfocus, disorganization, impulsivity, and emotional difficulties (Kessler et al., 2006). The most commonly prescribed ADD/ADHD stimulants are methylphenidate and amphetamine.

ADD/ADHD stimulants have been abused for their stimulant effects, both to promote mental acuity and antifatigue. Recently, many ADD/ADHD drugs have also been used by students to enhance mental focus. This has led to increased abuse by teenagers and young adults, which represents a growing concern for the illicit diversion control of these substances. Specifically, the National Survey on Drug Use and Health (NSDUH) began reporting in 2006 on lifetime nonmedical use of Adderall among persons aged 12 or older; each year since then, lifetime use has increased. For example, in 2006, an estimated 4.7 million respondents reported nonmedical use of Adderall, whereas 8.2 million respondents reported such use in 2011 (Center for Behavioral Health Statistics and Quality, 2012).

National and Regional Estimates

This section presents national and regional estimates for reports of ADD/ADHD stimulants that were submitted to State and local forensic laboratories. In NFLIS, the amphetamine base category includes amphetamine isomers: dextroamphetamine, levoamphetamine, and racemic mixtures of both (Dorland's, 2007). Some of these ADD/ADHD stimulants are formulated as combination drugs that have different proportions of levoamphetamine and dextroamphetamine and cannot be reported as a unique drug (e.g., Adderall, Dexedrine) or easily separated from illicitly manufactured amphetamine. Similarly, methylphenidate and dexmethylphenidate data are reported together in this NFLIS special report. According to NFLIS, ADD/ADHD stimulants represented an estimated 13,697 drug reports in 2011 (Table 1 and Figure 1). In 2011, 72% of ADD/ADHD stimulants were amphetamines, followed by methylphenidate (20%) and lisdexamfetamine (8%). Lisdexamfetamine was first reported to NFLIS in 2007. NFLIS reports of ADD/ADHD stimulants increased 120% from 6,231 reports in 2007 to 13,697 reports in 2011. Over this five-year period, lisdexamfetamine experienced the sharpest increase from only four reports in 2007 to 1,097 reports in 2011; amphetamine more than doubled from 4,451 to 9,890 reports; and methylphenidate increased from 1,776 to 2,710 reports.

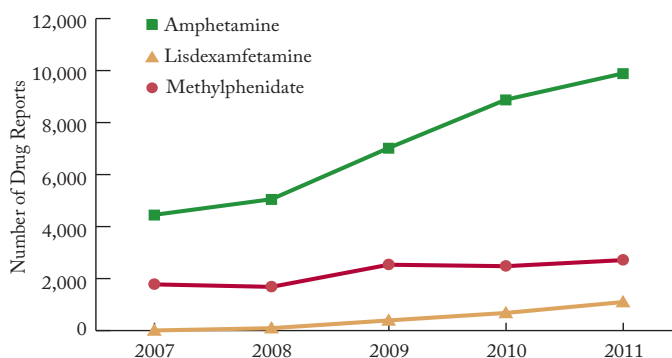
All ADD/ADHD stimulant drugs increased significantly in the Midwest and South from 2007 to 2011. ADD/ADHD nonstimulants did not have significant changes during this time. Amphetamine exhibited significant increases in the Northeast, South, and Midwest, with the largest increases occurring in the Northeast (151%) and South (144%) (data not shown). Methylphenidate

exhibited significant increases in the South, Midwest, and West from 2007 to 2011, with the largest increases taking place in the South (77%) and Midwest (69%). Lisdexamfetamine also experienced an upward trend over the five-year reporting period and increased significantly in all regions.

Table 1 ADD/ADHD STIMULANT REPORTS TO NFLIS, 2007 AND 2011

Drug	2007		2011	
	No.	% of Total	No.	% of Total
Amphetamine	4,451	71.4	9,890	72.2
Lisdexamfetamine	4	0.1	1,097	8.0
Methylphenidate	1,776	28.5	2,710	19.8
Total ADD/ADHD Stimulants	6,231	100.0	13,697	100.0

Figure 1 National trends of ADD/ADHD stimulants in NFLIS, 2007-2011



ADD/ADHD Stimulant Prescriptions Dispensed

IMS Health's National Prescription Audit Plus Retail database provides data on the number of prescriptions that have been legally dispensed for legitimate use. Nationally, the number of ADD/ADHD stimulant prescriptions dispensed annually increased 39% between 2007 (34.8 million) and 2011 (48.4 million) (Figure 2 and Table 2). In 2011, dispensed amphetamine prescriptions represented 42% (20.3 million) of the ADD/ADHD stimulants, and methylphenidate represented 40% (19.6 million). Lisdexamfetamine accounted for the remaining 18% (8.5 million).

