



PURPOSE: This report provides new information regarding comprehensive drug testing of toxicology specimens collected in clinical settings after suspected non-fatal opioid, stimulant, and/or other drug-related overdoses in cities across the United States (U.S.).

OVERVIEW: Drug use can lead to adverse events and overdose scenarios where individuals present to emergency departments (ED) for clinical evaluation and treatment. The culprit can be traditional drugs (e.g., heroin, fentanyl, cocaine, methamphetamine) or novel psychoactive substances (NPS); however, proper drug testing methodologies must be used for accurate identification and characterization. Street-level drug preparations may contain undeclared or unwanted substances (e.g., toxic adulterants, NPS) which can potentiate effects or lead to adverse reactions and unmasking scenarios. Understanding emerging drug trends and testing results can help direct new/revised approaches to clinical treatment and harm reduction.

OBJECTIVE: A partnership between the American College of Medical Toxicology (ACMT) and the Center for Forensic Science Research and Education (CFSRE) was established to comprehensively assess the role and prevalence of drugs, adulterants, NPS, and other relevant substances among suspected overdose events in the U.S.

SAMPLE SOURCE: Patients presented to EDs from April 2023 through November 2024 within the **Toxicology Investigators Consortium (ToxIC) Drug Overdose Toxicology Surveillance (DOTS) Reporting Program** experiencing a suspected opioid or stimulant related overdose. Blood samples were obtained for testing against an expansive library of drugs and other substances. Our findings provide near real-time assessment of drug markets and allude to resulting implications on clinical and forensic institutions.

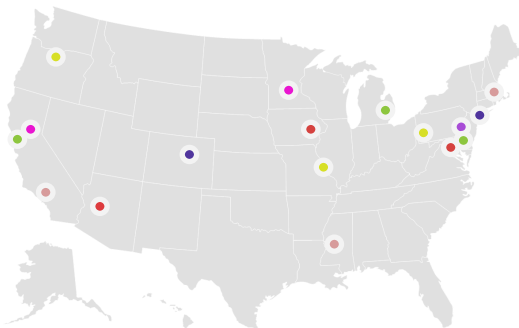
TOXICOLOGY TESTING: Analysis was performed via liquid chromatography quadrupole time-of-flight mass spectrometry (LC-QTOF-MS) and liquid chromatography tandem quadrupole mass spectrometry (LC-QQQ-MS). The scope of LC-QTOF-MS testing targeted more than 1,200 drugs, including a vast majority of NPS and metabolites. Drug classes included opioids, benzodiazepines, cannabinoids, stimulants, and hallucinogens, among others. The LC-QQQ-MS test was quantitative in nature, targeting fentanyl, norfentanyl, methamphetamine, amphetamine, cocaine, benzoylecgonine, xylazine, and naloxone. Additional targets included for quantitative testing were NPS of interest (e.g., bromazolam, cathinones, nitazene analogues, and others).

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PARTICIPATING HOSPITAL SITES

WEST

Portland, OR
Oregon Health & Science Univ.
Sacramento, CA
University of California, Davis
San Francisco, CA
University of California, San Francisco
Los Angeles, CA
University of California, Los Angeles, Ronald Reagan
Phoenix, AZ
Banner University Medical Center



CENTRAL

Denver, CO
University of Colorado
Minneapolis, MN
Hennepin Medical Center
Iowa City, IA
University of Iowa
Detroit, MI
Detroit Medical Center
St. Louis, MO
Washington University
Jackson, MS
University of Mississippi

EAST

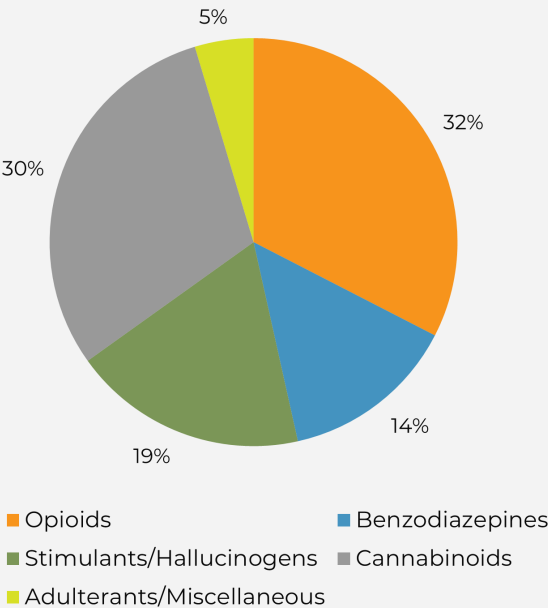
Boston, MA
Harvard University
New York, NY
Weill Cornell M.C.
Philadelphia, PA
University of Pennsylvania
Baltimore, MD
John's Hopkins Hospital
Washington, DC
Georgetown University
Pittsburgh, PA
University of Pittsburgh

