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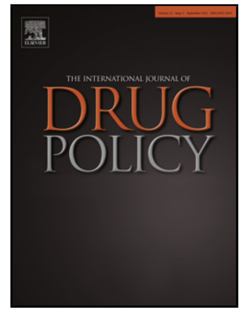

Title: Results of an international drug testing service for cryptomarket users

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Highlights

Highlights are mandatory for this journal. They consist of a short collection of bullet points that convey the core findings of the article and should be submitted in a separate editable file in the online submission system.

Please use 'Highlights' in the file name and include 3 to 5 bullet points (maximum 85 characters, including spaces, per bullet point).

- Analyses of drugs from cryptomarkets and conventional markets are compared
- Samples include cocaine, LSD, MDMA, amphetamine, ketamine and cannabis resin
- Cryptomarket-sourced drugs were less likely to be adulterated
- The main compound detected was more likely to be higher in purity
- Findings support theoretical predictions and perceptions of cryptomarket users

Results of an international drug testing service for cryptomarket users

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Note: A preliminary analysis of a subset of the cryptomarket content and purity data was published in the EMCDDA publication ‘EMCDDA Insights publication: Internet and Drug Markets’, 2016.

Abstract:

INTRODUCTION: User surveys indicate that expectations of higher drug purity are a key reason for cryptomarket use. In 2014–2015, Spain's NGO Energy Control conducted a 1-year pilot project to provide a testing service to cryptomarket drug users using the Transnational European Drug Information (TEDI) guidelines. In this paper, we present content and purity data from the trial.

METHODS: 219 samples were analyzed by gas chromatography associated with mass spectrometry (GC/MS). Users were asked to report what substance they allegedly purchased.

RESULTS: 40 different advertised substances were reported, although 77.6% were common recreational drugs (cocaine, MDMA, amphetamines, LSD, ketamine, cannabis). In 200 samples (91.3%), the main result of analysis matched the advertised substance. Where the advertised compound was detected, purity levels (m±SD) were: cocaine 71.6±19.4%; MDMA (crystal) 88.3±1.4%; MDMA (pills) 133.3±38.4mg; Amphetamine (speed) 51.3±33.9%; LSD 123.6±40.5µg; Cannabis resin THC: 16.5±7.5% CBD: 3.4±1.5%; Ketamine 71.3±38.4%. 39.8% of cocaine samples contained the adulterant levamisole (11.6±8%). No adulterants were found in MDMA and LSD samples.

DISCUSSION: The largest collection of test results from drug samples delivered from cryptomarkets are reported in this study. Most substances contained the advertised ingredient and most samples were of high purity. The representativeness of these results is unknown.

Keywords (3-6)

cryptomarkets; drug markets; purity; adulterants; drug checking; drug trend monitoring

Type: Short report.

Abstract word limit of 200 = 200 words

Body of report word limit of 2000 = 1970

Table limit of 1 = 1

INTRODUCTION

Studies on cryptomarkets have focused on economic and criminological aspects (Aldridge & Décary-Hétu, 2014; Christin, 2013) and user characteristics and motivations (Barratt, Ferris, & Winstock, 2014; van Hout & Bingham, 2013). Higher purity of substances and lower rates of adulteration, compared with 'street' markets, are reported as key reasons for their use. Most cryptomarket users who completed the Global Drug Survey in 2013 reported "better quality" of substances as a main reason for using cryptomarkets (Barratt, et al., 2014), and "concern for street drug quality" and "higher purity" have also been frequently reported in discussion threads in these marketplaces (van Hout & Bingham, 2013). Indeed, many vendors advertise that their products are "lab tested" and claim to have no adulterants or very high quality. It has also been argued that consumer feedback mechanisms available through cryptomarkets would result in access to higher quality drugs (Aldridge & Décary-Hétu, 2014; Christin, 2013; Martin, 2014).

