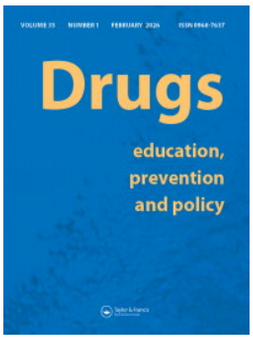

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'I want to know what I'm taking'—long-term evaluation of the drug checking service in Slovenia and its integration into drug policy

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ABSTRACT

Background: This study presents a long-term evaluation of the Slovenian drug checking service (DCS), focusing on service utilization, drug market trends, and its role in reaching hidden populations of people who use drugs (PWUD). In Slovenia, the DCS evolved from nongovernmental organization-led initiatives into a nationally funded and policy-integrated public health measure.

Methods: We analyzed data collected through questionnaires completed by PWUD at the time of sample submission (n = 2,759) and later upon receiving the test results (n = 153).

Results: A key finding is that the service effectively reaches hidden populations, as 82.9% of service users had no prior contact with any drug support services. Analysis of 5,518 samples revealed cocaine and MDMA as the most frequently submitted substances and led to the identification of numerous new psychoactive drugs, resulting in an average of 24 public health warnings per year.

Conclusions: The Slovenian DCS demonstrates its value as a key public health tool for drug market monitoring and harm reduction counseling. The DCS has the potential to contribute to risk reduction by providing PWUD with crucial information. This is supported by findings that nearly a quarter of service users expressed an intention not to use a substance after receiving an unexpected result.

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Long-term evaluation of drug checking; drug policy; harm reduction; PWUD

Introduction

The illicit drug market is diverse and dynamic: NPS continue to emerge, variability in substance purity is common, and potentially harmful adulterants are frequently present. These factors together increase risks for people who use drugs (PWUD), both in nightlife settings and among people who inject drugs, and consequently pose public health risks (Gonzalez-Nieto et al., 2025; Valente et al., 2024). To mitigate harms and risks associated with drug use, the development of drug checking services (DCS) has become a core harm reduction strategy. Contemporary DCS integrate the provision of chemical analysis results, bidirectional information exchange between the service and the user, and tailored interventions with the service user (Barratt & Measham, 2022).

The importance of the service has increased with the wider use of NPS after 2010 (Fornero et al., 2017) and fentanyl (Gonzalez-Nieto et al., 2025; Karamouzian et al., 2018). Information about adulterants and risks associated with the emergence of new substances and methods of use has become increasingly important for reducing risks and protecting the health of people who use drugs (PWUD) at festivals (Valente et al., 2024), those who inject drugs (Karamouzian et al., 2018), and other PWUD. Beyond these groups, community drug checking services (DCS) as a harm reduction measure can extend beyond the individual level of service users or vulnerable groups and have broader significance and impact on the illicit drug market, public health improvement, substance regulation, and policy responses to the emergence of new drugs (Wallace et al., 2020). The reliability of analytical results increases with more advanced and expensive methods, such as gas chromatography-mass spectrometry (GC-MS) or liquid chromatography-high resolution mass spectrometry (LC-HRMS). Through cooperation with the National Laboratory for Health, Environment and Food, these methods are also available in Slovenia, which improves the capacity for monitoring the drug market.

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Critics have argued that DCS may encourage drug use by creating a false sense of security (Scott & Scott, 2020). However, growing evidence indicates that these services effectively engage 'hard-to-reach' populations – people who use drugs (PWUD) in recreational or nightlife settings who rarely access traditional treatment or support services (Hungerbuehler et al., 2011; Masterton et al., 2022). By reaching these individuals, DCS promote informed decision-making and behavioral change, including the disposal of adulterated substances (Measham & Turnbull, 2021; Valente et al., 2023). DCS also play a critical role in the Early Warning System (EWS), which monitors drug markets and alerts authorities and PWUD to dangerous NPS or unusually potent substances (Fornero et al., 2017). The drug checking service in Slovenia is closely linked to the EWS, and anonymous sample collection has been possible since 2006 as part of the EWS (Verdenik et al., 2025). The system connects healthcare institutions, laboratories, police, and non-governmental organizations. Its aim is the rapid detection and notification of PWUD, professionals, and the public about the emergence of NPS and the reduction of health risks for PWUD. If an analyzed sample presents an increased health risk for the wider PWUD population, a warning is sent to the Slovenian EWS. If a psychoactive substance is detected for the first time in Slovenia (code FIC) or in the entire EU (code FIE), the collected information is sent to the European New Drug Database.

