Community Drug Early Warning System (CDEWS-3): Ohio -- Site 2 of 4

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Disclaimer

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Abstract

The Community Drug Early Warning System (CDEWS) provides timely information about emerging drug use in criminal justice populations in local communities by collecting and re-testing urine specimens already obtained and tested for a limited panel of drugs by criminal justice testing programs. CDEWS or local staff sample specimens that are ready to be discarded and send them de-identified to an independent laboratory for testing for an expanded panel of drugs. The CDEWS methodology has been implemented previously in five jurisdictions with non-prison populations (Wish et al., 2013; Wish et al., 2015). This report describes the first CDEWS study of prison inmates, conducted in the Belmont and Ross Correctional Institutions for adult males in Ohio. This report is the second of 4 reports that are part of the third CDEWS Study, CDEWS-3.

Urine drug testing is conducted in these facilities on the basis of the inmate's assignment to one of three test groups: *Random, For Cause,* and treatment *Program* testing. Specimens are tested by the correctional institution for a panel of 8 drugs. Specimens that had tested positive (CJS+) or negative (CJS-) for any drug by the prison drug screen were selected from each of the test groups for inclusion in the study. A total of 108 usable specimens were obtained from Belmont and 85 specimens from Ross.

The most dramatic findings from this study involved the detection of two types of prescription drugs in both institutions, buprenorphine, a prescribed opioid used to treat substance use disorder for opioids, and antidepressants. Buprenorphine is not prescribed for treatment in these institutions and it is not clear how much of the antidepressants detected were prescribed by the physicians at the prison. While marijuana use was detected in these institutions, it is noteworthy that not a single specimen tested positive for a synthetic cannabinoid. In contrast to other criminal populations studied by CDEWS in other locations, there was no evidence of synthetic cannabinoid use to avoid detection by the prison's drug testing program.

This study demonstrated that the CDEWS methodology could be adapted for prison settings. While the use of buprenorphine and marijuana was already being detected by these institutions' testing programs, the extensive use of antidepressants uncovered may be a new finding.

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Introduction

The Community Drug Early Warning System (CDEWS) provides timely information about emerging drug use in criminal justice populations in local communities by sampling and re-testing urine specimens already obtained 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 to an independent laboratory for testing for an expanded panel of drugs. By using already collected de-identified urine specimens, CDEWS can provide a relatively quick and inexpensive (see Appendices for details) snapshot of the types of drugs recently used by criminal justice populations.

The CDEWS results are especially important because prior epidemics of the use of illegal drugs have often shown up in the trends in urinalysis results from criminal justice populations before they have become evident in the larger community (DuPont & Wish, 1992; Wish, 1997). The CDEWS results can also be used by the local testing program to gain some insight into whether their standard limited test panel is identifying most of the drugs being used by their monitored population. The CDEWS methodology has been previously implemented successfully in five jurisdictions and the results are provided in two reports already released by the Office of National Drug Control Policy (ONDCP) (Wish et al., 2013; Wish et al., 2015). This third iteration of CDEWS (CDEWS-3) has four study sites and Ohio is the second of four CDEWS-3 site reports, containing findings from two correctional facilities, Belmont and Ross Correctional Institutions, from the Ohio site.

Until now, CDEWS has been conducted only with populations of persons under criminal justice supervision in the community (probationers or persons on pre-trial release), or recent arrestees. This report describes the first test of CDEWS with prison inmates. While prisoners are likely to have less access to illegal drugs than persons in the community, the smuggling of drugs into prisons can be a problem. CDEWS can provide prison administrators with a clearer idea of the licit and illicit drugs being used by inmates and some idea of the adequacy of their testing protocols. CDEWS may also provide an indication of whether synthetic drugs are being used to avoid detection by the institution's testing program. This first CDEWS study of drug use in a prison was made possible by the wardens at the Belmont and Ross Correctional facilities in Ohio who agreed to participate in this research.

Methodology

Site Selection Procedures

We sought specimens obtained from adult male inmates from the Belmont and Ross Correctional facilities. These sites are located in the Southeastern (Belmont) and Southern (Ross) parts of Ohio, near Columbus (Figure 1, map). Logistics for this site were discussed with site staff over the phone to establish the study protocols. Prior to data collection, CESAR submitted an application

for the necessary approvals from the Ohio Department of Rehabilitation and Correction and from the 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.

Inmate testing is conducted on the basis of the inmate's assignment to one of three test groups: 1) *Random* - monthly testing on the basis of a computer generated sample; 2) *For Cause* - testing based on suspected drug use; and 3) *Program* - testing based on enrollment in a prison drug treatment program. Program inmates are tested once per month in addition to being randomly tested. At the time of the study, Ross was only conducting *Random* and *For Cause* testing. The testing protocol used by each prison is described in Table 1.

Figure 1: Location of Participating Correctional Institutions

Belmont Correctional Institution

The Belmont Correctional Institution collects an estimated 3,284 urine specimens annually, from an average number of approximately 2,750 inmates. An onsite test cup that detects 8 drugs (amphetamines, benzodiazepines, buprenorphine, cocaine, marijuana, methamphetamine, opiates, and oxycodone) is the standard screen used by this institution. A small number of specimens whose results are contested by the inmate are sent to an outside laboratory for confirmation.

Ross Correctional Institution

The Ross Correctional Institution collects an estimated 3,600 specimens annually from an

average number of approximately 2,100 inmates using an onsite 8-drug test panel identical to the one used by the Belmont Correctional Institution. The same offsite laboratory used by Belmont Correctional Institution may be used to confirm a contested positive by Ross Correctional Institution.

