DRUGS AND THE INTERNET

To date the availability of illicit drugs has largely been examined through; household surveys and interviews with people who use drugs, indicators such as drug seizures and arrests, and analyses of hospital admissions and drug-related deaths. Over the past decade there has been an increasing awareness and interest in online marketplaces as a source for discussion about and purchase of drugs (Walsh, 2011). The advent of the Silk Road in 2011, an online marketplace operating on the 'darknet' (marketplaces operating on the 'darknet' are known as 'cryptomarkets'), broadened the availability of new psychoactive substances (NPS) and other more conventional illicit substances (such as cannabis and MDMA). After the closure of the Silk Road in October 2013, multiple new marketplaces emerged to take its place (Van Buskirk et al, 2014). The closure of Silk Road 2.0 and a large international law enforcement operation in November 2014 (dubbed Operation Onymous) have seen major changes in remaining darknet marketplaces. In addition to this, threats such as hacking attacks and exit scams (whereby markets close down taking any bitcoins held in escrow) continue to cause disarray in cryptomarkets.

This bulletin is the eighth in a series and provides analysis of trends over time in the availability and type of substances sold via the internet on the darknet. The focus of this analysis is on cryptomarkets that operate internationally, and are only accessible via The Onion Router (TOR), software that enables anonymous communication. The data largely provide information about vendors and substance availability and little about consumers who are buying drugs on cryptomarkets. It is not possible to determine how often, and in what amounts, illicit and new psychoactive substances are being purchased online. In 2016 the Australian Ecstasy and related Drugs Reporting System (EDRS) reported 18% of surveyed regular psychostimulant users had purchased an illicit drug online in their lifetime, with 14% reporting they had done so in the past 12 months (Stafford et al, 2016). The vast majority (84%) of those surveyed for the 2016 EDRS reported having knowledge of these markets, despite not having used them. Similarly, findings from the 2016 Global Drug Survey (GDS) show that 9% of Australian respondents reported purchasing drugs from cryptomarkets in the preceding 12 months and this figure has remained relatively unchanged over the past 3 years (personal communication, Monica Barratt, Global Drug Survey).

The current bulletin reports for the time period July 2016 to December 2016.

DRUGS AND THE INTERNET

KEY FINDINGS

- **Eighteen marketplaces** were actively monitored during the time period, **three** of which were first identified during this time.
- Despite downtime across smaller markets, there was notable **consistency in uptime, and vendor numbers recorded across larger markets.**
- **Alphabay and Dream Market** continued to be the largest two marketplaces at the end of the monitoring period, recording the largest number of unique vendors during this time.
- Across these marketplaces, **cannabis, pharmaceuticals, MDMA, cocaine and methamphetamine** were the five most commonly sold substances, with **NPS** popularity slightly declining.
- By December 2016, five of the eighteen marketplaces being monitored had closed, either as a result of suspected exit scams, or other reasons, reinforcing the volatility of these marketplaces.
- **Two NPS that appeared for the first time in the top 10** sold across the markets were **U-47700 and FuranylFentanyl,** both illicit opioid analgesics.

METHODS

Cryptomarket Monitoring

Cryptomarkets were accessed weekly using a dedicated user account. Exhaustive snapshots of each accessible marketplace were taken, including information on vendor name, listing description and, where possible, country of origin. Substance listings were placed into one of sixteen mutually exclusive categories – cannabis, cocaine, GHB, illicit opioids, ketamine, LSD (lysergic acid diethylamide), magic mushrooms, MDMA (3,4-methylenedioxy-methamphetamine), methamphetamine, NPS (new psychoactive substances), pharmaceuticals, PIEDs (performance and image enhancing drugs), precursors, synthetic cannabinoids, tobacco and weight loss. See Table in Appendix A for a detailed description of the categories of substances available on cryptomarkets.

