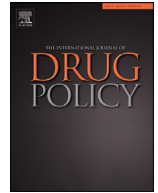




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## International Journal of Drug Policy

journal homepage: [www.elsevier.com/locate/drugpo](http://www.elsevier.com/locate/drugpo)

## Research Paper

## Intentions, actions and outcomes: A follow up survey on harm reduction practices after using an English festival drug checking service

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## ARTICLE INFO

## Keywords:

Drug checking  
Harm reduction  
Brief interventions  
Behavioural outcomes  
Follow-up  
Festivals  
Risk management

## ABSTRACT

**Background:** Drug checking is a health service whose behavioural outcomes have been assessed primarily through reported intentions of service users after receiving healthcare consultations or brief interventions (BIs). This study contributes to the evidence base through utilising a follow-up design to compare outcomes of risk communications on risk management and harm reduction practices both at and after attending drug checking services at three English music festivals in 2017.

**Methods:** Data were collected and analysed from: (i) 1,482 self-complete questionnaires at sample drop-off; (ii) 1,482 nominated primary service users at 1,482 face-to-face BIs; and (iii) an anonymous online self-report follow-up survey completed by a sub-sample of 130 primary service users (one quarter of legible, functioning email addresses received) followed up three months later. Ten measures (one verified action and nine intentions) were recorded at point of BI and compared with retrospectively reported outcomes and ongoing changes post-BI.

**Results:** Outcomes at follow-up were correlated with actions and intentions at BI for nine of the ten measures, including over half of service users disposing of samples identified as other than expected and two in five reporting reduced dosage for samples identified as expected. One in five reported alerting their friends to substances of concern.

**Conclusion:** Event-based drug checking services can access and engage productively with young adults earlier in drug taking careers and not in touch with health services, through tailored polydrug BIs. Rapid identification of substances of concern, dissemination of test results and associated risk communications during and after events through friendship networks, support services and early warning systems suggest that the benefits of drug checking can extend beyond service users and point of BI and can increase strategies and behaviours to reduce drug-related harm such as poisoning and overdose.

## Introduction

Drug checking combines chemical analysis with health consultations, with the primary aim of reducing harmful drug use and primary characteristic of direct engagement with people who use drugs. Drug checking is predicated upon a number of assumptions about drug-related harm. Whilst drug-related deaths (DRDs) are a key harm and their prevention is a primary goal, other drug-specific and drug-related harms arise for individual users and wider society from adulteration, misselling and variations in strength, that are the focus here. For example, overdose can result from 25x-NBOMe missold as LSD (Martins et al., 2017; Measham, 2020); anxiety, paranoia and psychosis from potent cathinones such as N-ethylpentylone missold as MDMA (Measham & Jones, 2017); severe toxicity from high dosage (Black et al., 2020); from

mixing polydrug use and medications with pre-existing health conditions (Liamis, Milionis, & Elisaf, 2008; Wu et al., 2009); and drug-related hyperthermia and hyponatremia (Campbell & Rosner, 2008). All can result in harm ranging from low-level adverse effects such as nausea through to acute and chronic psychological and physiological problems including permanent organ damage. Thus, drug checking aims not simply to reduce DRDs but also wider drug-related harm. Therefore its effectiveness should be measured not only by a reduction in DRDs but by successful risk communications that enhance risk management and increase harm reduction practices. By reducing adverse effects such as accidental poisoning and overdose, it is hoped that accessing emergency services, requiring medical intervention and admission to hospital will all be reduced. However, as with other harm reduction interventions, the aim is not to eliminate harm – so long as drug use remains a possibility, so too does drug-related harm – but to identify substances of

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Available online xxx

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concern in circulation and to increase strategies, behaviours and risk communications that could reduce that harm.

Evidence highlights the value of disseminating test results obtained from both publicly accessible drug checking and also non public drug testing (eg Johnson, Stansfield, & Hassan, 2020), for trend monitoring, public information alerts and early warning systems (eg Brunt & Niesink, 2011; Bücheli, Hungerbühler, & Schaub, 2010), However, a “limited” evidence base on individual behavioural outcomes of drug checking has been noted (EMCDDA, 2017: 139), and there is an absence of randomised controlled trials, longitudinal studies or follow-up studies. Opportunities to compare drug checking outcomes at regional and national level are also limited, with Leece (2017), Measham (2019) and Measham (2020) noting constraints such as legal, political and commercial sensitivities. A further practical obstacle to evaluation of event-based drug checking services is the non-standardised and resource-intensive nature of collecting data from individual event management, support services and other agencies in order to monitor trends in drug-related incidents.

Evaluations of individual behavioural outcomes of drug checking have focused on self-reported intentions of service users, whether linked to future/hypothetical (Benschop, Rabes, & Korf, 2002; Johnston et al., 2006; Michelow & Dowden, 2015; Southey, Kathirgalingam, & Crawford, 2020) or past/actual test results (Kriener & Schmid, 2002; Martins et al., 2017; Saleemi, Pennybaker, Wooldridge, & Johnson, 2017; Schroers, 2002). Leece’s (2017) review estimated that 4–76% of participants intended to discard substances of concern if test results revealed them to be other than expected, depending on which drugs were tested and other criteria. For example, Valente et al.’s (2019) study found a statistically significant association between intentions and test results, immediately before and immediately after receiving a result. A handful of studies recording verified disposals to drug checking services rather than self reported future intentions also have found significant relationships between receiving unexpected test results and subsequent disposals (eg Measham, 2019; Mema et al., 2018). Alongside disposal of unwanted substances, reviews by Kerr and Tupper (2017) and Danish Health Authority and Centre for Alcohol and Drug Research (2019) also note a range of other intentions expressed by drug checking service users that might reduce future drug-related harm, including reduced polydrug use, reduced dosage, and the sharing of alerts, test results and harm reduction advice between friends.