Implementation models of DCS vary widely depending on local policy and resources (Park et al., 2023; Rose et al., 2023). DCS is usually implemented within harm reduction programmes, either on-site or in the field, and is intended to address the risks associated with drug use and prevent serious health complications and deaths related to the consumption of unknown psychoactive substances. It has been introduced in several European countries (Brunt, 2017). Drug checking is an integrated service consisting of the chemical analysis of a sample to identify and quantify its content, and the return of these results to the service user (Ventura et al., 2013), thereby reducing exposure to risks from drug use. The service also includes providing harm reduction information and, in some cases, a counseling session that takes place upon sample collection (Trans European Drug Information Network (TEDI), 2022). In Slovenia, the service involves providing harm reduction information at the point of sample collection (e.g., not sharing sniffing utensils, reducing the dose). If very high-risk use is detected and the service user consents, a harm reduction counseling intervention is offered, primarily focused on reducing risks associated with use. Criteria for high-risk drug use include, for example, attending chemsex parties, drug injection by minors, and frequent use of high doses of synthetic cathinones. Participation in the conversation is voluntary, does not affect the information about the result, and is based on the motivational interviewing method.

In Slovenia, drug checking services originated from non-governmental organization initiatives. Initially, qualitative reagent-based testing was offered; later, laboratory testing of particularly hazardous substances was conducted in a forensic laboratory; and, ultimately, DCS became an integrated service, endorsed in national strategic documents and incorporated into the country's drug policy. With support from the Ministry of Health and in partnership with the National Institute of Public Health (NIJZ) and the National Laboratory of Health, Environment and Food (NLZOH), implementation of the integrated DCS began in late 2018 as part of a European Social Fund (ESF) project.

Currently, the Slovenian DCS system operates as a network of nine drug checking points coordinated by the NGO DrogArt in partnership with the national laboratory. Unlike the on-site festival checking (e.g. mobile labs) (Mema et al., 2018), Slovenia's model functions primarily as stationary, community-based services. The network consists of nine collection points: two targeting PWUD in nightlife settings, six operated by low-threshold programmes for high-risk PWUD (or people who inject drugs), and one combined point. In Slovenia, the drug checking service operates so that the service user submits one sample per occasion for anonymous, free-of-charge testing. At sample intake, the user participates in a brief, voluntary counseling conversation about their drug use, receives harm reduction information, and has access to harm reduction materials and supplies (e.g., sterile drug-use equipment, physiological saline, condoms). Results are delivered within four to seven days by telephone, email, or in person. Samples undergo quantitative laboratory analysis (GC-MS/LC-HRMS) at the National Laboratory of Health, Environment and Food (NLZOH), and data on samples and results are compiled in a national database managed by DrogArt.

Through collaboration among various stakeholders, we succeeded in incorporating DCS into the Resolution on the National Programme on Illicit Drugs 2014–2020 (National Institute of Public Health, 2019), its action plan, and later into an integrated service financed by the state. The drug checking service, as an integral and prominent part of the early warning system, is now officially defined in Slovenia in the Resolution on the National Programme on Illicit Drugs for the period 2023–2030 (Vlada Republike Slovenije, 2023), which

was approved by the National Assembly of the Republic of Slovenia. This service is further detailed in an operational action plan approved by the Government of the Republic of Slovenia, which sets out specific guidelines and measures for its implementation. Consequently, the DCS is included among the measures and activities for which the state allocates project-based funding, enabling effective implementation and continued development of the service at the national level.

Although DCS are increasingly becoming an integral component of harm reduction policies in several countries and are recognized as interventions with substantial public health benefits, relatively few systematic and long-term evaluations have been conducted to date (Maghsoudi et al., 2022; Pu et al., 2021). Recent research focused on implementation further emphasizes the need for robust evaluation frameworks to inform service design and ensure sustainability (Airth et al., 2025). With this evaluation, we aim to address this gap by conducting a systematic assessment of Slovenia's DCS over seven years (2018–2024). Specifically, we analyze trends in the unregulated drug market using laboratory data, assess the service's reach among hidden and hard-to-reach populations; and examine its role as a monitoring tool within the national EWS.

Methodology

For the evaluation of the DCS in the period 2018–2024, we used a mixed-methods research approach, combining quantitative and qualitative methods. In the first phase, the evaluation covered the implementation period of the ESF project between 2018 and 2022. After the project's conclusion, we continued data collection with the same methodological design in the years 2023–2025, which allowed us to establish a longer time series and thus conduct a comprehensive long-term evaluation. Before starting the evaluation, our team developed a plan and defined the purpose and objectives of the evaluation (drug market overview, EWS warnings, number of users, analysis of questionnaires on sample submission, and analysis of indirect effects of the DCS), reviewed the available literature at the time, and invited an external evaluator who was not associated with the organization to participate. We used quantitative methodology for collecting and analyzing data on samples and people's satisfaction with the service, and for understanding the influence of the drug checking service on changing consumption behavior[1] (Verdenik et al., 2025). Qualitative methodology was used to understand the significance of DCS from the perspective of professionals at the checking points (NGOs). The part of the evaluation on the impact of DCS on the behavior of PWUD was presented separately (Verdenik et al., 2025), and due to the extensive nature of the evaluation, the qualitative part will also be presented separately[5]. The following will explain the methodology for collecting data on samples and the evaluation of DCS from the service users' perspective.

