Purity, adulteration and price of drugs bought online versus offline in the Netherlands

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Abstract (300 words)

Background and aims: Online drug markets flourish and consumers have high expectations of online quality and drug value. The aim of this study was to i) describe online drug purchases, and ii) compare online with offline purchased drugs regarding purity, adulteration and price.

Design: Comparison of lab analyses of 32,663 drug consumer samples (stimulants and hallucinogens) purchased between January 2013 and January 2016, of which 928 were bought online.

Setting: The Netherlands.

Measurements: Primary outcome measures were i) the percentage of samples purchased online, and ii) the chemical purity of powders (or dosage per tablet); adulteration; and the price per gram, blotter or tablet of drugs bought online compared with drugs bought offline.

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Findings: The proportion of drug samples purchased online increased from 1.4% in 2013 to 4.1% in 2015. The frequency varied widely, from a maximum of 6 % for controlled, traditional substances (ecstasy tablets, MDMA powder, amphetamine powder, cocaine powder, 2C-B and LSD) to over a third for new psychoactive substances (NPS) (4-FA, 5/6-APB and MXE).

There were no large differences in drug purity, yet small but statistically significant differences were found for 4-FA (online 59% versus offline 52% purity for 4-FA on average, p=.001), MDMA powders (45% versus 61% purity for MDMA, p=.02), and ecstasy tablets (131 mg versus 121 mg MDMA/tablet dosage, p=.05). The proportion of adulterated samples purchased online and offline did not differ, except for 4-FA, being less adulterated online (X^2=8.3; p= <0.001). Drug prices were mostly higher online, ranging for various drugs from 10% to 23% higher than that of drugs purchased offline (6/10 substances: p= <.05).

Conclusions: Dutch drug users increasingly purchase drugs online: new psychoactive substances in particular. Purity and adulteration do not vary considerably between drugs purchased online and offline for most substances, while online prices are mostly higher than offline prices.

Keywords: drug markets, darknet, cryptomarkets, webshops, purity, adulteration, price, dosage, quality.

Introduction

Within the past decade, the marketing, sale and sourcing of (illicit) drugs via the Internet has grown rapidly [1-7]. The perception of better product quality is a main trigger for customers to purchase substances online [3-5;7-9;13-16], yet there is little evidence to support this assumption. This undue trust in online markets is potentially harmful because customers are often unaware of the presence of unexpected or unknown substances or harmful adulterants in drug products obtained online [17], which may increase the risk of adverse drug events.

Furthermore, the perception of lower prices may also attract customers to online markets [5;14]. However, studies of online drug pricing are scarce and contradicting. In fact, online prices were found to be higher for certain drugs [3], to vary with drug quality [18], to be unstable over time [6;10] and to vary geographically [5]. Another study mentioned the relatively low prices of online drugs, but proposes that this may be explained by bulk offers intended for further trade and resale and are thus incomparable with customer level street prices [19]. However, the perception of good value and of better product quality may direct consumers to Google-indexed web shops, and cryptomarkets or 'darknet markets', which are only accessible by using encryption software [14]. Customers reported that they purchased drugs online (particularly on cryptomarkets) for anonymity, convenience, customer service, the abundance of suppliers and the larger diversity of products offered compared with those available at local drug markets and dealers [4-5;7;11;13;17;20]. The growth of online drug purchases may also stem from another feature that online drug markets share with regular websites: customer reviews. Cryptomarkets in particular use mandatory feedback systems for 'quality control'[10], where shoppers comment on e.g. the reliability and security of the supply, financial value and importantly, perceived chemical purity [20]. However, such reports on perceived purity may be biased (e.g., artificial reviews from vendors or customers), or, in fact, may refer to a completely different substance or batch as stocks

change constantly. As customers do not have access to information on the actual content of the substances they intend to use, which would allow them to adapt their intake to its dosing, they have to rely on such subjective customer reviews. While research on this topic is still in its infancy, the 2015 Global Drug Survey (GDS) suggested that the perceived purity was higher for drugs purchased from cryptomarkets than when sourced via other routes. Only 27% of an international sample of darknet purchasers reported low purity versus 74% of those who purchased drugs from other sources. Similarly, 11% of online purchasers reported having received a product that did not contain the advertised substance compared with 41% of those who purchased drugs from other sources [9]. However, studies on the quality of online drug markets rely upon consumer-perceived quality instead of objective chemical laboratory analyses that would provide accurate information on drug purity and the presence of adulterants. It is thus unknown whether the GDS results suggesting that drugs on the cryptomarkets are in fact of better quality, are justified, or whether this merely reflects the reputation of the anonymous, global online drug market in contrast to local and face-to-face drug markets. One study offering chemical analyses of drug samples and harm reduction information to cryptomarket customers indeed suggested high substance purity, although a direct comparison with offline markets was not available [15;17].