The monitoring methods employed aim to replicate consumer access to these marketplaces. That is, repeated attempts are made to access a marketplace across the monitoring day, but if a marketplace is inaccessible or only partially accessible for whatever reason, the data are treated as missing. Partial snapshots are not entered into the dataset. A marketplace may be down for multiple reasons, including server outages, distributed denial of service attacks (DDoS; in which multiple sources are used to generate a large amount of traffic to an online service, thereby overwhelming its servers), law enforcement seizures, exit scams and hacking attacks. If a marketplace is down at one time point, unless there is reason to believe it will not return (in the case of seizures or exit scams), attempts will be made to access it at the next time point.

Marketplaces were excluded from monitoring if they had less than one hundred listings for sale, or only one vendor operating on the marketplace. Non-English language marketplaces were also excluded. New marketplaces are identified through the deepdotweb website (deepdotweb.com) that is accessible on the internet. The website provides education about cryptomarkets on a readily accessible internet page.

DRUGS AND THE INTERNET

RESULTS

Escrow Systems

Although the cryptomarkets identified in this bulletin sold largely comparable products in terms of illicit substances and NPS, many offered additional products such as erotica, hacking tools, drug paraphernalia and occasionally firearms. In addition, these marketplaces varied in transaction processes, with more than half of the markets operating on a multi-signature escrow system, and the remainder operating on a centralised escrow system. Escrow is the process of holding funds for a transaction until that transaction is completed and the product delivered, at which point the funds are released (Christin, 2012). In a centralised escrow system, funds are released when the buyer indicates that the product was received, with funds being stored in the marketplace itself. Therefore, if a marketplace's security is compromised, so too are the funds held in escrow. With multi-signature escrow, multiple signatures (encrypted 'keys' used to access funds) are required to release the funds. Two out of three participants in the sale (i.e. the buyer, the seller and the marketplace) must provide their specific keys for the funds to be released. This means that even when a marketplace's security is compromised, funds will not be released without the approval of two of the three involved parties. The multi-signature escrow system protects both the consumers and vendors from the risks of marketplace moderators closing the market and removing funds held in centralised escrow. The system also offers enhanced protection for consumers in the instance where goods are not received.

Marketplaces Monitored

The 18 marketplaces that were monitored over the current reporting period, from July to December 2016, along with their current status and transaction process, are outlined in Table 1.

Table 1: Classification and status of marketplaces active during monitoring period

Marketplace	Escrow System	First Monitored	Last Monitored	Current Status
Active at Final Time Point				
Outlaw	Centralised	29/05/2014	Ongoing	Active
Dream Market	Centralised	30/10/2014	Ongoing	Active
Valhalla (formerly Silkkitie)	Centralised	30/10/2014	Ongoing	Active
Alphabay	Multisignature	12/02/2015	Ongoing	Active
Silk Road 3.1 (formerly Cryptomarket)	Centralised	23/04/2015	Ongoing	Active
Tochka	Centralised	16/07/2015	Ongoing	Active
Hansa	Multisignature	13/08/2015	Ongoing	Active
Darknet Heroes League	Centralised	9/10/2015	Ongoing	Active
Acropolis	Multisignature	4/02/2016	Ongoing	Active
Apple	Multisignature	2/06/2016	Ongoing	Active
House of Lions	Centralised	20/06/2016	Ongoing	Active
Minerva	Multisignature	28/07/2016	Ongoing	Active
The Trade Route	Multisignature	09/08/2016	Ongoing	Active

Closed During Monitoring Period

| Detox	Multisignature	14/04/2016	3/11/2016	CLOSED Down for Unknown Reason
Oasis	Multisignature	21/01/2016	22/09/2016	CLOSED Suspected exit scam (deepdotweb.com)
Python	Multisignature	23/07/2015	27/10/2016	CLOSED Down for Unknown Reason
The RealDeal	Multisignature	14/05/2015	20/10/2016	CLOSED Down for Unknown Reason
Zocalo	Centralised	26/05/2016	13/10/2016	CLOSED Down for Unknown Reason

The total number of vendors on each marketplace at each time point for all monitored darknet marketplaces is shown in Figure 1 and Figure 2.

