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New psychoactive substances: Purchasing and supply patterns in Australia

Rachel Sutherland^{*1}, Raimondo Bruno^{1,2}, Amy Peacock^{1,2}, Paul Dietze^{1,3}, Courtney Breen¹, Lucinda Burns¹, Monica J. Barratt^{1,3,4}

¹National Drug and Alcohol Research Centre, University of New South Wales, Sydney, NSW, Australia

²School of Medicine (Psychology), Faculty of Health, University of Tasmania, Hobart, TAS, Australia

³ Burnet Institute, Centre for Population Health, Melbourne, Victoria, Australia

⁴National Drug Research Institute, Curtin University, Shenton Park, WA, Australia

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Corresponding Author*: Rachel Sutherland

National Drug and Alcohol Research Centre, University of New South Wales, Sydney, NSW, 2052, AUSTRALIA;

Phone: +61 2 9385 0256; Facsimile: +61 (0)2 9385 0222; E-mail: rachels@unsw.edu.au

Abstract

Objective: To examine the purchasing and supply patterns of new psychoactive substance (NPS) consumers in Australia.

Method: Data were obtained from a self-selected sample of 296 past-year NPS consumers, with comparisons made across DMT (n=104), 2C-x (n=59), NBOMe (n=27) and synthetic cannabinoid (n=22) users.

Results: Most consumers (58%) nominated a friend as their main NPS source and almost half (46%) reported that they had supplied NPS to others in the past year (predominantly 'social supply'). However, when comparisons were made across NPS, NBOMe users were more likely to nominate a dealer (30%) or online marketplace (22%) as their main source, and to report: supplying NPS to others (63%); supplying to strangers (29%) and acquaintances (24%); and supplying NPS for cash profit (29%).

Similarly, NPS consumers who nominated online markets as their main NPS source (9%; n=26) were more likely to have: supplied NPS to others (RR 1.57); supplied to strangers (RR 6.05) and acquaintances (RR 12.11); sold NPS for cash profit (RR 4.36); and to have exchanged NPS for something else (RR 3.27) than those who reported alternative primary sources.

Conclusion: NBOMe consumers and those who nominated online markets as their main NPS source reported greater engagement with for-profit supply; it's unclear if these individuals have 'drifted' into dealing or if they were already engaged in such activities.

Keywords: New psychoactive substances; DMT; 2C-x; NBOMe; synthetic cannabinoids; online purchasing.

1. Introduction

Over the past decade, the number and range of substances collectively referred to as 'new psychoactive substances' (NPS) has increased dramatically (European Monitoring Centre for Drugs and Drug Addiction, 2016b; EMCDDA). NPS are defined by the EMCDDA as substances which do not fall under international drug controls but which may pose a public health threat (European Monitoring Centre for Drugs and Drug Addiction, 2016b). However, there is no universally accepted way of determining whether individual substances are included within the NPS definition. 'Older-new' drugs, such as those currently controlled by international legislation but not previously well-established in the recreational drug-using scene (e.g. dimethyltryptamine; DMT), are also often included as NPS.

In 2015, the European Union were monitoring over 560 NPS, of which 70% were detected in the past five years (European Monitoring Centre for Drugs and Drug Addiction, 2016b). The rapid growth of the NPS market has been facilitated by a number of factors, one of which is the expansion of online marketplaces (European Monitoring Centre for Drugs and Drug Addiction, 2016a, 2016c). The first online drug transaction is reported to have occurred in 1971 (Buxton & Bingham, 2015), and over the past decade there has been an increasing awareness of, and interest in, surface web markets and cryptomarkets (Walsh, 2011). Surface web markets are accessible via typical search engines (e.g. Google, Yahoo), and cryptomarkets (also known as dark net markets) exist in a 'hidden' part of the internet not accessible through standard web browsers. Cryptomarkets host multiple sellers or vendors and have been facilitated by the development of encryption, digital currencies and anonymous browsing (Barratt & Aldridge, 2016a; Mounteney, Griffiths, & Vandam, 2016; Van Buskirk, Roxburgh, et al., 2016). The expansion of these online drug markets have provided new opportunities for the supply and purchase of drugs, with internet sales of NPS now an international phenomenon and many online stores advertising worldwide delivery (European Monitoring Centre for Drugs and Drug Addiction, 2011).

As surface web and cryptomarkets have grown, so too has the monitoring of such marketplaces. In 2011-2012, Bruno, Poesiat, and Matthews (2013) identified 43 unique surface web markets that were selling stimulant and psychedelic NPS to Australia, and there are currently over 20 cryptomarkets selling illicit drugs, including NPS (although not all vendors operating on these marketplaces sell to Australia; Barratt & Aldridge, 2016b; Van

Buskirk, Naicker, et al., 2016). In December 2015, NPS were found to be the sixth most commonly sold substances on AlphaBay and Nucleus (the two largest cryptomarkets at that time); 2C-x, DMT and NBOMe were the most commonly sold substances within this category (Van Buskirk, Roxburgh, et al., 2016). Whilst the online availability of NPS largely corresponds with the main NPS used in Australia (Sindicich, Stafford, & Breen, 2016), there is little evidence regarding the relative importance of online markets as a source of supply for NPS consumers. Indeed, despite being readily available online, and despite the widely held perception that most NPS are purchased online, it appears that most Australian consumers do not source NPS in this manner. That is, despite findings that NPS users are *more likely* to purchase drugs online than other drug users (Burns, et al., 2014; Van Buskirk, Roxburgh, et al., 2016), for the most part they appear to obtain these substances from 'in-person' sources such as friends and dealers (Burns, et al., 2014; European Commission, 2014; Stephenson & Richardson, 2014), although this can vary across studies (for example, see Global Drug Survey, 2016; O'Brien, Chatwin, Jenkins, & Measham, 2015; Soussan & Kjellgren, 2016).