In the Netherlands, the Drugs Information and Monitoring System (DIMS) has monitored the composition of consumer-derived drug samples available on the Dutch market for over two decades [21-23]. This study aims to i) describe online drug purchases, and ii) compare the lab analysed quality (chemical purity and presence of other psychoactive substances) and price between online and offline sourced drugs.

Methods

Design

This study includes data on consumer drug samples collected by DIMS from January 1st, 2013 to January 1st, 2016. The samples were lab-analysed for their contents, using gas chromatography coupled to mass spectrometry (GC-MS) and liquid chromatography with diode array detection (LC-DAD). For a detailed description of the testing procedure and laboratory techniques used, see Brunt et al., 2016 [26].

DIMS monitors the Dutch drugs market at consumer level: consumers are able to anonymously submit drug samples at testing offices typically embedded in regional institutes of prevention and addiction care throughout the country. Main reasons for testing drugs are "health concern" and "curiosity" [23-24]. Users of these facilities showed a relatively high education or paid employment and were mostly of Dutch ethnicity [24-25].

Drug sample information, such as price, region of purchase and name under which the drug was sold to the consumer, are recorded at the testing offices. Although the online purchasing source is not a mandatory reporting category, drug testing personnel were asked to register this information as a string variable under 'particularities'. Prior to 2013, the number of online bought samples submitted at DIMS was limited and not commonly registered. Online purchases were identified by searching this string for Internet-related words (e.g., Silk Road, Internet, online, or specific web addresses or names of known webshops; see online attachment). All samples identified as having been purchased online were manually reviewed to exclude misclassified samples (e.g., "consumer read on the Internet that…"). In addition, a random sample of 10% of all drug samples identified as having been purchased offline were manually reviewed to identify additional online-related words. Adding these words, the search query and manual check was repeated twice. The non-online group was labelled

offline for brevity, but it should be noted that this category also includes samples with no information on purchase location, and thus, these drugs could have been obtained online. Using the online-related key words, the online source was further specified as purchased in a Google-indexed webshop, a cryptomarket, or unspecified (see online attachment).

The category 'no advertised drug' could, in principle, contain other psychoactive substances as well as no psychoactive substances. However, samples submitted at DIMS rarely contain no psychoactive substances at all. Therefore, the category 'no advertised drug' generally does contain other psychoactive substances.

Mean prices are described as price per tablet (pill) or blotter (for LSD) or per gram (for powders). These are calculated, based on self-reported information by DIMS-customers upon submitting the sample. When prices for amounts other than per tablet, blotter or gram were reported, the prices were adjusted accordingly.

Statistical analyses

Trends in online purchasing were assessed as the monthly proportion of online purchased drug samples of the total and the proportion of online purchases was reported per substance (chemical class). Further analyses were restricted to substances for which a minimum of 15 online samples were available. For each of those drugs, the type of online source was specified. The mean chemical purity of powders (or dosage per ecstasy tablet) were compared between online and offline purchases with unpaired 2-sided t-tests. Then, the omnibus chi^2 test was used to compare the proportion of online versus offline consumer drug samples that were unadulterated (only containing the advertised substance) versus adulterated ('not containing the advertised substance', or 'containing the advertised substance and other psychoactive substances'). The other psychoactive substances that were chemically assessed included 3,4-methylenedioxy-amphetamine (MDA), 3,4-methylenedioxy-methamphetamine (MDMA), 3,4-methylenedioxy-N-ethylamphetamine (MDEA), amphetamine,

methamphetamine, meta-chlorophenylpiperazine (mCPP), phenacetin, cocaine, 2,5-dimethoxy-4-bromophenethylamine (2C-B), levamisole, gamma-hydroxybutyric acid (GHB), gamma-butyrolacton (GBL), lysergic acid diethylamide (LSD), 4-methylamphetamine, 4-fluoroamphetamine (4-FA/4-FMP), lidocaine, procaine, noscapine, 5-(2-aminopropyl)benzofuran/ 6-(2-aminopropyl)benzofuran (5/6-APB), methoxetamine, and other pharmacologically active compounds, such as medicines or illicit drugs from the NIST library [27]. Cafeine was not considered an adulteration. Then, the psychoactive substances most frequently detected were described for the adulterated samples. Finally, like purity, online and offline prices were compared with unpaired 2-sided t-tests, using the natural logarithm as price data was not normally distributed. The chemical analysis data and prices were analysed using SPSS version 22.

Analysis of tablets

The tablet dosages are expressed in mg/tablet rather than percentages of pure substance, as is the case for powders. Therefore, tablet quality and price were reported separately and excluded from the figures and tables for all substances except ecstasy tablets, which comprised the majority of tablet samples. It should be noted that ecstasy tablets are not always lab-tested. If they were recognized, according to DIMS protocol, the mean value of at least two matching tablets chemically analysed in the past three months was used for recognized tablets (at face-value, based on logo, shape, colour, diameter, thickness, physical profiles, grooves, and Marquis reagent test results) [22].

