# Monitoring drug markets and discrepancies
## Triangulating drug checking, survey and wastewater data

**Authors**

Monica J. Barratt [1,2,9], Isabelle Volpe [1,3,9], Cheneal Puljević [4,9], Rita Brien [5,9], Jason Ferris [6,9], Alan White [7,9], Madeline Harding [7,9], Benjamin Tscharke [8], Rory Verhagen [8], Jake W. O'Brien [8], Richard Bade [8], Dhayaalini Nadarajan [8], Nicole S. Schröter [8,9], Jacob Fry [9], Karen Blakey [9], Cameron Francis [9].
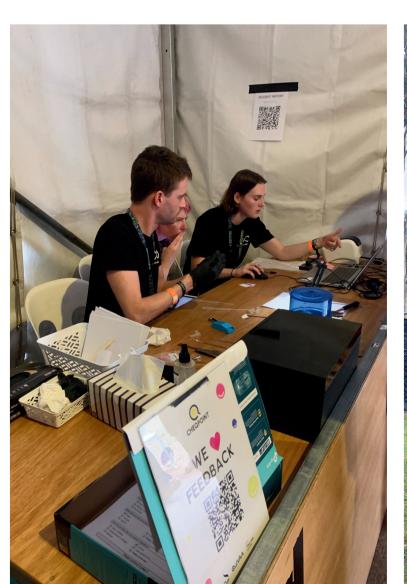
## Introduction

Drug checking services provide a unique way of monitoring drug markets and discrepancies in drug markets by collecting up-to-date information about what consumers intend to consume, and what their samples actually contain. Utilised in this way, drug checking services afford a different way of knowing what substances are circulating in local markets, alongside other methods such as self-report surveys and wastewater analyses. As each monitoring method has different benefits and limitations, our aim in this project was to triangulate these three methods across the same festival event to describe and monitor this drug market, and demonstrate the utility of doing so with multiple methods.

### TAKEAWAYS

- Novel substances were detected in drug checking and wastewater that were not expected or desired by patrons.
- Wastewater detection largely matched drug checking detections.
- Patron surveys and wastewater analysis help identify gaps in drug checking service coverage, and help corroborate drug checking detections, allowing services to better meet the needs of the communities they serve.
- Novel substances disguised as better-known drugs continue to emerge in Australian drug markets.

## Methods

In May 2024, The Loop Australia ran a drug checking service at a South East Queensland music festival. We collected data about what substances were present at the festival using three methods: a patron survey, drug checking service data, and wastewater analysis. Alcohol, nicotine, caffeine and cannabis have been excluded from these analyses.



(L) Intake at the on-site drug checking service; (R) Collecting a wastewater sample.

The mobile **drug checking service** tested 230 drug samples from 152 patrons. Patrons first completed a questionnaire including what substance/s they expected to be in submitted sample/s ('expected' column in table). Samples were then tested on-site by chemists using FTIR and colourimetric reagents ('detected'). Plant materials including magic mushrooms could not be tested by the service. Further confirmatory testing was conducted off-site at Griffith University when required.

Roaming researchers conducted a patron **survey** of 148 festivalgoers, including questions about what substances they had already consumed or intended to consume.

We collected two pooled **portaloo** samples from a centralised tank for **wastewater analysis**. Samples were tested for drug metabolites using LC-MS/MS off-site at the Queensland Alliance for Environmental Health Sciences laboratory.

## Findings

### Some drugs (especially plant material) were reported in the patron survey but not detected in wastewater analysis or drug checking analysis methods.

Magic mushrooms were reported in 34% of surveys but not detected in wastewater, and not analysed in drug checking methods. Non-detection of psilocybin in wastewater is likely the result of instability and susceptibility to degradation.

### The most common drugs were mostly consistent across data sources.

MDMA, ketamine, cocaine and LSD were the most expected and detected in the drug checking service. MDMA, LSD, ketamine, mushrooms, and cocaine were the most common in the patron survey.

### Synthetic cathinones and novel dissociatives were detected in drug checking and wastewater, but not reported in surveys.

These included dimethylpentylone, MMC-type substances, 2F-2oxo PCE and tiletamine.

### Drug checking identified cases where the expected substance was not the same as the detected substance, or where another substance was present.

Mescaline was expected in five samples at the drug checking service, but not detected in drug checking analysis. We did find three samples containing a novel mescaline analogue, confirmed off-site as diformylmescaline.
In two samples expected to be MDMA, we detected a synthetic cathinone (dimethylpentylone) and no MDMA.
15% of MDMA-expected samples also contained 'inactive' filler, including sorbitol, cellulose, creatine and dimethylsulfone.

### A range of substances were reported in the community survey but rarely (or not at all) presented to the drug checking service.

Prescription drugs fell into this category, possibly because they were less likely to be considered at risk of adulteration or contamination. Other unusual substances, like phenibut and kratom, were reported in the survey and detected in wastewater, but were not presented to drug checking.

