

**Drug Early Warning from Re-Testing Biological Samples:  
Allen County, Indiana**



Office of National Drug Control Policy  
Executive Office of the President  
July 2018

## **ACKNOWLEDGMENTS**

This report was funded by Cooperative Agreement #G1599ONDCP04A awarded by the Executive Office of the President, Office of National Drug Control Policy (ONDCP), to the University of Maryland's Center for Substance Abuse Research (CESAR). Eric D. Wish, Ph.D. (Principal Investigator), Amy Billing, MSSA, and Eleanor Erin Artigiani, MA, produced this report. Fe Caces, Ph.D., served as reviewer and Project Manager at ONDCP and Terry Zobeck, Ph.D., also served as a reviewer.

We are grateful to the criminal justice and laboratory staff that worked with us on this project. Without the support and assistance of the Allen County Adult Probation Program and the HOPE Probation staff, this project could not have been completed. The independent laboratory analyses for this report were conducted by the Armed Forces Medical Examiner System (AFMES) Laboratory. We would like to thank the specific staff listed below:

### **Allen County Adult Probation (HOPE Probation - Indiana)**

Judge Wendy Davis  
Eric Zimmerman, Director of Court Services/Chief Probation Officer  
Steve Keele  
Thomas Felts

### **Armed Forces Medical Examiner System, Division of Forensic Toxicology**

Dr. Jeff Walterscheid  
Lt. Commander Pedro Ortiz  
Major Lynn Wagner  
CTR Anastasia Berrier  
CTR Kimberley Heine  
CTR Theresa Hippolyte  
CTR Paul Kaiser

## **Disclaimer**

The information and opinions expressed herein are the views of the authors and do not necessarily represent the views of the Office of National Drug Control Policy (ONDCP) of the Executive Office of the President, or any other agency of the Federal Government.

## **Notice**

This report may be reproduced in whole or in part without permission from ONDCP. Citation of the source is appreciated. The suggested citation is:

Wish, E.D., Billing, A.S., and Artigiani, E.E. (2018). *Drug Early Warning from Re-Testing Biological Samples: Allen County, Indiana*. Office of National Drug Control Policy. Washington, DC: Executive Office of the President.

## **Electronic Access to Publication**

This document can be accessed electronically through the following World Wide Web address:

<https://ndews.umd.edu/resources/cdews-reports>

## **Originating Office**

Executive Office of the President  
Office of National Drug Control Policy  
Washington, DC 20503

July 2018



## Abstract

The Community Drug Early Warning System (CDEWS) provides timely information about emerging drug use in criminal justice populations in local communities by obtaining and re-testing urine specimens already collected and tested for a limited panel of drugs by local criminal justice testing programs. CDEWS or local staff sample specimens that are ready to be discarded and send them to an independent laboratory for testing for an expanded panel of more than 160 drugs. By using already collected de-identified urine specimens, CDEWS can produce a relatively quick and inexpensive snapshot of the types of drugs recently used by participating populations and their testing program's ability to detect drugs being used by their population.

The CDEWS methodology has been implemented in 15 sites and the results are contained in six reports already released by the Office of National Drug Control Policy. This report presents findings from adult probationers in the HOPE probation population in Allen County, Indiana.

This is the second CDEWS study of a HOPE program. The HOPE program, originally known as Hawaii's Opportunity Probation with Enforcement, was begun by Judge Steve Alm in Hawaii in 2004 and his program was the subject of an earlier CDEWS report. The HOPE program enrolls high risk felony probationers with serious criminal histories and extensive substance abuse histories in a program that includes frequent urine drug monitoring coupled with brief jail sanctions for drug violations. This program model has since been expanded to many jurisdictions throughout the country.

A sample of 150 urine specimens was collected from the Indiana HOPE program. Of these, 51 had tested positive for any drug in the local limited criminal justice system screen (CJS+) and 99 had tested negative for all drugs (CJS-). The de-identified specimens were sent to the CDEWS laboratory for expanded testing.

Perhaps the most important finding was that almost one half of the CJS- specimens studied contained a likely illicit drug (drug not likely to have been taken under a doctor's supervision). Marijuana, cocaine, synthetic cannabinoids (SC) and fentanyl were about as likely to be found in specimens that had passed the local CJS screen as specimens that had failed it. The greater sensitivity of the tests used by the CDEWS laboratory likely explains why our tests detected so many drugs in the CJS- specimens. Only a minority of the specimens from either group tested positive for SCs, and, as was found in several of our prior CDEWS studies, many of the SC positive specimens contained multiple SC metabolites.

Our findings may have important implications for the effectiveness of the Indiana HOPE program, which relies heavily on detecting recent drug use by probationers. The Indiana HOPE program may wish to consider whether they want to adopt more sensitive onsite or laboratory tests in order to detect recent drug use by probationers that is being missed by their current tests.

Our results differ from those from our prior study of the Hawaii HOPE program where fewer drugs, and primarily methamphetamine, were detected in CJS- specimens. Methamphetamine use is much more prevalent in Hawaii, as well as in the Western and Southern parts of the U.S. In Indiana, drugs other than methamphetamine were detected in almost one half of the HOPE probationers who tested CJS-. Our results therefore underscore the value of the CDEWS methodology for assessing the validity of the drug tests used by testing programs in diverse parts of the country where the drugs of use may differ and where the tests used may have varying sensitivity that may greatly affect their ability to detect recent drug use.

## Table of Contents

<b>Abstract</b> .....	v
<b>Introduction</b> .....	1
<b>Methodology</b> .....	2
Site Selection Procedures .....	2
Targeted Number of Specimens.....	2
Collection of Urine Specimens .....	3
Interviews with Toxicologists to Develop the CDEWS Testing Panel .....	3
Testing of Urine Specimens by the CDEWS Laboratory.....	3
<b>Results</b> .....	3
A. Specimens Received .....	4
B. Demographic Characteristics of Persons Providing Specimens.....	4
C. Drugs Detected by the CDEWS Laboratory.....	5
D. SC Metabolites Detected .....	11
<b>Study Limitations</b> .....	12
<b>Summary and Conclusions</b> .....	13
<b>References</b> .....	14
<b>Appendices</b> .....	17
<i>Appendix A: Site Selection Procedures</i> .....	18
Table A-1: Time to Obtain Approval and Collect Specimens On-Site.....	18
<i>Appendix B: Collection of Urine Specimens</i> .....	19
<i>Appendix C: Testing of Urine Specimens by the CDEWS Laboratory</i> .....	20
Table C-1: Toxicologists Interviewed for CDEWS.....	21
Table C-2: The CDEWS Laboratory Expanded Drug Screening Panel and Limits of Detection.....	22
<i>Appendix D: Glossary of Abbreviated Terms</i> .....	25

