What Works

Drug checking and related interventions

Edition 3

Dr Monica Barratt and Professor Nicole Lee

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hello@360edge.com.au
360edge.com.au
1300 988 184

About 360Edge

We are a leading Australian health consultancy, specialising in the alcohol and other drug, and allied, sectors. We provide a full suite of advisory services to help organisations accelerate change. We work with leading international organisations, governments and not for profit agencies across Australia and internationally.

Our vision is for a thriving community that provides the best policy and practice responses right across the spectrum of alcohol and other drug use. Our mission is to ensure governments and services have the tools they need to respond effectively and efficiently to people who use alcohol and other drugs to reduce harms.

We are driven to make a positive impact in the world and strongly believe in social justice and human rights, and it drives all of our work. We believe that everyone has the right to the opportunities and privileges that society has to offer. Our values of excellence, transparency and integrity are at the core of everything we do. We live these values within the team and with our customers and collaborators.

Our team of experienced 'pracademics' take a 360 approach to viewing situations from multiple perspectives. We collaboratively and holistically work with our clients at every stage, wherever they are in the cycle of change, to achieve their goals.

In the spirit of reconciliation, we acknowledge the traditional custodians of country throughout Australia and their connection to land, sea and community. We pay our deep respects to elders past, present and future, and to all Aboriginal and Torres Strait Islander peoples today.

In brief

Why drug checking?

In 2019, the deaths of 6 young people at music festivals in Australia connected to MDMA led to local calls for the introduction of drug checking services (sometimes called 'pill testing' in Australia) to assist people who use drugs to make safer decisions about the drugs they intend to consume.

Since then, more deaths in Australia have been found to be caused by the unexpected consumption of novel synthetic drugs and resulting in coronial recommendations to implement drug checking services.

Types of drug checking

Drug checking services vary in terms of who conducts the analyses and how; the quantitative and qualitative analytical methods used; who disseminates test results and how; where testing is located; and the level of engagement across stakeholders.

Evidence supports onsite rapid 'real time' testing where drugs are also sourced onsite, directly from people who use, and information is provided direct-to-consumers and emergency services onsite, as well as via broadcast alerts to attendees through social media and other channels.

There is also evidence to support approaches where drugs are primarily sourced from drop off sites and medical incidents. Results are then provided via stakeholder meetings, and alerts broadcast through social media and other channels.

Fixed-site drug checking facilities located in central urban areas are also common, where people who use drugs submit substances for analysis and receive the results alongside a health intervention.

Outcomes of drug checking

There is evidence that drug checking alters behaviour of people who use drugs, and further supporting evidence is still emerging. People are more likely to discard or report intention not to use a substance when the drug profile differs from expectations. Drug-checking services and related interventions also alter drug markets in positive ways and provide valuable information to front-line emergency services.

Further research is required to determine the effectiveness of drug checking to reduce hospitalisations and fatalities caused by drug taking, but the research that is available is promising.

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01 Introduction

What is drug checking?

Although no psychoactive drug is completely safe, it is also true that drug use is less risky when substances are consumed in their pure state at known and appropriate doses. As a result of drug prohibition, unregulated drugs can contain other unwanted and unexpected compounds or are of unknown and varied strength, presenting a major risk to people using them.

Because they are illegal, consumers are unable to accurately determine the contents or strength of the chemicals contained in a substance and are also unable to titrate the dose themselves to reduce risks. Unlike regulated drugs, such as alcohol and pharmaceuticals, which are clearly labelled with strength and contents, unregulated drugs are a bit of a mystery.

Drug checking services (also sometimes referred to as pill testing services in Australia) conduct a chemical analysis of drugs submitted directly by the public and return the results to the service user through a tailored intervention that aims to reduce drug-related harm.[1, 2]

Drug checking services, then called 'street drug analysis programs', began in the US and Canada in the late 1960s and early 1970s.[3, 4]

These services expanded into Europe in the 1990s due to growing concern about adulterants in synthetic 'party drugs' such as MDMA used at dance events. In 1992, the Dutch government-funded Drug Information and Monitoring System (DIMS) was established and similar services sprung up across Europe in subsequent years.[5, 6]

The past decade has seen renewed interest in drug checking services globally prompted by the increased risk posed by new and unknown synthetic substances,[7] the increased strength of European MDMA tablets and powders,[8] and the rise of fentanyl and other synthetic opioids fuelling an overdose crisis in North America.[9] The most recent review (2022) has found evidence of drug checking services operating in 26 different countries.[10]

In Australia, the implementation of drug checking services has been recommended by numerous government inquiries and coronial inquests, including the 2018 Parliament of Victoria Inquiry into Drug Law Reform,[11] the 2019 NSW Coronial Inquest in MDMA deaths at music festivals,[12] the 2020 NSW Special Inquiry into the Drug Ice,[13] and the Victorian Coroner on four separate occasions (2021-2023).[14-17] These recommendations have not yet been supported by either the NSW or the Victorian governments.

Other jurisdictions in Australia have made progress on drug checking, most notably in the ACT, which supported the trial of a drug checking service at a music festival in 2018 and 2019,[18] and a fixed-site service (CanTEST) began operation in 2022.[19] In 2023, Queensland announced its intention to implement drug checking services.[20]

In 2021, New Zealand passed legislation to make drug checking services fully legal, with extensive guidance on suitable service implementation features required to obtain a drug checking license.[21]

Why drug checking?

Drug checking services are based on principles of harm reduction. The primary aim is to reduce the harms associated with the use of psychoactive drugs in people who currently use them, without requiring abstinence.[22]

Harm reduction has different aims to demand (prevention and treatment) and supply reduction (law enforcement and customs), which aim to reduce the level of illicit drug consumption in the community. But drug checking may also have demand and supply reduction impacts.

A primary way that drug checking reduces harms is by providing people with information about the contents of the drugs they plan to take to enable them to make safer decisions about their use. These behavioural changes include not taking that drug at all, taking less of the drug, taking it over a longer period of time, taking it in a different setting, taking more care in mixing with other substances, or using a different route of administration.