The data for the long-term evaluation presented in this article were obtained in three ways:

Laboratory analysis of drug samples

From January 2018 to December 2024, the Intake Form and Laboratory Analysis served as the primary data collection tools. Upon sample collection at all nine checking points, the substance purchased as was recorded, and following analysis at the National Laboratory for Health, Environment and Food, the obtained results (actual chemical composition) were entered into a database. This activity resulted in a sample size of 5,518 accepted samples (2,759 visits) used for the descriptive analysis of the drug market, reasons for using the service, and the type of harm reduction information or short counseling sessions received. The intake questionnaire accompanying sample submission consists of 25 items, a unique code assigned upon sample reception, and additional questions completed by staff in the Drug Checking Service (DCS). These questions relate to specific aspects of the consultation process (e.g., key points of harm reduction information or short counseling session). The first section of the questionnaire is designed to collect data on the sample (expected substance, price, purchase location and source, adverse effects associated with use, appearance, form, and prevalence) as well as demographic information about the user. The second section serves as a tool for providing information and counseling, as well as for assessing risks associated with drug use.

Post-service-use surveys

From October 2021 to December 2024, the Post-Service-Use Survey was administered to users when they collected their results to gather feedback. Data were collected from 153 surveyed users exclusively at the DrogArt Association checking point, utilizing various methods for completion, including an online link (Google Forms), phone, or in person. During the data collection period, we invited 1,130 service users to complete the evaluation questionnaire, resulting in a response rate of 13.5%. Participants provided verbal informed consent, and all answers regarding user

experience and immediate impact were stored anonymously under an encrypted code. The questionnaire is currently still active and was generated using Google Forms. It consists of four quantitative questions (substance use based on the result; evaluation of individual components of the testing service; assessment of whether new harm reduction information was received; and the usefulness of the conversation during sample submission) and one open-ended question for suggestions and comments. The questionnaire requires entering the sample code provided upon submission, which enables linking demographic data from the database of all samples mentioned in the previous section.

Follow-up questionnaire on behavioral change

A Follow-Up Questionnaire was used between October 2021 and February 2022 to study the impact of the service on behavioral change. This tool was administered 10 to 14 days after users received their results, capturing data on the sustained effects of the DCS. 32 users responded to this questionnaire, providing data specifically concerning behavioral changes and service reach. The results regarding the impact of DCS on behavioral change were presented separately (Verdenik et al., 2025); here, only the results on the service's reach are shown.

This evaluation is based on data collected for routine service provision and quality improvement. As such, under national guidelines, it did not require formal university ethics committee review. Nevertheless, all procedures adhered to the code of ethics for researchers of the University of Ljubljana. Verbal informed consent was obtained for all data collection outside of standard intake procedures (e.g. follow-up questionnaires), and all data were fully anonymized using an encrypted code to protect confidentiality. To ensure objectivity, an external evaluator was involved in the development of the evaluation plan and reviewed the final analysis. This separation from the service-providing organization (DrogArt Association) helped ensure an independent perspective on the findings. For the first method of data acquisition, we did not obtain informed consent, as this is a standard part of the sample intake procedure in DCS. In the second part, consent was obtained verbally, and no personal data or data linkable to the service user were collected in the database, as everything was managed under the aforementioned random code. This analysis was conducted as part of ongoing service monitoring and improvement rather than a pre-registered evaluation study. However, the findings are structured to provide insights into the service's reach, implementation, and descriptive outcomes.

Results

Number of service users

Between 2018 and 2024, we recorded 2,759 visits to the DCS across all checking points in Slovenia (Table 1). The following section presents the results, specifically demographic data, reasons for using the service, and accompanying information and counseling interventions, as obtained from the intake questionnaire completed upon sample submission. Some service users visited the service multiple times, but due to the anonymity of the service, we do not record the number of unique users. We estimate that the proportion of unique users is equal to 50% of the number of accepted samples.

Demographic data

The largest proportion (56.2%) of service users are young PWUD, aged between 18 and 29 years. The proportion of service users aged 30 to 39 years was 24.7% and has remained stable between 2018 and 2024.Minor users of the service accounted for 4%, but this proportion has declined in recent years. The older population (40–49 years) of PWUD, whose total share is 11.7%, more frequently visits checking points primarily intended for intravenous drug users. This population represents 15.1% of all service users. The youngest service user was 15 years old at the time of the visit, and the oldest was 73.

The proportion of men in the DCS is 81% and women 19%[2]. The proportion of women is decreasing

Table 1. Number of visits and estimated unique DCSusers between 2018 and 2024 at all nine checkpoints in Slovenia.