Targeted Number of Specimens

From each prison, we sought a total of 110 specimens from unduplicated adult male inmates. If a person had contributed more than one specimen, only one specimen per donor (if feasible, the most recent) was selected for the CDEWS study. Both correctional facilities house only male inmates. As was the case with prior CDEWS studies, we wanted to over-sample specimens that had tested positive (CJS+) for any drug by the standard local CJS drug screen. This was especially important in a prison, where we expected there to be many more CJS- specimens. We also wanted to obtain a set of specimens from each of the testing protocols (*For Cause, Random and Program*) used to select inmates for testing. We worked with the local staff to review the number of specimens routinely collected in each institution and set goals that would be feasible during the limited study time period (October to February 2016).

From Belmont, we sought 30 CJS+ and 30 CJS- specimens from *For Cause* inmates. Because of the smaller number of CJS+ specimens expected in the *Random* test group, we asked prison staff to obtain a total of 25 specimens but to select CJS+ specimens first, if available. We sought the first 25 specimens available from the *Program* group, without regard to whether they were CJS+ or CJS-. For Ross, which had no *Program* group at the time of the study, we targeted 40 CJS+ and 40 CJS- specimens from the *For Cause* group and 30 specimens from the *Random* group, again giving priority to the CJS+ specimens.

Table 1: Description of the Participating Study Sites

Site	Populations Covered	CJS Testing Protocol	Drugs in Standard CJS Screen	Targeted Number of Specimens to be Collected for CDEWS	Targeted Collection Period
Ohio Rehabilitation and Correction: **Belmont Correctional Institution**	Adult male inmates (est. 3,284 specimens per year from 2,750 inmates)	Onsite cup screening; Offsite laboratory confirmation for contested positives	8-drug panel screen: amphetamines, benzodiazepines, buprenorphine, cocaine, marijuana, methamphetamine, opiates, and oxycodone.	110 specimens total, by population: **For Cause**: 30 CJS+ and 30 CJS- **Random**: 25 specimens **Program**: 25 specimens	October to February 2016
Ohio Rehabilitation and Correction: **Ross Correctional Institution**	Adult male inmates (est. 3,600 specimens per year from 2,100 inmates)	Onsite cup screening; Offsite laboratory confirmation for contested positives	Same As Belmont	110 specimens total, by population: **For Cause**: 40 CJS+ and 40 CJS- **Random**: 30 specimens	October to February 2016

Collection of Urine Specimens

Prior to collecting the urine specimens, CESAR staff talked with staff from each correctional institution by phone to determine their policies regarding required specimen holding periods, testing protocols, detection limits and other relevant site details. We attempted to collect some of the contested positive specimens sent for off-site confirmation testing (See Appendix B for details). However, due to specimen leakage in transit, only 20 contested positive specimens from Ross Correctional Institution were collected. Specimens were then collected by each program using the specific CDEWS guidelines provided by CESAR as to how specimens were to be handled and stored.

Prison staff tracked the inmate ID's of each specimen selected for the study. This information was maintained internally by the prison staff and was not shared with CESAR. This participant list was used to ensure that no more than one specimen was selected from each inmate for the study. Once the desired number of unique specimens was reached, designated correctional staff shipped specimens directly to the CDEWS independent laboratory for expanded drug testing. All specimens were de-identified during preparation for transfer to the CDEWS independent laboratory. Prison staff recorded the date the specimen was collected, age group, test group (*Random, For Cause, Program*), specimen test result (CJS+ or CJS- for any drug), inmate security level, gender, race and ethnicity. Additional details of the specimen selection are shown in Appendix B. Details about the CDEWS independent laboratory test panel are shown in Appendix C.

Interviews with Toxicologists to Develop the CDEWS-3 Testing Panel

In 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 then made illegal. To ensure that the drug test panel for this third study, CDEWS-3, included the most relevant drugs and metabolites, CESAR staff contacted 13 chemists at 9 labs, as well as 3 other experts from programs including the High Intensity Drug Trafficking Area Program (HIDTA) and other local law enforcement drug testing divisions prior to finalizing the test panel for CDEWS-3. The persons interviewed were selected from existing networks of toxicologists with expertise in the area of new psychoactive substances (NPS) and/or urine testing that we identified during the CDEWS-1 and CDEWS-2 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 list of persons interviewed appears below in Table 2.

Table 2: Toxicologists Interviewed for CDEWS-3

NAME	TITLE/AFFILIATION
Dr. (CDR) Thomas Bosy, Major William McCalmont	Armed Forces Medical Examiner System (AFMES)
Dr. Gregory Endres, Donna Iula	Cayman Chemical
Dr. Barry Logan	NMS Labs
Dr. Jeffery Moran	Arkansas Public Health Laboratory, Arkansas Department of Health
Dr. Marilyn Huestis	National Institute on Drug Abuse, National Institutes of Health Biomedical Research Center
Staff (2 unnamed per request)	State of HI Narcotics Enforcement Division
Wayne Kimoto, Michele Shishato	Honolulu Police Department Crime Laboratory
Kathy Pung	Hawaii Police Department Crime Laboratory
Jerome Robinson	Pretrial Services Agency for the District of Columbia
Gary Yabuta	Hawaii HIDTA
Jill Head; Emily Dye	Special Testing and Research Laboratory, Drug Enforcement Administration