However, despite potential heterogeneity in the forms of NPS used, and in the primary sources for each NPS, many of these studies combine NPS into a single category for analysis. Studies examining individual types or categories of NPS suggest that differences may exist across consumers; for example, friends have been found to be the most common source for obtaining DMT (Australia; Cacic, Potkonyak, & Marshall, 2010) and mephedrone (Ireland; McElrath & O'Neill, 2011), whilst other studies have found that the internet was most common source for obtaining plant-derived NPS (Sweden; Björnstad, Hultén, Beck, & Helander, 2009) and NBOMe (international; Lawn, Barratt, Williams, Horne, & Winstock, 2014). In regards to synthetic cannabinoids, retail outlets have been found to be a common source for obtaining these substances (Barratt, Cacic, & Lenton, 2013; Gunderson, Haughey, Ait-Daoud, Joshi, & Hart, 2014). At present, it is unclear if such findings represent genuine differences across NPS, or if they are the result of different methodologies, geographic differences and/or other study artefacts.

In addition to the direct purchasing of NPS for personal use, the internet could play a significant role in social supply (i.e. the non-commercial or non-profit-making distribution of drugs to non-strangers; Hough, et al., 2003), where one friend within a social group may purchase NPS online to provide to others within the group,

either for free, at cost price, or for profit. There are some anecdotal reports of this taking place (Stephenson & Richardson, 2014), however, the overall extent to which this is happening remains unknown. Given that social supply is common among illicit drug users (Belackova & Vaccaro, 2013; Bernard & Werse, 2013; Fowler, Kinner, & Krenske, 2007; Lenton, Grigg, Scott, Barratt, & Eleftheriadis, 2015), it seems likely that this practice would extend to NPS and online marketplaces. Furthermore, little is known about the extent to which people are obtaining NPS from online sources for the purposes of dealing for cash profit. This is of particular interest given that online drug marketplaces have reconfigured relationships among suppliers, intermediaries and buyers, with some evidence showing that individuals, couples and very loose networks are becoming key criminal actors in internet-facilitated drug trafficking (Lavorga, 2016).

In this paper we examined the supply and purchasing patterns of a sample of NPS consumers in Australia, with an emphasis on exploring online purchasing. Specifically, we aimed to:

- 1) Determine whether there were different purchasing and supply patterns across consumers of the most commonly used NPS, specifically DMT, 2C-x, NBOMe and synthetic cannabinoids; and
- 2) Examine whether purchasing and supply patterns differed across NPS consumers who nominated 'online' as their main NPS source compared to those who nominated an alternative main source.

2. Method

2.1 Study design

This paper uses data from the 2016 Ecstasy and related Drugs Reporting System (EDRS) (for full protocol details, see Sindicich, et al., 2016). The EDRS is a national monitoring study aimed at detecting emerging trends in illicit drug markets which has been conducted annually within all Australian capital cities since 2003; one component involves cross-sectional surveys with 'regular psychostimulant users' (RPU). The EDRS received ethical approval from the University of New South Wales (UNSW) Human Research Ethics Committee (HC15015), as well as from the relevant ethics committees in other Australian jurisdictions.

2.2 Participants and procedure

EDRS survey participants are a self-selected sample of RPU recruited through street-press advertisements, online forums and peer referral. Eligibility criteria were: at least monthly use of ecstasy or other psychostimulants in the preceding six months, 16 years of age or older, and residence in the city of interview for at least 12 months prior to the interview. Face-to-face structured interviews of approximately one-hour duration were conducted by trained interviewers at a negotiated time and location, and participants were reimbursed AUD40 for their time and out-of-pocket expenses.

In 2016, 795 participants were recruited and interviewed for the EDRS. Analysis is based on a subset of participants who reported past year use of NPS (n=296 Table 1).

2.3 Measures relevant to the current study

In addition to demographic questions (i.e., age, gender, sexual orientation, employment and educational status), participants were asked about their lifetime and past six-month use of licit and illicit substances. Participants who had used any NPS in the *past year* were asked to nominate the NPS used most often in that time frame and were then asked a series of questions in relation to use of that particular substance, including: how they obtained the substance (bought it/given for free/exchange; multiple responses allowed); typical and largest transaction sizes; the main source from whom they obtained this substance (friend/dealer/workmate/acquaintance/relative/online/other) and whether they obtained any other drugs from this source (including both 'traditional' illicit drugs, as well as other NPS); whether they had supplied NPS to others in the past 12 months; who they supplied NPS to; and the method of supply (gave away for free/shared/provided at cost price/provided for cash profit/exchanged; multiple responses allowed).

2.4 Statistical analysis

To address the first aim, purchasing and supply patterns were compared across the most commonly used NPS, namely DMT (n=104), the 2C-family substances (2C-x; n=59), NBOMe (n=27) and synthetic cannabinoids (n=22). Between-group comparisons of categorical variables were analysed using chi-squared tests (χ^2), and adjusted

residuals were used to analyse which cell differences contributed to the overall χ^2 results. An adjusted residual score of greater than 2.0 or below -2.0 indicated that the cells differed significantly.