Further ways that drug checking can reduce harm include service users taking up *referrals* to other health services, *enhanced clinical management* of adverse drug events where clinicians are made aware of the chemical composition of the drug/s taken, *shifts in drug markets* towards less adulteration and substitution to cater for better informed consumers, and rapid market monitoring which can inform *public drug alerts*, reaching far beyond the population of drug checking service users.

Who does drug checking serve?

Until recently, the Australian debate around drug checking has centred on the music festival setting with specific concern about the drug 'ecstasy' or MDMA.[23] Unsanctioned or underground drug checking has been documented in Australia over decades in the music festival context using easily accessible reagents to test drug samples.[24, 25]

While the music festival and other leisure contexts (nightclubs and parties) are still important settings for drug checking, they are not the only settings where people who use drugs can benefit from this intervention.

The emergence of an opioid overdose crisis in North America has prompted rapid uptake of drug checking services for people who use opioids, people who inject drugs and others who attend outreach and treatment centres.[26] Other groups have expressed an interest in drug checking services tailored to their unique needs, including people who use anabolic-androgenic steroids (AAS).[27]

Community support

There is significant support in the Australian community for harm reduction measures, including drug checking. Representative surveys of the general Australian community have found that drug checking is supported by the majority.

In the 2019 National Drug Strategy Household Survey, 57% supported 'allowing potential drug users to test their pills/drugs at designated sites', while only 27% opposed this measure.[28] A more detailed analysis of the same dataset found that younger people, women and those with higher educational levels for more likely to support drug checking.[29]

The 2019 Australian Election Study found that almost two-thirds (64%) of the public agreed that 'pill testing should be allowed at music festivals', while only 22% disagreed with this statement. Again, younger respondents were significantly more likely to support this intervention.[30]

A note about terminology

While there is not a globally accepted definition of drug checking, the European group the Trans European Drug Information (TEDI) recently published a definition which specifies that a drug checking service must:

- Have an explicit aim of reducing harm;
- Collect and analyse samples directly from the public;
- Return the analysis results to the service user directly;
- Involve an exchange of information between the service user and the drug checking service;
- Give information about risk to the service user directly, tailored to the specific analysis.[31]

'Drug checking' is the internationally accepted term for this activity. Although used elsewhere in the past, 'pill testing' is now a particularly Australian term. The terminology changed to recognise that not many drugs that are brought in for testing are pills and may also be powders or capsules. We have used the term drug checking throughout this report rather than pill testing.

As described by Barratt & Measham,[1] interventions that fall outside of the above definition may still have value for harm reduction and drug trend monitoring. These interventions include non-public testing of drugs which may be obtained through indirect means, including amnesty bins, police seizures, ground finds or used equipment, or the testing of bodily fluids or wastewater to determine substance use post-consumption. Combined with self-report data, these measures may inform public drug alerts.

02 Operational elements

Overview of key elements

Drug checking services and related interventions operate in a variety of ways both locally and overseas.

Commonly services differ on:

- Setting: Where the service is located
- Source: While drug checking services are defined by sourcing drugs directly from members of the public who intend to use them, other similar interventions source drugs from elsewhere
- Communication: Who disseminates test results and how, whether test results go directly to users (drug checking proper) or via an intermediary (adjacent interventions) and the varying levels of engagement and support from other stakeholder groups
- Technique: The range of quantitative or qualitative analytical methods used, who conducts the analyses and how

Setting

The location of facilities has a major impact on the analytical techniques used and the ability to communicate harm reduction information to people who use drugs.

In a review of drug checking services operating globally in 2017, the location of drug checking services was found to be driven by the local regulatory environment and the willingness and capacity of venues to host the services.[32]

The review found that:[32]

- Twenty-three of 31 services reported conducting onsite setting, including at festivals, nightclubs and other mass gatherings
- Eighteen of 31 services reported operating in fixed-site settings, including offices and outreach centres, and 2 of these services operated in hospital or emergency department settings
- Three services reported offering a postal submission service

Considering the different combinations of modes of submission, 12 operated only onsite, 10 ran onsite and fixed-site services, 6 operated only a fixed-site service, and single services reported operating onsite/fixed-site/postal, fixed-site/postal and only postal.[32]

A web survey of 851 Australians who attend festivals found that 94% would use a mobile drug checking onsite and 80% would use a fixed site service external to a site.[33]

Onsite mobile services

Onsite or mobile drug checking facilities usually operate at festivals or venues where illicit drugs are sourced and consumed. However, some mobile sites can operate and ‘pop up’ in other areas to better provide accessible drug checking information.

Internationally, Check It in Austria, Safer Dance in Switzerland, The Loop UK, Know Your Stuff in New Zealand and Check!n in Portugal are examples of onsite facilities that test drugs on the spot in clubs or at

dance events and immediately communicate the results to consumers.[32] In Australia, mobile facilities have been trialled at one festival in Canberra,[18] while unsanctioned or underground mobile drug checking has also been documented.[24, 25]

In most cases, the analytical techniques at these onsite facilities are more limited but many services such as Check it, Safer Dance and the Loop also utilise fixed site laboratories to conduct further testing with more sophisticated equipment.

Further recent developments include portable mass spectrometry devices, which can bring the accuracy and comprehensiveness of laboratory grade testing into the field. One example of paper spray mass spectrometry (PS-MS) which has been used in Canada for on-site drug testing in under 1 minute, although costs can be prohibitive for some services.[34]

Despite the limitations of most onsite facilities, they can show differences between expectations and actual contents in most samples. Where one technique may have limitations, combining it with another technique can increase effectiveness – for example, by combining infrared spectroscopy with immunoassay test strips, the limitations of the former (not being able to detect substances <5% of the mass) is negated by the latter (can detect any occurrence of the target drug class).[35]

Localised, onsite testing also has the distinct advantage of sourcing drugs from the festival or club in which the drugs would be consumed as well as the ability to communicate information to consumers either directly or in-directly via alerts at the venue.

Agencies operating onsite (including first-aid workers, peer educators and police) can also interact with the onsite lab improving frontline responses.

Fixed site services

Fixed site facilities operate from permanent offices, outreach centres, community centres, safer consumption rooms, pharmacies and even churches. These may involve mobile laboratories or access full laboratories for the most advanced chemical analysis techniques to provide the most accurate information on drug composition.