	Gender	2018	2019	2020	2021	2022	2023	2024	Total	%
Number of visits	M	185	515	402	475	667	600	662	3506	81%
	F	60	144	96	95	152	113	172	832	19%
	Σ	245	659	498	570	819	714	835	4338	100%
Estimate of unique DCS users[a]	M	150	352	283	350	375	341	376	2227	81%
	F	48	99	66	72	85	64	98	532	19%
	Σ	198	451	349	422	460	405	474	2759	100%

[a]The estimate of unique users was made by tracking users' contact information, with their consent, for the purpose of the evaluation questionnaire between October 2021 and February 2022. During this period, we maintained a database of email addresses and were able to estimate the number of unique email addresses relative to the number of samples.

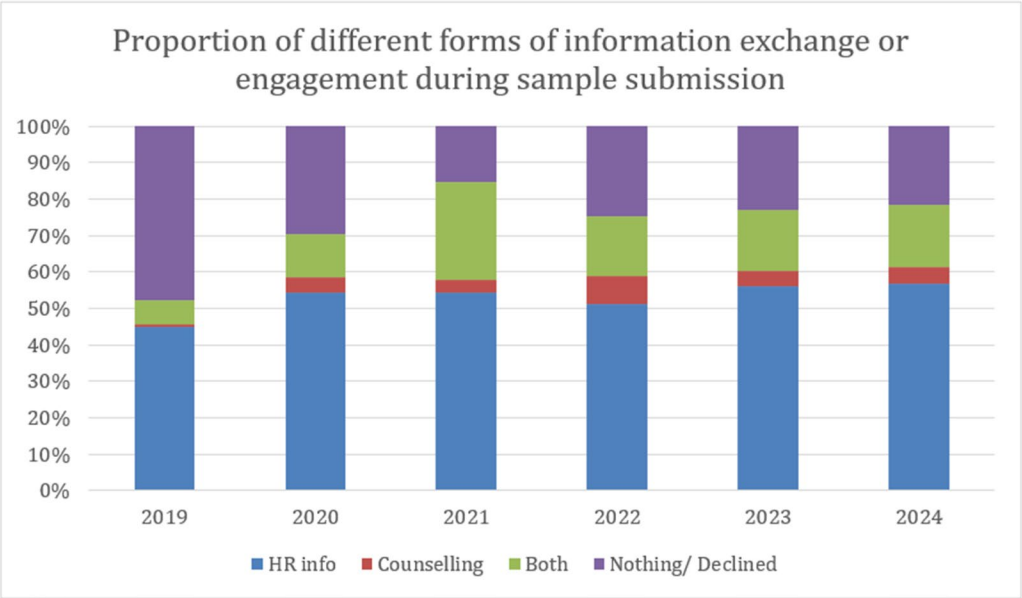

Figure 1. Proportion of different forms of information exchange or engagement during sample submission in the DCS. Some service users received only harm reduction information, others were provided with brief counseling, some received both, while others declined any such interaction. These data were not collected in 2018, and 2019 remains atypical, as systematic recording of this information began only after the sample submission process.

year by year and does not reflect the ratio in the general population in Slovenia, where the proportion of women who use drugs is higher (National Institute of Public Health, State of the Illicit Drug Field 2019).

Employment status has changed over the years in line with the age structure of the service users. Due to the increasing proportion of service users from organizations working with vulnerable groups of people who inject drugs, the proportion of unemployed has increased with age. The smaller number of minors, who usually attend secondary school, is also reflected in the change in employment structure. We collected data on employment or education status only until the end of the project, so we no longer used this question after 2022. The data can still serve as an insight into the status of service users in the DCS service until the end of that year. The largest proportion consists of service users with regular or other forms of employment (39.4%), followed by users with student status (29%), which aligns with the age structure. This is followed by service users who were in secondary education at the time of checking (17.8%), the unemployed (17.8%), and 2 users (0.1%) who were in primary education. A few service users (1.6%) indicated 'other' as their status.

Reasons for using the service

Service users could state more than one reason for using the service. The most frequently cited reasons relate to obtaining verified information about what they are using and reducing the risk of their drug use ('I want to know what I am using' – 85%; 'to get verified information about the substance and harm reduction' – 76%; 'to reduce risk' – 74%). Fifty-six per cent cited their own curiosity as a reason, and 43% use the service to check whether their dealers can be trusted. The least common reasons are related to bad experiences (suspicion of another substance or adulterants – 25%; bad experience in the past – 12%; and unusual effects – 8%). It should be noted that a good half of the samples submitted for laboratory analysis have not been used beforehand. Here too, the data are valid until the end of 2022, as we later combined some answers to simplify the questionnaire. The combined answers from 2023 to 2024 are also similar. The main reason remains obtaining verified information about the substance (76.2%), while the percentage for suspicion of another substance or adulterants (14.2%), 'checking the dealer' (11.3%), and curiosity (8.9%) decreased (n = 1266).