To address the second research aim, the sample was divided into two groups based on whether participants nominated 'online' as their main source for obtaining their most frequently used NPS in the past year or whether they nominated a 'non-online' source. Between-group comparisons of categorical variables were analysed using risk ratios (RR) with 95% confidence intervals reported.

For normally distributed continuous variables, *t*-tests were employed and means with their standard deviations (SD) reported. Where continuous variables were skewed (i.e. skewness > ± 1 or kurtosis > ± 3) Mann–Whitney U-tests were conducted, with medians and the corresponding interquartile ranges (IQR) reported. All analyses were conducted using IBM SPSS Statistics for Windows release 22.0 (IBM Corporation, 2013).

3. Results

3.1 Sample characteristics

The sample (n=296) had a median age of 21 years (IQR 19-24); 71% of participants were male, 97% were of English speaking background, 45% were tertiary qualified, 73% were employed in some capacity, 36% were students, 12% were unemployed and 2% were currently in drug treatment. Almost all (98%) participants reported recent (past six month) use of ecstasy, 42% reported recent methamphetamine use, 51% reported recent cocaine use, 66% reported recent LSD use and 92% reported recent cannabis use. Forty-six percent of participants reported using ecstasy or related drugs on a weekly or greater basis in the past month. The most commonly used NPS within the preceding six months were DMT (38%), 2C-B (24%), synthetic cannabinoids (11%) and NBOMe (10%), although frequency of use for each of these drugs was low (range: 1-3 days).

3.2 Differences in purchasing patterns across NPS consumers

Three-fifths (61%) of all NPS consumers reported that they had purchased NPS in the past year. This was significantly higher among participants who nominated NBOMe as the main NPS used in the past year (89%), compared to those who nominated DMT (53%), 2C-x (61%) and synthetic cannabis (52%) as the main NPS used ($p=0.007$) (Table 1). Almost half (46%) of consumers reported being given NPS for free and a small minority (7%) reported that they had received the substance in exchange for something else (e.g. other drugs), with no differences found across substances.

Most consumers (58%) nominated a friend as their main source for obtaining NPS in the past year. However, when comparisons were made across DMT, 2C-x, NBOMe and synthetic cannabinoid users it was found that NBOMe users were more likely to nominate a dealer (30%; $p=0.045$) or online marketplace (22%; $p=0.010$) as their main source, while synthetic cannabinoid users were more likely to nominate a shop (44%; $p<0.001$) as their main source. Over half (57%) of all NPS consumers reported that they had obtained other drugs from their main NPS source, with 2C-x consumers (71%) being more likely to have done so ($p=0.029$). Typical and largest transaction sizes were the same across all four NPS (hence only typical transaction sizes have been presented) and were relatively small for all substances.

3.3 Differences in supply patterns across NPS consumers

Almost half (46%) of all NPS consumers reported that they had supplied NPS to other people in the past 12 months, with NBOMe (63%) and DMT (52%) consumers being more likely to have done so and 2C-x users (22%) being less likely ($p=0.001$) (Table 1). Among those who had supplied to others, most reported that they had provided NPS to friends (96%), typically sharing them (56%) or giving away them for free (45%). However, NBOMe consumers were less likely to have supplied NPS to friends (82%; $p=0.022$) and to have shared with others (29%; $p=0.032$), and were more likely to have supplied to strangers (29%; $p<0.001$) and acquaintances (24%; $p=0.003$). They were also more likely to have sold NPS for cash profit (29%; $p=0.051$).

Insert table 1 here

3.4 Main source for obtaining NPS: Online vs non-online

Nine percent of NPS consumers nominated online marketplaces as their main source for obtaining these substances in the past year. This mostly consisted of ‘cryptomarkets’ (n=23), with a minority nominating ‘surface web markets’ (n=3) as their main source.

Participants who nominated an online marketplace as their main source for obtaining NPS had obtained a larger number of drugs from this source (median 5 vs 2; $p < 0.001$) and were subsequently more likely to have obtained other drugs from this source (RR 1.57 95% CI: 1.29-1.92), when compared to participants who nominated an alternative main source (Table 2). All participants who nominated an online marketplace as their main NPS source and who had obtained other drugs online reported that they had purchased ‘traditional’ illicit drugs (mainly ecstasy, LSD, benzodiazepines and cannabis) from this source, and 55% reported that they had obtained another NPS. NPS consumers who nominated ‘online’ as their main source were also more likely to have supplied NPS to others in the past year (RR 1.57 95% CI: 1.35-2.27), and were more likely to have supplied to strangers (RR 6.05 95% CI: 1.65-22.17) and acquaintances (RR 12.11 95% CI: 3.31-44.34). Furthermore, they were more likely to have sold NPS for cash profit (RR 4.36 95% CI: 2.02-9.43) and to have exchanged it for something else (RR 3.27 95% CI: 1.37-7.80). There were no significant differences in terms of typical NPS transaction sizes for pills, caps and grams. For ‘tabs’ of blotter paper the median typical transaction size among participants who nominated ‘online’ as their main source was 30 tabs compared to one tab for those who nominated an alternative main source ($p = 0.017$).

These associations remained significant even when participants who nominated the ‘surface web’ as their main source for obtaining NPS were excluded from analyses.