In the alcohol field, a follow-up study design has been utilised to compare brief intervention (BI) intentions with outcomes. For example, Daepfen, Bertholet, Gmel, and Gaume’s (2007) evaluation of the impact of BIs with hazardous drinkers found that those who expressed a stronger intention at BI to change their alcohol consumption were significantly more likely to have reduced their alcohol consumption in the subsequent 12 months. Across a range of settings, BIs in the alcohol field have demonstrated their value in reducing negative outcomes (Doumas, McKinley, & Book, 2009; Jackson, Johnson, & Campbell, 2009; Kaner et al., 2009; Moyer, Finney, Swearingen, & Vergun, 2002; O’Donnell et al., 2014), including in prisons (Newbury-Birch et al., 2018) and emergency rooms (Schmidt et al., 2016), as well as reaching people who otherwise might not seek formal help (Rumpf, Hapke, & John, 1998). BIs in the drugs field have also been shown to have value in primary care settings (Bernstein et al., 2009); with polysubstance users (Gmel, Gaume, Bertholet, Flückiger, & Daepfen, 2013; McCambridge & Strang, 2004); and in preventing increased drug use amongst lower risk drug users (Bertholet et al., 2020). Evidence on effectiveness of drug-related BIs in recreational settings is more limited, however, with a review of polydrug BIs in recreational settings by Akbar et al. (2011) noting a lack of uniformity in service design, evaluations and outcomes and a lack of consideration of grey literature.

The added value of a follow-up design for drug checking evaluations is that it can firstly, assess impact of the service from retrospectively reported responses to BIs by service users; secondly, identify any ongoing change in the time period between BI and follow-up; and thirdly,

compare outcomes at BI with recollected outcomes reported retrospectively for purposes of internal validity. However, despite future intentions being the main measure of behavioural change in drug checking evaluations, there are no known published surveys to date of service users followed up in the weeks after using a drug checking service to compare intentions with outcomes, at individual or population level. This study seeks to address the intention-behaviour gap in existing drug checking evaluations (Maghsoudi et al., 2021).

### *The festival context*

Music festivals are increasingly popular leisure events in the UK, with 975 music festivals attended by an estimated 5.2 million people in 2019 (Statistica, 2020) and a music and cultural festival sector valued at £1.1 billion before COVID-19 (Eventbrite, 2019). Larger music festivals tend to be headliner-driven, multi genre or genre-distinct events attracting 100,000s of young adults from across the UK and overseas. Smaller festivals are less commercial, have multi arts foci, family-oriented entertainments, local community engagement and a broader demographic reach. Almost all provide onsite support services such as medical, welfare and security as a condition of their license.

Research indicates that festival-goers have a higher prevalence of drug use than the general population (Hesse & Tutenges, 2012; Lim, Hellard, Hocking, Spelman, & Aitken, 2010; Martinus, McAlaney, McLaughlin, & Smith, 2010; McCormack, Measham, & Wignall, 2021), with music festivals acting as sites for “atypical intoxication” (Turner & Measham, 2019), psychedelic experimentation (Ruane, 2018), and normalised illicit drug use (Fox et al., 2017). The annual English Festival Survey conducted from 2010 onwards found in its 2018 tranche that over half of its 2250 respondents reported having taken and/or intending to take illicit drugs that day and over half of those took larger quantities of drugs than they otherwise would outside of a festival environment (Turner & Measham, 2019).

## Methods

### *Aims*

This paper presents first findings from drug checking services delivered at English music festivals in 2017, focusing here on the follow-up component of the study. Data are presented for ten measures recorded at point of BI and compared with recollected outcomes in relation to the same ten measures in a follow-up survey of the same service users three months later, to explore whether the service and its risk communications could enhance individual risk management and increase harm reduction practices. Nine of the ten measures reported here were intentions and one was an action, the disposal of further substances of concern directly with the NGO for independent verification, collection and destruction by police. Six of the measures were broadly positive (verified destruction, self disposal, taking a smaller dose, alerting friends, taking over an extended time period, and greater caution mixing drugs); two were broadly negative (taking a larger dose, and obtaining more on-site); and two were broadly neutral or potentially positive or negative dependent on context (taking the previously intended dose, and returning the substance to their supplier). Measures were compiled from open ended responses to drug checking in the previous year’s first festival pilot (Measham, 2019).

The study had four aims:

1. To assess whether drug checking reached its target audience of young adult drug users otherwise not in touch with health or substance misuse services (SMS);
2. To assess ten key measures (one action and nine intentions) recorded at a festival drug checking service with BI;
3. To compare the same ten measures at BI with outcomes recalled by a follow-up sub-sample surveyed three months later (at group not individual level);

- To identify any self-reported ongoing behavioural change in the subsequent three months.

#### Overview of the 2017 festival drug checking service

The 2017 drug checking service operated by members of the public voluntarily and anonymously submitting one dose of a substance of concern for laboratory analysis to a non-profit non-government organisation (NGO). Three contrasting festivals were chosen: two were electronic music-oriented with a predominantly young adult customer base and the third targeted a family-oriented demographic with a broader range of mainstream festival acts and entertainments. All three were outdoor camping festivals of four or more days in length in rural locations across England.