During the period July to December 2016, three new marketplaces were identified, and a total of 18 marketplaces actively monitored. Of these, five were closed, one (Oasis), due to a suspected exit scam (www.deepdotweb.com), and the others for unknown reasons. Oasis had considerable downtime during the period it was active, with less than 50% of possible snapshots of the market completed in the monitoring period (data not shown). At the end of the monitoring period, the two largest marketplaces remaining were Alphabay and Dream Market, operating at 1482 vendors and 1392 vendors, respectively on the 15th December 2016. These markets are also among the longest running of the current active markets, along with Outlaw, Valhalla and Hansa (Figure 1). While there has been a slight decline in the number of vendors operating on Alphabay during the monitoring period, in mid-2016, the number of vendors exceeded those operating on Evolution at the time of closure in March 2015. Regression analysis of trends over time among the larger markets show Dream Market, Hansa, and Apple vendor numbers have increased, while AlphaBay and Valhalla vendor numbers have decreased. Vendor numbers operating on Outlaw have remained stable (Figure 1).

For further detail of data dating back to June 2014, please see Appendix B.
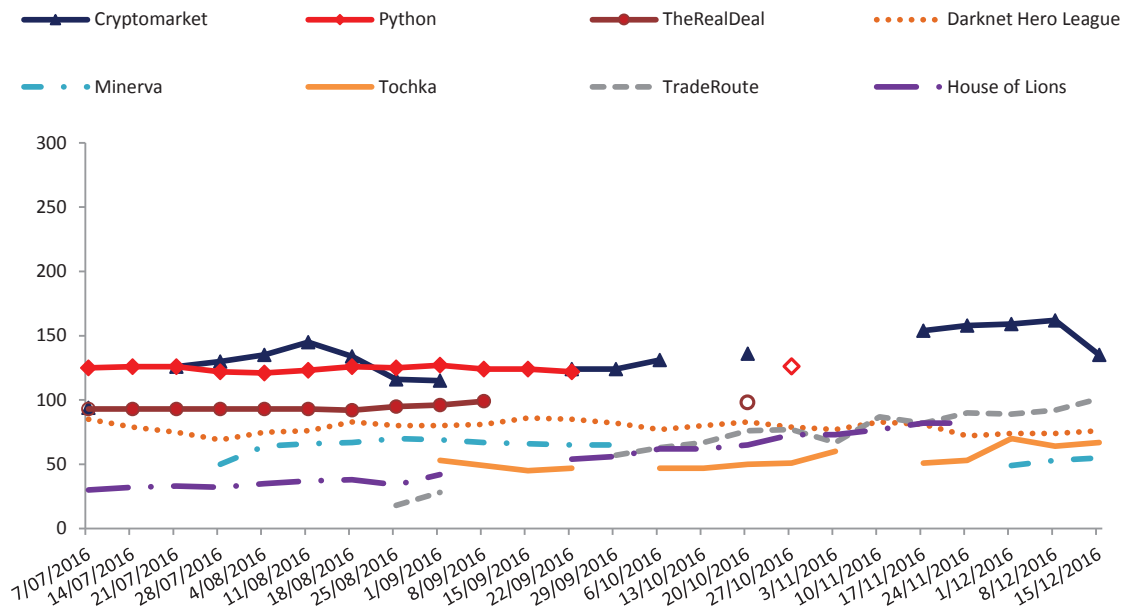
DRUGS AND THE INTERNET