Insert table 2 here

4. Discussion

We found significant differences in purchasing and supply patterns across NPS consumers. Overall, friends were nominated as the main source for obtaining these substances; however, analysis of DMT, 2C-x, NBOMe and synthetic cannabinoids consumers showed that NBOMe users were more likely to nominate a dealer or online marketplace as their main source, whilst synthetic cannabinoid users were more likely to nominate a shop as their main source. These findings are relatively consistent with previous research (Barratt, et al., 2013; Gunderson, et al., 2014; Lawn, et al., 2014), as well as with media reports suggesting that synthetic cannabinoids remain readily available via retail outlets (despite being largely prohibited across Australia e.g. Wordsworth, 2016).

It is unclear why NBOMe is more likely than DMT, 2C-x and synthetic cannabinoids to be purchased online, however it seems to us that the most likely explanation is a combination of consumer preference, availability and price. For example, a study comparing the subjective experiences of NPS relative to their traditional illicit drug counterparts found that 2C-B and 2C-I were rated less favourably than LSD in terms of pleasurable effects and likelihood of taking again (Matthews, et al.), whilst a study of dual cannabis and synthetic cannabis users found a strong preference for natural cannabis over synthetic cannabis (Winstock & Barratt, 2013). In contrast, NBOMe has been found to have a very similar profile of subjective effects when compared to other hallucinogens (i.e. LSD, magic mushrooms and ketamine; Lawn, et al., 2014). Given that consumers are presented with a smorgasbord of substances (and vendors) when purchasing online, it seems unlikely that they would purchase substances (e.g. 2C-x, synthetic cannabinoids) that are generally considered inferior to established illicit drugs. In contrast, those purchasing from a retail outlet, friend or dealer are limited by what is in stock/on hand at that time and thus may be more prone to 'opportunistic' purchases. Indeed, a recent study found that availability (i.e. no other drug available at the time) and legality were the most highly endorsed motivations for synthetic cannabinoids use among RPU in Australia (Sutherland, et al., In Press), providing some support for this theory.

Another factor to consider is pricing. Cheaper prices is reportedly one of the most common reasons for purchasing drugs online (Barratt, Ferris, & Winstock, 2014; Van Buskirk, Roxburgh, et al., 2016), although it is unclear if this varies across substances, with very few studies explicitly examining this topic. Interestingly, one of

the only published studies to compare the mean prices of drugs bought online versus offline found that online prices were *higher* than offline prices for ecstasy tablets, amphetamine powders, cocaine powders, LSD, 4-FA powders and 5/6-APB powders, whilst there were no significant differences in prices for 2C-B tablets, 2C-B powders and methoxetamine powders (van der Gouwe, Brunt, van Laar, & van der Pol, 2016). However, this study was based in the Netherlands and as such these findings are probably not transferrable to the Australian context, with prices on the Dutch drug market relatively low compared to Australia (van der Gouwe, et al., 2016). In addition, NBOMe, methylone and mephedrone were excluded from the study due to small online samples, and there is a need for further research on this topic.

Alternatively, the low prices of online drugs could be attributed to bulk offers (Aldridge & Décary-Héту, 2014), which would partially explain our finding regarding the increased likelihood of purchasing NBOMe online. More specifically, we found no significant differences in terms of typical transaction sizes for pills, caps and grams among those who nominated 'online' as their main NPS source and those who nominated an alternative main source. However, for tabs of blotter paper, the median typical transaction size was 30 among participants who nominated 'online' as their main NPS source - compared to one tab for those who nominated an alternative main source. The purchase of 'tabs' online was exclusively NBOMe, suggesting that those who purchase NBOMe online are more likely to buy in larger quantities due to potential discounts. For example, one participant reported purchasing 12,000 NBOMe tabs for AUD 2500, which equates to approximately 21 cents per tab. In contrast, participants who bought a single tab of NBOMe from friends and/or dealers reported paying a median of AUD 20 (range AUD 10-30 per tab).

In regards to the provision of NPS, we found that almost half of all NPS consumers had supplied these substances to others in the preceding 12 months, with NBOMe and DMT consumers being significantly more likely to have done so. Social supply was by far the most common form of supply, with most participants reporting that they had supplied to friends for no cash profit (i.e. shared, given away for free or provided at cost price). Indeed, mutual supply networks appear to be common among NPS consumers, with many individuals both sourcing from and supplying to friends. This is consistent with previous research showing that individuals within friendship groups source drugs from, and concurrently supply to, group members to ensure a consistent

supply of quality product and to minimise risks of health harms and criminal justice consequences (Bright & Sutherland, Under Review; Lenton, et al., 2015; Nicholas, 2008).

Although social supply was the most common form of supply reported by participants, NBOMe consumers, and those who nominated online markets as their main NPS source, were more likely to report supplying NPS to strangers and acquaintances and for cash profit. It is unclear if this represents a 'drift' into dealing for cash profit (whereby users gradually become dealers; Taylor & Potter, 2013), or if it is representative of existing dealers taking advantage of new business opportunities. As mentioned previously, 'cheaper prices' is one of the main reasons for sourcing drugs online, particularly amongst Australian consumers (Barratt, et al., 2014; Van Buskirk, Roxburgh, et al., 2016), and it seems feasible that the potential for high profit margins could attract existing dealers and also facilitate a drift into dealing for cash profit among those who were initially purchasing for personal use and/or social supply (e.g. "My time as a scumbag nbome dealer," 2015). Indeed, although the typical transaction size for NBOMe was relatively small in the current study (median of three tabs), there were some individuals buying in much higher quantities.