The Netherlands' Drugs Information and Monitoring System (DIMS) was established in 1992. As of 2022, it is a network of 32 organisations throughout the Netherlands offering testing and drop off facilities for people to submit their drug samples.[36, 37] More than 100,000 samples were collected and analysed by DIMS facilities between 1992 and 2010[38] and the service now handles 18,000 samples per annum.[37] People submit their samples to DIMS anonymously. If a person attends a drop off centre, they can be provided with some testing results onsite (reagent testing, chromatography etc) or can wait for the sample is sent directly to a central laboratory for further testing.[36]

A fixed-site drug checking facility also operates within the City of Zurich. The Drug Information Centre Zurich (DIZ) was established in 2006 and comprises free analysis of substances and a consultation with a social worker. The DIZ is open twice a week and conducts 40 analyses per week. Obligatory counselling includes drug information, safer use advice and referrals, and clients must also complete a questionnaire.[39, 40]

Postal services

Drug samples are sent in the post to fixed site laboratories which communicate the results of the analysis back to the poster, typically via email or on a website using an anonymous key. Postal services have a longer wait time for results.[32]

A postal service that does not provide an individually tailored intervention when

delivering results back to the service user would not be considered a drug checking service according to the TEDI definition.[1] The intervention could still be provided remotely (e.g. through digital communication technologies) in the context of a postal service.

Home testing services

Home-testing of drugs with colorimetric reagent kits or immunoassay test strips can be conducted by people who use drugs in the community. Kits and strips are legally available for purchase online as well as from adult shops.

In Australia, kits have been provided by harm reduction groups such as the University of Melbourne Chapter of Students for Sensible Drug Policy.[40]

In a 2019 study of 792 Australians who regularly used psychostimulants, over one-third reported testing drugs with most having used colorimetric reagent kits.[41]

Testing kits and strips are simple presence/absence tests and are not able to provide comprehensive information on risks on their own. They are, however, able to accurately determine whether the expected substance is absent, which may be enough to deter consumption.[42]

Distributed model

The distributed model of community drug checking is an approach to providing multi-site service access designed to support people who use drugs with differing needs. As described by Wallace and colleagues from Canada,[43] their distributed service delivery model incorporates a central hub location, distributed remote service locations, remote on-demand data interpretation, mail-in samples, and a web portal – with all of these components linked to a central data storage, analytics and reporting platform.

The distributed model can provide the advantages of all other model types, while offsetting the disadvantages of each, making it an excellent way to provide equitable access to a larger network of service users.[44]

Source of drug

According to TEDI, drug checking services must "collect and analyse samples directly from the public". However, other related interventions may access drugs through alternative pathways.

Direct-from-consumer

Direct-from-consumer sourcing is the preferred source of drug because it allows the collection of micro-level drug-market information from that specific time and place as well as an ability to communicate harm reduction information directly to consumer. It is also the most direct way to accurately track the difference between what people expect the substance to be and what it actually is.[45]

Amnesty bins

Providing drug disposal bins within and near festivals and leisure events allows consumers to discard illicit drugs safely without fear of police intervention. These drugs can then be provided to onsite or off-site facilities for testing.

Police seizures

Police currently test seized drugs in their own laboratories, but results are not usually released in a timely manner that has harm reduction benefits. Seizures by police can be provided to onsite or off-site facilities for more rapid testing and results dissemination.

Emergency services

Emergency services, first aid and welfare staff will often encounter illicit drugs in the process of helping festival-goers with their medical needs. These drugs can be provided to onsite or off-site facilities for testing to help identify the best treatment for drug-affected people.

Ground finds

Venue attendees and staff may find substances on the ground that they bring for testing.

Used equipment and paraphernalia

Used injecting equipment and bags which have been discarded after drug use can be collected and analysed for traces. Monitoring studies in Australia using trace analysis of these kinds of materials have fed into harm-reduction alerts and messaging.[46]

Communication

Drug checking most commonly refers to communication models that interact directly with the person intending to take the drug, but how test results are delivered is often heavily dependent on setting, source and the regulatory environment in which facilities operate.

A global review of 31 drug checking services found that, in addition to communicating results with consumers directly (as is a requirement to be classed a drug checking service), more than half of the services also alerted the public[24], health, welfare or outreach[21], researchers[19] and promoters or event managers[16] of the test results.[32]

Methods of communication of results were primarily in person[27], public website[21], email[21] and reports using aggregate data[20]. Services that provided analysis results directly to individual service users did so in person[27], by phone call[11], email[10], website public[6], website with a code[4], report using aggregate data[4], text message[2] and app.[1,32]

The main methods of providing harm reduction information are directly to a consumer, via a general alert system, or a combination of both.[32]

Direct to consumer

Although there have not been any direct comparisons with other methods of communication, personal contact with well-informed professionals is considered by many to be more effective than more general messaging at encouraging people who use drugs to pay attention to preventive information and reduce risky behaviours.[47, 48]

Direct contact is the preferred method for people who use the service; a majority (64%) of festival-goers report that they would not use a service that did not provide individual feedback of results, demonstrating the need for personally tailored results.[32]

The drug checking intervention, which is tailored to the service user and incorporates the findings of the chemical analysis, may also be delivered via phone or via other digitally facilitated technology (video call, audio call, text chat, etc.).[1]

General alerts

Either independently or in conjunction with direct-to-consumer communication of results, many facilities provide some sort of public alert system to disseminate information about concerning results about substances in circulation.

Alert-based systems disseminate public results on boards at festivals or post them online or through social media or festival apps.