Figure 1: Number of vendors across the largest six marketplaces by time point, July to December 2016
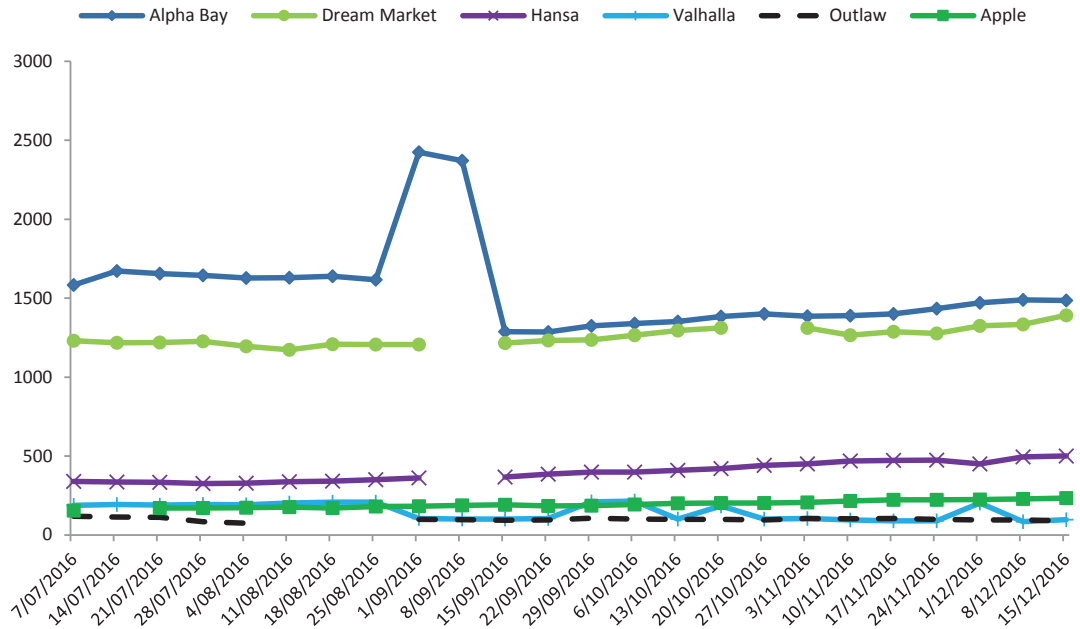
NB: missing data points indicate temporary marketplace outages or incomplete snapshots. Empty markers indicate permanent closure of marketplace. The sudden increase and decline in vendors on AlphaBay in September 2016 may in part be due to market changes implemented in the way listings were stored at this time.

Figure 2: Number of vendors across smaller marketplaces by time point, July to December 2016

NB: missing data points indicate temporary marketplace outages. Empty markers indicate permanent closure of marketplace.

SUBSTANCES FOR SALE

Substance Availability

Table 2 outlines the substances available from the four leading marketplaces ranked by the number of unique vendors identified selling each substance. Consistent with previous findings (Van Buskirk, et al, 2016), the top three available substances sold across marketplaces were cannabis, pharmaceuticals and MDMA. This was followed by cocaine, methamphetamine and NPS. Rankings of substances on the remaining marketplaces being monitored (data not shown) did not differ substantially. The ranking of NPS availability as a category overall, ranked by unique vendors, dropped from fifth in the first half of 2016, to sixth during the current monitoring period.

Table 2: Number of vendors on the top four marketplaces by substance type

Substance	Alphabay n	Alphabay %	Dream Market n	Dream Market %	Hansa n	Hansa %	Valhalla n	Valhalla %
Cannabis	1520	40	1415	47	392	44	183	51
Pharmaceuticals	1401	37	1096	36	278	31	112	31
MDMA	980	26	939	31	235	27	134	38
Cocaine	912	24	885	29	219	25	121	34
Methamphetamine	623	17	676	22	151	17	93	26
NPS	505	13	454	15	108	12	63	18
LSD	357	9	379	13	108	12	76	21
Illicit Opioids	311	8	326	11	66	7	43	12
Ketamine	221	6	258	9	62	7	36	10
Magic Mushrooms	170	5	169	6	49	6	16	4
PIEDs	200	5	101	3	28	3	14	4
GHB	67	2	48	2	12	1	9	3
Synthetic Cannabinoids	42	1	38	1	8	1	5	1
Total Unique Vendors	3758		3031		885		356	

NB: NPS = New Psychoactive Substances; PIEDs = Performance and Image Enhancing Drugs; As vendors often sell multiple substance classes, percentages do not add up to 100%. For further clarification of the categories used in the above table, please see Appendix B.