Since 1999, Spain's non-government organization Energy Control has offered its drug checking service as part of an integrated harm reduction service for recreational drug users. This service analyzes samples from Spanish illegal drug markets which are submitted by users at clubs, venues, rave parties or to Energy Control headquarters. In March 2014, Energy Control launched an International Drug Testing Service (IDTS) advertised only to cryptomarket users. IDTS objectives, procedures, methods and techniques follow the TEDI (Transnational European Drug Information) guidelines and methodology (TEDI, 2012). Preliminary results from the first 8 months of this service have been reported by Caudevilla (2016). In this paper we present data about purity and adulteration of samples submitted to IDTS in 1-year activity, from March 2014 to March 2015. We also expand the discussion to further situate the findings and the limitations of this unique data source.

METHODS

The target population were drug consumers who submitted drugs sourced through cryptomarkets. Information about IDTS was offered in 2 cryptomarket forums that were operating during the data collection period (Silk Road 2.0 and Evolution Marketplace). The post linked to the IDTS Energy Control web page (http://energycontrol.org/noticias/528-international.html) where detailed information about the IDTS was offered. After submitting samples for analysis, users received a detailed report with drug test results and specific and individualized information oriented to risk reduction. The cost of the service was 50 Euro payable in Bitcoin or through PayPal. These funds were used to cover the costs of providing the service. In order to maintain confidentiality we asked for no personal or socio-demographic data, but stamps and postmarks were used to collect information about the country of origin of the user (note that country of origin of the service user does not necessarily match the country of origin of the sample). Users were asked to report the type of substance they believed they were submitting for analysis.

In the text, the term "purity" refers to the proportion of the active principle present in a sample compared to those of synthesis impurities, residual solvents or diluents. "Adulteration" refers to the addition of a component not ordinarily part of that substance. The identification of the specimens was performed through a combination of different validated analysis techniques. In order to detect the substances, determine purity and check for potentially toxic adulterants, a chromatographic technique was used: gas chromatography associated to mass spectrometry (Giné, Espinosa, & Vilamala, 2014). The purity of LSD was ascertained using liquid chromatography associated to mass spectrometry (Johansen & Jensen, 2005). Both techniques were performed at the Municipal Institute for Medical Research in Barcelona (IMIM – Hospital del Mar).

RESULTS

From March 2014 to March 2015 a total of 219 samples were analysed. The number of samples analysed increased over time: March-June 2014 (n=23), July-September 2014 (n=50), October-December 2014 (n=57), January-March 2015 (n=89). Samples were submitted from Europe (n=92, 42.0%), Australia (n=57, 26.0%), United States (n=46, 21.0%), China (n=11, 5.0%), Canada (n=7, 3.2%) and Argentina (n=6, 2.7%).

In 200 of 219 samples (91.3%) the main result of analysis coincided with the information provided by the user. In the remaining 19 samples, analytical results revealed: (a) another drug than advertised (n=9), (b) a mixture of unexpected substances (n=7), or (c) the composition could not be determined with the analytical techniques performed (n=3).

Table 1 shows test results from most frequently analyzed substances. In 141 of 219 IDTS samples (64.4%) the expected substance was detected without any adulterants. No adulterants were detected in any substance submitted as MDMA, LSD or cannabis. In cocaine samples, levamisole was the most frequently detected adulterant, present in 42.6% (42 of 103) cocaine samples (concentration: 11.7 ± 8.0%; range: 2–43%). Other relevant detected adulterants in cocaine samples were phenacetine 6.8% (7 of 103) (concentration: 28.7 ± 22.4%; range: 4–54%), caffeine 5.8% (6 of 103) (concentration: 7.1 ± 5.7%; r: 0.3–13%), benzocaine 2.9% (3 of 103) (concentration: 25.3 ± 23.2%; range: 4–50%) and lidocaine 2.9% (3 of 103) (concentration: 14.7 ± 8.0%; range: 7–23%). Caffeine was found in 40.0% (4 of 10) of amphetamine (speed) samples (concentration: 26.0 ± 30.8%; range: 9–72%).