Results

Online purchasing

A total of 32,663 drug samples were submitted to DIMS between January 2013 and January 2016, 928 of which were identified as having been sourced online. The proportion of samples registered as having been sourced online increased from 1.4% in 2013 to 4.1% in 2015 (Figure 1) and varied largely among substances. Less than 6% of controlled drugs (ecstasy 1%, MDMA powder 2%, amphetamine 1%, cocaine 1%, LSD 5%, and 2C-B 6%) to over half of non-controlled drugs (4-fluoroamphetamine (4-FA) 32%; 5/6-APB 48%) or recently controlled drugs (methoxetamine (MXE) 54%), were purchased online. The following substances were excluded from further analyses because less than 15 online samples were available: heroin (N=88 offline / 0 online), GHB/GBL (N=176 offline / N=1 online), ketamine (N=842 offline / N=11 online), mephedrone (N=71 offline / N=5 online), and 'other substances' including NBOMe's, 3-MMC, methylone, and 2C-E/I/P (in total N=543 offline / N=99 online).

In total, 15% (N=136) of the online samples were purchased from cryptomarkets, 26% (N=245) from Google-indexed webshops, and the majority (59%; N=547) from unknown online sources (e.g., registration only mentioned as 'online' or 'Internet'). Despite this large proportion of drug samples from unspecified online sources, Figure 2 clearly shows that controlled traditional substances were rarely purchased from Google-indexed webshops, whereas non-controlled or recently controlled NPS were rarely purchased from cryptomarkets.

< Figure 1 and 2 about here >

Purity, adulteration and price

There were no large differences in average chemical purity between drugs purchased online and offline, yet small but statistically significant differences did exist. The mean purity of 4-FA was higher in online samples compared with offline samples (see Table 1), whereas in contrast, MDMA powders were of lower purity online than offline. For MDMA powders, the interquartile range (IQR) varied largely, with 50 % of the samples between 0 and 79 mg MDMA.

Comparing the proportions of adulterated samples between the online and offline samples only revealed a small but statistically significant difference for 4-FA powder, which contained a higher purity in the samples purchased online (see Figure 3).

Figure 3 shows that cocaine and 2C-B powders had large proportions of adulterated samples, compared with amphetamine, 4-FA, 5/6-APB, MXE and MDMA powders. While approximately half of samples sold as LSD were unadulterated, those that were adulterated rarely contained LSD but usually contained other psychoactive substances. MDMA powders and ecstasy tablets frequently contained amphetamine or, to a lesser extent, para-methoxymethamphetamine (PMMA). The most important cocaine adulterant was levamisole.

For most other substances with fewer online samples, small differences in the same direction were observed, but these were not statistically significant. For substances for which at least 20 online purchased samples were available (i.e. ecstasy tablets, cocaine and 4-FA), similar adulterations were found compared with samples bought offline.

Although the overall purities of samples purchased online and offline were not very different, average online prices (as reported by DIMS-customers and prices measured per tablet or blotter (for LSD), or per gram of powder) were mostly higher than those offline (Table 2). However, price differences varied widely among the different types of substances: ecstasy tablets (+10% online), amphetamine powder (+23% online), cocaine powder (+22% online),

4-FA powder (+17% online), and 5/6-ABP powder (+23% online). 2C-B powder showed a similar, but non-statistically significantly trend (+16% online).

< Figure 3 and Table 1 and Table 2 about here >

Tablets

Ecstasy tablets were relatively unadulterated and more expensive online (Figure 3 and Table 2). As with 4-FA, but in contrast to MDMA powder, the doses of ecstasy tablets were higher online than offline. The online supplement shows that there were too few amphetamine and 5/6-APB tablets for further analysis, whereas most 2C-B samples were tablets (n=429/525). The online purchased 2C-B tablets were more often unadulterated (60%) than offline purchased tablets (28%) and powders (online and offline about 20%). Strikingly often, 2C-B tablets and 4-FA tablets sourced offline did not contain the specified substance (62% and 76%, respectively). This was also reflected by the average tablet dosages being lower offline than online, yet prices did not differ statistically significantly.

Discussion

This is one of the first studies to compare purity and prices of online and offline drug markets using laboratory-verified consumer samples. At DIMS, there has been an increase in online drug purchases since 2013, yet the vast majority of collected samples were still sourced offline. This trend is in line with results from the Global Drug Survey 2016, that reports a rise in last year's darknet purchases from 4,5% to 6,7% among its global participants [16]. As online prices were generally higher than those from offline markets and the purity did not

vary considerably between the online and offline groups, our findings neither confirm nor refute the good reputation of online drug quality compared with that of offline drug markets, at least in the Netherlands.