NPS Availability

Table 3 details the ten most commonly sold NPS on the top four marketplaces (ranked by unique vendors selling NPS). The categories of 2C-x and NBOMe family were used for clarity as many of the drugs in these categories (e.g. 2C-B, 2C-I, 2C-E in the 2C-x category) are sold in the same form, and are advertised as having similar effects. Synthetic cannabinoids were collapsed into one category given the large number of variations that exist (Ammann et al, 2012). Additionally, synthetic cannabinoids were often sold as blends, consisting of different combinations of many chemicals, making classification more complex. Although forum discussions reveal preferences among users for a number of specific substances, collapsing synthetic cannabinoids provides the most accurate estimation of their popularity on these marketplaces.

DRUGS AND THE INTERNET

Drugs from the 2C-x category, U-47700, and DMT were the most commonly sold NPS across all marketplaces, with some variation across the markets. The ranking of the top 10 most commonly sold NPS across all markets has changed from previous bulletins. Two NPS appeared for the first time this period, U-47700 (ranked 2nd) and FuranylFentanyl (ranked 8th), both opioid analgesics. NBOMe substances dropped from 4th to equal 6th alongside α-PVP, and α-PVP moved from 10th up to 6th during the current period.

Table 3: Number of vendors from the top four marketplaces selling the ten most common NPS by average rank across all marketplaces

Substance	Alphabay		Dream Market		Hansa		Valhalla	
	n	%^	n	%^	n	%^	n	%^
2C-x	89	2	107	4	26	3	11	3
U-47700	48	2	41	2	10	2	7	3
DMT	64	1	61	1	18	1	12	2
MDA	27	1	21	1	2	1	0	2
Mephedrone	44	1	64	2	10	1	10	3
α-PVP	27	1	24	1	9	1	3	1
NBOMe	53	1	39	1	8	1	6	1
FuranylFentanyl	40	1	32	1	8	1	5	1
Synthetic Cannabinoids	42	1	38	1	8	1	5	1
DOx	41	1	33	1	8	1	5	1
Total	**517**	13	**450**	15	**111**	12	**64**	19

NB: Percentages indicate proportion of unique NPS vendors on the listed marketplace, while the final row denotes the number of all unique NPS vendors on that marketplace. For further information on the substances and categories listed, please see Appendices A and B.
^Represents the percentage of all vendors across all substances (refer Table 2)

SUMMARY

- The two largest marketplaces still operating at the end of the monitoring period were Alphabay and Dream Market.

- Vendor numbers across markets, both large and small, were remarkably consistent across the monitoring period, and in contrast to the previous monitoring periods, vendor numbers appear to have levelled out.

- Substances sold across all marketplaces appeared to be consistent with previous bulletins, with cannabis, pharmaceuticals and MDMA most commonly sold.

- The specific types of NPS sold across cryptomarkets were largely consistent with those observed in earlier bulletins, with the exception of two opioid analgesics. U-47700 and FuranylFentanyl appeared for the first time in the top ten. Further analysis of Australian vendors, and international vendors specifically shipping to Australia on Dream Market, however shows that vendors selling these substances to Australia are not prevalent. The specific types of NPS sold across darknet marketplaces were largely consistent with those observed in earlier bulletins, with an increase in vendors selling ephedrine.

- Consistent with previous findings, the most commonly available substances on these marketplaces are largely traditional illicit substances, rather than NPS.