## List of Tables

Table 1: Description of the Participating Study Site.....	2
Table 2: Number of CJS Positive and Negative Specimens Sampled.....	4
Table 3: Demographic Characteristics of Individuals Providing Specimens from Allen County HOPE Probation, by CJS Drug Screen Result.....	5
Table 4: CDEWS Laboratory Test Results for the Allen County HOPE Probation Sample, by CJS Drug Screen Result .....	7
Table 5: Limits of Detection (LODs) Used for Drugs Tested for by the Allen County HOPE Probation Program and CDEWS Laboratory.....	9
Table 6: Percentage Positive for Selected Drugs for the Allen County HOPE Probation Sample, by CJS Drug Screen Result.....	10

Table 7: Metabolites Detected in All Synthetic Cannabinoid (SC) Positive Specimens from Adult HOPE Probationers in Allen County, Indiana ..... 11

## Introduction

The Community Drug Early Warning System (CDEWS) provides timely information about emerging drug use in criminal justice populations in local communities by obtaining and re-testing urine specimens already collected and tested for a limited panel of drugs by local criminal justice testing programs. CDEWS or local staff sample the specimens that are ready to be discarded and send them de-identified to an independent laboratory for testing for an expanded panel of drugs. By using already collected urine specimens, CDEWS can provide a relatively quick and inexpensive snapshot of the types of drugs recently used by criminal justice populations (see Appendices A and B for details). Thus, the CDEWS methodology has two primary objectives: (1) to identify and describe the use of emerging drugs in populations at high risk for recent drug use; and (2) to specify any important drugs that the current local testing program may be missing. A major innovation in the CDEWS methodology used in the current study is the expansion of the CDEWS testing panel to include testing for more than 160 licit and illicit substances, including opioids, benzodiazepines, antidepressants, and new psychoactive substances (NPS) such as synthetic cannabinoids (SC), cathinones, phenethylamines, and fentanyl, using more sensitive testing technology than many criminal justice testing programs.

The CDEWS results are especially important for detecting emerging drugs because prior epidemics in the use of illegal drugs have often shown up in urinalysis results from criminal justice populations before they became evident in the larger community (DuPont & Wish, 1992; Wish, 1997). In addition, local testing programs typically can test for only a small number (often 6-12) of different drugs and the CDEWS results for more than 160 substances can be used by the local testing programs to gain some insight into whether their standard limited test panel is adequate to identify most of the drugs being used by their population.

The CDEWS methodology has now been piloted in 15 sites and the results are provided in six reports already released by the Office of National Drug Control Policy (ONDCP) (Billing et al., 2017; Wish et al., 2013, 2015, 2016, 2016b, 2017). This report contains findings from a single jurisdiction – the Adult HOPE Probation program in Allen County, Indiana. The HOPE program, originally known as Hawaii’s Opportunity Probation with Enforcement, was begun by Judge Steve Alm in Hawaii in 2004 and his program was the subject of an earlier CDEWS report (Wish et al., 2016). The HOPE program enrolls high risk felony probationers with serious criminal histories and extensive substance abuse histories in a program that includes frequent urine drug monitoring coupled with brief jail sanctions for drug violations (The Institute for Behavior and Health, Inc., 2015). This program model has since been expanded to many jurisdictions throughout the country. The HOPE population was also studied as part of the CDEWS project in Kentucky (forthcoming).

# Methodology

## Site Selection Procedures

We sought specimens from adult participants of the Allen County, Indiana HOPE probation program. Logistics for this site were discussed with site staff over the phone to establish the study protocols. Prior to data collection, the Center for Substance Abuse Research (CESAR) at the University of Maryland, College Park, which carried out this study, submitted an application for the necessary approvals and obtained approval for the study from University of Maryland’s Institutional Review Board (IRB). The specific steps taken to recruit and work with this site are described in Appendix A, along with more details about the specimen collection in Appendix B. Table 1 provides an overview of the key characteristics of this site.

The Allen County Adult HOPE Probation program collects about 3,500 urine specimens annually, from an average number of approximately 175 HOPE probationers. An onsite test cup that detects 10 drugs (barbiturates, benzodiazepines, buprenorphine, cocaine, marijuana, MDMA, methadone, methamphetamine, opiates, and oxycodone) is the standard screen used by this program. SC, other NPS, EtG (alcohol) and other tests are available upon request. Contested positive specimens are sent to an outside testing laboratory (Redwood Toxicology) for confirmation.

## Targeted Number of Specimens

We targeted for collection a total of 150 specimens from unduplicated adult HOPE probationers between October 2015 and May 2016. As was the case with prior CDEWS studies, we wanted to collect both specimens that had tested positive (CJS+) or negative (CJS-) for anything by the standard local CJS drug screen. We therefore worked with the local staff to collect 50 CJS+ and 100 CJS- specimens from the Allen County Adult HOPE Probation population.

**Table 1: Description of the Participating Study Site**

Site	Populations Covered	CJS Testing Protocol	Drugs in Standard CJS Screen	Targeted Number of Specimens to be Collected for CDEWS
Allen County, Indiana: HOPE Probationers	Adult HOPE probationers  (est 3,500 specimens per year from 175 HOPE Probationers)	Onsite cup screening; Offsite laboratory confirmation for contested positives and other suspected use	<u>10-panel screen</u> : barbiturates, benzodiazepines, buprenorphine, cocaine, marijuana, MDMA, methadone, methamphetamine, opiates, and oxycodone.  Synthetic cannabinoids, other new psychoactive substances, EtG (alcohol) and other tests are available upon request.	150 specimens (50 CJS+; 100 CJS-)

## Collection of Urine Specimens

Prior to collecting the urine specimens, CESAR staff talked with staff from the program by phone to determine their policies regarding required specimen holding periods, testing protocols, detection limits and other relevant site details. Specimens were then accumulated by the Allen County Adult HOPE Probation program using the specific CDEWS guidelines provided by CESAR as to how specimens were to be handled and stored. Designated probation staff shipped specimens directly to the CDEWS laboratory for expanded drug testing. Additional details of the specimen selection appear in Appendix B. Details about the CDEWS laboratory test panel appear in Appendix C.

## Interviews with Toxicologists to Develop the CDEWS Testing Panel

In the prior CDEWS studies, we had learned that both the chemical composition of synthetic drugs available and patterns of use can vary widely even within a brief period of time. It is a recognized challenge for both laboratories and law enforcement to keep up with the rapid changes in the composition of synthetic drugs. The chemists producing these drugs modify the chemical structures of the drugs as existing formulations are scheduled by the DEA and made illegal. To ensure that the drug test panel for this study was as current as possible and included the most relevant drugs/metabolites, CESAR staff reviewed data on emerging drug trends and conducted interviews with toxicologists and other relevant professional contacts to identify substances for inclusion on the panel. Additional information on the data reviewed and persons interviewed appears in Appendix C.