Number of information and counselling sessions

In addition to substance analysis, the DCS also provides a harm reduction intervention upon sample collection. We can inform the service user who brings a sample about harm reduction guidelines related to the substance itself, as well as other topics that are important to them. Among other reasons, service

users mentioned, for example, the intention to receive harm-reduction information specifically related to the substance they submitted for testing. Additional topics included driving under the influence of drugs, appropriate responses in case of complications, preparation for parties, hydration, information on typical adulterants and other substances present on the market, and hearing protection using earplugs, among others. While providing information, we also check for other risk factors in the service user and, if necessary, conduct a more in-depth counseling session. The intervention depends on the service user's readiness for a conversation. We started recording the number of information and counseling sessions conducted upon sample collection in 2019 at the DrogArt Association's checking points in Ljubljana and Maribor. In six years of data recording, we conducted 2,276 information sessions at DrogArt upon sample submission (i.e., in 68.3% of service visits), along with the distribution of various materials for reducing harm from drug use (paraphernalia for use and precise dosing, saline solutions, condoms and lubricants, leaflets). In addition to information sessions, 663 counseling sessions were also conducted (i.e. 19.9% of service visits).

The number of information and counseling sessions is increasing year by year, which is a result of upgrading the work in the checking service and the professionalization of the sample collection team (inclusion of a counselor, regular intervisions, optimization of sample collection).

Reaching the hidden population of PWUD

To determine whether DCS also attracts PWUD who have not previously participated in any support programme for drugs, that is, those belonging to the so-called hidden population of PWUD, we added a question to the sample intake questionnaire in October 2021: 'Have you ever turned to any support programme because of your drug use?' By the end of 2024, at the DrogArt Association checking point we had collected 1,693 responses. Of these, 17.1% reported having participated in a support programme for drug use in the past, while 82.9% answered negatively. In this way, we identified a large number of PWUD who are not covered by existing support programmes for drug use.

Number of PWUD enrolled in the DrogArt counselling center

During counseling sessions, we check for various risk factors with PWUD, such as the frequency and quantity of drug use, living conditions, family relationships, social network relationships, employment capabilities, and educational success. If risky drug use is identified, we present the PWUD with the option of joining the DrogArt counseling center or other support programs and provide additional motivation. At the DrogArt Center for Counseling and Psychotherapy, the PWUD has an introductory counseling session on their first visit, where they state where they learned about the counseling option. Between 2018 and 2024, 13 PWUD were enrolled in the DrogArt counseling center exclusively through the checking service.

Evaluation of the DrogArt DCS by service users

General assessment of the service

We studied the evaluation of the DCS on a smaller sample of service users (n = 153) who answered a questionnaire about their satisfaction with individual parts of the testing service.On a four-point scale from 'very satisfied' to 'very dissatisfied,' they rated: DrogArt's warnings about the dangers of tested substances on social media, the interpretation of the received results, the speed of checking from sample submission to receiving the result, the introductory conversation upon sample collection, and the location of sample collection, and finally gave an overall assessment of the DCS. They were most satisfied with the conversation with the professional worker upon sample submission and the location, and least satisfied with the time from sample submission to receiving the result. The waiting time for results during the evaluation was 4–7 days.

Assessment of the harm reduction intervention at sample collection

Upon sample collection, a conversation about harm reduction strategies is also conducted with the service user, and they are offered materials to limit harm from drug use (paraphernalia for use, saline solutions, condoms, etc.). Almost three-quarters (73.7%) of participants stated that they received new information they did not previously know, or materials for reducing harm from drug use upon sample submission (n = 152[3]). Sixty-eight percent of them rated the conversation with the professional worker upon sample submission as very useful (n = 153).

Reach of information about analysis results and harm reduction information

The harm reduction information and laboratory analysis results that service users receive through the checking service have a potentially useful value for a wider

circle of PWUD than indicated by the number of service users, due to the nature of sharing within a circle of friends and acquaintances. Using a 'follow-up' questionnaire, we obtained 32 responses to the question 'With how many people did you share the test results or risk information you received?', with which we checked the actual reach of the DCS. On average, one service user shares this information with four other people, which means that the actual reach of the information is four times greater than the number of service users who visited the DCS. Between 2018 and 2024, we thus estimate that information aimed at harm reduction through the DCS could have reached over 11,000 different PWUD. This figure is only an approximate estimate, as it is derived from two separate assessments: the unique number of DCS users and the average rating of information sharing, which was obtained from a very small subsample (Figure 1).

A brief overview of the drug market over seven years of the integrated checking service

An important part of DCS is monitoring the drug market within the country and abroad, participating in the monitoring of the EU drug market through aggregated data, and issuing warnings when particularly dangerous or new psychoactive substances appear. One objective of this evaluation was to analyze trends in the unregulated drug market using laboratory data over a six-year period. Therefore, a brief summary of the obtained data is presented below, which is available in an extended form in the unpublished document *Report on analyzed substances and evaluation of the drug checking service* (Verdenik & Kvaternik, 2023), and the data are collected for the needs of the broader EUDA review. Four different analytical techniques[4] were used for the analysis or detection of the substances described below.