For each submitted sample, service users completed a questionnaire about their expectations and previous experiences of the substance in advance of the test and these were recorded in the NGO database. Submitted substances were transported to non-publicly accessible field laboratories by police-approved personnel. Teams of up to 30 chemists prepared and analysed samples over the course of an hour, using a suite of chemical techniques and instruments for qualitative and quantitative analysis including fourier transform infrared spectroscopy, ultraviolet spectroscopy, colorimetric reagents, mass loss analysis and fentanyl strips. An integrated multiple technology model allows drug checking services to establish best practice in rapid and accurate identification of the contents and strength of submitted substances within time, space and field constraints (Wallace et al., 2021). In the UK festival context, this integrated multiple technology model facilitated triangulation and identification of up to several hundred submitted substances each day, focused on the primary purpose of informing risk communications delivered through tailored BIs.

The drug checking service employed a multi-faceted harm reduction logic model (Rossi, Lipsey, & Freeman, 2004). Firstly, test results were disseminated directly to service users to increase their knowledge of substances they (and/or their friends) had taken or planned to take, resulting, it was hoped, in increased risk awareness around consumption. All service users were given an opportunity to dispose of further substances of concern with the testing service for onward safe police destruction (as recommended by Valente et al., 2019), for example when unwanted or potentially harmful substances were identified.

Secondly, pre-test information on service user expectations and experiences, along with the drug checking results, were entered into an electronic database by chemists that was accessed in 'real time' by the NGO chemistry and healthcare teams split across the festival site. These test results were then embedded within structured polydrug BIs delivered by multidisciplinary teams of up to 30 qualified health professionals – trained in harm reduction risk communications and experienced in delivery of clinical results and BIs – composed of medical doctors, nurses, pharmacists, psychiatrists, social workers and substance misuse practitioners. The 2017 BI format covered an intoxication screening; legal disclaimer; informed consent; historical and current use of medicines and illicit drugs; substance origin and expected contents; test result, dosage and effects; post-test intentions; the opportunity to dispose of further substances of concern, ask questions and be signposted or referred to SMS and other support services; and further information such as regarding polydrug use, alcohol and hydration. Harm reduction advice was tailored to the individual test result, service user(s) and local drug market. Whilst the testing service was framed as free, confidential and non-judgemental with drug use neither encouraged nor discouraged, BIs emphasised the potential risks involved in all drug use, and staff training and service delivery were mindful to policy and legislative constraints.

Thirdly, the multi-agency emphasis involved testing substances of concern and sharing test results with stakeholders daily (Fisher & Measham, 2018). Such partnerships with medical, welfare and other emergency and support services facilitate prompt presentation, rapid diagnosis and effective response to emergent conditions onsite and off-

site as well as trend monitoring. Data on content and strength of submitted substances of concern were also passed to offsite stakeholders and to local, national and international early warning systems (eg EMCDDA, 2012, 2019; Measham, 2020) and other international drug checking NGOs. A number of media and social media alerts were issued in partnership with stakeholders, following pre-agreed protocols and in line with good practice (Sumnall & Atkinson, 2021).

#### Data collection

Three electronic data collection sources were utilised: two onsite, and one online three to four months after the festival finished (see Table 1 and Chart 1). Firstly, a self complete questionnaire was utilised at sample submission. The questionnaire asked the service user what the submitted substance of concern was sold or acquired as; what the service user thought it contained; if they or anyone they knew had consumed the substance; and if yes, if they had a bad experience with it. This information directed chemists to potential adulteration before starting their suite of chemical analyses.

Secondly, face-to-face tailored BIs were delivered directly to 3498 festival-goers in 1482 friendship groups, along with their individual test result. Data on service user responses were collected and electronically recorded by health staff during BIs from 1482 primary service users, one person nominated by each of the 1482 friendship groups receiving the BI together. Data on outcomes were recorded at the end of the BI.

Thirdly, over two in five BI primary service users (44.3%, n=657) consented to participate in an anonymous online follow-up survey and provided their email addresses after BI and before leaving the service, written on paper and deposited in a box by the entrance. Eight in ten (n=526) of the submitted email addresses were legible and functioning three months later and were sent links to an online survey. One in four of those who consented to follow-up and provided legible email addresses (n=130) fully completed the online follow-up survey at three to four months after their BI. Electronic datasets collected onsite and online were cleaned, conditioned and analysed by the authors using Python, Excel and SPSS statistical software. Ethical approval was obtained from Durham University and stakeholder approval for the drug checking service was obtained from the relevant local authorities, police, public health and festival management. In order to prioritise trust and engagement with a novel drug checking service in only the second year of its delivery in the UK, both the BI and follow-up survey were anonymous and therefore data were not individually matched.

## Results

#### Sample demographics

2017 festival BI primary service users were 64% male, 86.4% identified as white and had a mean age of 23.5 years old. Follow-up subsample respondents were 60% male, 90% identified as white and had a mean age of 23.4 years old. There were no statistically significant differences between the gender and age of BI and follow-up service users (see Table 2). Ethnicity was statistically different between BI and follow-up, suggesting that non-White respondents were slightly less likely to complete the follow-up survey.

#### Contact with healthcare services before and after the BI

Just 3.6% of all 2017 festival BI primary service users reported having spoken with a health professional about their alcohol or other drug use previously. Over one in twenty (6.3%) requested signposting and onwards referrals to local healthcare and SMS after the festival finished.