Based on the information reviewed, we added 26 additional NPS to our previous CDEWS-3 drug panel: 2C-B-FLY, 4-Fluoroamphetamine (4-FA), 4-Fluoromethamphetamine (4-FMA), 4-AAP (Dipyrone metabolite), 4-ANPP (Despropionyl fentanyl), 5-MEO-MiPT, 5-APDB/6-APDB, Betahydroxythiofentanyl, Bromo-DragonFLY, Butyryl Fentanyl, Dibutylone, Dimethylone, DMT, Furanylfentanyl, MT-45, Parafluorobutyryl fentanyl, Parafluorofentanyl, Psilocin, 2C-T, U-47700, W-15, W-18, Loperamide, 4-MAAP (Dipyrone metabolite), DHNK (Ketamine metabolite), and Ketamine (see Table C-2 in Appendix for the full panel). Several additional NPS were identified as relevant to the study but were not included due to reference standard availability and cost.

## Testing of Urine Specimens by the CDEWS Laboratory

All specimens were sent to the CDEWS laboratory, the Armed Forces Medical Examiner System (AFMES) Laboratory located in Delaware, for an expanded drug testing panel. Details on the testing panel are provided in Appendix C. All specimens were tested for a panel of 26 SC metabolites and 59 other NPS, along with 84 other illicit and prescription drugs for a total of 169 drugs.

## Results

The term *CJS test result* refers to the limited onsite 10-drug screen (or optional additional tests) routinely used by the local criminal justice agency to screen the HOPE probationers. *CDEWS*

*test result* refers to the expanded drug tests used by the CDEWS laboratory, which included all of the drugs tested for by the smaller CJS test panels.

We first describe the specimens collected and some basic demographic information about the probationers who provided them. Next, we describe the CDEWS test results for specimens tested with our expanded drug screen, including SCs. The results for CJS+ and CJS- specimens are presented separately because we stratified our sample selection to collect twice as many CJS- specimens as CJS+ specimens. Given this stratification, it would be inappropriate for our analyses to simply combine and average the results from these two groups.

### A. Specimens Received

Specimens were collected between October 2015 and May 2016. We had targeted 150 specimens (50 CJS+; 100 CJS-) and received a total of 150 (51 CJS+; 99 CJS-) specimens. Table 2 shows the specimens received, according to the local CJS testing results.

**Table 2: Number of CJS Positive and Negative Specimens Sampled**

Site and Population	CJS Test Result		
	<i>Positive</i>	<i>Negative</i>	<i>Total</i>
<b>Allen County, Indiana: Allen County Adult Probation</b>			
HOPE Probation	51	99	150

### B. Demographic Characteristics of Persons Providing Specimens

Table 3 presents the demographic information obtained. The majority of specimens from HOPE probationers who tested CJS+ or CJS- came from persons 40 years of age or younger (70% and 74%, respectively) and a little more than 80 percent of all specimens came from males.

**Table 3: Demographic Characteristics of Individuals Providing Specimens from Allen County HOPE Probation, by CJS Drug Screen Result**  
(N=148 specimens)

<b>HOPE Probation – Allen County, Indiana</b>		
	<b>CJS+ (for any drug) (N=50)</b>	<b>CJS- (for any drug) (N=98)</b>
<b>Age</b>		
18 to 20	6	6
21 to 25	10	17
26 to 30	22	27
31 to 40	32	24
41 to 50	14	18
51 and older	16	8
Total	100%	100%
<b>Gender</b>		
Male	84%	83%
Female	16	17
Total	100%	100%

Notes:

N's differ slightly for some characteristics because of missing information.

Certain percentages have been rounded in order for the total to equal 100%.

### C. Drugs Detected by the CDEWS Laboratory

A complete listing of the CDEWS drug test results, grouped by CJS test result are presented in Table 4. In this report, the term “ Any NPS” excludes the following New Psychoactive drugs: synthetic cannabinoids and synthetic fentanyl analogues, which appear separately in our tables.

**CJS+ Specimens:** Non-fentanyl opioids was the class of drugs most likely (71%) to be detected in the CJS+ specimens. Hydromorphone (29%), morphine (29%), oxycodone (24%), and hydrocodone (22%) were the specific non-fentanyl opioids most likely to be detected. Fentanyl was rarely detected (4%). Antidepressants were detected in 31 percent of the CJS+ specimens, primarily trazodone. Marijuana (22%) and cocaine (16%), drugs included in the local CJS screen were also relatively likely to be detected. While 14 percent tested positive for Any NPS, this was most likely attributed to trazodone, an antidepressant, for which mCPP (an NPS) is the major active metabolite. Seven of the nine specimens positive for mCPP were also positive for trazodone. SCs and benzodiazepines were

each detected in 14 percent of specimens. Naloxone was detected in 12 percent and was likely the result of the person having taken a naloxone/buprenorphine combination drug (five of the eight specimens positive for buprenorphine/norbuprenorphine also tested positive for naloxone).

**CJS- Specimens:** Non-fentanyl opioids were found in 16 percent of the CJS- specimens and antidepressants were found in almost one quarter (23%). The individual drugs most frequently detected were marijuana (21%) and cocaine (20%), which were about as common as found in the CJS+ specimens. Marijuana and cocaine are included in the screen used by the Allen County HOPE Probation program but were apparently not detected by them. The more sensitive tests used by the CDEWS laboratory probably explains why these drugs went undetected in the CJS- group. Antidepressants were found in 23 percent of the CJS- specimens, again mostly stemming from the use of trazodone (19%). SCs and NPS were found in 10-11 percent of specimens.

**Table 4: CDEWS Laboratory Test Results for the Allen County HOPE Probation Sample<sup>^</sup>,  
by CJS Drug Screen Result**  
(N=150 specimens collected between October 2015-May 2016)

<b>Percent Positive by CDEWS Lab for:</b>	<b>CJS+ (for any drug) (N=51) %</b>	<b>CJS- (for any drug) (N=99) %</b>
Marijuana	22	21 <sup>§</sup>
Cocaine	16	20 <sup>§</sup>
Methamphetamine	0	1 <sup>§</sup>
<b>Any Non-Fentanyl Opioid</b>	<b>71</b>	<b>16</b>
Hydromorphone	29	3
Morphine	29	2
Oxycodone	24	4 <sup>§</sup>
Hydrocodone	22	1
Oxymorphone	14	2
Buprenorphine/Norbuprenorphine	12	2 <sup>§</sup>
Methadone/EDDP	8	3 <sup>§</sup>
Tramadol	6	2
Codeine	6	0
Tapentadol	0	2
Meperidine/Normeperidine	0	1
<b>Any Fentanyl</b>	<b>4</b>	<b>3</b>
Fentanyl/Norfentanyl	4	1
Butyrylfentanyl	0	2
Furanylfentanyl	0	2
Parafluorobutyryl fentanyl	0	2
<b>Any Antidepressant</b>	<b>31</b>	<b>23</b>
Trazodone <sup>†</sup>	26	19
Citalopram	4	2
Bupropion	2	2
Paroxetine	2	2
Fluoxetine	4	0
<b>Any New Psychoactive Substance (NPS)</b>	<b>14</b>	<b>10</b>
mCPP <sup>†</sup>	12	3
25I-NBOMe	0	4
β-Methylphenethylamine	0	3
Methoxetamine (MXE)	4	0
MT-45	0	2
Dibutylone	2	0
Ethylone	2	0
Eutylone	2	0
Flephedrone	2	0
MBDB	2	0