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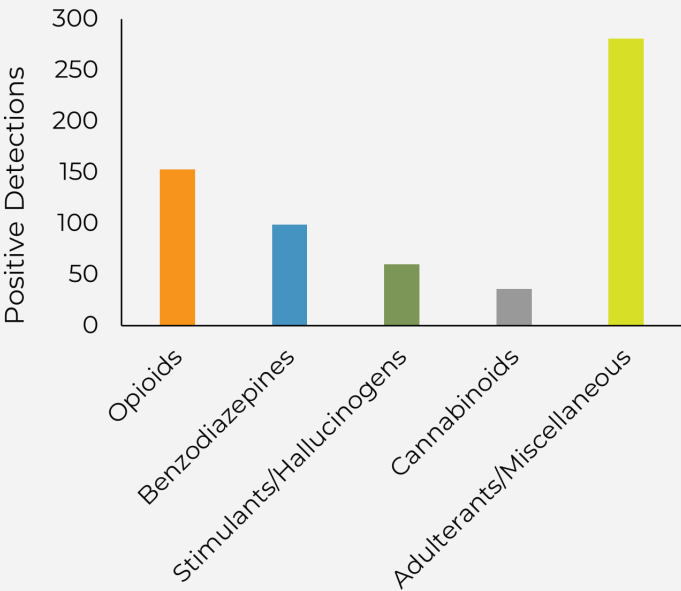
For more information, contact npsdiscovery@cfsre.org or visit www.npsdiscovery.org.

ALL SITE SUMMARY — NPS DETECTIONS (N=995)

Individual NPS Detected by Subclass



Total NPS Identifications by Subclass



ALL SITE SUMMARY — QUANTITATIVE RESULTS (N=995)

TRADITIONAL DRUGS (NG/ML)

Drug	N	Mean ± S.D.	Median	Range
Fentanyl	747	8.0 ± 11	4.5	<1 – 140
Norfentanyl	690	7.6 ± 18	3.3	<1 – 220
Naloxone	455	12 ± 37	4.4	<1 – >1000
BZE	455	190 ± 230	91	<1 – >1000
Methamphetamine	390	170 ± 210	88	<1 – >1000
Amphetamine	368	31 ± 40	19	<1 – 280
Cocaine	294	7.6 ± 15	2.4	<1 – 67
Ethanol (mg/dL)	85	110 ± 96	78	<10 – >400

NPS BENZODIAZEPINES (NG/ML)

Drug	N	Mean ± S.D.	Median	Range
Bromazolam	312	76 ± 76	56	<5 – >500
Flubromazepam	7	65 ± 64	47	<5 – >500
8-Aminoclonazolam	1	-	-	<5
Clonazolam	1	-	-	<5

NPS STIMULANTS & HALLUCINOGENS (NG/ML)

Drug	N	Mean ± S.D.	Median	Range
<i>N,N</i> -Dimethylpentylone	25	29 ± 16	27	<10 – 63
Pentylone	20	19 ± 18	15	<10 – 54
Eutylone	3	-	-	<10 – 57
<i>N</i> -Isopropyl Butylone	3	-	-	<10 – 54
2F-2oxo-PCE	1	-	-	2.5
<i>N</i> -Cyclohexyl Butylone	1	-	-	<10

ADULTERANTS (NG/ML)

Drug	N	Mean ± S.D.	Median	Range
Xylazine	189	14 ± 29	4	<1 – 150
Medetomidine	27	1.5 ± 1.8	0.97	<0.1 – 5.8
2,6-Xylidine	7	-	-	<5 – 10
3-OH Xylazine	3	-	-	<1
1-(2,6-Xylyl)-2-Thiourea	2	-	-	3.1 – 3.4

NPS OPIOIDS (NG/ML)