Online purchasing

Nearly all (online and offline) consumer samples in this study were psychostimulants; most samples were ecstasy tablets as ecstasy is the most frequently used illicit substance in the Netherlands after cannabis [28]. However, unlike previous studies in other countries [5;10;13], 4-FA was the drug most frequently purchased online in our study, not ecstasy. This is in line with findings from the Global Drug Survey 2015; the proportion of Dutch GDS participants who reported 12-month online drug purchases was comparable with that in the total sample (8.8% versus 9.3%). However, within this group, the proportion reporting online purchases of NPS was much higher among Dutch respondents (72%, versus 28% in the total sample), whereas the proportion reporting online purchases of traditional illicit drugs was much lower than the total sample (37%, versus 76% in the total sample) (Winstock, personal communication, March/April 2016). Typically, Dutch drug users do not go online for traditional illicit substances (but when they do, this is mainly on cryptomarkets), whereas for non-controlled NPS they tend to access Google-indexed webshops but not cryptomarkets [17]. This is in correspondence with Caudevilla's suggestion [15], and with the results of the Global Drug Survey 2016 that reports that 50,5% of respondents source NPS online [16].

Purity, adulteration and price

A main objective of this study was to compare online and offline drug quality in the Netherlands, assessed as the proportion of unadulterated samples and their overall chemical purity. The purity did not vary considerably, hereby contrasting Caudevilla who finds that cryptomarket sourced cocaine samples were more pure and less adulterated compared to

those bought on the Spanish drug market [15]. Yet online sourced 4-FA was slightly but statistically significantly less adulterated (7 percentage points) and of higher purity (also 7 percentage points) than samples bought offline. Our finding that for most other substances small but statistically insignificant differences in the same direction were observed may represent a lack of power to identify similar small differences. The only exception was that MDMA powder was offline more pure than online. Still, as variations among samples were much larger than the online/offline differences, these small differences were deemed clinically irrelevant. For example, the difference was only 10 mg MDMA for ecstasy tablets, and the probability of experiencing desirable effects peaks at 81–100 mg MDMA and adverse effects tend to exceed desirable effects at doses above 160 mg [23]. Likewise, for the other types of substances, similar small differences in purity between offline and online purchases are not expected to result in major health consequences.

The proportion of unadulterated samples was higher for non-controlled substances than for controlled substances, with the exception of ecstasy tablets and LSD, both controlled substances that were relatively unadulterated, which are not powders and therefore presumably not easily adulterated after production. Tentatively, one may argue that this illustrates the delicacy of the decision to control substances emphasizing their health-related risks to potential users, and the potential side-effect of creating a more harmful adulterated market. The risk of contributing to a more adulterated market, however, depends on the toxicity of the adulterants used. This article paints a general picture of frequently detected adulterants per substance, especially PMMA in ecstasy/MDMA and levamisole in cocaine, which can cause severe health risks over and above those of unadulterated MDMA and cocaine [29-31]. In the only comparable study using chemical analyses of online drug samples (International Drug Testing Service) almost half of the cocaine samples were adulterated as 42/103 samples contained levamisole [15;17]. The average purity of cocaine

samples reported in this study was also much higher (72%) than we found for online (56%) and offline (53%) cocaine powders. Online/offline sourcing does not provide an explanation for the difference in findings, and though it is early to draw conclusions, local differences between drug markets and different time frames may play a more important role in this discrepancy. The comparison of specific adulterants (particularly those that are more toxic than the drug itself) between the online and offline markets remains an issue to be addressed to comprehensibly inform drug consumers and form a drug policy strategy.

In contrast to the small purity differences found, online prices for various drugs were 10-23% higher, despite the prevailing perception of better values online [5;14]. Tentatively, such higher prices may be interpreted by the consumer as higher quality, which might result in the intake of lower amounts. Apparently, online drug shopping has a number of advantages for which a minority of Dutch customers are willing to pay a little extra.

Notwithstanding several plausible reasons for price differences observed between online and offline markets, the findings in our study should be interpreted within the context of the Dutch setting. Prices on the Dutch drug market are relatively low compared with those in other European countries or Australia [7;32-33;39]. Given the global nature of online drug markets, this may in itself explain the higher online prices compared with the local Dutch drug market. Furthermore, the effort it takes to set up a new enterprise in a new market as well as advertising and 'transaction costs', such as the risk of arrest and of seizure of the product, of low product quality and lack of choice, as well as the risks of violence, may vary locally [34]. Finally, costs related to shipments (including loss of packages) may influence the (global) online markets to a lesser extent. Moreover, the Netherlands are a main producer of ecstasy and amphetamine [7;33;35-37], which may augment local offline availability and low prices. Particularly because the average doses of MDMA in ecstasy are historically high

combined with minimal risks of being caught and relatively low sentencing, there may be little urgency for Dutch users to buy traditional drugs online.