**Table 4 (Cont'd): CDEWS Laboratory Test Results for the Allen County HOPE Probation Sample<sup>^</sup>, by CJS Drug Screen Result**

Methedrone	2	0
Methiopropamine	2	0
4-Fluoromethamphetamine (4-FMA)	2	0
4-Methylethcathinone (4-MEC)	2	0
Any Synthetic Cannabinoid (SC)	14	11
BB-22	4	4
UR-144	2	5
5F-PB-22	2	3
AB-PINACA	2	2
JWH-018	2	2
XLR-11	2	2
JWH-122	4	0
AB-FUBINACA (Parent)	2	1
JWH-073	2	1
MAM-2201	2	0
PB-22	0	1
JWH-019	0	1
Any Benzodiazepine	14	3
Alprazolam/ $\alpha$ -Hydroxyalprazolam	10**	0**
Oxazepam	4	1
Diazepam/Nordiazepam	4	0
Temazepam	4	0
Clonazepam/7-Aminoclonazepam	0	2
Estazolam	2	0
Other Drugs		
Naloxone	12**	1**
Cetirizine	8	3
Dextromethorphan	4	3
Loperamide	0	5
Cyclobenzaprine	8*	0*
Amphetamine	6	1
Ephedrine/Pseudoephedrine	0	2
Ketamine/DHMK	0	2
Hydroxyzine	0	1
LSD	0	1

<sup>^</sup>The Allen County HOPE Probation Program routinely tests for a panel of ten drugs, including: barbiturates, benzodiazepines, buprenorphine, cocaine, marijuana, MDMA, methadone, methamphetamine, opiates, and oxycodone. Synthetic cannabinoids, other new psychoactive substances, EtG (alcohol) and other tests are available upon request.

<sup>§</sup>The limits of detection for drugs tested for by the CDEWS laboratory were more sensitive than those used by the Allen County HOPE Probation testing program as LC/MS/MS was used to screen for most drugs in this CDEWS study. This may explain the drug positives found in the CJS- group for the drugs contained on the Allen County HOPE Probation testing panel. See Table 5 for the limits of detection used by the CDEWS laboratory versus the Allen County HOPE Probation Program.

<sup>†</sup>Trazodone is an antidepressant whose major active metabolite is mCPP. It is not possible to definitively determine whether the presence of mCPP was due to trazodone use or whether mCPP was taken on its own. Seven of the 9 specimens positive for mCPP were also positive for trazodone.

\*p<.05 by Fisher's Exact Test.

\*\*p<.01 by Fisher's Exact Test.

Given the number of drugs found in the specimens from the CJS- group, we compared the limits of detection (LODs) of the tests used by the probation program with those used by the CDEWS laboratory. Table 5 shows that, as expected, the CDEWS laboratory tests (LC/MS and LC/MS/MS) had LODs that were much lower (and thus more sensitive) than those used by the Indiana HOPE Probation program (which uses mostly enzyme immunoassay tests). For example, the CDEWS laboratory's test for THC (marijuana) could detect a concentration as low as 5ng/mL while the CJS test could only detect a concentration of 50ng/mL or higher. This large increase in the sensitivity of the tests used by CDEWS likely explains why so many drugs were found in the CJS- negative specimens. A full list of the LODs used by the CDEWS laboratory can be found in Appendix C.

**Table 5: Limits of Detection (LODs) Used for Drugs Tested for by the Allen County HOPE Probation Program and CDEWS Laboratory**

	Indiana: HOPE ng/mL	CDEWS Laboratory ng/mL
<b>Test (compound)</b>		
Barbiturates	300	Not Tested For
Benzodiazepines	300	25*
Buprenorphine	10	1
Cocaine	300	25
MDMA	500	25
Methadone	300	25
Methamphetamine	1000	25
Opiates	300	25§
Oxycodone	100	25
THC	50	5

\*Given that the CDEWS Laboratory tests for specific benzodiazepines using LC/MS/MS, the LOD indicated reflects the LOD of the specific benzodiazepine (Oxazepam) that likely would have been detected by the instant cup screen.

§Given that the CDEWS Laboratory tests for specific opioids using LC/MS/MS, the LOD indicated reflects the LOD of the specific opiates that likely would have been detected by the Indiana HOPE program including morphine, codeine, hydrocodone, and hydromorphone (Cone et al., 1992).

Table 6 presents a comparison of primarily illicit drugs detected in the two groups. One would expect to find these drugs in the CJS+ specimens because many of them were included in the routine CJS screen that caused them to be classified as CJS+. It is clear, however, that the CJS- specimens were about as likely to test positive for these drugs as the CJS+ specimens. In fact, 45 percent of the CJS- specimens were positive for at least one of the seven selected drugs/drug categories in Table 6. Even after excluding marijuana, 37 percent of the CJS- specimens contained at least one of the six drugs/drug categories.

**Table 6: Percentage Positive for Selected Drugs for the Allen County HOPE<sup>^</sup> Probation Sample, by CJS Drug Screen Result**

(N=150 specimens collected between October 2015-May 2016)

<b>Positive by CDEWS Lab for:</b>	<b>CJS+ (for any drug) (N=51)</b>	<b>CJS- (for any drug) (N=99)</b>
1. Marijuana <sup>§</sup>	22%	21%
2. Cocaine <sup>§</sup>	16	20
3. Any New Psychoactive Substance	14	10
4. Any Synthetic Cannabinoid (SC)	14	11
5. Any Fentanyl	4	3
6. LSD	0	1
7. Methamphetamine <sup>§</sup>	0	1
Positive for Any of 7	49	45
Positive for Any of 6 (excluding marijuana)	35	37

<sup>^</sup> The Allen County HOPE Probation Program routinely tests for a panel of ten drugs, including: barbiturates, benzodiazepines, buprenorphine, cocaine, marijuana, MDMA, methadone, methamphetamine, opiates, and oxycodone. Synthetic cannabinoids, other new psychoactive substances, EtG (alcohol) and other tests are available upon request.

<sup>§</sup>The limits of detection for drugs tested for by the CDEWS laboratory were more sensitive than those used by the Allen County HOPE Probation testing program as LC/MS/MS was used to screen for most drugs in this CDEWS study. This may explain the drug positives found for marijuana, cocaine, and methamphetamine (drugs tested for by the HOPE program) in the CJS Screen Negative group. See Table 5 for the limits of detection used by the CDEWS laboratory versus the HOPE Probation program.