To plan our test panel, we also reviewed data and information from multiple international, national and local sources. These included a review of the 2014 national data from the Drug Enforcement Administration's (DEA) National Forensic Laboratory Information System (NFLIS), data runs for 2014-2015 provided by the DEA's Special Testing and Research Laboratory, as well as reports from the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA), United Nations Office on Drugs and Crime (UNODC) Early Warning Advisories, and other sources (Baumann, 2015; Dye, 2014; EMCDDA, 2015; Head, 2014; NMS Labs, 2015; UNODC, Early Warning Advisory, 2013a, 2013b, 2013c, 2014a, 2014b, 2014c, 2014d, 2014e, 2015a, 2015b, 2015c; U.S. DEA, Office of Diversion Control, 2014, 2015; U.S. DEA, Office of Diversion Control, NFLIS, 2015c; U.S. DEA, Special Testing and Research Laboratory, Emerging Trends Program/Reference Material Program, 2015). We also

reviewed local NFLIS data, as well as any other local data available, to assess local drug trends in our participating sites (Maryland Poison Center, University of Maryland School of Pharmacy, 2015; U.S. DEA, Office of Diversion Control, NFLIS, 2015a, 2015b, 2015d, 2015e; Washington/Baltimore HIDTA, Investigative Support Center, 2015; Winter et al., 2014).

Based on the information reviewed, we added six new SC metabolites to our previous CDEWS-2 metabolite screen: 5F-AMB, AB-CHMINACA (parent), AB-CHMINACA (metab 4), AB-CHMINACA (metab 6), AB-FUBINACA (parent), and ADB-FUBINACA (parent), along with 14 additional new psychoactive substances (see Table C-1 in Appendix C for the full panel). Other SC metabolites were identified, but tests for many of them were not available at the time of CDEWS-3, and therefore could not be included in the test panel.

Testing of Urine Specimens by the CDEWS-3 Independent Laboratory

All specimens were sent to the CDEWS independent laboratory, the Armed Forces Medical Examiner System (AFMES) Laboratory located in Delaware, for an expanded drug testing panel (see Table C-1 in Appendix C). All specimens were tested for a panel of 27 SC metabolites and 37 stimulants, along with 89 other illicit and prescription drugs.

Results

The term *CJS test result* refers to the limited 8-drug screens routinely used by the local correctional facilities to screen the inmate populations. *CDEWS test result* will refer to the expanded drug tests used by the CDEWS independent laboratory, which included all of the drugs tested for by the smaller CJS test panels plus about 150 additional substances.

We first describe the specimens collected and some basic demographic information about the inmates who provided them. Next, we describe the CDEWS test results for specimens tested with our expanded drug screen. The results for CJS positive (CJS+) and CJS negative (CJS-) specimens and test group are presented separately because we stratified our sample selection according to CJS+ and CJS- specimens and from each test group. Given this sample stratification, it would be inappropriate for our analyses to simply combine and average all of the specimen results. For all tables, any cells with fewer than 10 cases are reported as frequencies rather than percentages.

A. Specimens Received

Specimens were collected between October 2015 and January 2016. Table 3 shows the targeted number of specimens sought from each institution and the numbers actually received. While we had sought 110 specimens from each prison, we obtained 108 from Belmont and 85 from Ross. These numbers exclude 9 specimens (5 from Belmont and 4 from Ross) for which the CJS test result was not recorded. These 9 specimens contained only drugs already detected in other

specimens and have been dropped from further analysis. In addition, one specimen from Belmont and three from Ross did not specify the test group and were dropped from further consideration.

Belmont provided fewer specimens from the *For Cause* inmates (17 CJS+ and 12 CJS-) but surpassed the goals for the specimens from the *Program* (35) and *Random* (43) test groups. Most of the *Program* specimens were CJS+, and most of the *Random* specimens were CJS-. Ross provided fewer *For Cause* CJS+ specimens (19) than sought, but 38 of the targeted 40 *For Cause* CJS- specimens were obtained. Ross provided 25 *Random* specimens, of which the majority (15) had tested CJS-. Because of the diverse patterns of the specimens received from these institutions, all subsequent results will be presented separately, by CJS test result and test group.

Table 3: Number of CJS Positive and Negative Specimens Sampled from Each Population

Site and Population	*Targeted Number*	*Obtained*			
Ohio: Ohio Department of Rehabilitation and Correction (ODRC)		CJS Screen Positive	CJS Screen Negative	Total	Missing CJS Drug Screen Result
Belmont Correctional Institution					
For Cause, CJS Positive Specimens	30	17	—	17	1
For Cause, CJS Negative Specimens	30	—	12	12	
Program	25	28	7	35	—
Random	25	3	40	43	3
Unknown Test Group	—	1	—	1	1
Total	*110*	*49*	*59*	*108*	*5*
*Ross Correctional Institution**					
For Cause, CJS Positive Specimens	40	19	—	19	1
For Cause, CJS Negative Specimens	40	—	38	38	
Random	30	10	15	25	3
Unknown Test Group	—	—	3	3	—
Total	*110*	*29*	*56*	*85*	*4*
Total	220	78	115	193	9

*Ross Correctional Institution had no *Program* test group at the time of the study.