This exemplifies difficulties in the extrapolation of our results, as the Dutch market may not be representative of foreign markets. Moreover, even though DIMS runs the most advanced monitoring system to date allowing for validation of consumer drug samples by laboratory analysis (and provision of targeted prevention messages and warnings), this monitoring system could be optimized by improving the level of information retrieved from its customers, especially regarding Internet sourced samples. Although our data showed an increase in online purchases in line with previous studies [14;17], it should be noted that this study had to rely on reporting of online sources as registered in an open text field, which may have led to underreporting. Moreover, such data could lead to bias with an increased awareness of testing staff over time or differential awareness (for reporting of the online source) for different substances. Misclassification may also arise when drug samples were purchased from a dealer, or were given by a friend, who in turn had purchased it online. While overcoming these issues would increase our estimate of the proportion of online purchased samples, this would dilute our online-offline comparisons. The current presented estimates are likely to be conservative. Currently, the data collection is improved by structurally reporting the online source as a category, overcoming such problems as missing online samples (50% missing data regarding the specific online source in the current study) and reducing the possibility of reporting bias.

Although drug samples purchased online still comprise a minority of the total number of samples, the Internet as a source for marketing or obtaining drugs is well and truly a phenomenon of the contemporary world that is likely to expand further. Despite our findings that online customers receive on average equal quality for a higher price than offline, we hypothesize that consumers are willing to pay more for the convenience of purchasing drugs

online. Despite the current modest role for online purchasing controlled substances via cryptomarkets, Google-indexed webshops already source up to half of the non-controlled substances. Therefore, it seems advisable that prevention professionals and harm reduction organizations expand their territories to online markets [38]. The provision of harm reduction advice to cryptomarket shoppers, as pioneered by Doctor X (e.g., Silk Road) might be monitored, possibly evaluated and intensified.

It is clear that monitoring information of (online) drug testing services, such as DIMS and the Energy Control International Drug Testing Service [15], provide essential insights into the substances that increasing numbers of (young) people expose themselves to, and these data are unavailable in other regions. These monitoring systems improve our understanding of drug markets and allow us to follow and respond to trends in online markets, for example a possible transition from centralized marketplaces, such as Silk Road, to decentralized marketplaces such as Open Bazaar. Avenues of further research include weighing law enforcement interventions against their potential interference with the above mentioned monitoring and harm reduction efforts, and the (potential) health gains of controlling new psychoactive substances against the potential side-effect of creating a more adulterated market.

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Figure 1 Proportion of samples submitted at DIMS bought online between January 2013-January 2016