[Insert Table 1 about here]

DISCUSSION

Cryptomarkets offer a wide variety of products, have system of feedback and rating and are partially controlled by administrators. These characteristics could influence the quality and purity of drugs offered as suggested by predictions of criminologists and economists studying the mechanisms of cryptomarkets (Aldridge & Décary-Hétu, 2014; Christin, 2013; Martin, 2014) and the perceptions of cryptomarket users (Barratt, et al., 2014; van Hout & Bingham, 2013).

Some of our data are consistent with current reports and are a reflection of the global market. For example, results for MDMA, with high purities in crystalized form and very elevated dosages of MDMA in tablet form as reported here, have been recently reported by other harm reduction groups offering drug checking services as well (Brunt et al., 2016). Also, frequencies of levamisole contamination in our sample are congruent with this widespread problem reported in the rest of the global drug market (Chang, Osterloh, & Thomas, 2010).

Given broader evidence of the adulteration of conventional drugs with New Psychoactive Substances (NPS), the low frequency of NPS in our cryptomarket samples is noteworthy. Energy Control has previously identified 24 different NPS in 173 samples that were sold as MDMA, amphetamines, ketamine or cocaine between 2009-2012 from conventional markets (Giné et al., 2014). During 2013 and 2014, blotters containing 25x-NBOMe or hallucinogenic phenethylamines (DOB, DOC, DOI) in samples sold as LSD have been reported, sometimes associated with severe toxicity (Caldicott, Bright, & Barratt, 2013), but in our data we did not detect NBOMes in *any* of the samples suspected to be LSD. In our data, the vast majority of the samples were common recreational or prescription drugs. NPS are widely offered in cryptomarkets but demand appears limited (Barratt et al., 2014; Caudevilla, 2014). It is possible that users of NPS choose to buy them elsewhere, as their availability from easily accessible websites is high. An alternate explanation could be that, within the free market conditions provided by cryptomarkets, users prefer ‘classical’ drugs rather than substitutes.

Although it would be inaccurate to formally compare our results with other data sources because we lack data about sample country of origin (see limitations section below), the purity of our sample of cryptomarket-sourced substances appears relatively high in comparison to other published research. In 2014, Energy Control (2015) analyzed 2938 samples collected from the illegal Spanish drug market using the same techniques described in this article. In 589 alleged cocaine samples, 14% contained only cocaine, and the purity of samples containing cocaine was 48%. In 627 alleged crystal MDMA samples, 84% of samples contained only MDMA, and the purity detected was 74%. In 359 alleged MDMA pills, 69% of samples contained only MDMA, and the MDMA concentration per pill was 114mg. Another European data source used police seizure data to estimate the purity of cocaine (interquartile range 33–50%), amphetamine (IQR 9–19%), and MDMA pills (IQR 77–98 mg) (EMCDDA, 2015). Taking just the example of cocaine for which we have the greatest number of samples (n=103), the purity of cryptomarket cocaine samples (71.6%) appears relatively high compared with the Spanish illicit drug market (48%) and the broader European seizures (interquartile range 33–50%). Cryptomarket cocaine samples also appear to be less likely to be adulterated (51.5% only contained cocaine) compared with samples from the Spanish illicit drug markets (14% only contained cocaine). Access to a matched comparison group is needed to reliably test for differences in adulteration and purity levels.

This study has a number of limitations which should be considered when interpreting our results. While the invitation for cryptomarket users to access the service was only actively promoted by Energy Control within cryptomarket forums, a Google search of the URL found that it was posted to other drug websites, including illicit drug discussion groups, steroid discussion groups, and other social discussion sites, therefore we cannot guarantee that all of the drugs tested through this service were bought through cryptomarkets. It is not possible for us to ascertain the country of origin of the drugs submitted for testing, although this limitation is also present when analyzing samples from conventional markets. It was also not possible for us to compare the cryptomarket results with fully comparable data from conventional drug markets, due to lack of information about country of origin. Additionally, our sample is not necessarily a representative sample of cryptomarket drugs more broadly, and that for all drugs except cocaine, our estimates rely on a small number of samples, which may limit their reliability. To address these limitations, our service will add additional items for service users to complete asking them whether their sample was sourced through cryptomarkets and the suspected country of origin of the sample.