B. Demographic Characteristics of Persons Providing Specimens

Table 4 presents the demographic characteristics of the inmates who provided specimens, according to CJS test result and test group. Very little demographic information was collected. While the numbers are small, it appears that in both facilities, the CJS+ specimens were likely to come from younger inmates, aged 30 or younger. With one exception (Belmont *For Cause* CJS-), the majority of CJS- specimens came from inmates 31 or older. Almost all specimens from Belmont came from Caucasian inmates, whereas most specimens from Ross came from Black/African American inmates. Ethnicity does not appear in Table 4 because ethnicity was not recorded for most specimens from both prisons. Where it was recorded, it was overwhelmingly Non-Hispanic. All specimens from Belmont came from inmates with a Level 1 (minimum) or 2 (medium) security level. Ross inmates were all Level 3 (close security).

Table 4: Demographic Characteristics of Male∞ Inmates Providing Specimens from Belmont and Ross Correctional Institutions (Ohio), by Test Group† and CJS Drug Screen Result

(N=189 specimens)Δ§

	Belmont Correctional Institution* (N=107)						Ross Correctional Institution* (N=82)			
	For Cause (N=29)		Program (N=35)		Random (N=43)		For Cause (N=57)		Random (N=25)	
	CJS Screen Positive (for any drug) (N=17) %	*CJS Screen Negative (for any drug)* (N=12) %	*CJS Screen Positive (for any drug)* (N=28) %	*CJS Screen Negative (for any drug)* (N=7)× *f*	*CJS Screen Positive (for any drug)* (N=3)× *f*	*CJS Screen Negative (for any drug)* (N=40) %	*CJS Screen Positive (for any drug)* (N=19) %	*CJS Screen Negative (for any drug)* (N=38) %	*CJS Screen Positive (for any drug)* (N=10) %	*CJS Screen Negative (for any drug)* (N=15) %
Age	(N=17)	(N=12)	(N=28)	(N=7)×	(N=3)×	(N=39)	(N=19)	(N=38)	(N=10)	(N=14)
18-30	76%	50%	50%	0	2 people	18%	74%	39%	50%	29%
31 or older	24	50	50	7 people	1 person	82	26	61	50	71
Total	100%	100%	100%	—	—	100%	100%	100%	100%	100%
Race	(N=12)	(N=7)× *f*	(N=26)	(N=6)×	(N=3)×	(N=39)	(N=19)	(N=38)	(N=10)	(N=15)
Caucasian	83%	2 people	85%	6 people	3 people	59%	42%	29%	50%	40%
Black/African-American	17	5 people	15	0	0	41	58	68	50	60
Other	0	0	0	0	0	0	0	3	0	0
Total	100%	—	100%	—	—	100%	100%	100%	100%	100%
Inmate Security Level+	(N=17)	(N=11)	(N=28)	(N=7)×	(N=2)×	(N=40)	(N=19)	(N=38)	(N=5)× *f*	(N=13)
Level 1	12%	9%	4%	0	2 people	30%	N/A	N/A	N/A	N/A
Level 2	88	91	96	7 people	0	70	N/A	N/A	N/A	N/A
Level 3	N/A	N/A	N/A	N/A	N/A	N/A	100	100	5 people	100
Total	100%	100%	100%	—	—	100%	100%	100%	—	100%

∞Belmont and Ross Correctional Institutions are male-only correctional facilities.

†Inmate testing is conducted on the basis of assigned test groups. Testing for each group is conducted as follows: 1) Random: selected for monthly testing on the basis of a computer generated sample; 2) For Cause: selected for testing based on suspected drug use; and 3) Program: selected for testing based on inmate enrollment in a drug treatment program. Those enrolled in a drug treatment program are tested once per month in addition to random testing.

Δ5 specimens from the Belmont Correctional Institution and 4 specimens from the Ross Correctional Institution with an unknown CJS Drug Screen Result were omitted from this table.

§1 specimen from the Belmont Correctional Institution and 3 specimens from the Ross Correctional Institution with an unknown test group were omitted from this table.

*Inmates from Belmont and Ross Correctional Institutions are routinely tested for a panel of eight drugs, including: amphetamines, buprenorphine, benzodiazepines, cocaine, methamphetamine, opiates, oxycodone, and marijuana.

×The total number of samples was too small to compute a meaningful percentage.

+Security levels are defined as follows: Level 1 = minimum security; Level 2 = medium security; Level 3 = close security.

Note: Certain percentages have been rounded in order for the total to equal 100%. N's differ for some characteristics due to missing information.

C. Drugs Detected by the CDEWS Independent Laboratory

Table 5 presents the CDEWS independent laboratory's test results in relation to the local CJS test result and the inmate's test group.

Belmont Correctional Institution

CJS+ Specimens: The drugs most likely to be found in the CJS+ specimens from persons in the *For Cause* and *Program* test groups were buprenorphine and naloxone. These drugs most likely stem from the use of Suboxone, which is a formulation that combines buprenorphine and naloxone. Almost all (75%) of the buprenorphine positive specimens from *For Cause* inmates contained naloxone, as did all of the buprenorphine specimens from *Program* inmates. One *For Cause* specimen contained only naloxone. Suboxone is not prescribed to inmates in this institution, and there is an acknowledged problem of inmates smuggling Suboxone into this prison. 6% of the *For Cause* specimens contained marijuana and 6% contained an antidepressant (fluoxetine). Antidepressants (nortriptyline, amitriptyline) were also found in a minority (14%) of the CJS+ *Program* specimens, as well as normeperidine (4%). There were only 3 CJS+ specimens from the *Random* test group and these specimens contained buprenorphine, naloxone, or marijuana. The CDEWS independent laboratory found that only 18% of the CJS+ specimens tested positive for one of the drugs included in the local test screen (cocaine, buprenorphine or marijuana). Failure of the CDEWS independent laboratory to find drugs in a CJS+ specimen could be caused by degradation of the drug in the specimen by the time it was analyzed. However, upon making an inquiry to prison staff, CDEWS staff learned that there has been a problem of false positives for buprenorphine from the test cups used by both of the participating prisons during the study period and that this problem has since been corrected.