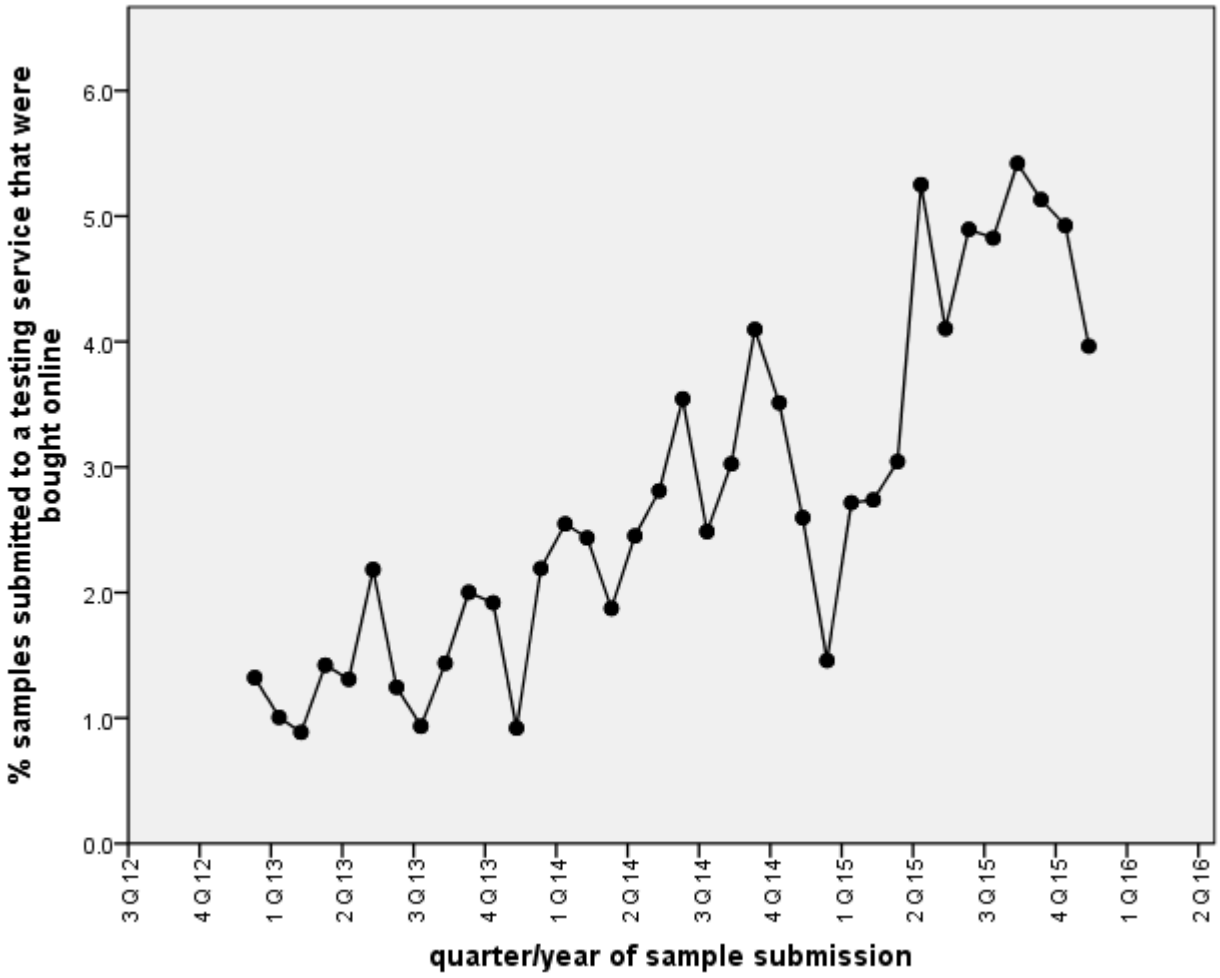


Figure 2 Sourcing location of online purchased samples submitted at DIMS