## D. SC Metabolites Detected

Table 7 shows the SC metabolites detected in all 18 SC positive specimens from the CJS+ and CJS- groups combined. The metabolites most likely to be found were BB-22, UR-144, and/or 5F-PB-22, each detected in almost a quarter to one-third of the SC positive specimens. While the majority (55%) of SC positive specimens contained a single metabolite, more than one-quarter (28%) contained three or four metabolites. Prior CDEWS studies, in sites such as Washington, DC, and Maryland, have also found multiple metabolites in SC positive specimens (Billing et al., 2017; Wish et al., 2015, 2017).

**Table 7: Metabolites Detected in All Synthetic Cannabinoid (SC) Positive Specimens from Adult HOPE Probationers in Allen County, Indiana**

(N=18 specimens collected between October 2015–May 2016)

Percentage Positive for Each SC Metabolite (N=18)	
BB-22	33%
UR-144	33
5F-PB-22	22
AB-PINACA	17
JWH-018	17
XLR-11	17
AB-FUBINACA (Parent)	11
JWH-073	11
JWH-122	11
JWH-019	6
MAM-2201	6
PB-22	6
Total Number of Metabolites Detected (of 12) in All SC Positive Specimens	
1	55%
2	17
3	11
4	17
} 28%	
Total	100%

## Study Limitations

The CDEWS model depends on collecting a small number of specimens that have already tested positive or negative by a program's routine drug screen. While every attempt was made to randomly select from the specimens available that met our selection criteria, we do not know whether our samples are representative of all persons tested in the participating CJS populations. However, CDEWS results have been found to be internally consistent and often agree with other indicators of drug use in the studied populations (Wish et al., 2013, 2015). CDEWS is designed to produce an indication of the relative use and availability of drugs in a community rather than prevalence estimates.

CDEWS obtains samples of urine specimens that have already been collected and tested as part of an existing drug testing program. The persons selected for testing are typically at high risk for drug use because of their prior use or treatment history, suspected drug misuse, and/or drug offense history. While a population at high risk for drug use is exactly what we seek in order to achieve the CDEWS mission of discovering the use of emerging drugs, it also means that the CDEWS findings do not necessarily represent all persons in the CJS programs we studied. Nevertheless, drug trends in high risk criminal justice populations often foreshadow trends that appear later in the general population (DuPont & Wish, 1992).

Every effort is made to include in the CDEWS Laboratory test panel most of the currently available drugs likely to be misused. However, given the rapidly changing nature of NPS, it is possible that some drugs may have been missed by the CDEWS testing panel. The continuously changing nature of the substances available make it difficult to develop urine tests for all of the new drugs as quickly as they are discovered. So it is possible that our results under detect some drugs that were used.

In addition, while we found that some specimens contained multiple drugs/metabolites, this does not necessarily mean that the user sought all of these drugs or was aware of the composition of the substance ingested. Multiple drugs in a specimen may also simply reflect the byproducts produced from formulating, transporting or taking the drug.

The CDEWS test results can only provide an indication of the recent use of prescription and illicit drugs by the people who submitted the specimens. A more complete understanding of the results would require additional study. For example, we cannot tell whether a person testing positive for a prescribed drug is taking it under medical supervision. Nor can our test results tell us why or how often persons used the drug or where they obtained it.

Decisions regarding modifying CJS drug testing protocols should not be based on CDEWS results alone. Rather, local policymakers should review the CDEWS results and weigh the complex law enforcement, public health, and budgetary considerations involved. CDEWS studies may provide

critical information with which to paint a picture of the age and gender characteristics of likely CJS drug users and, most importantly, the local communities where one might wish to collect more detailed information about a particular drug's availability and use.

## Summary and Conclusions

Perhaps the most important finding was that a large number of the CJS- specimens studied contained likely illicit drugs. Marijuana, cocaine, SC, and fentanyl were about as likely to be found in specimens that had passed the local CJS screen as specimens that had failed it. The greater sensitivity of the tests used by the CDEWS laboratory likely explains why our tests detected drugs in the CJS- specimens. These findings may have important implications for the effectiveness of the Indiana HOPE program which relies heavily on detecting recent drug use by probationers. The Indiana HOPE program may wish to consider whether they want to adopt more sensitive onsite or laboratory tests in order to detect recent drug use currently being missed by their tests.

Both CJS+ and CJS- specimens contained SC. In aggregate, 12 different SC metabolites were detected and many specimens contained multiple metabolites. These results are similar to those reported in several prior CDEWS studies (Billing et al., 2017; Wish et al., 2015, 2017). The Indiana HOPE program may want to consider whether it is important for them to identify the recent use of synthetic cannabinoids in their population.

Our results differ from those from our study of the Hawaii HOPE program where fewer drugs, primarily methamphetamine, were detected in CJS- specimens (Wish et al., 2016). This difference was likely caused by the more sensitive test for methamphetamine used by the CDEWS laboratory. Methamphetamine use is much more prevalent in Hawaii, as well as in the Western and Southern parts of the U.S. In contrast, in Indiana, drugs other than methamphetamine were detected in almost one half the HOPE probationers who tested CJS-. The two HOPE programs also used different urine tests, which could also account for the different amount of drugs detected by their screens.

These results therefore underscore the value of using the CDEWS methodology for assessing the validity of CJS testing in different parts of the country where drug trends may differ and where different types of onsite tests may be employed.

## References

- Baumann, Michael H. (2016). Designer drugs of abuse: The science behind the headlines [PowerPoint slides]. Baltimore, MD: National Institutes of Health, National Institute on Drug Abuse, Designer Drug Research Unit.
- Billing, A.S., Artigiani, E.E., Robinson, J., Adatsi, F. and Wish, E.D. (2017). Community drug early warning system (CDEWS-3): Washington, DC – Site 3 of 4. Office of National Drug Control Policy. Washington, DC: Executive Office of the President.
- Booze, L., PharmD, Maryland Poison Center (personal communication, 5 April 2016)
- Cone, E.J., Dickerson, S., Paul, B.D., & Mitchell, J.M. (1992). Forensic drug testing for opiates. IV. Analytical sensitivity, specificity, and accuracy of commercial urine opiate immunoassays. *Journal of Analytical Toxicology*, 16(2): 72-78.
- DuPont, R.L. & Wish, E.D. (1992). Operation Tripwire revisited. *The Annals of the American Academy of Political and Social Science*, 521: 91-111.
- Dye, Emily K. (2014). The expansion of emerging drug markets in the United States - An update [PowerPoint slides]. Dulles, VA: U.S. Drug Enforcement Administration, Special Testing and Research Laboratory, Emerging Trends Program.
- Eggleston, W., Clark, K.H., & Marraffa, J.M. (2017). Loperamide abuse associated with cardiac dysrhythmia and death. *The Annals of Emergency Medicine*, 69(1): 83-86.
- Head, Jill M. (2016). Synthetic Drug Threats in the United States [PowerPoint slides]. Dulles, VA: U.S. Drug Enforcement Administration, Special Testing and Research Laboratory, Emerging Trends Program.
- Indiana State Epidemiology and Outcomes Workgroup (2014). *The Consumption and Consequences of Alcohol, Tobacco, and Drugs in Indiana: A State Epidemiological Profile 2014*. Indianapolis, IN: Center for Health Policy at Indiana University-Purdue University Indianapolis (IUPUI).
- Keenan, C. (2016). *March 2016 Drug Testing Statistics* [Memorandum]. Washington, DC: Pretrial Services Agency for the District of Columbia.
- Logan, B. (2016). Designer Drug Update Summer 2016 Webinar: Novel Synthetic Cannabinoids and Designer Opioids Dominate the Market [PowerPoint slides]. Willow Grove, PA: NMS Labs.
- Mian, Rashed. (2014, February 1). Potent Painkiller Mixed with Heroin Blamed for Deaths. *Long Island Press*. Retrieved from <https://www.longislandpress.com/2014/02/01/potent-painkiller-mixed-with-heroin-blamed-for-deaths/> on July 14, 2016.