It is also possible that some of the samples have been submitted to analysis by dealers to use test reports as a proof for their "good quality products". This was a major concern for us as our service is conceived as a harm reduction tool for drug consumers and not a "quality control guarantee" for vendors. As part of our work in this project we conducted weekly monitoring of markets and forums during the study (Silk Road 2.0 and Evolution Marketplace) and we did not detect any vendor using our information in this sense. We have been aware in three occasions that some users have started up crowdfunding initiatives to submit samples and publish results (for example see: http://avengerfxkkmt2a6.onion/). In these cases we have asked that the following notice be posted—"the test result is only valid for the submitted sample and it is not a guarantee of vendor or market"—and this has occurred in all cases.

On the whole, the main substances analyzed by IDTS are the same as the ones used in recreational settings: MDMA, amphetamines and cocaine. Each of these substances varies greatly with regard to their levels of purity and their adulterant percentages. For users, this means not only dealing with the risks of the substance but also dealing effectively with the risks associated with its adulterants. Some of the analyzed substances (penthobarbital, acetylfentanil, butyrfentanil and scopolamine) and some of the adulterants detected (levamisole and phenacetin) pose a greater overdose risk than better-known substances and expose users to other potentially life-threatening situations (McIntyre et al., 2015). Our data suggest that the hypothesis of higher purities of substances in cryptomarkets is plausible but future papers utilizing a larger sample size and comparisons with other sources of information are needed to confirm this. In this complex environment of unregulated supply, the only way to learn about the actual composition of these substances is to have them properly tested by a drug testing service. Furthermore, the introduction of a drug testing service within cryptomarkets is a powerful tool that engages drug users and promotes healthier practices.

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Table 1: Advertised substance and purities in samples from International Drug Testing Service (March 2014 – March 2015)

Advertised substance [a]	n	Substance detected			Purity of advertised substance [b]	
		Only the advertised substance	Advertised substance combined with other substances	Does not contain the advertised substance	Mean ± SD	Range
Cocaine	103	51.5% (53/103)	46.6% (48/103)	1.9% (2/103)	71.6 ± 19.4%	5-99%
LSD	15	100.0% (15/15)	0	0	123.6 ± 40.5µg	53-195µg
MDMA crystal	13	100.0% (13/13)	0	0	88.3 ± 1.4%	76-99%
MDMA pills	11	100.0% (11/11)	0	0	133.3 ± 38.4mg	83-188mg
Amphetamine	10	40.0% (4/10)	60.0% (6/10)	0	51.3 ± 33.9%	10-98%
Ketamine	6	50.0% (3/6)	33.3% (2/6)	16.7% (1/6)	71.3 ± 38.4%	27-95%
Cannabis resin	5	100.0% (5/5)	0	0	THC: 16.5 ± 7.5% CBD: 3.4 ± 1.5%	THC: 9.1-16.4% CBD: 1.6-5.3%

[a]Only advertised substances with 5 or more samples are shown. Other advertised substances analyzed were 5F-PB-22, mephedrone, MDA (n=4), methamphetamine, alprazolam (n=3), clonazepam, ephedrine, midazolam, modafinil, mescaline, DMT, 2C-B, 2C-E, butyrfentanil, DOB, DOET, DOM, DON, DXM, ethylphenidate, flubromazepam, kratom, methylone, penthedrone, penthobarbital, nimetazepam, 2-MeO-diphenidine, 3-fluorophemetrazine, acetyl fentanyl, alfa-PVP, benzocaine, scopolamine, AKB-48, XLR-11 (n=1).

[b] Purities have been calculated using any sample containing advertised substances (both alone and in combination).

Conflicts of interest

The authors state that there are no conflicts to report.