Furthermore, it is unknown if those supplying NBOMe to others (for profit or otherwise) are supplying it at face value or as an alternative substance (i.e. LSD). When deposited on blotter paper LSD and NBOMe are virtually identical in appearance and, given the health risks associated with unwittingly ingesting NBOMe (e.g. increased risk of overdose), concerns have been raised about the possibility of NBOMe being sold as LSD (Caldicott, Bright, & Barratt, 2013; Isbister, Poklis, Poklis, & Grice, 2015). This practice has been verified in some European countries (Busardò, Pichini, Pacifici, & Karch, 2016; Giné, Espinosa, & Vilamala, 2014; "Welsh emerging drugs and identification of novel substance project," 2016), however it is still unknown to what extent this practice occurs in Australia, with further research required.

4.1 Limitations

Our analysis is reliant upon self-report data from participants which may be subject to bias. Although evidence points to sufficient validity and reliability of self-report in studies assessing illicit drug use (Darke, 1998), it is possible that participants may have: 1) under-reported purchasing and supply patterns and; 2) incorrectly

identified the NPS being consumed (i.e. it may have been sold to them as one thing, but have been something else). The latter is particularly pertinent in relation to LSD and NBOMe and future studies should corroborate self-report with chemical analysis. Additionally, the EDRS sample is not representative of all RPU or NPS consumers in Australia, although an assessment of the EDRS data in NSW did find that it had high generalisability to population estimates (Topp, Barker, & Degenhardt, 2004). In regards to supplying NPS for 'cash profit' it is unknown how much profit was actually made, and it is possible that this included 'minimally commercial supply' (Coomber & Moyle, 2014), whereby small financial gain is made but is not the primary driver of drug supply. Furthermore, our findings relate to the *main* NPS used in the past year and the *main* source for obtaining this substance; it is important to note that some participants had used multiple NPS in the past year and would have likely obtained these substances through multiple sources. Finally, some of our findings are based on relatively small sample sizes, meaning that caution must be exercised when interpreting null results.

5. Conclusion

The recent proliferation of NPS, combined with their global distribution through the internet and other sources, raises important questions about how consumers and dealers engage with the market for these drugs. Our study found that most NPS consumers continue to source these substances from 'in-person' sources such as friends and dealers, although this varied across substances. Social supply and mutual supply networks were common, with many participants both sourcing from and supplying to friends.

Overall, nine percent of past year NPS consumers nominated online marketplaces as their main NPS source, with this being significantly higher among NBOMe consumers (22%). Participants who nominated online marketplaces as their main source for obtaining NPS were found to have different purchasing and supply patterns to those who nominated an alternative main source, with larger purchase quantities noted and an increased likelihood of NPS supply to strangers and acquaintances and for cash profit. It is unclear if this is indicative of a 'drift' into dealing for profit or if existing dealers are attracted to online marketplaces due to factors such as cheaper prices, all of which requires further research.

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Contributors

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Conflict of interest

No conflicts declared.

Table 1: Purchasing and supply patterns across past year NPS consumers, 2016

	Past year NPS consumers* n=296 %	Main NPS used in past year				p value
		DMT n=104 % (adjusted residuals)	2C-x n=59 % (adjusted residuals)	NBOMe n=27 % (adjusted residuals)	Synthetic cannabis n=23 % (adjusted residuals)	
<i>In the past year</i>						
How obtained substance# %						
Bought it	61.1	52.9 (-1.9)	61.0 (0.2)	88.9 (3.3)	52.2 (-0.8)	0.007
Given for free	46.2	56.9	47.5	37.0	47.8	0.274
Exchanged for something other than cash	7.2	6.9	0	11.1	4.3	0.125
Median typical transaction size						
Caps (IQR; n)	2 (1-2.5;29)	-	1 (1-3; 19)	-	-	-
Pills (IQR; n)	2 (1-4;30)	-	1 (1-2; 12)	-	-	-
Grams (IQR; n)	1 (0.29-3; 126)	1 (0.20-1; 62)	0.2 (0.1-1.25;10)	-	3 (1-3.75; 16)	-
Tabs (IQR; n)	2 (1-10; 31)	-	-	3 (1-8.75; 24)	-	-
Main source %						
Friend	57.5	66.7	69.5	48.1	52.2	0.146
Acquaintance	4.4	5.9	5.1	0	4.3	0.645
Dealer	17.0	17.6 (0.4)	15.3 (-0.3)	29.6 (2.0)	0 (-2.3)	0.045
Online###	8.8	4.9 (-1.4)	8.5 (0.3)	22.2 (3.1)	0 (-1.5)	0.010
Shop	8.8	0 (-2.0)	0 (-3.1)	0 (-1.2)	43.5 (9.3)	<0.001
Other^	3.4	-	-	-	-	-
Source provided you with other drugs %	56.5	51.5 (-1.3)	71.2 (2.7)	55.6 (-0.1)	39.1 (-1.7)	0.029
Supplied NPS to others %	46.4	51.5 (2.2)	22.4 (-3.8)	63.0 (2.2)	39.1 (-0.5)	0.001
Who supplied NPS to*** %	n=135	n=52	n=13	n=17	n=9^^	
Friends	96.3	98.1 (1.6)	100 (0.9)	82.4 (-2.7)		0.022
Relatives	5.2	7.7	0	0		0.297
Acquaintances	6.7	1.9 (-2.1)	0 (-1.0)	23.5 (3.4)		0.003
Strangers	5.9	1.9 (-2.5)	0 (-1.1)	29.4 (3.9)		<0.001
Method of supply*** %						
Gave away for free	44.8	48.1	46.2	52.9		0.921
Shared	56.0	65.4 (1.9)	61.5 (0.3)	29.4 (-2.6)		0.032
Provided at cost price	22.4	17.3	23.1	35.3		0.297
Provided for cash profit	14.2	7.7	7.7	29.4		0.051
Exchanged	12.7	11.5	0	17.6		0.302