The evaluation results clearly show that during the implementation of the integrated DCS within the ESF project from 2018, the number of analyses and service users increased compared to the first evaluation between 2015 and 2017, on the basis of which we developed the new, improved service. Improvements were made regarding greater reach, speed of returning results, and information or brief counseling sessions with service users upon sample collection. Faster analysis results and greater service accessibility are reflected in a larger number of laboratory analyses after 2018, which contributes to better monitoring of the drug market, detection of new and dangerous substances, and a greater number of included service users, and thus to better information and inclusion in support programs. For example, in 2015, we accepted 36 samples, in 2017 141, and in the first year of the new integrated service (2018) 397 samples, and then between 2019 and 2024 an average of more than 850 samples per year.

In the DCS in Slovenia, between 2018 and 2024, we accepted a total of 5,517 different samples for laboratory analysis across nine checking points. During this period, the number of samples received varied significantly across testing points. The highest number was recorded at the DrogArt Ljubljana site (3,467), followed by DrogArt Maribor (1,041), Stigma (540), and Šent (110). At the remaining five sites, fewer than 100 samples were collected per site throughout the entire period. The most frequently submitted samples were cocaine, which accounted for 25.9% of samples, followed by MDMA samples (in the form of ecstasy pills and crystals) at 17.9%, amphetamine at 11.8%, and heroin at 7.6%. Among the most commonly detected adulterants, caffeine was found in amphetamines, reaching up to 80% (with an average of 47%) of the sample, and levamisole was found in cocaine (with an average content of 13.8%).

Although cannabis is the most widespread illicit drug in Slovenia, its share in the accepted samples is only 7.4%. This is followed by samples of LSD (7.2%), ketamine samples (2.9%), and 2C-B samples (2.7%). Different benzodiazepines (the most common of which was Xanax) account for 2.7% of all collected samples. We received 357 samples (6.4%) purchased as NPS for checking. Under 'other,' we classify substances that are illicit drugs, but their numbers are small (methamphetamine, GHB and derivatives, psilocybin, mescaline) and psychoactive substances classified as medicines (modafinil, methylphenidate, oxycodone). In total, there were 4.3% such samples. Between 2020 and 2021, we also accepted 16 samples of various anabolic steroids purchased on the black market, but we stopped accepting them at the beginning of 2021 due to non-compliance with the funded project. In this short time, we observed that the anabolic steroid market carries similar risks for people as the illicit drug market and that there is no organization available to provide them with information on reducing the risks of their use. In 2024, the project 'Upgrade of checking for new psychoactive substances and illicit drugs with the inclusion of substances prohibited in sports and other substances that enhance physical performance and appearance began in Slovenia.

EWS system warnings on the appearance of NPS

Since one of the objectives of the evaluation was to monitor the usefulness of the DCS system in forwarding

alerts to the national EWS, we also examined the number of alerts sent. In 2018, 11 warnings were issued within the DCS, and in 2019, this number rose to 36, with an average of 24 warnings issued per year. Most often, the warnings were related to ecstasy pills with high MDMA content, cocaine samples containing levamisole, fake Xanax pills, the presence of synthetic cannabinoids in cannabis samples, and stronger samples of heroin and amphetamine. The substances we detected for the first time in Slovenia (FIC) through the DCS are as follows: HHC, 5-MeO-DiPT, N-sec-butyl-pentedrone, 4-MMA, 2-MMC, Deschloroketamine (DCK), 1V-LSD, 2C-B-Fly, X-FMA, (4,5 or 6)-APB, Etazene, Clozapine, Diethylpentylone, DOC, 5-MeO-DMT, Adinazolam, 2-Br-4,5-DMPEA, BK-2C-B, Diclazepam. Additionally: Protonitazene (code FIE - first in EU), Etometazene, HHC-O, Metonitazene, N-cyclohexylmethylone, HHCP-O, 1cP-AI-LAD, 3-CMC, delta9-THC-C8.

Discussion

This study presents a long-term evaluation (2018–2024) of the Slovenian Drug Checking Service (DCS), a public health intervention that has developed from NGO-led initiatives into a nationally funded and policy-integrated measure. The evaluation, based on 5,518 sample analyses and data from 2,759 service visits, confirms the value of the DCS for both drug market monitoring and harm reduction. A key finding is the service's relatively high efficacy in reaching the hidden population of PWUD, as 82.9% of users had no prior contact with any drug support services. Furthermore, the service proved useful in monitoring the illicit drug market, detecting numerous NPS, and issuing an average of 24 public health warnings per year. Importantly, the service contributes to risk reduction by influencing user behavior, as nearly a quarter of users reported an intention not to use a substance after receiving an unexpected test result.