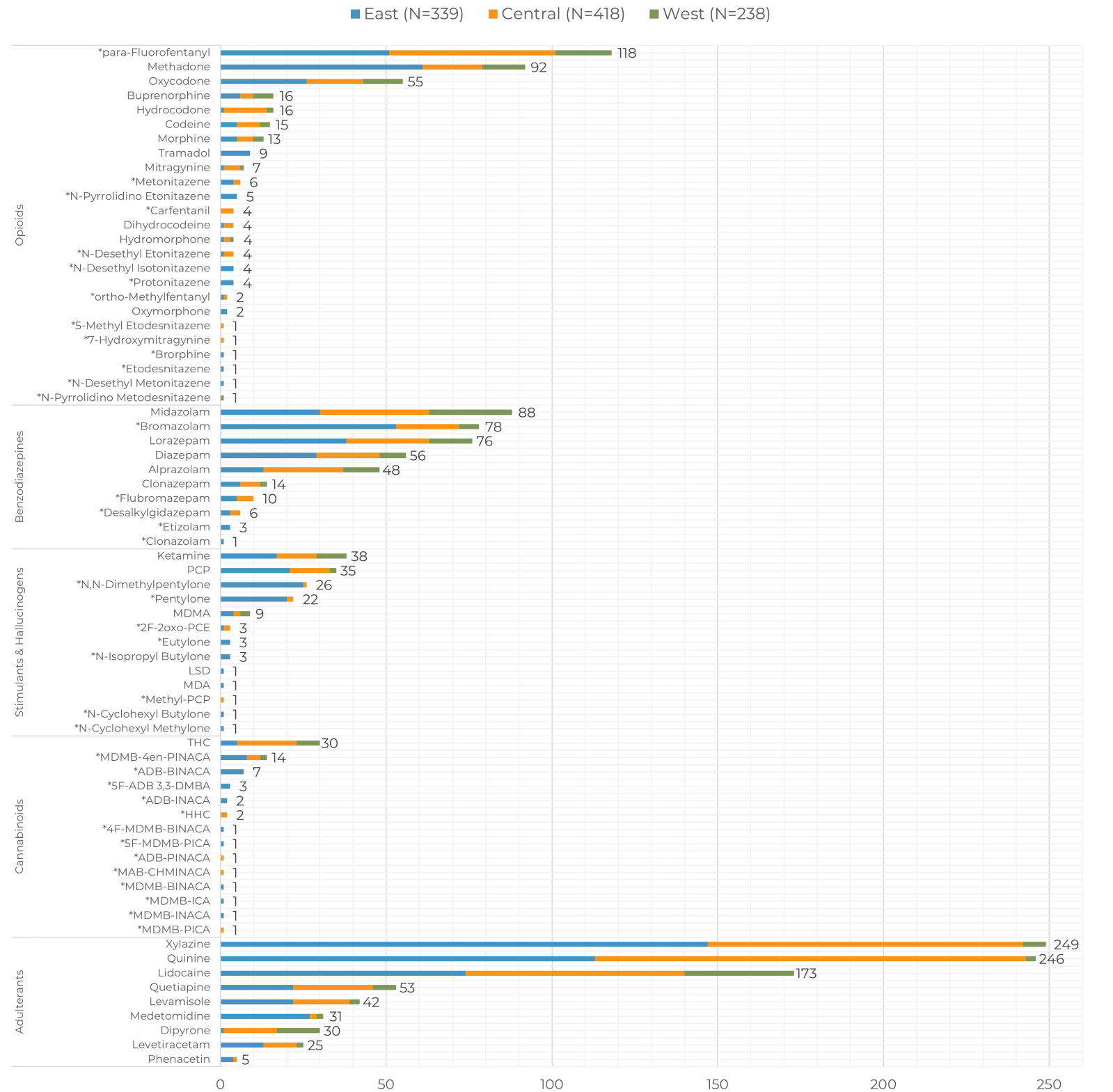
Drug	N	Mean ± S.D.	Median	Range
Metonitazene	5	1.5 ± 1.3	1.0	<1 – 3.5
Carfentanil	4	0.41 ± 0.28	0.33	0.2 – 0.8
<i>N</i> -Desethyl Isotonitazene	4	2.1 ± 2.1	1.1	0.83 – 5.3
<i>N</i> -Pyrrolidino Etonitazene	4	0.45 ± 0.43	0.21	<0.2 – 0.96
Protonitazene	4	-	-	<0.5 – 0.9
<i>ortho</i> -Methylfentanyl	2	-	-	<0.1
4'-OH Nitazene	1	-	-	<0.5
5-Methyl Etodesnitazene	1	-	-	14
Etodesnitazene	1	-	-	0.35

SYNTHETIC CANNABINOIDS (NG/ML)

Drug	N	Mean ± S.D.	Median	Range
MDMB-4en-PINACA	12	1.2 ± 1.2	0.87	<0.2 – 4.1
ADB-BINACA	6	3.3 ± 4.0	1.6	0.39 – 11
MDMB-BINACA	2	-	-	<0.2 – 11