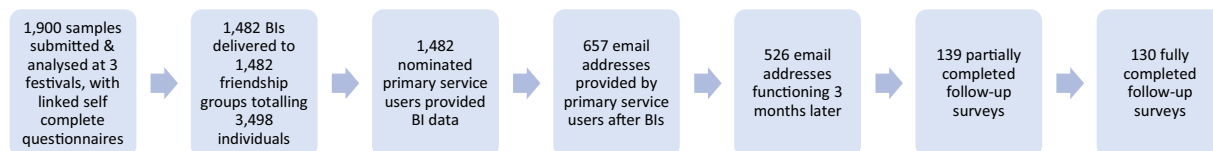
#### Festival drug checking test results

For the 1482 tested samples with linked BIs, 77.3% (n=1146) of samples were identified as the expected substance, that is, it was the drug

**Table 1**

Overview of 2017 datasets: festival BI sample and post-festival follow-up online survey sub-sample by 3 festivals.

	Festival 1	Festival 2	Festival 3	All Festivals
Capacity	60,000	25,000	25,000	110,000
Festival substances tested	1135	688	77	1900
Brief Interventions	863	553	66	1482
Service users per BI (mean)				2.36
BI service users who consented to follow-up & provided email (n)	282 (235 valid)	253 (197 valid)	122 (94 valid)	657 (526 functioning & valid 3 months later) (44.3% of primary service user popn. 0.6% of total festival popn).
Follow-up survey respondents (n)	74 (26.2% of email list)	60 (23.7% of email list)	4 (3.3% of email list)	130 (8 people attended 2 festivals) (19.8% of original email list 24.7% of those with functioning email addresses)

**Chart 1.** 2017 Festival drug checking: flow chart of follow-up study inclusion.**Table 2**

Population demographic comparisons for festival BI sample and follow-up online survey sub-sample.

	Festival BI primary service users	Follow-up online survey sub-sample
Population details	Festival BI service users who received test & BI, nominated to be primary service user & providing BI data	Festival BI primary service users who consented to follow-up, submitted email & fully completed online survey
Total	1482	130
Mean age	23.5	23.4
Median age	21	20
s.d.	6.7	7.6
Gender (% male)	63.9%	60.0%
Ethnicity	86.4% White, 3% mixed race, 2.4% Asian, 2.2% Black	90.0% White, 7.7% mixed race, 0.8% Asian, 0% Black

- Age at BI and follow-up not different – tested with two sample Kolmogorov–Smirnov test  $p=0.6344$
- Gender at BI and follow-up not different – tested with  $\chi^2$   $p=0.2483$
- Ethnicity at BI and follow-up different – tested with  $\chi^2$   $p=0.0455$

that they thought they had been sold or given (see Tables 3 and 4). Another 10.7% ( $n=159$ ) of samples were substances other than what they thought they had been sold or given, and 11.9% ( $n=177$ ) had no expectation of sample contents, for example if found on the ground or gifted to them without information on contents. Missold substances included cutting agents such as benzocaine missold as cocaine, New Psychoactive Substances such as N-ethylpentylone missold as MDMA, and non-psychoactive substances such as brown sugar missold as MDMA and salt missold as ketamine. The identification of N-ethylpentylone, a long-lasting cathinone, being missold as MDMA triggered alerts onsite and via social media at two of the three festivals, resulting in festival-goers handing in additional substances for police destruction that had been bought onsite (Measham & Jones, 2017).

#### Sub-sample test results

Over four in five follow-up respondents (84.6%,  $n=110$ ) recollected that their submitted sample was identified as the expected substance, that is, it was the drug that they thought they had been sold or given (see Tables 3–5). For those samples whose contents were as expected, nearly two thirds (63.6%,  $n=70$ ) were the expected strength as well, whereas for three in ten (30%,  $n=33$ ) their sample was a higher strength than expected and for one in fifteen (6.4%,  $n=7$ ), their sample was lower strength. This suggests that by providing information on a submitted sample's strength as well as contents, drug checking services create an additional opportunity to provide individually tailored advice on dosage – which was unexpectedly high for nearly half of follow-up respondents

– as well as addressing potential misunderstandings about dosage in general and their substance of concern in particular. Of the one in six follow-up respondents (15.4%,  $n=20$ ) whose submitted sample was other than expected, three quarters reported that it was a different drug and a quarter reported that it contained a non-psychoactive adulterant.

Service user responses to BI were compared with outcomes recalled retrospectively over three months later, for ten key measures summarised below.

#### Destruction

One in five festival BI primary service users whose submitted sample was identified as other than expected handed over further substances of concern for independent verification, collection and onward destruction by police and one in five at follow-up recollected having handed over further substances for destruction at BI (20.8% and 21.1% respectively). Additionally, a small number of service users at BI and follow-up (2.0% and 3.7% respectively) whose submitted sample was as expected disposed of further substances for destruction, for example, if having had a bad experience with that substance. Nearly one third (31.7%) of festival BI service users reported already having had a bad experience with that substance, along with seven already having received onsite medical or welfare assistance at that festival, and two having been taken to hospital from that festival and returned. This suggests that motivation for using a drug checking service can include seeking out a learning opportunity, such as obtaining more information about a previous negative drug taking episode and associated ill health.

**Table 3**

Comparison of festival BI actions and intentions with follow-up sub-sample recollected outcomes for submitted substances whose contents were identified as expected or other than expected (six mutually exclusive responses).