- NMS Labs (2015). Designer Drug Testing at NMS Labs. Willow Grove, PA: NMS Labs.
- Polhemus, A. Drug Monitoring Initiative (personal communication, 10 May 2016)
- Saint Louis, Catherine. (2016, May 10). Addicts Who Can't Find Painkillers Turn to Anti-Diarrhea Drugs. *The New York Times*. Retrieved from <http://www.nytimes.com/2016/05/11/health/imodium-opioid-addiction.html> on July 13, 2016.
- Shewmaker, C. Kentucky Department of Corrections (personal communication, 4 May 2016)
- The Institute for Behavior and Health, Inc. (2015). State of the art of HOPE probation. (1st ed.). Rockville: The Institute for Behavior and Health, Inc.
- United Nations Office on Drugs and Crime (UNODC), Early Warning Advisory on New Psychoactive Substances (2016). United States: 19 recent deaths associated with synthetic opioid use. Vienna, AT: UNODC.
- U.S. Drug Enforcement Administration (DEA), Office of Diversion Control (2015). National Forensic Laboratory Information System: 2014 Annual Report. Springfield, VA: U.S. Drug Enforcement Administration.
- U.S. Drug Enforcement Administration (DEA), Office of Diversion Control, National Forensic Laboratory Information System (2016a). [NFLIS 2015 – Allen County, Indiana]. Unpublished raw data.
- U.S. Drug Enforcement Administration (DEA), Office of Diversion Control, National Forensic Laboratory Information System (2016b). [NFLIS 2015 – Baltimore City, Maryland]. Unpublished raw data.
- U.S. Drug Enforcement Administration (DEA), Office of Diversion Control, National Forensic Laboratory Information System (2016c). [NFLIS 2015 – Maryland]. Unpublished raw data.
- U.S. Drug Enforcement Administration (DEA), Office of Diversion Control, National Forensic Laboratory Information System (2016d). [NFLIS 2015 – National]. Unpublished raw data.
- U.S. Drug Enforcement Administration (DEA), Special Testing and Research Laboratory, Emerging Trends Program (2016a). [CY2015 National Trends]. Unpublished raw data.
- U.S. Drug Enforcement Administration (DEA), Special Testing and Research Laboratory, Emerging Trends Program. Emerging Threat Report First Quarter (2016b). Springfield, VA: U.S. Drug Enforcement Administration.

- U.S. Food and Drug Administration (FDA). (2016). Drug Safety Communication: FDA warns about serious heart problems with high doses of the antidiarrheal medicine loperamide (Imodium), including from abuse and misuse. Silver Spring, MD: U.S. Food and Drug Administration.
- Wish, E.D. (1997). The crack epidemic of the 1980's and the birth of a new drug monitoring system in the United States. Paper Presented at The Crack Decade: Research Perspectives and Lessons Learned Conference November 4-5, 1997.
- Wish, E.D., Artigiani, E.E. & Billing, A.S. (2013). Community drug early warning system: The CDEWS pilot project. Office of National Drug Control Policy. Washington, DC: Executive Office of the President.
- Wish, E.D., Billing, A.S., & Artigiani, E.E. (2015). Community drug early warning system: The CDEWS-2 replication study. Office of National Drug Control Policy. Washington, DC: Executive Office of the President.
- Wish, E.D., Billing, A.S., & Artigiani, E.E. (2016). Community drug early warning system (CDEWS-3): Honolulu, Hawaii – Site 1 of 4. Office of National Drug Control Policy. Washington, DC: Executive Office of the President.
- Wish, E.D., Billing, A.S., & Artigiani, E.E. (2016b). Community drug early warning system (CDEWS-3): Ohio – Site 2 of 4. Office of National Drug Control Policy. Washington, DC: Executive Office of the President.
- Wish, E.D., Billing, A.S., and Artigiani, E.E. (2017). Community drug early warning system (CDEWS-3): Maryland – Site 4 of 4. Office of National Drug Control Policy. Washington, DC: Executive Office of the President.

**Appendices**

## Appendix A: Site Selection Procedures

The Allen County Adult HOPE Probation program offered a unique opportunity to collect specimens from an additional population of HOPE probationers. This site tests its specimens using on-site test cups, and also utilizes an offsite testing laboratory (Redwood Toxicology) for confirmations of contested positive specimens. For this study, we sought only uncontested positive and negative specimens that could be collected directly from the probation program office. Judge Wendy Davis was interested in implementing the study in the Allen County Adult Probation program and helped us to obtain approval for the study. We held telephone conferences with the judge, probation administrators and program staff to share information on the study and learn about the procedures being used by their site. An overview of the proposed methods was then sent to these staff for review. Using this document, approval from the County judges and program administrators was obtained for the study. Negotiations and approval for this site were very quick and took approximately 2.5 weeks (see Table A-1). The UM IRB application was then submitted and approved. Using a specified protocol, specimens were prepared by the probation staff and sent to the CDEWS laboratory. Specimen collection took approximately 6.5 months, as the accumulation of positive specimens from unique persons took several months.

**Table A-1: Time to Obtain Approval and Collect Specimens On-Site**

Site	Time to Obtain Approval	Researcher Time On-Site Collecting Specimens
<i>Allen County, Indiana: Adult Probation (HOPE) – Allen County Adult Probation Department</i>	2.5 weeks	No time spent on site

## ***Appendix B: Collection of Urine Specimens***

Specimens are routinely tested by probation staff onsite using a test cup for a panel of ten drugs (consisting of barbiturates, benzodiazepines, buprenorphine, cocaine, marijuana, MDMA, methadone, methamphetamine, opiates, and oxycodone). Other drugs including SC, NPS, and EtG (alcohol) may be tested for suspected users and others upon request from probation agents. Contested positives are sent by the probation program to an offsite laboratory, Redwood Toxicology, for confirmation testing.