CJS- Specimens: The CJS- specimens painted a very different pattern. With the exception of one specimen from the *Random* test group testing positive for marijuana and likely missed by the local screen, there was a significant number of CJS- specimens that tested positive for mainly antidepressants. One quarter of the specimens from the *For Cause* and *Random* test groups tested positive for an antidepressant. While the numbers of specimens sampled are rather small, they still suggest a considerable amount of antidepressant use by CJS- inmates. We do not know if these drugs are prescribed for inmates in this prison.

Ross Correctional Institution

CJS+ Specimens: Marijuana (37%) was the drug most likely to be found in the *For Cause* specimens, followed by naloxone (26%) and buprenorphine (16%). One specimen, 5%, contained cocaine. All of these buprenorphine positive specimens contained naloxone. Two specimens contained only naloxone. It is possible that the presence of naloxone alone (without buprenorphine) could be due to the fact that naloxone is eliminated from the body more quickly than buprenorphine, or it could have been ingested on its own (Dodd, 1985). Given this, it is likely that the estimate of Suboxone use is really better reflected by the 26% positive for naloxone. The *Random* test group of specimens contained marijuana (10%), fluoxetine (10%) or cetirizine (10%). These percentages are based on only 10 specimens. The CDEWS laboratory again found that only a minority (41%) of the CJS+ specimens tested positive for any of the drugs in the local CJS drug panel, likely for the reasons discussed in the prior section for Belmont.

CJS- Specimens: 5% of the *For Cause* specimens contained an opioid (normeperidine or tramadol, both at 3%). 5% contained an antidepressant (nortriptyline, 3%; amitriptyline, 3%; paroxetine, 3%). 7% of the *Random* specimens contained an antidepressant (nortriptyline, 7%; amitriptyline, 7%; citalopram, 7%).

Table 5: CDEWS Laboratory Test Results// by Correctional Facility, Test Group, and CJS Drug Screen Result

(Collected between October 2015–January 2016)‖

	Belmont Correctional Institution* (N=107)Δ§						Ross Correctional Institution* (N=82)Δ§			
	For Cause (N=29)		Program (N=35)		Random (N=43)		For Cause (N=57)		Random (N=25)	
Positive by CDEWS Lab for:	CJS Screen Positive† (for any drug) (N=17) %	CJS Screen Negative (for any drug) (N=12) %	CJS Screen Positive† (for any drug) (N=28) %	CJS Screen Negative (for any drug) (N=7)× *f*	CJS Screen Positive† (for any drug) (N=3)× *f*	CJS Screen Negative (for any drug) (N=40) %	CJS Screen Positive† (for any drug) (N=19) %	CJS Screen Negative (for any drug) (N=38) %	CJS Screen Positive† (for any drug) (N=10) %	CJS Screen Negative (for any drug) (N=15) %
Any Opioid	24%	0%	14%	0	1 person	0%	16%	5%	0%	0%
Buprenorphine‡	24	0	14	0	1 person	0	16	0	0	0
Normeperidine	0	0	4	0	0	0	0	3	0	0
Tramadol	0	0	0	0	0	0	0	3	0	0
Marijuana	6	0	0	0	1 person	3	37	0	10	0
Cocaine	0	0	0	0	0	0	5	0	0	0
Any Antidepressant	6	25	14	0	0	25	0	5	10	7
Nortriptyline	0	8	14	0	0	5	0	3	0	7
Doxepin	0	17	0	0	0	10	0	0	0	0
Amitriptyline	0	8	7	0	0	5	0	3	0	7
Citalopram	0	0	0	0	0	5	0	0	0	7
Fluoxetine	6	0	0	0	0	0	0	0	10	0
Paroxetine	0	0	0	0	0	3	0	3	0	0
Sertraline	0	0	0	0	0	5	0	0	0	0
Other Drugs										
Naloxone≠	24	0	14	0	1 person	0	26	0	0	0
Cyclobenzaprine	0	0	4	0	0	5	0	0	0	0
Cetirizine	0	0	0	0	0	0	0	0	10	0
Chlorpromazine	0	0	0	1 person	0	0	0	0	0	0

//The CDEWS independent laboratory found that only 18% of the CJS+ specimens from Belmont Correctional Facility and 41% of the CJS+ specimens from Ross Correctional Facility tested positive for one of the drugs included in the local test screen. Failure of the CDEWS independent laboratory to find drugs in a CJS+ specimen could be caused by degradation of the drug in the specimen by the time it was analyzed. However, upon making an inquiry to prison staff, CDEWS staff learned that there has been a problem of false positives for buprenorphine from the test cups used by both of the participating prisons during the study period and that this problem has since been corrected.

‖The collection date was missing for 35 of the 189 specimens included in the table as this information was inadvertently omitted at the time of specimen sampling.

*Inmates from Belmont and Ross Correctional Institutions are routinely tested for a panel of eight drugs, including: amphetamines, buprenorphine, benzodiazepines, cocaine, methamphetamine, opiates, oxycodone, and marijuana.