Public drug alerts systems can also be informed by adjacent or complementary monitoring systems. For example, in Victoria, Australia, the Emerging Drugs Network of Australia Victoria (EDNAV) detected a cluster of hospitalisations related to counterfeit benzodiazepines via blood analysis that identified novel benzodiazepine consumption. A public drug alert was widely disseminated.[49]

Public alerts can have broad reach. The Dutch drug information monitoring system (DIMS) was set up to gain information about the drug market for policy purposes and to provide information to the public. DIMS has led numerous national mass media warning campaigns that included national radio and television broadcasts, posts on social media

and the internet, and flyers and posters at large dance events.[50, 51]

In New Zealand, in a recent example from 2022, twelve people were hospitalised over one weekend from one batch sold as cocaine that contained fentanyl. Drug checking service Know Your Stuff received the sample on the Saturday, tested on the Sunday, got laboratory confirmation on the Tuesday and an alert was disseminated immediately.[52] Only one person was hospitalised the following weekend and after that, no further harm was detected.[53]

Testing technique

Two major sources of illicit drug harms are unexpected contents (e.g. active adulterants, inactive fillers and drugs that mimic other drugs) and unexpected dose or strength (i.e. the amount of the expected drug that is present).

Most drug checking facilities provide information on the presence or absence of certain drugs as well as the presence of certain adulterants. They compare the drug profile with a library of reference profiles of known substances.

Analysis methods

Drug checking services vary considerably in the chemical drug analysis techniques used.[35]

Colorimetric reagents and test strips

These are kits containing chemicals that change colour when combined with particular chemicals. The most well-known reagents are marquis (often used for testing MDMA and speed), mandelin (often used for testing for ketamine and PMA), and mecke (often used to test for opiates).

Immunoassay test strips are available that detect fentanyl or benzodiazepine. Typically, these tests only provide information about the presence or absence of a substance but not how much of the substance is present or what else is present. When used individually, they often only indicate where a class of drugs is present, rather than a specified substance (e.g. Marquis tests for MD-like compounds, rather than MDMA itself; fentanyl test strips identify fentanyl and a range of fentanyl analogues but cannot distinguish between them).

Chromatography

Chromatography separates mixtures of substances into their components. The most commonly used techniques are thin-layer chromatography ('TLC'), high-performance liquid chromatography ('HPLC') and Ultra-High Performance Liquid Chromatography ('UHPLC').

Spectroscopy

Spectroscopy uses electromagnetic radiation to get information about the structure of a substance. Commonly used techniques include Fourier Transform Infrared Spectroscopy (FTIR), ultraviolet–visible spectroscopy (UV-Vis) and Raman spectroscopy.

Mass spectrometry

Mass spectrometry separates different chemicals in a substance by their mass. Techniques include gas chromatograph mass spectrometry (GC-MS), liquid chromatography mass spectrometry (LC-MS), ion trap mass spectrometry (IT-MS), direct analysis in real time – mass spectrometry (DART-MS) and paper spray mass spectrometry (PS-MS).

Amount of drug required

Generally, the more of a drug used in analysis, the greater the accuracy of information that can be provided to the consumer.

In countries like Australia, where drugs are relatively expensive, providing whole doses to test services may be a barrier. For example, Barratt et al.[33] found that only a third of Australian potential service users reported willingness to donate a whole dose for testing. However, many analysis methods

only require access to trace amounts to generate a result.[35]

Risk of false positives

Some critics of drug checking cite the limitations of forensic techniques as a reason not to implement drug checking.

Their argument is that the equipment can sometimes return a false negative (fail to identify something that is there) and people may take a drug thinking it is safe.[54, 55]

However, this argument is a logical fallacy because the risk of harm, and the likelihood someone will take a drug, is significantly greater when consumers have no information about the drug's contents.

Drug checking services have clear messaging that there is risk with all drug use. The focus is on highlighting risk, not guaranteeing safety.[36]

Many services use multiple methods of testing to reduce the risks of false positives.

The global survey of drug checking service providers [32] found that 15 of the 31 services reported at least 1 mass spectrometry or liquid chromatography method and 11 reported at least 1 spectroscopy method (including FTIR, UV-Vis, Raman). TLC was utilised by 13 services. Sixteen of 31 services reported use of reagent tests. A quarter [4 of 16] services that used reagent kits reported only using this method in combination with other analysis techniques.

The Loop UK, for example, uses six different types of analytic technique with triangulation between results and repeat testing if required.[56]

The TEDI project, an international collaborative effort between 2011 and 2013, combined data from the drug checking systems of Spain, Switzerland, Belgium, Austria, Portugal and the Netherlands to compare results and exchange knowledge about the different analysis techniques used.[57]

Laboratory techniques used were often dependent on the setting, meaning the nature of the drug-checking service affects the speed, accuracy and reliability of the analysis results and, therefore, the potential extent of harm reduction.[57]

There is a likely compromise in conducting forensic analyses in challenging conditions that necessitates a trade-off between speed, accuracy, reliability and portability of equipment.[56] However, the technology is advancing rapidly and the combined use of multiple analytical techniques increases the effectiveness of these interventions.

Two examples of emerging techniques that provide accuracy and speed include mass spectrometry (DART-MS) and paper spray mass spectrometry (PS-MS), which both hold promise as new tools for drug checking services.[34, 58]

03 Evidence

There is a growing evidence base that supports the use of drug checking as a harm reduction intervention.

In 2022, a systematic review of drug checking research across all populations and contexts was published in the highest ranked journal in this area: *Addiction*.[2] This review covered behavioural outcomes, monitoring of drug markets, and outcomes related to different drug checking models. This review is supplemented by a more target review published in 2021 covering behavioural outcomes from drug checking at music festivals.[59]

Although concerns have been raised that allowing drug checking services will increase drug use, this is not supported by international evidence.

Several studies have demonstrated that the presence of a drug checking facilities does not encourage those who do not use drugs to begin drug use.[5, 39, 60, 61] Recently, a study from the long-running Dutch service DIMS found that only 0.7% indicated they had never used any of the twenty drugs studied, indicating that these services almost exclusively cater for people who already consume drugs.[61]

And in Australia, a study of festival-goers in Western Australia[62] found there was no increase in intention to use among people who had never used ecstasy in a scenario where drug checking was available. Instead, drug checking facilities appear to make it less likely a drug will be consumed if it contains a substance they were not expecting, potentially reducing drug use.

A study of perceptions of drug-checking and associated anticipated behaviours of people in the Berlin party scene[63] found that the most important motivator for drug-checking was to avoid contamination of substances with cutting agents.