Over the period of approximately 6.5 months (October 2015 to May 2016), staff at the Allen County Adult Probation program identified specimens for possible inclusion in the study. Allen County Adult Probation staff began by identifying any uncontested positive and negative specimens from the HOPE probation program that could be released for the study. We did not select contested positives as part of the study sample because only a small percentage of their specimens are contested (therefore, a large sample of uncontested positive specimens were available directly from the probation program for sampling). This program had no holding period for uncontested positive and negative specimens so specimens were identified for the study as they were being collected. Positive specimens were defined as specimens positive for any drug on the 10 panel screen. Probation staff tracked the names of the persons from whom specimens had been collected for the study using a participant list to ensure that only one specimen per person (if feasible, the most recent) was included in the study sample. Specimens selected for the study were de-identified and labeled with the following demographic and other elements: specimen collection date, year of birth, test result (positive/negative), and gender. Only specimens with a minimum volume of 15mL were included in the study. Selected specimens were packaged and shipped to the CDEWS laboratory. 51 positives and 99 negatives were collected from the HOPE probation program.

## **Appendix C: Testing of Urine Specimens by the CDEWS Laboratory**

### **Armed Forces Medical Examiner System Laboratory**

CESAR contracted with the Armed Forces Medical Examiner System Laboratory for testing, as this laboratory has a shared mission to identify emerging drugs for testing in the United States. The drugs and metabolites included in the CDEWS panel were selected after interviewing 14 chemists at seven labs (see Table C-1 below) to identify NPS to consider adding to our panel and to assess the availability of tests for these drugs. We also reviewed data and information from multiple international, national and local sources before finalizing the testing panel. All specimens were held in cold storage for the duration of the study. Over 160 drugs were tested for using Liquid Chromatography-Tandem Mass Spectrometry (LC/MS/MS). The test results, labeled by study ID, were sent electronically to CESAR.

### **Selecting Substances for Inclusion in the Testing Panel**

Selecting substances to include in the study test panel was critical to the ability of the study to detect emerging drugs, particularly as related to NPS, an area of fast-paced change in terms of availability and use.

To plan our test panel, we reviewed data and information from multiple international, national and local sources. These included a review of the 2015 National data from the Drug Enforcement Administration's (DEA) National Forensic Laboratory Information System (NFLIS), special data runs for 2015 provided by the DEA's Special Testing and Research Laboratory, as well as reports from the United Nations Office on Drugs and Crime (UNODC) Early Warning Advisories, and other sources (Baumann, 2016; Head, 2016; Logan, 2016; NMS Labs, 2015; UNODC, Early Warning Advisory, 2016; U.S. DEA, Office of Diversion Control, 2015; U.S. DEA, Office of Diversion Control, NFLIS, 2016d; U.S. DEA, Special Testing and Research Laboratory, Emerging Trends Program, 2016a, 2016b). We also reviewed data from participating CDEWS jurisdictions and other local data to assess local drug trends (Booze, 2016; Indiana State Epidemiology and Outcomes Workgroup, 2014; Keenan, 2016; Polhemus, 2016; Shewmaker, 2016; U.S. DEA, Office of Diversion Control, NFLIS, 2016a, 2016b, 2016c).

In addition, we also interviewed 14 chemists at seven labs prior to finalizing the test panel. The persons interviewed were selected from existing networks of toxicologists with expertise in the area of NPS and/or urine testing that we have identified from past CDEWS studies, as well as through other professional networks. We also identified contacts through referrals from our existing network of toxicologists, researchers, and law enforcement representatives. A standard set of questions was asked including:

- What specific substances do you think are most important for us to include in our testing panel?
- Are there any new or emerging synthetic drugs that we should include?
- What synthetic drugs do you test for at your agency?

- What synthetic cannabinoid metabolites have you been finding in your most recent specimens? cathinones? other synthetic drugs?
- To your knowledge, are there tests available for each of these drugs? What would be the recommended test (EIA, LC/MS, etc.)?

**Table C-1: Toxicologists Interviewed for CDEWS**

NAME	TITLE/AFFILIATION
Dr. Gregory Endres; Dr. Donna Iula	Cayman Chemical
Jerome Robinson; Dr. Felix Adatsi	Pretrial Services Agency for the District of Columbia
Jill Head; Emily Dye	Special Testing and Research Laboratory, Drug Enforcement Administration
Lt. Niki Crawford	Indiana State Police
Sgt. Ryan Johnson	Kentucky State Police Crime Laboratory
Dr. Karl Scheidweiler	National Institute on Drug Abuse, National Institutes of Health Biomedical Research Center
Dr. (CDR) Thomas Bosity; Dr. Jeffrey Walterscheid; LCDR Pedro Ortiz; Dr. Paul Kaiser; Theresa Hippolyte	Armed Forces Medical Examiner System (AFMES)

Based on the information reviewed, we added 26 additional NPS to our previous CDEWS-3 drug panel: 2C-B-FLY, 4-Fluoroamphetamine (4-FA), 4-Fluoromethamphetamine (4-FMA), 4-AAP (Dipyrone metabolite), 4-ANPP (Despropionyl fentanyl), 5-MEO-MiPT, 5-APDB/6-APDB, Betahydroxythiofentanyl, Bromo-DragonFLY, Butyryl Fentanyl, Dibutylone, Dimethylone, DMT, Furanylfentanyl, MT-45, Parafluorobutyryl fentanyl, Parafluorofentanyl, Psilocin, 2C-T, U-47700, W-15, W-18, Loperamide, 4-MAAP (Dipyrone metabolite), DHNK (Ketamine metabolite), and Ketamine (see Table C-2 in Appendix for the full panel). Dipyrone is a prescription drug (sometimes mixed with fentanyl) and Loperamide is an over-the-counter drug subject to abuse (Eggleston et al., 2017; Mian, 2014; Saint Louis, 2016; U.S. FDA, 2016). Several NPS were identified as relevant to the study but were not included due to reference standard availability and cost.

**Table C-2: The CDEWS Laboratory Expanded Drug Screening Panel and Limits of Detection**

**SYNTHETIC CANNABINOID PANEL**

	COMPOUND	LOD (ng/mL)
1	JWH-018-5-COOH	0.20
2	JWH-019-6-OH	0.20
3	JWH-073-4-COOH	0.20
4	JWH-081-5-OH	0.20
5	JWH-122-5-OH	0.20
6	JWH-210-5-OH	0.20
7	JWH-250-5-OH	0.20
8	AM2201-4-OH	0.20
9	MAM-2201-5-COOH/JWH 122 COOH	0.20
10	RCS-4-5-COOH	0.20
11	UR-144-5-COOH	0.20
12	XLR-11-4-OH	Presence
13	AKB-48 COOH	0.20
14	5F AKB-48 metabolite	0.20
15	BB-22 metabolite	0.20
16	PB-22 Carb Indole	0.20
17	5F PB-22 Carb Indole	0.20
18	AB-PINACA	0.20
19	5F AB PINACA	0.20
20	ADB-PINACA-5-COOH	0.20
21	ADBICA-5-COOH	0.20
22	AB-FUBINACA (Parent)	0.20
23	AB-CHMINACA (Parent)	0.20
24	AB-CHMINACA (metab 4)	0.20
25	AB-CHMINACA (metab 6)	0.20
26	ADB-FUBINACA (Parent)	0.20