Δ5 specimens from the Belmont Correctional Institution and 4 specimens from the Ross Correctional Institution with an unknown CJS Drug Screen Result were omitted from this table. These specimens only contained drugs already found in the CJS screen positive or negative specimens.

§2 specimens from the Belmont Correctional Institution (1 of which also had an unknown CJS Drug Screen Result) and 3 specimens from the Ross Correctional Institution with an unknown test group were omitted from this table. These specimens only contained drugs already found in the CJS screen positive or negative specimens.

†All positive specimens collected from the Belmont Correctional Institution were uncontested positives. We attempted to collect a sample of contested positives for this facility, however, these specimens were not included in the analyses due to specimen leakage in transit. Among the 29 positive specimens collected from Ross Correctional Institution, 20 of them were contested positive specimens that were sent to the offsite laboratory for confirmation testing. The remainder were uncontested positives provided by the facility.

×The total number of samples was too small to compute a meaningful percentage.

‡All buprenorphine specimens were confirmed by LC/MS/MS and contained norbuprenorphine.

≠The combination of naloxone's high clearance and large volume of distribution results in a very short terminal elimination half-life compared to that of buprenorphine/norbuprenorphine (Dodd, 1985). This may be why naloxone was detected in buprenorphine/norbuprenorphine negative specimens.

Study Limitations

The CDEWS model depends on collecting a small number of specimens that have already tested positive or negative by the CJS agency's routine drug screen. Every attempt was made to randomly select from the specimens available that met our selection criteria. We do not know whether these small samples are representative of all inmates tested in the participating institutions. 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; Wish et al., 2015). CDEWS is designed to produce an indication of the relative use and availability of drugs in a population rather than precise 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 in this prison study include those tested at random, for cause, and/or because they were in a prison drug treatment program. These results must therefore be interpreted in relation to the specific test groups that were sampled and the findings may not represent all inmates within each of the test groups in the institutions we studied.

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

Decisions regarding modifying prison drug testing protocols should not be based on CDEWS results alone. Rather, prison administrators should review the CDEWS results and also weigh the complex law enforcement, public health, and budgetary considerations involved. CDEWS prison studies may provide critical information with which to paint a picture of the types of drugs available to inmate populations. Prison administrators should examine the possible implications of the use of these drugs without medical supervision.

Discussion

Detection of prescription drugs. The most dramatic findings from this study involved the detection of two types of prescription drugs in both institutions. Buprenorphine, a prescribed opioid used to treat dependence on opioids, was identified in specimens from *For Cause* inmates in both prisons that had tested CJS+ by the local screen. Naloxone was also detected in the same groups. Naloxone is a drug often mixed with buprenorphine in a widely prescribed film version formulation of buprenorphine that has been smuggled into prisons (Sontag, 2013; ODADAS, 2011). The prison drug screen includes a test for buprenorphine and it is likely that a positive for this drug was the reason the specimen was labeled CJS+. Test records from these two facilities during July-August 2015 show that most of the positive specimens from *For Cause* inmates had contained either buprenorphine or marijuana (THC). The smuggling of buprenorphine into these two prisons was a problem known to the prison administrators and is being addressed.

The other group of prescription drugs identified included antidepressants. The use of antidepressants was found by the CDEWS independent laboratory in 7 of the 10 groups tested, in both CJS+ and CJS- specimens. The antidepressants most likely to be found were nortriptyline, doxepin and amitriptyline. We were unable to determine if any of these antidepressants are prescribed by the physicians at the prison. Antidepressant use is worthy of review at both facilities.

Also noteworthy was that we found no specimens testing positive for any of the synthetic cannabinoids (SC) in our test panel. This situation contrasts with the results from our prior studies of criminal populations in other states where people sometimes used SC to avoid detection by drug tests (Wish et al., 2013; Wish et al., 2015). The smoking of SC would perhaps be too conspicuous in a prison. It would be interesting to determine if the marijuana use found in these prisons resulted from inmates using edibles, rather than smoking the drug.

Feasibility of conducting CDEWS in prisons. This first CDEWS study of an inmate population has shown that it was indeed feasible to obtain the already collected and tested specimens from inmate testing programs. Prison staff were cooperative and selected specimens according to the provided collection protocol. Obtaining positive specimens that had been contested and sent to an outside laboratory proved to be more challenging, but this has been our experience obtaining specimens from private labs in non-prison venues as well.

Conclusions. We conclude that CDEWS studies can be carried out in a prison setting. We also conclude from this first CDEWS prison study that the expanded testing detected few drugs of which the prison administrators were unaware. The use of buprenorphine and marijuana was already being identified and addressed in both prisons using their standard onsite tests. There was no use of SC identified and the types of drugs detected in each prison were very

similar. A major new finding was the detection of antidepressants that may or may not have been prescribed by prison medical staff.