Other drug categories that reported to IMS, while exhibiting increases in their dispensing rate, had a much smaller increase in comparison with the ADD/ADHD stimulants from 2007 to 2011. Opioid analgesics and benzodiazepines had a similar increase of nearly 17% and 16%, but this increase was more than two times less than the increase in ADD/ADHD stimulants. ADD/ADHD nonstimulants remained unchanged during this time.

Figure 2 ADD/ADHD stimulant prescriptions dispensed, 2007-2011

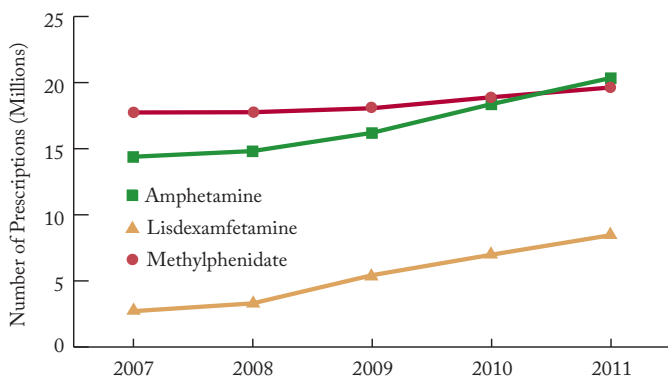


Table 2 TOTAL PRESCRIPTIONS DISPENSED (IN MILLIONS), BY DRUG CATEGORY, 2007-2011

Drug Category	2007	2008	2009	2010	2011	% Increase (2007 to 2011)
Opioid analgesics ¹	196.7	205.0	212.4	220.5	229.9	16.9
Benzodiazepines ²	277.1	288.3	298.5	309.9	321.5	16.0
ADD/ADHD nonstimulants ³	27.9	26.6	26.8	27.5	28.3	1.4
ADD/ADHD stimulants ⁴	34.8	35.9	39.7	44.2	48.4	39.0

¹ Opioid analgesics reported include buprenorphine, hydrocodone, hydromorphone, morphine, methadone, and oxycodone.

² Benzodiazepines reported include alprazolam, lorazepam, and diazepam.

³ ADD/ADHD nonstimulants reported include atomoxetine and bupropion.

⁴ ADD/ADHD stimulants reported include amphetamine, dextroamphetamine, methylphenidate, dexmethylphenidate, and lisdexamfetamine.

ADD/ADHD Stimulants Retail Distribution

Annual DEA data from the Automation of Reports and Consolidated Orders System (ARCOS) show that legal distribution of ADD/ADHD stimulants to practitioners, pharmacies, and other businesses increased from 2007 to 2011. Nationally, the number of ADD/ADHD stimulant prescriptions (amphetamine, methylphenidate, lisdexamfetamine) dispensed increased 41% between 2007 and 2011 (Table 3). Increased stimulant distribution during this five-year period was greatest for lisdexamfetamine at more than a 700% increase, followed by amphetamine (46%) and methylphenidate (6%). Five States (AL, DE, LA, RI, SC) had ADD/ADHD distributions greater than 5.0 kilograms per 100,000 population in 2007. While these States remained the top 5 States for legal distribution of ADD/ADHD stimulants in 2011, an additional 18 States (GA, IN, KS, MA, ME, MI, MN, MO, MS, NC, NH, OH, SD, TN, UT, VA, WI, WV) also had ADD/ADHD distributions greater than 5.0 kilograms per 100,000 population. In summary, the number of States distributing more than 5.0 kilograms

annually increased from 5 to 23 States over the five-year period. Of these States, the largest distribution occurred in the South (43%) and Midwest (35%), followed by the Northeast (17%) and West (4%).

Table 3 *ARCOS ADD/ADHD STIMULANT DISTRIBUTION IN KILOGRAMS PER 100,000 POPULATION, 2007-2011*

Drug	2007		2011		% Increase from 2007 to 2011
	kg	% of Total	kg	% of Total	
Amphetamine	3.0	32.4	4.4	33.5	46.2
Methylphenidate	6.0	64.5	6.4	48.5	6.3
Lisdexamfetamine	0.3	3.1	2.4	18.0	717.2
Total ADD/ADHD Stimulants	9.3	100.00	13.2	100.00	41.0

Toxic Exposures

The Substance Abuse and Mental Health Services Administration's Drug Abuse Warning Network (DAWN) tracks emergency department (ED) visits involving CNS stimulants (including amphetamine, dextroamphetamine, methylphenidate, and miscellaneous drugs). These ED visits increased 37% over the period from 2007 to 2010 (from 48,732 to 66,888 visits). ED visits specifically for the ADD/ADHD stimulants amphetamine,

dextroamphetamine, and methylphenidate increased 21% (from 24,856 to 30,175 visits). Controlling for population size, in 2010 there were 17.5 visits involving any CNS stimulant per 100,000 general population, but 63.9 visits for persons aged 18 to 20. The rate of visits specifically involving the ADD/ADHD stimulants amphetamine, dextroamphetamine, and methylphenidate was 30.0 visits per 100,000 persons aged 18 to 20, whereas rates for other age groups ranged from 9.4 to 16.2 visits.