If the sample contained an unexpected or unwanted agent along with the intended substances, then 66% of respondents indicated they would dispose of the substance. If the sample contained only unexpected or unwanted agents, without the intended substance, then 94% would dispose.[63]

Overall, there is no evidence that drug prevalence, initiation or mortality rates have increased in European countries with drug checking by comparison with those without.[5, 39]

A global review[32] found that most drug checking services[20 of 31] reported that there has been some type of evaluation of their service. At that time, evaluation reports that were published and available to the public were less common; many evaluations were either in-house, unpublished or currently underway. This problem has been attributed to a lack of funding for evaluations.[64] However, since 2017, service evaluations have become more commonplace, contributing to the evidence based reviewed below.

Monitoring and data collection

Monitoring of illicit drug markets is crucial for understand drug trends to assist front-line services. New psychoactive substances are increasingly being mis-sold as better known drugs, the monitoring of which is assisted by data from drug checking services.[7, 57, 65] In the 2022 systematic review, the authors conclude that “strong evidence exists demonstrating that drug checking services provide a unique form of drug market monitoring by providing information on the level of concordance

between expected and detected contents in drug samples".[2]

Drug checking services are now routinely contributing important and unique information to drug monitoring systems. European Early Warning Systems (EWS) now routinely include data from the main drug checking services in that region, alongside police seizure data.[66]

Establishment of centralised databases such as those in the Netherlands and France[67] provide strong evidence for the utility of drug checking services as public health surveillance tools. Findings of adulterated drugs can be communicated to the public through posters at events, press releases, and written, broadcast, and social media[38, 50, 57, 64] as well as through peer networks of people who use drugs.[64]

In North America, trends in the composition of unregulated opioid supplies have been tracked using drug checking data. In one example, fentanyl concentrations were modelled over 2 years in 3621 samples tested in British Columbia, where it was found that variation in fentanyl concentration decreased over the study period.[68]

Drug checking can also be a useful to monitor demographic data about people who use drugs, drug trends and patterns of use.[61, 69, 70] This information in-turn can be relayed to consumers to provide education about substances of concern onsite and the risks associated with drug consumption.

Behaviour change

Studies of drug checking service users generally find that they modify their drug use behaviours in positive ways after receiving the intervention. The way these outcomes are measures varies, in terms of the types of behaviours measured as well as whether the measures are self-report or observed drug disposals, or whether they are measured as intended or actual/past actions.[2, 59]

According to the Maghsoudi et al.[2] systematic review, enacted behaviours (as observed or per self-reported historical recall) were measured in 16 studies, including 8 studies of observed drug discards, while intended behaviours in response to actual or hypothetical analysis results were assessed in 22 studies. Regardless of how it was measured, studies consistently found that services users were more likely to report not using/discarding/not intending to use the substance if it contained unexpected substances.

In the review conducted by Palamar et al.[59], only 6 studies met inclusion criteria, which required that drug checking had been conducted in a festival setting. Across these studies, between 16% and 94% of participants reported intention to or actual discard of the substance after learning it was adulterated. Palamar et al. recommend that future studies employ more systematic sampling methods to recruit more representative samples of festival attendees.

There have been two studies recently published that utilised follow-up self-report methods to measure the impact of drug checking services.[71, 72] Most service users (86% Portugal, 69% UK) who received test results indicating that the drug was different than expected did not go on to consume the substance. About half of service users (50% Portugal, 59% UK) whose test results indicated that their drugs were stronger than expected took a smaller dose than usual.

A recent environmental scan of drug checking also reported that the use of drug checking has demonstrated positive influence on the intention to use drugs, and actual drug use behaviours. The most common change in behaviour was among people whose sample returned a positive test for unexpected fentanyl. Drug checking was associated with a reduction in intended dose, which led to lower odds of overdose.[73]

Market change

People who use drugs tend to have a high level of trust in their drug dealers, but less so when drugs are sourced opportunistically from an unfamiliar source.[74] Festival drug dealers in a UK study were found to be twice as likely to mis-sell products as neighbourhood dealers.[56]

A survey of twenty people who use drugs in Vancouver, Canada indicated that people would provide knowledge to drug dealers about drug contents if they were to use a drug checking service.[74] Drug checking can act as quality control on the illicit market, with drug manufacturers and dealers less likely to distribute highly dangerous substances when clients are able to check their drugs.[57] Survey reports of people who access drug checking suggest that inconsistent or contaminated drugs can lead some people to seek out a new dealer.[5, 75] In countries where drug checking is well-established, tested samples more closely follow anticipated composition trends, as compared to countries not employing drug checking.[64]

While the DIMS system has not been directly linked to prevention of drug-related deaths, monitoring systems have shown decreases in detected batches of harmful drugs from local supplies following alerts. Early reviews of DIMS found that after each campaign, compounds people were warned against were no longer found in samples brought in for testing.[76] Some dangerous substances which were used to adulterate MDMA have disappeared from the market in Europe following the introduction of drug checking.[60] For example, in 2014, alerts were rapidly issued advising the public to avoid 'Superman' pills that contained an unexpected lethal dose of PMMA. No deaths were recorded in the Netherlands. In neighbouring UK where no warnings were issued, the same tablets were associated with several deaths.[51]

Overdose

Although research is limited, there is some evidence that drug checking can play a role in preventing drug-related hospitalisations and deaths.[38, 56]

Deaths and hospitalisations as a result of illicit drugs such as MDMA are relatively rare in Australia,[77] and are heavily dependent on changes in illicit drug markets, weather and patterns of consumption.

Nevertheless, comparisons between festivals providing drug checking facilities and those without indicate a role in reducing on-site medical incidents and hospitalisations. In an evaluation of onsite drug checking facilities at a festival in the UK found a 95% reduction in drug-related transportations to hospital compared with the previous year [56, 78], while a 12% fall in drug-related medical incidents on-site was recorded by medical services provider Red Cross when drug checking was introduced compared with the previous year.[69]

Drug checking interventions in fixed sites that serve more structurally vulnerable populations are integrated into overdose response strategies.[79] Research designs specifically testing their efficacy on hospital and deaths data are harder to conduct, though, as the population group is more dispersed than at a festival site.