*Includes DMT (n=104); 2C-x (n=59); NBOMe (n=27); synthetic cannabis (n=23); herbal highs (n=18); MXE (n=16); methylone (n=9); mephedrone (n=5); PMA (n=7); salvia divinorum (n=5); etizolam (n=5); mescaline (n=4); 5-Meo-DMT (n=2); LSA (n=1); datura (n=1); 3-Meo-PCP (n=1); 5-MAPB (n=1); ayahuasca (n=1); changa (n=1); kava (n=1); 5-Meo-MIPT (n=1); NBOH (n=1); phenibut (n=1); unknown (n=2)

#Multiple responses allowed, hence sum of percentages may exceed 100%

^Includes workmates (1%); relatives (0.7%); home-made/grown (1.7%); ^^Excluded from subsequent analysis, due to small numbers (n<10)

###Includes cryptomarkets (n=23) and surface web marketplaces (n=3); association remains significant even when surface web marketplaces are excluded from analysis

**Among those who had supplied NPS to others in the past year. Note: significant findings bolded. Adjusted residuals only reported when p<0.05

Table 2: Purchasing and supply patterns among past year NPS consumers who nominated online marketplaces as their main source, 2016

	Main source for obtaining NPS in past year		RR (95% CI)/U [^]	p value
	Online* n=26	Not online n=268		
<i>In the past year</i>				
Median number of drugs obtained from source (n; IQR)	5 (26; 2-7.25)	2 (268; 1-3)	1532.5	<0.001
Median typical transaction size				
Pills (n; IQR)	10 (3; -)	2 (27; 1-3)	14.5	0.072
Caps (n; IQR)	1 (1; -)	2 (28; 1-2.75)	6.5	0.483
Grams (n; IQR)	1 (13; 0.5-2)	1 (112; 0.25-3)	721	0.954
Tabs (n; IQR)	30 (6; 2-3300)	1 (25; 1-4.5)	28.5	0.017
Obtained other drugs from source %	84.6	53.8	1.57 (1.29-1.92)	0.002
Type of drug obtained from source %	N=22	N=143		
Traditional	100	99.3	1.01 (0.99-1.02)	0.694
NPS	54.5	13.3	4.11 (2.33-7.23)	<0.001
Supplied NPS to others %	76.0	43.4	1.75 (1.35-2.27)	0.002
Who supplied NPS to** %	N=19	N=115		
Friends	94.7	96.5	0.98 (0.88-1.10)	0.704
Relatives	15.8	3.5	4.54 (1.10-18.71)	0.025 [#]
Acquaintances	31.6	2.6	12.11 (3.31-44.34)	<0.001
Strangers	21.1	3.5	6.05 (1.65-22.17)	0.003
Method of supply** %				
Gave away for free	63.2	42.1	1.50 (1.00-2.25)	0.088
Shared	68.4	53.5	1.28 (0.90-1.82)	0.226
Provided at cost price	21.1	22.8	0.92 (0.36-2.35)	0.865
Provided for cash profit	42.1	9.6	4.36 (2.02-9.43)	<0.001
Exchanged	31.6	9.6	3.27 (1.37-7.80)	0.008

*Includes cryptomarkets (n=23) and surface web marketplaces (n=3). Associations remain significant even when surface web marketplaces are excluded from analyses (except for 'supplying to relatives' which loses significance)

[^]Risk ratios (RR) and 95% confidence intervals (95% CI) are reported for chi-square analyses; results of the Mann-Whitney U test (U) are reported for the comparison of medians

**Among those who had supplied NPS to others in the past year; multiple responses allowed, hence sum of percentages may exceed 100%

[#]This association loses significance when 'surface web' marketplaces are excluded from analysis