between January 2013 and January 2016

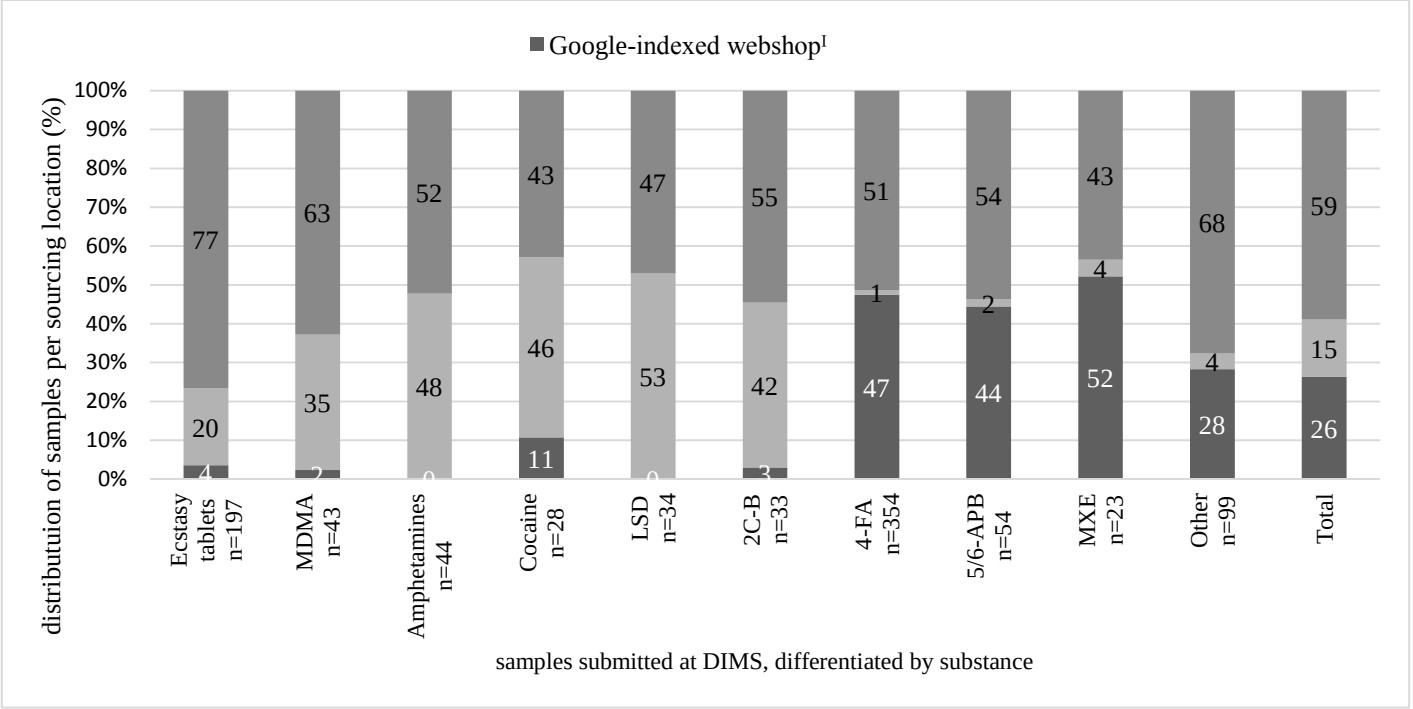
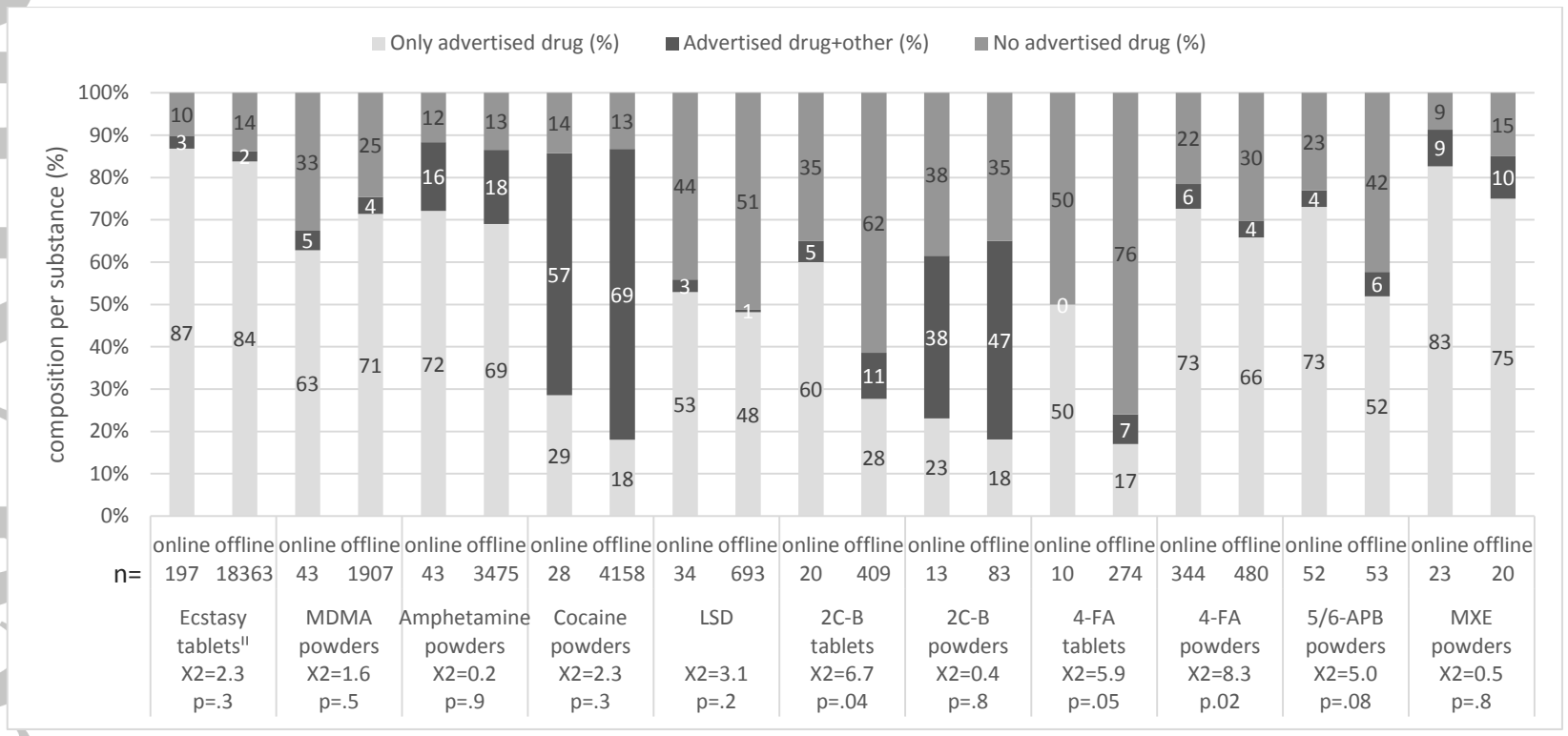