---

**TABLE 1.**

### Presence of substances at a South East Queensland music festival according to three data sources [n (%)].

| | SUBSTANCE | SURVEY (N=148) EXPECTED | DRUG CHECKING (N=230) EXPECTED | DRUG CHECKING (N=230) DETECTED | WASTEWATER DETECTED |
|---|---|---|---|---|---|
| STIMULANTS | MDMA | 64 (43%) | 106 (46%) | 106 (46%) | Detected |
| STIMULANTS | Cocaine | 26 (18%) | 13 (6%) | 12 (5%) | Detected |
| STIMULANTS | Amphetamine powder (speed) | 1 (1%) | 3 (1%) | 1 (<1%) | Detected |
| STIMULANTS | Crystal methamphetamine (ice) | 1 (1%) | 1 (<1%) | 4 (2%) | Detected |
| STIMULANTS | MDA | 0 (0%) | 2 (1%) | 2 (1%) | N/A |
| STIMULANTS | Prescription stimulants | 25 (17%) | 0 (0%) | 0 (0%) | N/A |
| STIMULANTS | Synthetic cathinones | 0 (0%) | 2 (1%) | 4 (2%) | Detected |
| STIMULANTS | Other novel stimulants | 0 (0%) | 0 (0%) | 0 (0%) | N/A |
| PSYCHEDELICS | LSD | 53 (36%) | 12 (5%) | 12 (5%)* | N/A |
| PSYCHEDELICS | Magic mushrooms | 50 (34%) | 3 (1%) | N/A** | Not detected |
| PSYCHEDELICS | 2C drugs | 6 (4%) | 3 (1%) | 2 (1%) | Not detected |
| PSYCHEDELICS | NBOMe series | 0 (0%) | 0 (0%) | 0 (0%) | Not detected |
| PSYCHEDELICS | DMT | 10 (7%) | 1 (<1%) | 1 (<1%) | N/A |
| PSYCHEDELICS | Mescaline | 0 (0%) | 5 (2%) | 0 (0%) | N/A |
| PSYCHEDELICS | Novel mescaline analogue | 0 (0%) | 0 (0%) | 3 (1%) | N/A |
| PSYCHEDELICS | Other tryptamines | 0 (0%) | 1 (<1%) | 1 (<1%) | N/A |
| DISSOCIATIVES | Ketamine | 52 (35%) | 65 (28%) | 61 (27%) | Detected |
| DISSOCIATIVES | Novel dissociatives | 0 (0%) | 0 (0%) | 3 (1%) | Detected |
| DEPRESSANTS | GHB/GBL/1-4,B | 1 (1%) | 2 (1%) | 4 (2%) | N/A |
| DEPRESSANTS | Prescription benzos | 21 (14%) | 1 (<1%) | 1 (<1%) | N/A |
| DEPRESSANTS | Novel benzos | 0 (0%) | 0 (0%) | 0 (0%) | Not detected |
| DEPRESSANTS | Prescription z-drugs | 1 (1%) | 0 (0%) | 0 (0%) | N/A |
| DEPRESSANTS | Kava | 0 (0%) | 0 (0%) | 0 (0%) | N/A |
| DEPRESSANTS | Kratom | 3 (2%) | 0 (0%) | 0 (0%) | Detected |
| DEPRESSANTS | Phenibut | 1 (1%) | 0 (0%) | 0 (0%) | Detected |
| OPIOIDS | Heroin | 0 (0%) | 0 (0%) | 0 (0%) | N/A |
| OPIOIDS | Opium | 0 (0%) | 1 (<1%) | 1 (<1%) | N/A |
| OPIOIDS | Prescription opioids | 2 (1%) | 0 (0%) | 0 (0%) | Detected |
| OPIOIDS | Novel opioids | 0 (0%) | 0 (0%) | 0 (0%) | N/A |
| OTHER | Nitrous oxide | 12 (8%) | 0 (0%) | 0 (0%) | N/A |
| OTHER | Synthetic cannabinoids | 0 (0%) | 0 (0%) | 0 (0%) | N/A |
| OTHER | Other drugs | 6 (4%)*** | 0 (0%) | 0 (0%) | N/A |
| OTHER | Unknown substance | 1 (1%) | 10 (4%) | N/A | N/A |

*Methods for testing LSD are only able to indicate that an indole-related compound is present. These are presumed to be LSD. Indoles are psychedelic substances like LSD and related compounds.
**N/A indicates that substances were not tested in this method or data were not available for this study.
***Other drugs included sassafras, 1(1%); coca leaf, 2(1%); pregabalin, 1(1%); poppers, 1(1%); khat leaf, 1(1%).

**Interpretation note:** This table does not show 'matches' between expected and detected, e.g. MDMA was not detected in all 106 'expected' MDMA samples but was detected in 106 samples overall (including n=3 where the expected substance was 'unknown', and excluding n=3 where MDMA was expected but not detected).

---