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Appendices

Appendix A: Site Selection Procedures

This site was of interest to the study as this was the first CDEWS collection of urine specimens from an inmate population. We selected urine specimens from two correctional facilities in Ohio (Belmont and Ross Correctional Institutions) that were part of the Ohio Department of Rehabilitation and Correction (ODRC) system. These facilities test their specimens using on-site test cups, and also utilize an offsite testing laboratory (LabCorp) for confirmations of contested positive specimens. For this study, we selected uncontested positive and negative specimens directly from the correctional institutions, as well as contested positive specimens (from Ross Correctional Institution only) that were returned to the correctional facility by LabCorp following the completion of their testing. We attempted to collect contested positive specimens from both institutions, however, we were unable to collect any for Belmont Correctional Institution due to specimen leakage in transit to the correctional facility. Warden Michele Miller at Belmont Correctional Institution had strong interest in participating in the study and helped us to obtain approval for the study. We held telephone conferences with correctional staff to share information on the study and learn about the procedures being used by their sites. A research application for the study was then submitted to ODRC for review and approval. Following approval of the study, an overview of the proposed methods were sent to correctional staff for review. Negotiations and approval took approximately 2 months (see Table A-1). The UM IRB application was then submitted and approved. Using a specified protocol, specimens were prepared by correctional staff and sent to the CDEWS laboratory. Specimen collection took approximately 3.5 months.

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

Site	Time to Obtain Approval	Researcher Time On-Site Collecting Specimens
Ohio: Adult Inmate Population – Ohio Department of Rehabilitation and Correction (Belmont and Ross Correctional Institutions)	2 months	No time spent on site

Appendix B: Collection of Urine Specimens

Over the period of approximately 3.5 months (October 2015 to February 2016), staff at Belmont and Ross Correctional Institutions identified specimens for possible inclusion in the study. Specimens are routinely tested onsite using a test cup for a panel of eight drugs (consisting of amphetamines, benzodiazepines, buprenorphine, cocaine, marijuana, methamphetamine, opiates, and oxycodone). Contested positives are sent to an offsite laboratory, LabCorp, for confirmation testing. Specimens were sampled from three test groups (*Random, For Cause, and Program*) at the Belmont Correctional Institution and two groups (*Random, For Cause*) at the Ross Correctional Institution. *Random* specimens are those that were collected based on a computer generated sample. *For Cause* specimens include those collected due to suspicion of drug use. *Program* specimens include those collected from inmates that have been sanctioned for a drug offense and/or are enrolled in a drug treatment program. Both of the correctional facilities house males only. Given this, our sample is comprised of males only for these two sites.

Correctional staff began by identifying any uncontested positive and negative specimens from the correctional facilities that could be released for the study. There is no holding period for uncontested positive and negative specimens so specimens were identified for the study as they were being collected. Given that a large percentage of their positive specimens are contested, we negotiated to have LabCorp return the contested positives to the correctional facilities at the completion of their testing. We attempted to collect a sample of contested positives for Belmont Correctional Institution, however, these specimens were not included in the analyses due to specimen leakage in transit. Among the 29 positive specimens collected from Ross Correctional Institution, 20 of them were contested positive specimens that were sent to the offsite laboratory for confirmation testing. Positive specimens were defined as specimens positive for any drug on the eight panel screen. Correctional staff tracked the Inmate ID's of the persons from whom specimens had been collected for the study using a participant list to ensure that only one specimen per person was included in the study sample. Specimens selected for the study were de-identified and labeled with demographic and other elements, including population group, specimen collection date, age group, test group (random, for cause, program), test result (positive/negative), inmate security level, gender, race, and ethnicity. Only specimens with a minimum volume of 15mL were included in the study. Specimens were then packaged and shipped to the CDEWS laboratory. 59 negatives, 49 positives and 5 specimens with an missing CJS drug screen result were collected from the Belmont Correctional Facility. 56 negatives, 29 positives and 4 specimens with a missing CJS drug screen result were collected from the Ross Correctional Facility.

Appendix C: Testing of Urine Specimens by the CDEWS Independent 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-3 panel were selected after interviewing 13 chemists at 9 labs, as well as 3 other experts from programs including the High Intensity Drug Trafficking Area Program (HIDTA) and other law enforcement drug testing divisions to identify new psychoactive substances (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 150 drugs were tested for using Gas Chromatography/Mass Spectrometry (GC/MS) and 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 synthetic cannabinoids since those in use are constantly altered, presumably to avoid detection and legal sanction. NPS are also 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. This included a review of the 2014 national data from the Drug Enforcement Administration's (DEA) National Forensic Laboratory Information System (NFLIS), special data runs for 2014-2015 provided by the DEA's Special Testing and Research Laboratory, as well as reports from the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA), United Nations Office on Drugs and Crime (UNODC) Early Warning Advisories, and other sources (Baumann, 2015; Dye, 2014; EMCDDA, 2015; Head, 2014; NMS Labs, 2015; UNODC, Early Warning Advisory, 2013a, 2013b, 2013c, 2014a, 2014b, 2014c, 2014d, 2014e, 2015a, 2015b, 2015c; U.S. DEA, Office of Diversion Control, 2014, 2015; U.S. DEA, Office of Diversion Control, NFLIS, 2015c; U.S. DEA, Special Testing and Research Laboratory, Emerging Trends Program/Reference Material Program, 2015). We also reviewed local NFLIS data, as well as any other local data available, to assess local drug trends in our participating CDEWS sites (Maryland Poison Center, University of Maryland School of Pharmacy, 2015; U.S. DEA, Office of Diversion Control, NFLIS, 2015a, 2015b, 2015d, 2015e; Washington Baltimore HIDTA, Investigative Support Center, 2015; Winter et al., 2014).

In addition, we also interviewed 13 chemists at 9 labs, as well as 3 other experts from programs including the High Intensity Drug Trafficking Area Program (HIDTA) and other law enforcement drug testing divisions prior to finalizing the test panel for CDEWS-3. 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.)?