The drug checking service allows for the monitoring of the drug market and its characteristics (Brunt, 2017). This provides key information, such as the most common adulterants, the purity of illicit drugs, and the emergence of new psychoactive substances, which are necessary for a rapid response to the risks present on the drug market at any given time (Karamouzian et al., 2018; Valente et al., 2024). This information contributes to the effectiveness of the Slovenian EWS, which can provide timely warnings about current dangers through targeted communication, thus helping to reduce health complications due to drug use. This can, for example, be extremely important in preventing deaths in the event of the emergence of potent synthetic opioids, such as fentanyl, its analogues, and the nitazene group, which are currently causing a large number of premature deaths in some countries worldwide. For instance, synthetic opiates were responsible for more than 100,000 overdose deaths in the USA in 2023 and a current rate of 22 deaths per day in Canada (Gonzalez-Nieto et al., 2025).

In addition to rapid response and informing PWUD about detected dangers, information about the drug market is also important in the wider European context, as it is included in the publications of the EU Drugs Agency (EUDA). The importance of drug checking as a tool for market monitoring is also increasingly recognized by the EUDA, which supports the European network of organizations that conduct checking (TEDI). In this way, a pan-European database of data obtained through drug checking is being established, and standards for drug checking and effective health risk communication in Europe are being developed (European Monitoring Center for Drugs and Drug Addiction, 2023). The obtained data play an important role in acquiring current and credible information for non-governmental organizations working in the drug field, enabling them to inform PWUD more effectively and build trust, which consequently increases the effectiveness of their support programs. The information obtained can also be used for the rapid and effective formulation of responses to the emergence of particularly risky substances, such as synthetic opioids, on the rapidly changing drug market. They also highlight the need for public health interventions that can mitigate the harmful consequences for PWUD (Gonzalez-Nieto et al., 2025). For this purpose, the document

Preparedness and Response Plan for a Public Health Threat due to Synthetic Opioids or Other Psychoactive Substances was adopted in Slovenia (Havaši et al., 2025), the purpose of which is to establish a rapid, effective, and coordinated system for detecting and managing public health threats. The implementation of the plan enables an improved response from all relevant stakeholders to the emergence of synthetic opioids and other NPS. DCS fit into this context and must be adapted to the local environment and the specific needs of heterogeneous groups of PWUD, according to different service models (Carver et al., 2023). Such an approach allows for faster and more effective action and reduces the harmful consequences for PWUD.

For the service to be used by PWUD, it is important to ensure anonymity, easy accessibility, trust in the service providers, credibility and completeness of the results, including qualitative and quantitative analysis, and the shortest possible waiting time from sample

submission to receiving the results. The evaluation of the service showed high user satisfaction, as they were satisfied with all aspects of the service—the initial conversation upon sample submission, the interpretation and speed of the received results, the location and method of sample submission, and the warnings about dangers on the website. Some improvements to the service after 2018, such as additional quantitative analyses and receiving results within a week, attracted a larger number of PWUD in the very first year of analyses at National Laboratory for Health, Environment and Food than in all the years before. The number of analyses increased throughout the years, except during the COVID-19 epidemic, when the decline was minimal despite the complete shutdown of nightlife. It should be emphasized that the number of analyses is not directly proportional to the number of service users, as some restrictions were adopted regarding the number of possible samples submitted per person due to high interest. Since 2022, it has been possible to submit only one sample per person. Despite this and some other limitations, the service has reached an increasing number of service users over the years.

A larger number of service users also means a larger number of conversations conducted about harm reduction strategies and counseling sessions. In 2024, we had a conversation about harm reduction measures with 57% of service users, conducted only a harm reduction counseling session with 4.3%, and both with 17%. Also, more than 95% of service users recognize the conversation with a professional upon sample submission as useful or very useful. This effect of the DCS thus strengthens the knowledge of PWUD about potential risks, which indirectly reduces harm from drug use. The effect is much greater than the number of direct service users would suggest, due to drug use and the sharing of information within a circle of friends who also receive information from the DCS. The actual reach of information received in the service is five times greater than the total number of users of the DCS, as each service user shares the information received with 4 other friends. We estimate that over 11,000 PWUD received information about harm reduction upon sample submission and received results. The findings of the evaluation are linked to the conclusions of the research by Valente et al. (2024), which shows that PWUD in recreational settings can act as multipliers of harm reduction messages provided by harm reduction services.

Young men predominate among service users (81%), which opens up opportunities for further improvements to the service to make it more attractive to women as well. The main target group is young recreational PWUD. Most often, these are students or young employed individuals, who represent about 56% of all service users. This is partly a consequence of the DrogArt organization, which accepts the most samples and works in the field of reducing the harmful consequences of drugs among young people, as PWUD at other points are older. Among the most common reasons for using the service in our evaluation, users cite factors closely related to harm reduction, such as being informed about what they are using, obtaining verified information about the substance and harm reduction strategies, and reducing the risk of drug use. Drug checking, with verified information about what exactly they possess, thus further contributes to PWUD making responsible decisions they could not otherwise make and strengthens awareness of the dangers of the black market.