ADD/ADHD Stimulants, by State in NFLIS, 2011

This section presents NFLIS data at the State level on the number of amphetamine, methylphenidate, and lisdexamfetamine reports submitted by State and local laboratories in 2007 and 2011. As shown in Figures 3 and 4, a total of 48 States reported amphetamine and 45 States reported methylphenidate during 2011. In comparison, only 36 States reported lisdexamfetamine (data not shown). There was an 80% increase in the number of States with 100 or greater reports of amphetamine (15 to 27 States) from 2007 to 2011. During the same period, States with 50 or more methylphenidate reports nearly doubled from 8 to 14 States.

Figure 3 Amphetamine reports in NFLIS, by State, 2011

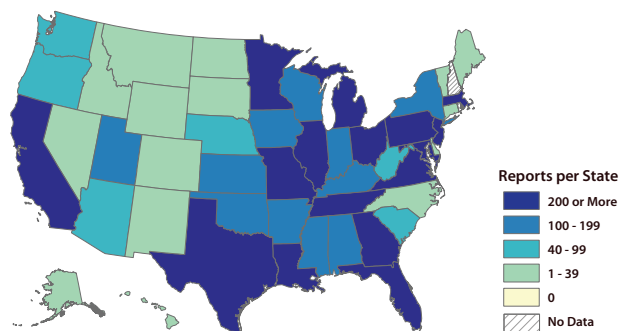
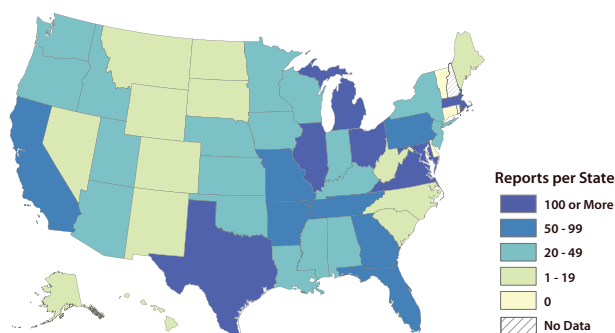


Figure 4 Methylphenidate reports in NFLIS, by State, 2011



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. During 2011, a total of 77,246 drugs were submitted to STRIDE and analyzed by March 31, 2011. Of these, there were 133 reports of ADD/ADHD stimulants (0.17% of total STRIDE reports). The most common ADD/ADHD stimulants reported were amphetamine (112 reports; 84%) and methylphenidate (19 reports; 14%). Lisdexamfetamine was reported in only two cases in 2011. Reporting of ADD/ADHD stimulants in STRIDE did not change significantly from 2007 to 2011 (116 to 133 reports). Similar to 2011, amphetamine (72 reports) and methylphenidate (44 reports) were the most ADD/ADHD stimulants reported in 2007.

Appendix: ADD/ADHD Stimulants

Substance (CSA Schedule II Effective Date)	Formulation	Year of FDA Approval
Methylphenidate (October 28, 1971)	Ritalin ^{a,b}	1955
–	Metadate ^{a,b}	1999 ^a , 1999 ^b
–	Methylin ^{a,b}	2000 ^b
–	Concerta ^b	2000 ^a , 2008 ^b
Dexmethylphenidate ^c	Focalin ^{a,b}	2001 ^a , 2005 ^b
Lisdexamfetamine (June 4, 2007)	Vyvanse	2007
Amphetamine (July 7, 1971)	Adderall ^{a,b,d}	1996 ^a , 2001 ^b
–	Dexedrine ^{a,e}	1997 (discontinued)
–	Spansule ^{b,e}	2008
–	DextroStat ^{a,e}	1975
–	Benzedrine	1959 (discontinued)

CSA = Controlled Substances Act; FDA = Food and Drug Administration.

^a Immediate release.

^b Extended release.

^c Dexmethylphenidate data are combined with methylphenidate data in this report.

^d Equal proportions of dextroamphetamine saccharate, dextroamphetamine sulfate, amphetamine aspartate monohydrate, and amphetamine sulfate.

^e Dextro isomer of the compound d,l-amphetamine sulfate.

References

Center for Behavioral Health Statistics and Quality. (2012). Tables 7.23A and 7.23B. In *Results from the 2011 National Survey on Drug Use and Health: Detailed tables*. Rockville, MD: Substance Abuse and Mental Health Services Administration. See <http://www.samhsa.gov/data/NSDUH/2011SummNatFindDetTables/Index.aspx>.

Dorland's medical dictionary for health consumers. (2007). Philadelphia, PA: Saunders, an imprint of Elsevier, Inc. According to *Dorland's*, "racemic" means "optically inactive, being composed of equal amounts of dextrorotatory and levorotatory isomers."

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

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