As research evidence indicates more harm-reducing behaviours and less harmful drug market conditions as a result of drug checking services, we would expect less

hospitalisations and deaths to result; however, well designed and controlled longitudinal studies in this space are still needed for confirmation. These kinds of studies require substantial additional resourcing.[64]

Brief intervention

Service users of drug checking are a captive audience of people who use drugs to whom harm reduction information can be delivered.

Both onsite or offsite testing facilities provide people who use drugs with an opportunity to gain accurate harm reduction information as well as brief counselling or referral to treatment services if required.

Most drug checking service users have never been in touch with drug services before so these services are able to access a new and 'hidden' user group from a service perspective.[69]

In CanTEST's evaluation report, it was found that 70% of the service users had never previously accessed a healthcare worker for information or advice about drug use, demonstrating the outreach capacity of this intervention.[19]

Future evaluation and research

Existing research and evaluations of drug checking services indicate support for drug checking as a harm reduction intervention but have notable limitations.

Generally, evaluations have focused on operational outputs (such as the number of drugs tested; a number of brief interventions delivered; contaminants and purity levels found) rather than outcomes (such as changes in intended behaviour, actual behaviour, overdose rates, and market behaviour) or process measures (such as operations, acceptability).

An evaluation framework was developed by researchers Australian National University to the latest drug-checking pilot at Groovin' The Moo festival in Canberra.[80] The evaluation framework uses participant surveys (pre, post and two months follow up from service use), observational data and administrative data such as policing and health services data. Key research questions intended to be answered by the evaluation are:

1. How successfully was the program implemented, given its specific context?
2. To what extent was the program received positively by participants and by other key stakeholders?
3. To what extent did the program result in participants' attitudinal and/or behavioural change related to illicit drug use?
4. To what extent did the program produce valuable information about illicit drug availability in Canberra, and how did the authorities use that information?
5. Did the program have any unintended consequences, either positive or negative? If so, what were they?
6. Should the program continue and, if so, what changes in the program and its contexts are desirable?

A similar evaluation framework was utilised to evaluate the fixed-site service CanTEST.[19]

Substance drug checking service in Vancouver Island has published a number of pre-implementation studies using theoretical frameworks that incorporate broader contexts (e.g. the context of drug prohibition and associated criminalisation; issues related to stigmatisation).[81, 82] These studies set up that service for well-informed post-evaluations that look more broadly at the effects of drug checking upon drug use, harms and markets.

While these evaluation frameworks provide insight into the effectiveness of drug checking facilities, future research would ideally include the monitoring of drug-related harms over time, comparing similar jurisdictions with and without drug checking facilities, or with drug checking services that offer different features. Such designs require dedicated research funding, beyond just the operation of the service.[64]

Drug-checking facilities should be evaluated to measure outcomes of drug disposals, both intended and verified; localised drug-related morbidity and mortality, such as first aid attendance and hospitalisations at festivals or in other community locations; and effective engagement with target populations.

Drug checking services could be used to also estimate the prevalence of drug use at festivals, similar that conducted by the Loop UK.[83]

04 Case studies

The 2017 global catalogue of drug checking services published a set of service profiles, covering 28 drug checking services.[84]

In this section, different types of drug checking are highlighted in a series of selected case studies. These details have been reviewed and confirmed by the organisations noted.

Fixed site drug checking

DIMS (The Netherlands)

Who are they?

The Drugs Monitoring and Information System (DIMS), based in the Netherlands, is the oldest continuously running drug checking service in the world, having recently celebrated 30 years of operation.[85]

DIMS receives financial support from the Ministry of Health, Welfare and Sports and co-ordinates drug checking with 32 office locations throughout the country.[36, 85] The service now handles around 18,000 samples per annum.[37]

Services offered

- Fixed site drug checking
- Direct-to-consumer harm reduction information
- Qualitative and quantitative testing
- Monitoring and alerts
- Peer education

How the fixed-site model works

DIMS is a nationwide network of fixed-site facilities at drug prevention institutions across the Netherlands.

People who use drugs can have small amounts of their drugs tested anonymously and without the risk of being arrested or prosecuted.[36]

Staff consist of health and prevention professionals and peer educators who communicate to consumers about the effects of the particular substances and their associated risks.[38, 61]

Important information, such as experiences with adverse effects with the drug in question are recorded and saved in the DIMS database.

Other important inputs in the database are regional origin, date, source of purchase, price, and reason for testing.[38]

Some sites are merely receiving stations and directly send all the samples they receive to the DIMS Bureau at the Trimbos Institute and do not offer onsite testing.

A number of analytical techniques are used on site. Initial reagent testing at intake is used to determine whether a tablet contains any ecstasy-like substances, amphetamine, a hallucinogenic compound, or none of these.

Some sites use Fourier Transform Infrared Spectroscopy to analyse GHB, amphetamine, ketamine and MDMA powder.

Ecstasy tablets are usually produced in large batches and information on tablets is reported by DIMS weekly.

This enables certain tablets to be determined and recognised through a specially developed database on the DIMS website, known as the 'recognition list'.[36] This allows for more rapid identifying of substances at the fixed site, without the need to send substances for further testing. Tablets that are not recognised by this online system are sent for further testing.

Qualitative and quantitative analyses of the drugs samples are performed by a dedicated commercial laboratory that receives samples on a weekly basis, using a combination of reagent testing, Fourier Transform Infrared Spectroscopy, gas chromatography mass spectrometry and liquid chromatography diode array detection.

Individuals who submitted drugs for lab testing phone the fixed site a week after submission for an explanation of results. Information is also used to assist with alerts as well as to improve the provision of direct-to-consumer harm reduction information and to monitor illicit drug markets.

Evaluation

An evaluation of Jellinek Prevention, which is part of DIMS and operates in Amsterdam, along with two other European drug checking facilities in 2002, concluded that people who used these services were better informed and showed more health-conscious behaviour.[5] The evaluation further noted that drug checking services such as DIMS are crucial to understanding emerging trends in the synthetic drugs market.[5]

DIMS is currently investigating further opportunities to conduct an updated evaluation of their services.

Festival and public drug checking

KnowYourStuff (New Zealand)

Who are they?

KnowYourStuffNZ started in 2015 and have so far completed more than 10,000 tests.