Outcomes	Contents as expected		Other than expected	
	A) Festival BI	B) Follow-up	C) Festival BI	D) Follow-up
Verified destruction	23 (2.0%)	4 (3.7%)	33 (20.8%)	4 (21.1%)
Self Disposal	30 (2.6%)	1 (0.9%)	47 (29.6%)	6 (31.6%)
Took smaller dose	439 (38.3%)	45 (41.7%)	32 (20.1%)	6 (31.6%)
Took intended dose	494 (43.1%)	46 (42.6%)	24 (15.1%)	0 (0.0%)
Took larger dose	29 (2.5%)	7 (6.5%)	1 (0.6%)	0 (0.0%)
Returned to supplier	10 (0.9%)	0 (0%)	15 (9.4%)	3 (15.8%)
Other	121 (10.6%)	5 (4.6%)	7 (4.4%)	0 (0.0%)
Total	n=1146 (77.3%)	n=108 (83.1%)	n=159 (10.7%)	n=19 (14.6%)

'Contents as expected' refers here to when the content or identity of the substance is identified as what the service user thought they had bought or been given and does not refer to strength. Festival BI data excludes n=177 respondents with missing data for this variable eg. if found on ground.

Festival BI and follow-up datasets both have a further n=3 respondents excluded because missing data on outcomes.

'Other' – other than consumed eg none left, gave away etc.

Tests for statistical association using chi squared:

Columns A x C – BI contents as expected v other than expected have statistically significantly different outcomes – tested with  $\chi^2$  p-value <0.001;

Columns B x D – follow-up contents as expected v other than expected have statistically significantly different outcomes – tested with  $\chi^2$  p-value <0.001;

Columns A x B – contents as expected for BI v follow-up do not have statistically significant different outcomes – tested with  $\chi^2$  p=0.1170;

Columns C x D – contents other than expected for BI v follow-up do not have statistically significant different outcomes – tested with  $\chi^2$  p=0.4851.

**Table 4**

Comparison of festival BI intentions with follow-up sub-sample recollected outcomes for submitted substances whose contents were identified as expected or other than expected (four non mutually exclusive responses).

Outcomes	Contents as expected		Other than expected	
	A) Festival BI	B) Follow-up	C) Festival BI	D) Follow-up
More careful mixing	447 (39.0%) *	32 (29.4%)	28 (17.6%) *	1 (5.3%)
Alerted friends	281 (24.5%) *** ****	15 (13.8%) ** ****	42 (26.4%) *** ****	10 (52.6%) *** ****
Took over extended period	278 (24.3%) *	30 (27.5%)	17 (10.7%) *	2 (10.5%)
Obtained more onsite	29 (2.5%)	3 (2.8%)	3 (1.9%)	2 (10.5%)
Total	n=1146 (77.3%)	n=108 (83.1%)	n=159 (10.7%)	n=19 (14.6%)

'Contents as expected' refers here to when the content or identity of the substance is identified as what the service user thought they had bought or been given and does not refer to strength. Festival BI data excludes n=177 respondents with missing data for this variable eg. if found on ground.

Festival BI and follow-up datasets both have a further n=3 respondents excluded because missing data on outcomes.

'Other' – multiple responses other than consumption eg none left, gave away etc.

Tests for statistical association using chi squared:

\* Columns A x C – BI contents as expected v other than expected have statistically significantly different outcomes – tested with  $\chi^2$  p-value <0.001;

\*\* Columns B x D – follow-up contents as expected v other than expected have statistically significantly different outcomes – tested with  $\chi^2$  p-value <0.001;

\*\*\* Columns A x B – contents as expected for BI v follow-up have statistically significant different outcomes – tested with  $\chi^2$  p-value <=0.05;

\*\*\*\* Columns C x D – contents other than expected for BI v follow-up have statistically significant different outcomes – tested with  $\chi^2$  p-value <=0.05.

### Self Disposal

Intention to dispose of further substances of concern is distinguished here from disposal to the drug checking service for onward destruction because it was unverified. Three in ten service users at BI and follow-up (29.6% and 31.6% respectively) whose sample was identified as other than expected, reported intending to, and recollected having disposed of further substances of concern after their BI.

When combining the destruction and self disposal measures, in total over half of service users at BI and follow-up (50.3% and 52.6% respec-

tively) whose sample was identified as other than expected, reported either handing over further substances of concern in their possession for onward destruction (for example, if their stock was on their person at the BI) or expressed an intention to dispose of further substances in their possession themselves later (for example, if their stock was stored in their tent).

### Smaller doses

Healthcare consultations contextualised the strength of submitted substances in an individually tailored discussion about dosage and dif-

**Table 5**

Self reported test results comparing contents, strength and subsequent dosage, for follow-up online survey sub-sample (percentages by expected/unexpected contents).

	Contents as expected			Contents other than expected		
	Strength as expected	Stronger	Weaker	Different drug	Unexpected adulterant	Total
Not Taken	4 (5.7%)	4 (12.5%) 10 (9.3%)	2 (33.3%)	10 (71.4%)	3 (60.0%) 13 (68.4%)	23 (18.1%)
Took less	26 (37.1%)	19 (59.4%) 45 (41.2%)	0 (0%)	4 (28.6%)	2 (40.0%) 6 (31.6%)	51 (40.2%)
Took same	37 (52.9%)	7 (21.9%) 46 (42.6%)	2 (33.3%)	0 (0%)	0 (0%) 0 (0%)	46 (36.2%)
Took more	3 (4.3%)	2 (6.3%) 7 (6.5%)	2 (33.3%)	0 (0%)	0 (0%) 0 (0%)	7 (5.5%)
Total	70 (100%)	32 (33*) (100%) 108 (110*)	6 (7*) (100%)	14 (15*) (100%)	5 (100%) 19 (20*)	127 (130*) (100%)

Fisher's Exact Test (contents as expected / not as expected and dose taken) = 33.926,  $p < 0.001$

\* 3 missing responses for subsequent dose - excluded from crosstab analysis

ferential risk around issues such as body mass index, gender, tolerance, and mixing with other legal or illicit drugs. Two in five service users at BI and follow-up (38.3% and 41.7% respectively) whose sample was identified as expected, reported intending to, and recollected having taken, a smaller dose of further substances after receiving their BI than they had planned before using the service. This was usually in cases where the strength of their sample and/or accompanying advice on purity trends and dosage suggested a higher strength than they had expected and/or a greater appreciation of the risk from their usual dose of that substance than they had previously understood to be the case.