Note: significant findings bolded

References

- Aldridge, J., & Décary-Hétu, D. (2014). Not an 'ebay for drugs': The cryptomarket 'silk road' as a paradigm shifting criminal innovation. *SSRN*. doi: <http://dx.doi.org/10.2139/ssrn.2436643>
- Barratt, M. J., & Aldridge, J. (2016a). Everything you always wanted to know about drug cryptomarkets* (*but were afraid to ask). *International Journal of Drug Policy*, 35, 1-6. doi: 10.1016/j.drugpo.2016.07.005
- Barratt, M. J., & Aldridge, J. (2016b, 2 September 2016). Explainer: What are drug cryptomarkets? *The Conversation* Retrieved 12 October, 2016, from <https://theconversation.com/explainer-what-are-drug-cryptomarkets-64596> (Archived by WebCite® at <http://www.webcitation.org/6lDZ1V4Gl>)
- Barratt, M. J., Cakic, V., & Lenton, S. (2013). Patterns of synthetic cannabinoid use in australia. *Drug and Alcohol Review*, 32(2), 141-146. doi: 10.1111/j.1465-3362.2012.00519.x
- Barratt, M. J., Ferris, J. A., & Winstock, A. R. (2014). Use of silk road, the online drug marketplace, in the united kingdom, australia and the united states. *Addiction*, 109(5), 774-783. doi: 10.1111/add.12470
- Belackova, V., & Vaccaro, C. A. (2013). "A friend with weed is a friend indeed": Understanding the relationship between friendship identity and market relations among marijuana users. *Journal of Drug Issues*. doi: 10.1177/0022042613475589
- Bernard, C., & Werse, B. (2013). The other side of dealing drugs: Supporting personal use and social supply: Preliminary findings of a quantitative-qualitative study on socially inconspicuous drug users and dealers. [Article]. *Monatsschrift fur Kriminologie und Strafrechtsreform*, 96(6), 447-460.
- Björnstad, K., Hultén, P., Beck, O., & Helander, A. (2009). Bioanalytical and clinical evaluation of 103 suspected cases of intoxications with psychoactive plant materials. *Clinical Toxicology*, 47(6), 566-572. doi: 10.1080/15563650903037181
- Bright, D., & Sutherland, R. (Under Review). "Just doing a favor for a friend": The social supply of ecstasy through friendship networks. *Journal of Drug Issues*.
- Bruno, R., Poesiat, R., & Matthews, A. J. (2013). Monitoring the internet for emerging psychoactive substances available to australia. *Drug and Alcohol Review*, 32(5), 541-544. doi: 10.1111/dar.12049
- Burns, L., Roxburgh, A., Matthews, A., Bruno, R., Lenton, S., & Van Buskirk, J. (2014). The rise of new psychoactive substance use in australia. *Drug Testing and Analysis*, 6(7-8), 846-849. doi: 10.1002/dta.1626
- Busardò, F. P., Pichini, S., Pacifici, R., & Karch, S. B. (2016). The never-ending public health issue of adulterants in abused drugs. *Journal of Analytical Toxicology*, 40(7), 561-562. doi: 10.1093/jat/bkw051
- Buxton, J., & Bingham, T. (2015). The rise and challenge of dark net drug markets *Policy Brief 7*. Swansea University: Global Drug Policy Observatory.
- Cakic, V., Potkonyak, J., & Marshall, A. (2010). Dimethyltryptamine (dmt): Subjective effects and patterns of use among australian recreational

- users. *Drug and Alcohol Dependence*, 111(1-2), 30-37. doi: <http://dx.doi.org/10.1016/j.drugalcdep.2010.03.015>
- Caldicott, D., Bright, S., & Barratt, M. (2013). Nbome - a very different kettle of fish. *The Medical Journal of Australia*, 199(5), 322-323.
- Coomber, R., & Moyle, L. (2014). Beyond drug dealing: Developing and extending the concept of 'social supply' of illicit drugs to 'minimally commercial supply'. [Article]. *Drugs: Education, Prevention and Policy*, 21(2), 157-164. doi: 10.3109/09687637.2013.798265
- European Commission. (2014). Young people and drugs. Flash eurobarometer 401 *Flash Eurobarometer 401*.
- European Monitoring Centre for Drugs and Drug Addiction. (2011). Online sales of new psychoactive substances/'legal highs': Summary of results from the 2011 multilingual snapshots. Luxembourg: Publications Office of the European Union.
- European Monitoring Centre for Drugs and Drug Addiction. (2016a). Eu drug markets report. In-depth analysis. Luxembourg: Publications Office of the European Union.
- European Monitoring Centre for Drugs and Drug Addiction. (2016b). Health responses to new psychoactive substances. Luxembourg: Publications Office of the European Union.
- European Monitoring Centre for Drugs and Drug Addiction. (2016c). The internet and drug markets. Luxembourg: Publications Office of the European Union.
- Fowler, G., Kinner, S., & Krenske, L. (2007). Containing ecstasy: Analytical tools for profiling an illegal drug market *Monograph Series No. 27*. Hobart: National Drug Law Enforcement Research Fund.
- Giné, C. V., Espinosa, I. F., & Vilamala, M. V. (2014). New psychoactive substances as adulterants of controlled drugs. A worrying phenomenon? *Drug Testing and Analysis*, 6(7-8), 819-824. doi: 10.1002/dta.1610
- Global Drug Survey. (2016). The global drug survey 2016 findings Retrieved 20 September, 2016, from <https://www.globaldrugsurvey.com/past-findings/the-global-drug-survey-2016-findings/> (Archived by WebCite® at <http://www.webcitation.org/6LL5SyusW>)
- Gunderson, E. W., Haughey, H. M., Ait-Daoud, N., Joshi, A. S., & Hart, C. L. (2014). A survey of synthetic cannabinoid consumption by current cannabis users. *Substance Abuse*, 35(2), 184-189. doi: 10.1080/08897077.2013.846288
- Hough, M., Warburton, H., Few, B., May, T., Man, L.-H., Witton, J., et al. (2003). *A growing market: The domestic cultivation of marijuana*. York: Joseph Rowntree Foundation.
- IBM Corporation. (2013). Ibm spss statistics for windows, version 22.0. Armonk, NY: IBM Corporation.
- Isbister, K. I., Poklis, A., Poklis, J. L., & Grice, J. (2015). Beware of blotting paper hallucinogens: Severe toxicity with nbomes. *The Medical Journal of Australia*, 203(6), 266-267.
- Lavorga, A. (2016). How the use of the internet is affecting drug trafficking practices *The internet and drug markets* (pp. 85-90). Luxembourg: Publications Office of the European Union.
- Lawn, W., Barratt, M., Williams, M., Horne, A., & Winstock, A. (2014). The nbome hallucinogenic drug series: Patterns of use, characteristics of users and