One of the more important identified effects of the service is the inclusion of the hidden, hard-to-reach drug population in support programs, such as harm reduction organizations. More than 82% of DrogArt DCS users had not been in contact with any social welfare programme in the drug field before checking. It should be added that this involves self-motivation to visit the organization, which increases openness to receiving harm reduction information or counseling. In this way, we can also reach PWUD who have not yet developed visible, more risky drug use, and can address identified problems in a timely manner and redirect them to counseling programs. In seven years, at least thirteen DrogArt users have started the counseling process, to which they were redirected through the DCS. The number may seem small, but it is important for high-risk individuals, as a relatively large number of users received brief counseling sessions upon sample submission. The expansion of existing user groups was noticeable in all organizations or their checking points included in the DCS network. Other organizations also observe cases where users enter counseling programs through the DCS.

The evaluation, in a section published separately (Verdenik et al., 2025), showed that the DCS can positively influence behavioral change among PWUD. Almost a quarter (23%) of service users expressed the intention (positive behavioral intention) not to use the tested substance after receiving the laboratory result. The proportion of such service users increases in line with the risk presented by the sample due to a result inconsistent with the purchase. It is highest for samples where the analysis showed that the sample did not contain the purchased substance but one or more other inactive or psychoactive substances, increasing sharply to 65.5%. The impact of the DCS on behavioral

change can contribute to avoiding the use of substances with a higher health risk[5] and indirectly influence the prevention of health complications and overdoses (Karamouzian et al., 2018; Verdenik et al., 2025). We compared the results, taking into account the limitations, with the findings of other studies (Measham & Turnbull, 2021; Valente et al., 2023) regarding the positive effect of DCS on behavior action outcomes.

The importance of reducing health risks for PWUD, preventing deaths, and including individuals who were not involved in any other service or support program before using DCS, in addition to monitoring the drug market and participating in international monitoring (EWS, EUDA, TEDI), is of great significance for the country's drug policy. In the Slovenian case, cooperation between key actors and the coordination of interests among stakeholders were crucial for the inclusion of the integrated DCS in systemic funding and drug policy. The support of the Ministry of Health and inclusion in the aforementioned Resolution on the National Programme on Illicit Drugs, as well as participation in the ESF project, were of key importance for the development of the service. It was important that the DCS was evaluated in the first period of its implementation, with further adjustments made based on the evaluation, and long-term effects, reach, and changes in the drug market were also monitored. The development of a broader DCS with rapid result acquisition enables more effective market monitoring, and the combination of accessibility and appropriate information transfer reduces potential harm for PWUD. The positive results of the evaluations strengthen the justification and relevance of this public health measure.

The limitations of the evaluation are that between the first and second phase of the evaluation, we slightly changed and simplified the questionnaire, as described in the results. Additionally, due to ensuring anonymity, it was difficult to determine the number of service users, so this estimate is based on indirect data, such as email addresses. Due to limitations, we collected data on the evaluation of checking at only one of the checking points.

Conclusion

The drug checking service has a dual value—for the individual PWUD and for the wider society. It is establishing itself as an important public health measure, as it reduces risks by enabling the rapid identification of substances and by detecting discrepancies between expected and actual composition. The formulation of clear and effective public health messages that guide PWUD toward decisions that contribute to maintaining health is crucial, while also enabling contact with harder-to-reach populations. DCS is not just a checking service but a crucial low-threshold entry point for engaging a hard-to-reach population with the broader health system. In the Slovenian context, in addition to its direct impact on harm reduction, the DCS also has a broader significance in the area of supply reduction, as it contributes to the creation of a safer, more transparent, and more regulated environment on the drug market. In Slovenia, the DCS has evolved from an initiative of non-governmental organizations into a systemic public health measure integrated into the national drug policy. The evaluation has shown that the service can reduce risks for PWUD, enable early identification of dangerous substances, promote positive behavioral changes, and reach hidden populations.

Notes

1. For the analysis, we used a mixed-method approach with a follow-up questionnaire, and data were collected between 2021 and 2022.
2. As part of online interventions (which are part of the DrogArt Association's program, separate from DCS), we examined the dynamics of drug checking. Some female users reported that, typically, when drugs are used in a group of friends, it is men who purchase the drugs and also take care of the checking.
3. The total number of participants who answered the question is presented in brackets.
4. We used Fourier Transform Infrared Spectroscopy (FTIR-ATR), High-Performance Liquid Chromatography with a Diode Array Detector (HPLC-DAD), Gas Chromatography with Mass-Selective Spectrometry (GC-MS), and High-Resolution Liquid Chromatography (LC-HRMS).
5. Highly potent substances (e.g. ecstasy pills with a high dose of MDMA, which can exceed the average dose for a person several times over).

Ethical statement

In accordance with national regulations in Slovenia, formal ethical approval was not required for this type of evaluative study. Nevertheless, the research was conducted in full compliance with the Code of Ethics for Researchers at the University of Ljubljana. Informed consent was obtained from all participants, and all data were processed and stored in accordance with applicable local data protection legislation.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Data availability statement

The data used for this study is not publicly available. For further information on the data and materials used in this study, please contact the corresponding author.

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