For follow-up respondents whose test identified the expected substance but at a higher strength than anticipated, 59.4% ( $n=19$ ) took a lower dose and 12.5% ( $n=4$ ) did not take any more of the substance.

#### Same sized dose

Over two in five service users at BI and follow-up (43.1% and 42.6% respectively) whose sample was identified as expected reported intending to, and recollected having taken, the same sized dose of the submitted substance in future as they had intended to do before receiving the BI. This was often in cases where the test result, strength and/or accompanying advice on purity trends and dosage were as expected.

#### Larger doses

A small number of service users at BI and follow-up (2.5% and 6.5% respectively) whose sample was identified as expected reported intending to, and recollected having taken a larger dose of the submitted substance than they intended to before using the drug checking service. This included respondents whose sample strength and/or accompanying advice on purity trends and dosage suggested a lower strength than they had expected and/or a greater appreciation of common dosage for that substance than they had previously understood to be the case, and also those taking a larger dose spread over a longer time period.

#### Returned to supplier

About one in ten service users at BI and one in six at follow-up (9.4% and 15.8% respectively) whose sample was identified as other than expected reported intending to, and recollected having returned the substance of concern to the person who supplied it.

#### Mixing drugs

Health staff discussed additional risks from polydrug use, both generally and in relation to the submitted substance, with particular synergies of concern highlighted including regarding legal and illicit drugs, and over-the-counter and prescription medications. Two in five service users at BI whose sample was identified as expected reported intending to be

more careful about combining the submitted substance with others and three in ten at follow-up recollected having done so (39% and 29.4% respectively).

#### Alerting friends immediately after BI

One quarter of service users at BI reported intending to alert their friends and acquaintances to their test result and one fifth at follow-up recollected having done so (24.8% and 19.5% respectively).

#### Extended time frames

Just under one quarter of service users at BI whose sample was identified as expected reported intending to take future substances over a longer time period than they had previously intended to do before receiving the BI and over one quarter at follow-up recollected having done so (24.3% and 27.5% respectively). Another one in ten service users at BI and follow-up (10.7% and 10.5% respectively) whose sample was identified as other than expected reported intending to, then recollected having taken further substances over a longer time period. This extended time frame could potentially reduce the risk of overdose or other harms, particularly if taken after the festival and re-establishing usual patterns of eating and sleeping.

#### Obtained more onsite

The study also assessed potential unintended consequences including incentivisation of drug supply and use. One in 40 service users at BI and follow-up (2.5% and 2.8% respectively) whose sample was identified as expected reported intending to obtain more of the substance onsite after receiving their test result and recollected having done so.

#### Comparison of BI and follow-up measures

Four statistical tests of association were conducted with six mutually exclusive measures (1–6 above, Table 3) and four non mutually exclusive measures (7–10 above, Table 4), at BI and follow-up. Results showed that:

- (i) Eight of the ten measures at BI were significantly associated with whether the submitted sample was identified as expected or not;
- (ii) Seven of the ten measures at follow-up were significantly associated with whether the submitted sample was identified as expected or not;
- (iii) There were no statistically significant differences between festival BI and follow-up outcomes for service users whose samples were identified as expected, for nine of the ten key measures (the exception being alerting friends);

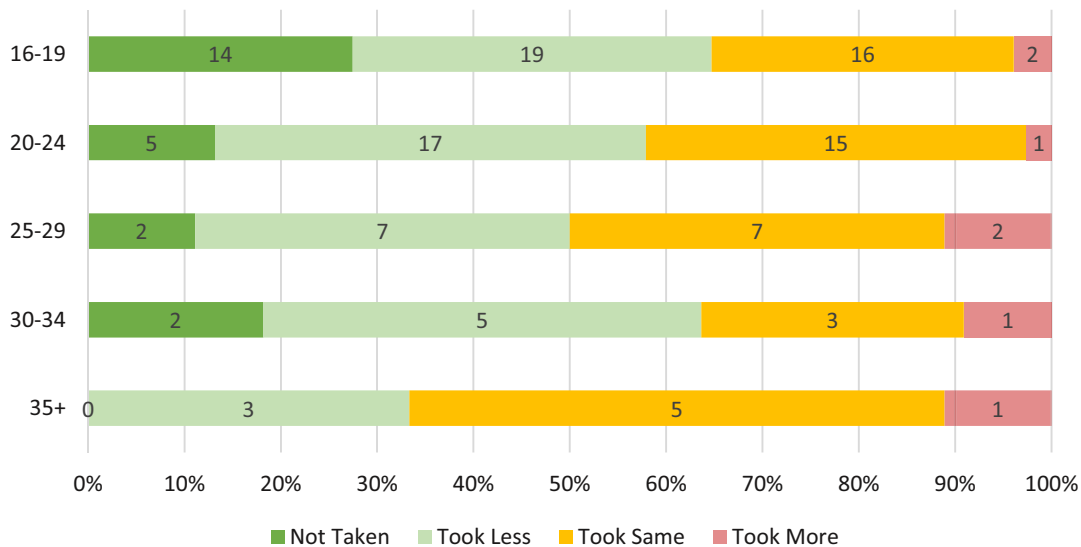


Chart 2. 2017 Online follow-up survey of drug checking service users: self-reported changes to dosage after brief intervention by age.