IMPLICATIONS

The current monitoring period is notable in that there was continued stability across larger marketplaces after previous periods of volatility. No significant disruptions were observed during the current period. Though downtime was observed on smaller markets, this appeared to precede markets closing down for unknown reasons. All of the markets that closed during the monitoring period were smaller in size, and appeared to have little impact on the larger marketplaces. Unlike the closure of Evolution and Agora, which triggered sudden increases in vendor numbers on other marketplaces, there were no large increases in vendor numbers on AlphaBay or Dream Market. These two markets have continued to dominate, recording the largest number of unique vendors during the period. Unlike previous periods however, where AlphaBay and Dream Market recorded upward trends, vendor numbers during the current period appear to have levelled out. Interestingly, trends across AlphaBay appear to mirror trends across Dream Market. In early August/September 2016, a sharp increase in vendor numbers operating on AlphaBay occurred, followed by a decline. While reasons for these changes remain unclear, they occurred at the same time changes to marketplace security were made, with listings being removed after 30 days among these changes. A recent news story in Motherboard (https://motherboard.vice.com/en_us/article/dark-web-market-alphabay-staff-to-alleged-extortionist-dont-dox-us-heres-some-money) revealed that AlphaBay moderators were threatened in August 2016 with anonymous information about AlphaBay staff members being made public (doxing) if they refused to pay a ransom amount. Moderators confirmed they paid the extortionist to avoid the doxing from happening. This is likely to have had an impact not only on the number of listings appearing on AlphaBay around this time, but also on the number of vendors operating on AlphaBay. In addition, two AlphaBay vendors were arrested in August 2016 (https://www.deepdotweb.com/2016/08/26/timeline-arrests-alphabay-vendors-area51-darkapollo/), which is also likely to have impacted other vendors operating on AlphaBay at this time.

The pattern of two marketplaces being dominant at any one time has continued. Should either AphaBay or Dream Market close, an impact on smaller markets, with rapid increases in vendor numbers, is likely.

Substance availability across markets also appeared consistent with previous monitoring periods. However, two opioid analgesic analogues, U-47700 and FuranylFentanyl, appeared for the first time in the top ten NPS being sold. Both of these substances are documented as being substantially more potent than morphine, which clearly increases the risk of fatal overdose (Mohr et al, 2016). Indeed there have been increasing numbers of fatal opioid overdoses recorded in relation to opioid analogues over the past few years (acetyfentanyl in Europe, EMCDDA, 2016; and butyryl fentanyl, furanyl fentanyl and U-47700 in the USA, Mohr et al, 2016; https://www.theguardian.com/world/2016/apr/11/synthetic-opiates-drug-laws-w-18-fentanyl).

While the U-47700 and FuranylFentanyl listings were largely confined to international vendors (very few Australian vendors had these products listed), ongoing monitoring of the emergence of opioid analogues on cryptomarkets is important, particularly within the

DRUGS AND THE INTERNET

context of the recent seizures of potent opioid analogues (carfentanil and furanylfentanyl) at the Australian border (http://www.abc.net.au/news/2017-02-17/lethal-drug-carfentanyl-found-brisbane-mail-centre-qld/8280790;http://www.news.com.au/national/breaking-news/nt-police-warn-against-fatal-new-drug/news-story/47ecccfe3dbdb1fc6c015e4930ca3c11).

Findings from this period show stability in relation to vendor numbers across cryptomarkets, and numbers don't appear to be rising as rapidly as seen previously. However, these markets continue to be under threat from law enforcement, exit scams and extortionist attempts, reinforcing the volatile nature of cryptomarket trading.

References

http://www.abc.net.au/news/2017-02-17/lethal-drug-carfentanyl-found-brisbane-mail-centre-qld/8280790 Website accessed 11 April 2017.

Ammann, J., McLaren, J. M., Gerostamoulos, D., & Beyer, J. (2012). Detection and Quantification of New Designer Drugs in Human Blood: Part 1 – Synthetic Cannabinoids. Journal of Analytical Toxicology, 36(6), 372-380. doi: 10.1093/jat/bks048

Christin, N. (2012). Traveling the Silk Road: A measurement analysis of a large anonymous online marketplace.

https://www.deepdotweb.com/2016/08/26/timeline-arrests-alphabay-vendors-area51-darkapollo/ Website accessed 11 April 2017.