QUALITATIVE RESULTS BY REGION (N=995, *NPS)



ADDITIONAL DRUGS: Fentanyl (East n=251, Central n=310, West n=152, Total n=760), Methamphetamine (E. n=64, C. n=170, W. n=159, T. n=393), Amphetamine (E. n=51, C. n=147, W. n=111, T. n=309), Cocaine (E. n=143, C. n=125, W. n=38, T. n=306)

QUANTITATIVE RESULTS (NG/ML) BY REGION (EAST N=339, CENTRAL N=418, WEST N=238)

TRADITIONAL DRUGS	East			Central			West		
	N	Mean ± S.D.	Median	N	Mean ± S.D.	Median	N	Mean ± S.D.	Median
Ethanol (mg/dL)	27	96 ± 83	58	33	100 ± 100	67	25	130 ± 100	100
Fentanyl	244	9.0 ± 14	4.6	305	8.3 ± 10	4.7	198	6.4 ± 7.6	3.9
Norfentanyl	227	9.7 ± 17	4.3	277	7.6 ± 22	3.3	186	4.6 ± 7.3	2.1
Methamphetamine	58	80 ± 150	27	160	160 ± 199	89	172	200 ± 224	110
Amphetamine	50	23 ± 48	9.5	147	28 ± 33	17	171	35 ± 43	23
Cocaine	136	5.0 ± 11	2.1	120	3.8 ± 3.2	2.6	38	29 ± 31	14
BZE	203	197 ± 246	100	181	191 ± 234	86	71	160 ± 200	86
Naloxone	95	8.0 ± 12	3.3	159	13 ± 25	5.1	121	15 ± 54	4.6

ADULTERANTS	East			Central			West		
	N	Mean ± S.D.	Median	N	Mean ± S.D.	Median	N	Mean ± S.D.	Median
Xylazine	114	14 ± 7	5.9	70	13 ± 31	3.2	5	<1	-
Medetomidine	23	1.7 ± 1.9	1.2	2	1.0 ± 0.45	1.0	2	0.33 ± 0.18	0.33
2,6-Xylidine	6	<5	-	1	10	10			
3-OH Xylazine	3	<1	-						
1-(2,6-Xylyl)-2-Thiourea	2	3.2 ± 0.21	3.2						

NPS OPIOIDS	East			Central			West		
	N	Mean ± S.D.	Median	N	Mean ± S.D.	Median	N	Mean ± S.D.	Median
Metonitazene	3	1.6 ± 1.6	1.0	2	1.1	-			
Carfentanil				4	0.41 ± 0.28	0.33			
N-Desethyl Isotonitazene	4	2.1 ± 2.1	1.1						
N-Pyrrolidino Etonitazene	4	0.45 ± 0.43	0.42						
Protonitazene	4	0.9	0.9						
4'-OH Nitazene	1	N/A	-						
5-Methyl Etodesnitazene				1	14	-			
Etodesnitazene	1	0.35	-						
ortho-Methylfentanyl	1	<0.5	-	1	<0.5	-			

NPS BENZODIAZEPINES	East			Central			West		
	N	Mean ± S.D.	Median	N	Mean ± S.D.	Median	N	Mean ± S.D.	Median
Bromazolam	51	76 ± 81	58	15	84 ± 63	63	4	28 ± 20	28
Flubromazepam	4	47 ± 45	47	3	82 ± 95	82			
8-Aminoclonazepam	1	<5	-						
Clonazepam	1	<5	-						

NPS STIMULANTS & HALLUCINOGENS	East			Central			West		
	N	Mean ± S.D.	Median	N	Mean ± S.D.	Median	N	Mean ± S.D.	Median
N,N-Dimethylpentylone	24	29 ± 16	27	1	<10	-			
Pentylone	19	19 ± 18	15	1	<10	-			
Eutylone	3	57	57						
N-Isopropyl Butylone	3	54	54						
2F-2oxo-PCE	1	2.5	2.5						
N-Cyclohexyl Butylone	1	<1	-						

SYNTHETIC CANNABINOIDS	East			Central			West		
	N	Mean ± S.D.	Median	N	Mean ± S.D.	Median	N	Mean ± S.D.	Median
MDMB-4en-PINACA	7	1.3 ± 1.4	1.0	4	1.1 ± 0.80	0.87	1	0.43	-
ADB-BINACA	6	3.0 ± 3.3	1.6						
MDMB-BINACA	2	11	11						