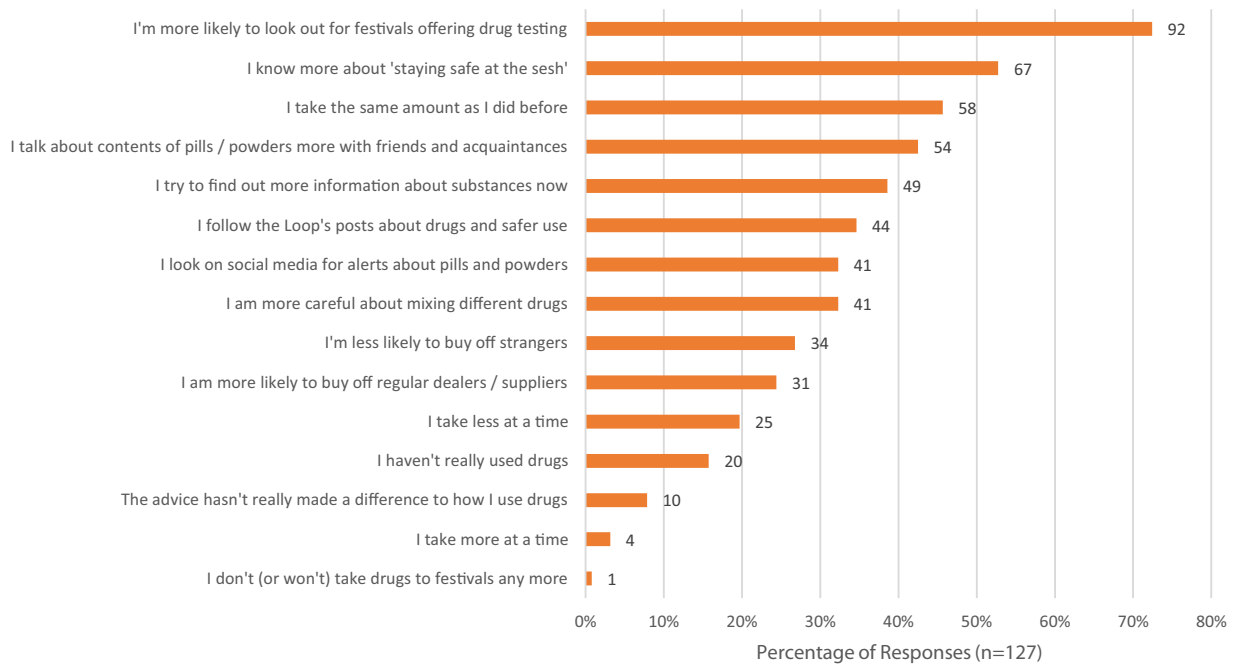


Chart 3. Self-reported ongoing change at 3+ months after brief intervention.

(iv) There were no statistically significant differences between festival BI and follow-up outcomes for service users whose samples were identified as other than expected, for nine of the ten key measures (the exception being alerting friends).

Alerting friends was the only one of ten measures for which outcomes were not correlated with the contents of the submitted sample, suggesting that communications to friends happen regardless of whether contents were expected or not, and that drug checking may provide additional benefits in terms of the reach of harm reduction messaging beyond those service users directly receiving a BI.

Age

Analysing responses by age, service users under 20 years old at BI and follow-up were more likely than over 20s to have been mis-sold their submitted substance, disposed of further substances with the drug

checking service, and taken smaller doses after BI (see Chart 2). This raises the possibility that drug checking may have a disproportionately greater impact on younger and potentially less experienced drug users, earlier in drug taking careers, less likely to be in touch with healthcare or SMS about alcohol or other drug use, and also potentially with lower tolerance and/or greater vulnerability to drug-related harms. This supports BI studies that have identified positive outcomes from BIs with young drug users not previously in touch with SMS (Bernstein et al., 2009) and the continuation of impact several months after BI (Bertholet et al., 2020).

Ongoing behavioural change

Nearly two thirds (63.8%, n=83) of follow-up respondents reported ongoing changes to their drug-related behaviours in the three months afterwards that they attributed to their BI. Care is required in considera-

tion of such findings, however, because festival drug use may not be representative of consumption patterns outside of festival settings and any changes cannot necessarily be causally attributed to the BI. Indeed, in response to questions about specific elements of post-festival behaviour change, one in six follow-up respondents (15.7%,  $n=20$ ) reported not taking drugs in the three months since the festival (see [Chart 3](#)). Nevertheless, only ten follow-up respondents (7.9%) reported that the drug checking service had no subsequent impact on their drug-related behaviours. Nearly one third (32.3%,  $n=41$ ) reported continuing to be more cautious about polydrug use, over a quarter continued to be less likely to buy drugs off strangers (26.8%,  $n=34$ ) and one fifth (19.7%,  $n=25$ ) continued to take smaller doses. Continued lowered dosage is a particularly valuable outcome in the UK context of record high DRDs ([ONS, 2020](#)) and their association with record high strength cocaine and MDMA pills. Ongoing increased caution towards polydrug use is also of value for this demographic, given that DRDs can occur when two contraindicated drugs are consumed in relatively small but fatal amounts in festival settings (eg. [Guardian, 2014](#)).