Based on the information reviewed, we added six new SC metabolites to our previous CDEWS-2 metabolite screen: 5F-AMB, AB-CHMINACA (parent), AB-CHMINACA (metab 4), AB-CHMINACA (metab 6), AB-FUBINACA (parent), and ADB-FUBINACA (parent) (see Table C-1 in Appendix C for the full panel). We also tested specimens for the following SC metabolites that were part of our earlier CDEWS studies: JWH-018, JWH-019, JWH-073, JWH-081, JWH-122, JWH-210, JWH-250, AM-2201, MAM-2201, RCS-4, UR-144, XLR-11, AKB-48, 5F-AKB-48, BB-22, PB-22, 5F-PB-22, AB-PINACA, 5F-AB-PINACA, ADB-PINACA, and ADBICA. Many additional SC metabolites were identified as relevant to the study, however, urine tests were not available for these metabolites at the time the study began. The synthetic cannabinoid tests were performed using liquid chromatography-tandem mass spectrometry (LC/MS/MS).

Further, for CDEWS-3, we expanded the designer stimulant panel to add 14 new compounds. The new additions are: 25C-NBoMe, 2C-T-7, AH-7921, alpha-PVP, B-Methylphenethylamine, Flephedrone, Methiopropamine, Methoxetamine, Mitragynine, Naphyrone, Phenmetrazine, Phentermine, PMMA, and Trazodone. Several additional NPS were identified as relevant to the study but were not included due to test availability and cost.

Table C-1: The CDEWS-3 Laboratory Expanded Drug Screening Panel and Levels of Detection

SYNTHETIC CANNABINOID PANEL

	COMPOUND	LOD (ng/mL)
1	JWH-018-5-COOH	0.25
2	JWH-019-6-OH	0.25
3	JWH-073-4-COOH	0.25
4	JWH-081-5-OH	0.25
5	JWH-122-5-OH	0.25
6	JWH-210-5-OH	0.25
7	JWH-250-5-OH	0.25
8	AM2201-4-OH	0.50
9	MAM-2201-5-COOH/JWH 122 COOH	0.50
10	RCS-4-5-COOH	0.50
11	UR-144-5-COOH	0.50
12	XLR-11-4-OH	Presence
13	AKB-48 COOH	0.50
14	5F AKB-48 metabolite	0.50
15	BB-22 metabolite	0.50
16	PB-22 Carb Indole	0.50
17	5F PB-22 Carb Indole	0.50
18	AB-PINACA	0.50
19	5F AB PINACA	0.50
20	ADB-PINACA-5-COOH	0.50
21	ADBICA-5-COOH	0.50
22	AB-FUBINACA (Parent)	0.50
23	AB-CHMINACA (Parent)	0.50
24	AB-CHMINACA (metab 4)	0.50
25	AB-CHMINACA (metab 6)	0.50
26	ADB-FUBINACA (Parent)	0.50
27	5F-AMB	0.50

Table C-1 (Cont'd): The CDEWS-3 Laboratory Expanded Drug Screening Panel and Levels of Detection

DESIGNER PANEL

	COMPOUND	LOD (ng/mL)
1	25B-NBoMe	2.5
2	25I-NBoMe	2.5
3	25C-NBoMe	2.5
4	2C-B	10
5	2-Fluoroamphetamine	10
6	2-Fluoromethamphetamine	10
7	3-Fluoromethcathinone	10
8	4-Methylethcathinone (4-MEC)	10
9	Buphedrone	10
10	Butylone	10
11	Benzylpiperazine	10
12	Cathinone	10
13	Methcathinone/Ephedrone	10
14	Ethylone	10
15	Eutylone	10
16	mCPP	10
17	MBDB	10
18	MDPV	10
19	α-PVP	10
20	Mephedrone	10
21	Methedrone	10
22	Methylone	10
23	Pentedrone	10
24	Pentylone	10
25	TFMPP	10
26	Phentermine	10
27	B-Methylphenethylamine	10
28	Trazodone	10
29	Phenmetrazine	10
30	Naphyrone	10
31	Mitragynine	10
32	Methoxetamine	10
33	PMMA	10
34	2C-T-7	10
35	Flephedrone	10
36	AH-7921	10
37	Methiopropamine	10

Table C-1 (Cont'd): The CDEWS-3 Laboratory Expanded Drug Screening Panel and Levels of Detection

THC/BARBS/BUPRENORPHINE/LSD PANEL

	COMPOUND	SCREEN	LOD (ng/mL)	CONFIRM	LOD (ng/mL)
1	THC-COOH	PMOD	15	LC/MS/MS	5
2	Amobarbital	PMOD	200	LC/MS/MS	25
3	Butalbital	PMOD	200	LC/MS/MS	25
4	Pentobarbital	PMOD	200	LC/MS/MS	25
5	Phenobarbital	PMOD	200	LC/MS/MS	25
6	Secobarbital	PMOD	200	LC/MS/MS	25
7	Buprenorphine	PMOD	10	LC/MS/MS	1
8	Norbuprenorphine	na	na	LC/MS/MS	1
9	Naloxone	na	na	LC/MS/MS	1
10	LSD	PMOD	0.5	LC/MS/MS	0.05

Table C-1 (Cont'd): The CDEWS-3 Laboratory Expanded Drug Screening Panel and Levels 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	Benzoylecgonine	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	Desmorphine	25	59	Oxymorphone	25
20	Desmethylvenlafaxine/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	α-Hydroxyalprazolam	25	78	Zolpidem	5
39	α-Hydroxymidazolam	5	79	Zopiclone	5
40	α-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
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
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