KYSNZ offer qualitative substance analysis onsite at festivals in New Zealand and have expanded into public clinics.

The service is funded by donations and public funding and provided mostly by volunteers.[53]

In 2021, New Zealand introduced national legislation which made drug checking legal.[21]

Services offered

- Onsite drug checking at festivals and in NZ cities
- Direct-to-consumer harm reduction information
- Qualitative testing
- Sourced directly from consumer
- Monitoring and alerts

How the festival model works

Drugs are provided by users onsite at festivals and are tested using FTIR Spectroscopy with additional testing for specific substances using reagents and immunoassay test strips. Information provided to users is mostly qualitative in nature noting potential content with limited information about strength or dosage of substances.

Consumers are provided with harm reduction information on site with the service having a legal requirement to provide "accurate and appropriate" advice.

Results are recorded and conveyed in terms such as: "This result is consistent with the presence of XYZ" rather than "This is XYZ" in order to adequately convey limitations of testing techniques.

Evaluation

Internal evaluations of KnowYourStuffNZ indicate that the intervention has been effective at positive behaviour change. In 2020/2021 KnowYourStuffNZ attended 27 events and tested 2,744 samples.

Key findings included 69% of the season's samples were what people expected and 68% of service users who received a negative test result said that they did not intend to consume the substance.[86]

One recent study found that of 155 survey respondents who attended the KnowYourStuffNZ service, 68% reported that they had changed their behaviour after using the service, with 87% of those that used the service noting that their knowledge of harm reduction had improved.[87]

Multi-modal drug checking

Energy Control (Spain)

Who are they?

Energy Control is a drug prevention project founded in 1999 in Spain that consists of peer-to-peer interventions, school workshops, and the use of new technologies and other activities in the area of risk reduction associated with drug use.[32]

Energy Control receives national funding, state-level funding, city-level funding as well as co-payments from service users. The substance analysis service costs around 200,000 euros per annum. As at 2023, the service had analysed more than 70,000 substances.[88]

The fixed-site operations are open to the public once a week. In Barcelona the opening hours are from 1pm to 8pm, and in other cities from 6pm to 9pm. The fixed-sites collect between 60-100 samples per week, and events collect between 50-150 samples per night.[88]

Some of the main drugs tested include MDMA, cocaine, speed and a range of new psychoactive substances.[7, 89]

Drug checking services are offered through onsite drug checking at events or via a drop-in centre. There is also scope to receive drugs to test via post from anywhere in the world.[90]

Services offered

- Fixed site drug checking
- Onsite mobile drug checking
- Direct-to-consumer harm reduction information
- Sourced directly from consumer, onsite, and via postal service
- Qualitative and quantitative testing
- Monitoring and alerts

How the mail service works

Energy Control's fixed site operations can receive drugs to test via post. Once received drugs are tested via a number of qualitative and quantitative methods including HPLC, GC-MS, UV/Vis, FTIR and TLC testing. Consumers can receive the results via phone or email alongside tailored harm reduction information.

Evaluation

Internal evaluations have found that the drug checking services have effectively monitored the illicit drug market and assisted in targeting hard-to-reach user demographics.[64]

Multi-agency drug checking

The Loop Drug Checking Service (UK)

Who are they?

The Loop is a charity founded in the UK in 2012 by Professor Fiona Measham and colleagues. Its mission is to provide high quality evidence-based and evidence-making drug checking services, associated harm reduction advice and information, as well as in-house research, evaluation and training.

The Loop is staffed by a team of four paid staff (CEO, administrator, training co-ordinator and event manager), a senior team of 40 unpaid staff, and a general team of approximately 300 unpaid staff.

All volunteers are professionals - predominantly qualified and experienced chemists, health professionals, trainers, teachers and academic researchers - who commit their time to supporting the organisation.

In order to conduct drug checking at a given location, The Loop partners with local stakeholders - including local authorities, public health, substance misuse services, event management and police - to ensure that there is an agreed memorandum of understanding between parties. The Loop only ever operates with police support.

The Loop introduced the UK's first onsite harm reduction ('back of house') testing service at nightclubs in 2013 and at festivals in 2014.

The Loop introduced the UK's first event-based ('front of house') drug checking service in 2016 at Secret Garden Party and Kendal Calling festivals;[56] and the UK's first community-based drug checking service in 2018 in Bristol and Durham city centres.[91]

City centre testing attracted a diverse demographic of service users, including people experiencing homelessness and injecting opiates.

The Loop obtained the first UK Home Office 'test case' license in late 2023, using a new framework designed specifically for drug checking services and is evaluating this for the Home Office ahead of anticipated drug checking services opening in Scotland in 2024.

Services offered

- Community-based city centre and event-based festival and nightlife drug checking with mobile pop-up laboratories and partnerships with fixed site university and commercial laboratories
- Direct-to-consumer individual test results and healthcare consultations (2016 onwards)
- Sourced directly from consumer ('front of house') and from collaborative agencies and individuals ('back of house')
- Agency consultancy and information service
- Qualitative and quantitative analysis
- Monitoring and alerts issued through media, social media, apps and public health EWS
- Specialist training for drug checking organisations, harm reduction organisations, drug treatment services, event management and staff, university staff and students, professional trainers

How the multi-agency services works

Along with users submitting drugs directly for testing at onsite facilities, The Loop UK refers to their approach as a Multi Agency Safety Testing approach.

This includes sourcing drugs for testing from a variety of agencies on-site including, amnesty bins, the police, emergency services, welfare and general staff on site.

This information is then communicated back to agencies to assist their work as well as via alerts, with samples associated with medical incidents prioritised.

The key to the multi-agency framework is to harness support of all onsite agencies including police and healthcare staff, as well as utilising professional chemists and healthcare staff to deliver the Loop's testing and healthcare consultation service to the highest professional standards, with the primary aim of harm reduction.

Other key features of The Loop include its in-house research and evaluation team, with over 10 Loop-related peer reviewed papers published to date; and its in-house communications team, who design and issue infographics and alerts which often make headline news and can garner half a million or more viewers.

Evaluation

An evaluation of The Loop facilities across four days at a UK festival[56] revealed that one in five substances was not as sold or acquired.