**Table C-2 (Cont'd): The CDEWS Laboratory Expanded Drug Screening Panel and Limits of Detection**

**NEW PSYCHOACTIVE SUBSTANCE PANEL (NOT INCLUDING SC)**

	COMPOUND	LOD (ng/mL)		COMPOUND	LOD (ng/mL)
1	25B-NBOMe	5	31	α-PVP	5
2	25I-NBOMe	5	32	Mephedrone	5
3	25C-NBOMe	5	33	Methedrone	5
4	2C-B	5	34	Methylone	5
5	2C-B-FLY	5	35	Parafluorobutyryl fentanyl	5
6	4-Fluoroamphetamine (4-FA)	5	36	Parafluorofentanyl	5
7	4-Fluoromethamphetamine (4-FMA)	5	37	Pentedrone	5
8	4-AAP (Dipyrone metabolite)	5	38	Pentylone	5
9	4-ANPP (Despropionyl fentanyl)	5	39	TFMPP	5
10	4-Methylethcathinone (4-MEC)	5	40	Phentermine	5
11	5-MEO-MiPT	5	41	B-Methylphenethylamine	5
12	5-APDB/6-APDB	5	42	Trazodone	5
13	Betahydroxythiofentanyl	5	43	Psilocin	5
14	Bromo-DragonFLY	5	44	Naphyrone	5
15	Buphedrone	5	45	Mitragynine	5
16	Butylone	5	46	Methoxetamine (MXE)	5
17	Butyryl Fentanyl	5	47	PMMA	5
18	Benzylpiperazine	5	48	2C-T	5
19	Cathinone	5	49	Flephedrone	5
20	Dibutylone	5	50	Methiopropamine	5
21	Dimethylone	5	51	U-47700	5
22	DMT	5	52	W-15	5
23	Methcathinone/Ephedrone	5	53	W-18	5
24	Ethylone	5	54	Loperamide	5
25	Eutylone	5	55	4-MAAP (Dipyrone metabolite)	5
26	Furanylfentanyl	5	56	DHMK (Ketamine metabolite)	5
27	mCPP	5	57	Ketamine	5
28	MBDB	5	58	2C-T-7	5
29	MDPV	5	59	Carfentanil	5
30	MT-45	5			

**THC/BUPRENORPHINE/LSD PANEL**

	COMPOUND	LOD (ng/mL)
1	THC-COOH	5
2	Buprenorphine	1
3	Norbuprenorphine	1
4	Naloxone	1
5	LSD/Metabolite (2-oxo-3-hydroxy-LSD)	0.05/.25

**Table C-2 (Cont'd): The CDEWS Laboratory Expanded Drug Screening Panel and Limits of Detection**

**GENERAL PANEL**

	COMPOUND	LOD (ng/mL)		COMPOUND	LOD (ng/mL)
1	6-Monoacetylmorphine (6-MAM)	5	41	Hydroxyzine	25
2	7-Aminoclonazepam	25	42	Ketamine	25
3	Acetylfentanyl	1	43	Lorazepam	25
4	Alprazolam	25	44	MDA	25
5	Amitriptyline	25	45	MDEA	25
6	Amphetamine	25	46	MDMA	25
7	Atomoxetine	25	47	Meperidine	25
8	Benzoyllecgonine (Cocaine)	25	48	Methadone	25
9	Bupropion	25	49	Methamphetamine	25
10	Carisoprodol	50	50	Methylphenidate	25
11	Cetirizine	25	51	Morphine	25
12	Chlorpromazine	25	52	Naloxone	25
13	Citalopram	25	53	Nordiazepam	25
14	Clonazepam	25	54	Norfentanyl	4
15	Codeine	25	55	Normeperidine	25
16	Cyclobenzaprine	25	56	Nortriptyline	25
17	Demoxepam	25	57	Oxazepam	25
18	Desalkflurazepam	25	58	Oxycodone	25
19	Desomorphine	25	59	Oxymorphone	25
20	Desvenlafaxine	25	60	Paroxetine	25
21	Dextromethorphan	25	61	PCP	10
22	Diazepam	25	62	Phenmetrazine	25
23	Diclazepam	25	63	Phenazepam	25
24	Doxepin	25	64	Prazepam	25
25	Duloxetine	25	65	Promethazine	25
26	EDDP	25	66	Pseudoephedrine	25
27	Ephedrine	25	67	Pyrazolam	25
28	Estazolam	25	68	Propoxyphene	25
29	Etizolam	25	69	Quinidine	25
30	Fentanyl	1	70	Quinine	25
31	Flubromazepam	25	71	Sertraline	25
32	Flunitrazepam	25	72	Tapentadol	25
33	Fluoxetine	25	73	Temazepam	25
34	Flurazepam	25	74	Thioridazine	25
35	Haloperidol	25	75	Tramadol	25
36	Hydrocodone	25	76	Venlafaxine	25
37	Hydromorphone	25	77	Zaleplon	5
38	$\alpha$ -Hydroxyalprazolam	25	78	Zolpidem	5
39	$\alpha$ -Hydroxymidazolam	5	79	Zopiclone	5
40	$\alpha$ -Hydroxytriazolam	25			

## ***Appendix D: Glossary of Abbreviated Terms***

**6-MAM:** 6-Monoacetylmorphine, a unique metabolite of heroin used to definitively determine heroin use

**CDEWS:** Community Drug Early Warning System

**CESAR:** Center for Substance Abuse Research

**CJS:** Criminal Justice System

**DEA:** Drug Enforcement Administration

**EIA:** Enzyme Immunoassay, a method of urine drug testing

**IRB:** Institutional Review Board at the University of Maryland, a committee that must approve all human subjects research at the University of Maryland

**LC/MS:** Liquid Chromatography/Mass Spectrometry, a method for confirming drug positives in urine

**LC/MS/MS:** Liquid Chromatography-Tandem Mass Spectrometry, a method for confirming drug positives in urine

**LOD:** Limit(s) of detection

**LSD:** Lysergic Acid Diethylamide, a hallucinogen

**MDMA:** 3,4-methylenedioxy-N-methylamphetamine, also known as ecstasy or Molly

**NFLIS:** National Forensic Laboratory Information System

**NIDA:** National Institute on Drug Abuse

**NPS:** New psychoactive substances, defined by UNODC as “substances of abuse, either in a pure form or a preparation, that are not controlled by the 1961 Single Convention on Narcotic Drugs or the 1971 Convention on Psychotropic Substances, but which may pose a public health threat”

**ONDCP:** Office of National Drug Control Policy

**PCP:** Phencyclidine, a dissociative anesthetic and hallucinogen

**SC:** Synthetic Cannabinoid, also known as synthetic marijuana, K2, or spice

**THC:** Tetrahydrocannabinol, the primary active ingredient in marijuana

**UM:** University of Maryland

**UNODC:** United Nations Office on Drugs and Crime