European Monitoring Centre for Drugs and Drug Addiction. EMCDDA–Europol Joint Report on a new psychoactive substance: N-phenyl-N-[1-(2-phenylethyl)piperidin-4-yl] acetamide (acetylfentanyl). Lisbon: European Monitoring Centre for Drugs and Drug Addiction, 2016.

https://www.theguardian.com/world/2016/apr/11/synthetic-opiates-drug-laws-w-18-fentanyl Website accessed 11 April 2017.

Mohr, L.A., Friscia, M., Paps, D. (2016). Analysis of Novel Synthetic Opioids U-47700, U-50488 and Furanyl Fentanyl by LC–MS/MS in Postmortem Casework. Journal of Analytical Toxicology, 40, 709-717. doi: 10.1093/jat/bkw086

https://motherboard.vice.com/en_us/article/dark-web-market-alphabay-staff-to-alleged-extortionist-dont-dox-us-heres-some-money Website accessed 11 April 2017.

http://www.news.com.au/national/breaking-news/nt-police-warn-against-fatal-new-drug/news-story/47ecccfe3dbdb1fc6c015e4930ca3c11 Website accessed 11 April 2017.

Stafford, J., Breen, C., & Burns, L. (2016). Australian Drug Trends 2016: Findings from the Ecstasy and Related Drugs Reporting System (EDRS). Paper presented at the 2016 NDARC Annual Research Symposium, Sydney Australia.

Van Buskirk, J., Naicker, S., Bruno, R., Burns, L., Breen, C. & Roxburgh, A. (2016). Drugs and the Internet, Issue 7 (Vol. 7). Sydney: National Drug and Alcohol Research Centre.

Van Buskirk, J., Roxburgh, A., Farrell, M., & Burns, L. (2014). The closure of the Silk Road: what has this meant for online drug trading? Addiction, 109(4), 517-518. doi: 10.1111/add.12422.

Walsh, C. (2011). Drugs, the Internet and change. Journal of Psychoactive Drugs, 43(1), 55-63. doi: 10.1080/02791072.2011.566501

Appendix A: Chemical classification of substances and explanation of categories used in this bulletin

Table A1: Chemical classification of mentioned NPS

NPS	Category	Subcategory
2C-x	Phenethylamine	Psychedelic
α-PVP	Other Stimulant	Norepinephrine-Dopamine Reuptake Inhibitor
DMT	Tryptamine	Psychedelic
DOx	Phenethylamine	Psychedelic Amphetamine
Ephedrine	Phenethylamine	Amphetamine Type Stimulant/ Methamphetamine precursor
FuranylFentanyl	Opioid Analgesic	Fentanyl Analogue
MDA	Phenylpropylamine	Substituted methylenedioxyphenethylamine (MDxx)
Mephedrone	Substituted cathinone	Amphetamine Type Stimulant
Methylone	Phenylpropylamine	Substituted methylenedioxyphenethylamine (MDxx)
NBOMe Family	Phenethylamine	Psychedelic
U-47700	Opioid Analgesic	Opioid

Table A2: Glossary of categories and abbreviations used in bulletin

Category	Commonly Available Examples
2C-x	2C-B, 2C-E, 2C-I
Cannabis	Marijuana, hash, edibles (THC infused foods)
DOx	DOI, DOM, DOC
Illicit Opioids	Heroin, Opium
MDMA	MDMA powder, 'Ecstasy' pills
Methamphetamine	Powder (Speed), crystal (Ice)
NBOMe Family	25C-NBOMe, 25I-NBOMe, 25E-NBOMe
Pharmaceuticals	Pharmaceutical Opioids, Benzodiazepines, Sildenafil (Viagra)
PIEDs	Performance and Image Enhancing Drugs, eg. Clenbuterol, Nordicor, Biogen
Synthetic Cannabinoids	JWH Family, AM2201, UR144, AB-PINACA

DRUGS AND THE INTERNET

Appendix B: Number of unique vendors across larger darknet marketplaces June 2014 to December 2016

Legend: Evolution, Agora, Alphabay, Dream Market, Hansa