One in five service users utilised the independently verified disposal service for onwards safe destruction of further substances of concern in their possession and another one in six moderated their consumption.

A more recent study evaluation The Loop's services to English festivalgoers during the summer of 2018.[69] 2672 substances were submitted and tested, and these results were delivered during 2043 tailored brief interventions to 4240 service users (it was common for groups of friends to attend the service together). Ninety five percent of the service users had not previously accessed health services regarding their alcohol or other drug use. For samples matching purchase intent, nearly half intended to reduce dosage, with younger and female service users significantly more likely to do so. For substances identified as other than expected, nearly two thirds disposed of them.[69]

The Loop's drug checking service is one of the only services that has been evaluated against independently measured harm outcomes. When drug checking was introduced to the UK's Secret Garden Party in 2016, researchers compared drug-related hospitalisations in that year with those from 2015, finding a 95% reduction.[56, 78]

When drug checking was provided for the first time at Loves Saves the Day festival in 2018, The Red Cross reported a 12% fall in drug-related medical incidents on-site from 2017 to 2018, in the context of increased attendance and hotter conditions at the 2018 event.[69]

Further research arising from the Loop's activities can be found at wearetheloop.org/publications

Distributed drug checking

Substance (Vancouver Island)

Who are they?

Substance (aka the Vancouver Island Drug Checking Project) in British Columbia, Canada, developed as an innovative response to addressing toxic drug supply as a key contributor to rising overdose-related deaths.[44]

The project was developed by Bruce Wallace and Dennis Hore at the University of Victoria with Chris Gill at the Vancouver Island University.

Together they have pioneered a "distributed model of community drug checking"[43] which allows service users to attend several remote locations that connect to technicians at their central storefront location in the city of Victoria.

This model is designed to increase the reach and accessibility of drug checking services, particularly in rural areas, while reducing the need for paid, trained technicians at each location.

Currently the project is collaborating with public health and BC Centre for Substance Use (BCCSU) to scale up these innovations throughout the many drug sites in the province of BC.

Services offered

- Inner-city hub fixed-site drug checking service with broad chemical analysis capacities including onsite Paper-Spray Mass-Spectrometry (PS-MS)
- Remote service locations with custom drug checking kiosk with FTIR and strip-tests
- Custom platform for central data storage, analytics, reporting and integration
- Public data dissemination tailored to local needs

How the distributed service works

The project tests approximately 200 substances per week, with around 7000 substances in total tested in 2022.

Service users can access the service several ways:(1) Walk-in to the Substance storefront site (the hub),(2) access one of the distributed service locations which are linked to the main technicians in the hub,(3) mailing in or dropping-off samples,(4) outreach services which include outreach workers collecting samples and distributing weekly reports to locations such as overdose prevention and housing sites.

While those attending the hub directly submit samples and receive interventions as per other fixed site services, the second option improves accessibility through remote kiosk locations, staffed by a trained harm reduction worker. Those kiosks have an FTIR linked to the main database.

The remote site simply loads the sample on the FTIR and pushes 'send' and the technician in the hub provides all of the interpretation and reporting for all of the sites, essentially eliminating the need for trained FTIR technicians throughout the region.

Samples are also collected and couriered weekly to the hub for complementary PS-MS analysis which results in detailed weekly reports for each site.

Evaluation

The Substance group have published qualitative studies that use the Consolidated Framework for Implementation Research (CFIR).

A pre-implementation study informed the development of their model. In this study, 27 in-depth interviews were conducted with potential service users.(82, 92)

Findings included the importance of confidential and anonymous services in the context of criminalisation and stigmatisation of substance use, engaging people with lived experience in the service to establish and maintain trust, and the provision of accurate results through respectful and non-judgemental interactions.(82)

Further analysis of these interviews extracted strategies for utilising drug checking within the supply chain as a market intervention.(92)

It was noted that drug checking services should be designed as market interventions, and not just evaluated on how they inform individual drug use behaviours.

As a market intervention, this research suggests that drug checking works better if it ensures the outcomes of the intervention do not exceed the risks of criminalisation, that the setting strives for safe locations without risk of arrest, that the results can be provided as a written print-out and/or as an encrypted message (not just verbally), and that the service does not exclude sellers.

The project further produces research related to instrumentation, drug analysis and reporting from service data.

The public can access over 20 peer reviewed publications arising from this service at https://substance.uvic.ca/#research

Local fixed-site drug checking

CanTEST health and drug checking service (Australia)

Who are they?

CanTEST is Australia's first fixed-site drug checking service. They have been operating since July 2022 and by June 2023 they had tested over 1000 substance samples.(93)

In the first 6 months of the service, 437 drug checking interventions were conducted with 614 drug samples analysed.(19)

Up to 27 October 2023, 1164 people had attended the service and 1597 samples had been tested.(94)

Services offered

- In-person fixed-site drug checking with verbal result delivery
- Testing technologies conducted on-site include Fourier transform infra-red (FTIR) spectroscopy, ultra-performance liquid chromatography-photodiode array (UPLC-PDA), fentanyl test strips (FTS) and LSD and benzodiazepine testing protocols
- Monthly public results reporting
- Individual drug alerts or community notices

How the service works

The service is co-located with an existing health service in Canberra's city centre. It operates for six hours across two days: Thursday 3-6pm and Fridays 6-9pm.

Members of the public can get their drugs tested by taking a small amount to CanTEST for testing which can take up to 20 minutes, after which time they receive a brief harm-reduction intervention with a peer educator and/or health professional. No identification is requested to maintain confidentiality.

Evaluation

An independent evaluation was conducted covering the first 6 months of CanTEST operation.[19] Only half the test results (53%) detected the expected drug, demonstrating the need for this kind of service in the Canberra drugs market.

Service users whose drugs contained additional drugs, a different drug or where the testing was inconclusive were 4 times more likely to report that they would definitely not use that drug, compared with those where the expected drug was detected (32% v 8%). Ten percent of drugs tested resulted in the drug being disposed on-site.

At the time of writing, CanTEST had published eight community notices which detailed substitutions and adulterations of submitted drug samples and 13 monthly results snapshot reports.[95]

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