- self-reported effects in a large international sample. *Journal of Psychopharmacology*, 28(8), 780-788. doi: 10.1177/0269881114523866
- Lenton, S., Grigg, J., Scott, J., Barratt, M., & Eleftheriadis, D. (2015). The social supply of cannabis among young people in australia. [Article]. *Trends and Issues in Crime and Criminal Justice*(503).
- Matthews, A., Sutherland, R., Peacock, A., Van Buskirk, J., Whittaker, E., Burns, L., et al. I like the old stuff better than the new stuff? Subjective experiences of new psychoactive substances. *International Journal of Drug Policy*. doi: 10.1016/j.drugpo.2016.11.004
- McElrath, K., & O'Neill, C. (2011). Experiences with mephedrone pre- and post-legislative controls: Perceptions of safety and sources of supply. *International Journal of Drug Policy*, 22(2), 120-127. doi: <http://dx.doi.org/10.1016/j.drugpo.2010.11.001>
- Mounteney, J., Griffiths, P., & Vandam, L. (2016). What is the future for internet drug markets? *The internet and drug markets* (pp. 127-133). Luxembourg: Publications Office of the European Union.
- . My time as a scumbag nbome dealer. (2015) Retrieved 13 October, 2016, from https://www.reddit.com/r/Drugs/comments/3iszs8/my_time_as_a_scumbag_nbome_dealer_part_1/ (Archived by WebCite® at <http://www.webcitation.org/6lDXcwpqh>)
- Nicholas, R. (2008). The impact of social networks and not-for-profit illicit drug dealing on illicit drug markets in australia. Hobart: National Drug Law Enforcement Research Fund.
- O'Brien, K., Chatwin, C., Jenkins, C., & Measham, F. (2015). New psychoactive substances and british drug policy: A view from the cyber-psychonauts. [Article]. *Drugs: Education, Prevention and Policy*, 22(3), 217-223. doi: 10.3109/09687637.2014.989959
- Sindicich, N., Stafford, J., & Breen, C. (2016). Australian trends in ecstasy and related drug markets 2015. Findings from the ecstasy and related drugs reporting system (edrs) *Australian Drug Trend Series No. 154*. . Sydney: National Drug and Alcohol Research Centre, UNSW Australia.
- Soussan, C., & Kjellgren, A. (2016). The users of novel psychoactive substances: Online survey about their characteristics, attitudes and motivations. *International Journal of Drug Policy*, 32, 77-84. doi: <http://dx.doi.org/10.1016/j.drugpo.2016.03.007>
- Stephenson, G., & Richardson, A. (2014). New psychoactive substances in england. A review of the evidence. Crime and Policing Analysis Unit: Home Office Science.
- Sutherland, R., Bruno, R., Peacock, A., Lenton, S., Matthews, A., Salom, C., et al. (In Press). Motivations for new psychoactive substance use among regular psychostimulant users in australia. *International Journal of Drug Policy*.
- Taylor, M., & Potter, G. R. (2013). From “social supply” to “real dealing”: Drift, friendship, and trust in drug-dealing careers. *Journal of Drug Issues*, 43(4), 392-406. doi: 10.1177/0022042612474974
- Topp, L., Barker, B., & Degenhardt, L. (2004). The external validity of results derived from ecstasy users recruited using purposive sampling strategies. *Drug and Alcohol Dependence*, 73(1), 33-40. doi: <http://dx.doi.org/10.1016/j.drugalcdep.2003.09.001>

- Van Buskirk, J., Naicker, S., Bruno, R., Burns, L., Breen, C., & Roxburgh, A. (2016). Drugs and the internet. Issue 6. Sydney: National Drug and Alcohol Research Centre, UNSW Australia.
- Van Buskirk, J., Roxburgh, A., Bruno, R., Naicker, S., Lenton, S., Sutherland, R., et al. (2016). Characterising dark net marketplace purchasers in a sample of regular psychostimulant users. *International Journal of Drug Policy*, 35, 32-37. doi: <http://dx.doi.org/10.1016/j.drugpo.2016.01.010>
- van der Gouwe, D., Brunt, T. M., van Laar, M., & van der Pol, P. (2016). Purity, adulteration and price of drugs bought online versus offline in the netherlands. *Addiction*, n/a-n/a. doi: 10.1111/add.13720
- Walsh, C. (2011). Drugs, the internet and change. *Journal of Psychoactive Drugs*, 43(1), 55-63. doi: 10.1080/02791072.2011.566501
- . Welsh emerging drugs and identification of novel substance project. (2016) Retrieved 13 October, 2016, from <http://www.wedinos.org/db/samples/> (Archived by WebCite® at <http://www.webcitation.org/6lDYih43w>)
- Winstock, A. R., & Barratt, M. J. (2013). Synthetic cannabis: A comparison of patterns of use and effect profile with natural cannabis in a large global sample. *Drug and Alcohol Dependence*, 131(1-2), 106-111. doi: <http://dx.doi.org/10.1016/j.drugalcdep.2012.12.011>
- Wordsworth, M. (2016). Deadly and illegal synthetic drugs still available over the shop counter, *Australian Broadcasting Corporation*. Retrieved from <http://www.abc.net.au/7.30/content/2015/s4407972.htm> (Archived by WebCite® at <http://www.webcitation.org/6lJj8mNji>)