Figure 2.Percentage of samples per substance categorized by its sourcing location. I.Google-indexed webshop: online shop indexed by Google and other searching engines, where drugs are being marketed, usually as research chemicals. II.Cryptomarket or darknet market: online platform where drugs are being sold and that is not indexed by Google. III.Unspecified: % of samples per substance bought online, but without information about its specific online purchasing location..

Figure 3 Proportion unadulterated and adulterated consumer drug samples bought online versus offline[I]



I. Offline = samples from unspecified source and those sourced not online. II. The category 'ecstasy' contains tablets that were sold as ecstasy or MDMA. Amphetamine and 5/6-APB tablets were excluded. ‘Only advertised drug’ contains the specified drug alone, ‘Advertised drug+other’ contains the specified drug, and another active component, ‘No advertised drug’ does not contain the specified drug and may or may not contain another active component. X2= omnibus chi squared test with 2 degrees of freedom for every drug category.

Table 1 Chemical purity of consumer drug samples bought online versus offline[I]

	N		Purity in %[II]				
	online	offline[I]	online mean (sd)	offline[I] mean (sd)	*p*	*t*	mean difference online–offline (95%CI)
Ecstasy tablets ('purity'=dose in mg)[II+III]	197	18363	131mg (61)[II]	121mg (66)[II]	*.05*	2.0	9.3 (0.04;18.5)[II]
4-FA tablets ('purity'=dose in mg)[II]	10	273	69 mg	30 mg	*.074*	2.0	40.0 (-4.8;84.8)
2C-B tablets ('purity'=dose in mg)[II]	20	409	21 mg	10 mg	*.049*	2.0	10.7 (3.1;18.3)
MDMA powders	43	1907	45% (38)	61% (44)	*.02*	-2.4	-16.6 (-30.0;-3.1)
Amphetamine powders	43	3475	39% (26)	41% (25)	*.7*	-0.4	-1.5 (-9.2;6.1)
Cocaine powders	28	4158	56% (29)	53% (27)	*.6*	0.5	2.3 (-7.5;12.3)
LSD ('purity'=dose in µg)[II]	34	693	35µg (36)[II]	33µg (46)[II]	*.9*	0.2	1.4 (-14.4;17.2)[II]
2C-B powders	13	83	44% (37)	42% (35)	*.9*	0.1	1.4 (-19.6;22.5)
4-FA powders	344	480	59% (32)	52% (35)	*.001*	3.3	7.8 (3.2;12.6)
5/6-APB powders	52	53	n.a.	n.a.			
Methoxetamine powders	23	20	n.a.	n.a.			

I. Offline = samples not online or from unspecified source. II. Purity represents the mean percentage of pure substance. The maximum chemical purity of powders is never 100% (analysed to the base component of the substance), but varies between substances: MDMA 84%, amphetamine 73%, cocaine 89%, 2C-B 88%, 4-FA 81%. For tablets purity is defined as the percentage of pure substance, but as the mean dosage in mg per tablet. Similarly, LSD 'purity' is the dosage in µg per blotter. Type of adulterants in online and offline samples were found to be similar. III Dose of ecstasy tablets from *cryptomarkets* (N=39) was analysed separately and compared with the offline samples: mean dose = 149 mg (*p*=.01). CI= confidence interval. Degrees of freedom t-test was *N*-2.

Table 2 Prices[I] of consumer drug samples bought online versus offline[II]

	N		Price in €[I]		Ln (price in €[I])[II]				
	online	offline[II]	online mean (sd)	offline[II] mean (sd)	online mean (sd)	offline[II] mean (sd)	*p*	*t*	mean difference ln(price) online–offline (95%CI)
Ecstasy tablets[IV]	185	13831	4.2 (1.6)	3.8 (1.6)	1.37 (0.36)	1.28 (0.42)	*.001*	3.2	0.10 (0.04;0.16)
MDMA powders	39	1507	21.4 (13.2)	20.3 (9.9)	2.87 (0.69)	2.83 (0.75)	*.7*	0.35	0.04 (-0.19;0.28)
Amphetamine powders	41	2990	9.4 (5.1)	7.2 (4.4)	2.09 (0.57)	1.81 (0.61)	*.003*	2.94	0.28 (0.09;0.47)
Cocaine powders	26	3696	65.1 (17.5)	51.1 (11.8)	4.13 (0.33)	3.88 (0.45)	*.005*	2.84	0.25 (0.08;0.42)
LSD	32	610	6.0 (2.0)	5.5 (5.8)	1.73 (0.35)	1.53 (0.55)	*.04*	2.04	0.20 (0.01;0.40)
2C-B tablets	19	340	21.1 (29.0)	9.7 (18.0)	1.20 (0.53)	1.29 (0.43)	*.4*	-0.84	-0.09 (-0.29;0.12)
2C-B powders	12	61	48.8 (30.2)	41.1 (29.8)	3.55 (1.03)	3.29 (1.22)	*.5*	0.70	0.26 (-0.49;1.01)
4-FA powders[V]	320	413	14.6 (8.0)	12.1 (8.2)	2.51 (0.65)	2.23 (0.77)	*<.001*[III]	5.30	0.28 (0.18;0.39)
5/6-APB powders	50	43	26.4 (7.0)	20.3 (10.1)	3.22 (0.38)	2.77 (0.88)	*.001*[III]	3.28	0.45 (0.18;0.72)
Methoxetamine powders	23	18	21.0 (6.6)	21.3 (8.9)	2.97 (0.47)	2.90 (0.71)	*.7*	0.37	0.07 (-0.31;0.44)

I. Prices are expressed in price per tablet (per blotter for LSD) or per gram for powders. II Offline = samples not online or from unspecified source. III. The non-normally distributed price data was log-transformed (after imputing €1 for €0) to allow t-test. Results for 4-FA powders and 5/6-APB powders should be interpreted with caution as the standard deviation after transformation were differed for online and offline samples. IV. The mean price of online ecstasy tablets specifically from cryptomarkets (N=38) was also higher than offline samples (mean price =€ 4.7, ln(price)=1.47, p=0.004). V. As price data was available for only 7 online 4-FA tablets, these data were not included in this table (mean online price=€3.6, mean offline=€4.3 N=248). CI= confidence interval. The degrees of freedom for every t-test was the total N minus 2. The total N is lower than in Table 1 due to missing price data.