There was also ongoing additional engagement in conversations about drugs and drug safety three months after BI. Over two in five follow-up respondents (42.5%,  $n=54$ ) continued to talk more with friends and acquaintances about drug contents, nearly two in five (38.6%, 49) continued trying to find out more information about drugs, and over a third (34.6%,  $n=44$ ) reported continuing to follow the NGO's social media alerts and associated harm reduction advice.

In terms of service user feedback, over nine in ten (92.3%,  $n=120$ ) follow-up respondents strongly agreed with the statement that they would use the NGO's drug checking service again and the same number strongly agreed that they would be happy to recommend the NGO's drug checking service to a friend. Nearly three quarters were more likely to look out for festivals offering drug checking in future.

## Discussion

UK festivals provide a unique opportunity to engage large numbers of young adult drug users not previously in touch with healthcare or SMS at point of consumption and to create new routes into services. Rapid testing of substances of concern in circulation in local drug markets provides 'real time' information to inform polydrug BIs, risk communications, alerts and trend monitoring.

This study compares data collected at point of BI with the first known drug checking follow-up survey. The study found no statistically significant differences between nine measures recorded at BI and recollected over three months later, suggesting that intentions may predict outcomes for this service user group (although this may depend on the relationships established at BI).

Outcomes were predominantly positive. Over half of service users at BI and follow-up destroyed or disposed of further substances of concern if other than expected, illustrating how drug checking potentially could reduce the risk of poisoning from harmful substances. This finding supports other drug checking evaluations on disposals ([Benschop et al., 2002](#); [Martins et al., 2017](#); [Michelow & Dowden, 2015](#); [Valente et al., 2019](#)), endorses the provision of safe disposal facilities within drug checking services and the additional opportunity for independent verification of disposals. Large proportions of service users at BI and follow-up also reported reducing dosage and extending consumption periods, illustrating how drug checking potentially could reduce the risk of overdose.

Dissemination of test results and associated harm reduction advice at and after events through friendship groups, stakeholder networks, and media and social media, highlight the potential value of drug checking beyond service user groups, as well as the role of peers and social media in risk communications (DHA/CRF, 2019; [Kerr & Tupper, 2017](#); [Sumnall & Atkinson, 2021](#); [Valente et al., 2019](#)). One in ten service users also reported informing their supplier of substances of concern, support-

ing [Betsos et al.'s \(2021\)](#) suggestion that drug checking can create new opportunities for accountability feedback loops along supply chains.

Whilst relatively small, the follow-up study demonstrates the potential value and methodological feasibility of post-BI surveys in examining proximal and distal outcomes that otherwise would not be identified by evaluation at point of BI. Ongoing harm reduction practices that were attributed to the BI included caution about polydrug use, reduced dosage, and increased information-seeking and communications about drugs. This is particularly important given the low proportion of service users (3.6%) who had spoken previously with health professionals about their alcohol and other drug use. This suggests that drug checking, when integrated with effective BIs, potentially could provide opportunities to reduce drug-related harm in both the short and longer term.

Future research should consider how follow-up studies can further build the evidence base in this field, to assess immediate and ongoing behavioural change after engaging with a drug checking service and to address the intention-behaviour gap. Further consideration could also be given to demographic differences in using drug checking services and subsequent evidence of risk reduction for event-based and community-based services.

## Limitations

This study has a number of limitations related to the nature of field conditions when delivering event-based drug checking services. The collection of high quality research data around the sensitive topics of drug use and supply remains challenging, particularly when undertaken in the dynamic context and physical conditions of outdoor music festivals.

One in four of those who consented to follow-up and gave legible email addresses fully completed the follow-up survey, with higher attrition amongst minority ethnic service users. This was the second year of drug checking in the UK and the first year the service was advertised beforehand and available to such numbers, so this was the first direct experience of a drug checking service for the overwhelming majority. It is anticipated that follow-up response rates will improve with greater familiarity with, direct experience of, and trust in drug checking and follow-up studies in future, enabling increased statistical confidence in follow-up data.

Social desirability or selection biases are also concerns, with follow-up respondents potentially disproportionately positive about drug checking or more confident discussing their drug use. This was partly addressed by an anonymous online survey. Also, there were no statistically significant differences between BI and follow-up service users regarding age, gender, test results or nine of the ten behavioural measures. Furthermore, given that there was no statistically significant difference between independently verified destruction and follow-up respondents' recall of handing over substances for destruction, this study found no evidence to suggest that follow-up respondents disproportionately recalled positive outcomes. Indeed, responses to the two negative outcomes were slightly higher at follow-up than BI.

Due to the desire to ensure anonymity, no identifying information was collected to link individual service users, BIs, or follow-up surveys, and thus data at BI and follow-up were compared at population rather than individual level. Drug checking centres on users trusting the service enough to submit substances of concern, the majority of which are later confirmed to be controlled drugs, leading to a risk of incrimination in a criminal offence. Consequently, building trust in the process is a priority for drug checking services ([Sumnall & Atkinson, 2021](#)). Future studies could consider case matching individuals between BI and follow-up, subject to not compromising that trust.

## Ethical approval

All procedures were performed in compliance with relevant laws and institutional guidelines and with full support of police and other stake-



holders. Informed consent was obtained from all participants and ethical approval was obtained from Durham University, UK.

## Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Declaration of Competing Interest

Fiona Measham is unpaid director of The Loop, a non profit non government organisation that delivered the drug checking service: [www.wearetheloop.org](http://www.wearetheloop.org)

Gavin Turnbull declares no competing interest.

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