DRUGS AND THE INTERNET

Issue 6, March 2016

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To date the availability of illicit drugs in Australia 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, as an online marketplace, 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, Roxburgh, Farrell, & Burns, 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 darknet markets.

This bulletin is the sixth in a series by Drug Trends that provides analysis of trends over time in the availability and type of substances sold via the internet to Australia. The current bulletin reports for the time period July 2015 to December 2015.

Key findings

- **Eighteen marketplaces** were actively monitored during the time period, six of which were first identified during this time.
- The second largest marketplace identified in the previous bulletin, Agora, **went offline in August 2015 amid security concerns and has not returned to date.**
- Consistent with the previous monitoring period, **considerable downtime was experienced across marketplaces,** in which markets were not able to be accessed. This appeared to be due to high volume traffic on larger marketplaces.
- **Nucleus and Alphabay** were the largest marketplaces at the end of the monitoring period, recording the largest number of unique retailers.

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- Across these marketplaces, **cannabis, pharmaceuticals, MDMA, cocaine and methamphetamine** were the five most commonly sold substances, with NPS popularity slightly declining.
- By December 2015, **five of the eighteen marketplaces being monitored had closed,** either as a result of scams, or various other reasons, reinforcing the volatility of these marketplaces.

METHODS USED IN THIS BULLETIN

'Surface Web' Monitoring

The methodology for monitoring the 'surface web' was adapted from the European Monitoring Centre for Drugs and Drug Addiction outlined in Solberg, Sedefov, and Griffiths (2011). 'Surface web' sites are those that are registered with search engines, and hence can be identified using tools such as Google web searches. Retailers were located by using a generic list of search terms (e.g. "herbal highs", "research chemicals", "legal ecstasy", etc.).

Expanding on the methodology employed in previous bulletins, online forums discussing NPS use were also monitored for mention of surface web retailers that offered NPS for sale.

Once retailers were identified, availability of selling and shipping to Australia was confirmed and the substances on offer were recorded. Searches were conducted monthly from July 2015 until December 2015, between the 15th and the 25th of each month. Searches were ceased once saturation point was determined, i.e. when no new retailers were returned within the first 100 search results for each search term. Retailers identified in previous searches were revisited and current activity confirmed, including current availability of substances for sale.

Dark Web Marketplace ('Dark Web') Monitoring

Darknet marketplaces were accessed weekly using a dedicated domestic user account. Exhaustive snapshots of each accessible marketplace were taken, including information on retailer 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 6 in Appendix A for a detailed description of the categories of substances available on darknet marketplaces.

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 that marketplace cannot be accessed, i.e. is 'down', it will not be accessed on the following day. In addition, partial snapshots are not entered into the dataset. If a marketplace is inaccessible, or only partially accessible for whatever reason, it will be treated as missing data. 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 retailer operating on the marketplace. Marketplaces that were language and country specific were also excluded as many did not ship to Australia.

RESULTS

Number of Retailers

Surface Web

The number of retailers on the surface web selling to Australia appeared stable between July and September 2015, (498 retailers in July 2015 to 50 in September 2015) before a decline was observed between October and December 2015. These numbers represent an overall decrease from all previous bulletins and may be due to both a public crackdown of research chemical producers in China and the passing of a blanket ban of research chemicals in the UK, which is due to take effect on the 6th of April 2016 but was proposed and drafted by the UK parliament during the monitoring period. These factors may drive surface web retailers of research chemicals and related substances to dark net markets; future bulletins will monitor research chemicals to assess if these changes may be taking place.

Table 1 : Number of unique Retailers Operating on the Surface Web by Time Point.

Month	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15
Number of surface web retailers	49	49	50	46	40	37

Dark Web Marketplaces

Escrow Systems

Although the Darknet marketplaces 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 around a third operating on a multi-signature escrow system, and half 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.

Marketplaces Monitored

The marketplaces over the current monitoring period, from July to December 2015, along with their current status, and their transaction process are outlined in **Table 2**.

Table 2: 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
Nucleus	Centralised	30/10/2014	Ongoing	Active
Silkkitie (now Valhalla)	Centralised	30/10/2014	Ongoing	Active
Dream Market	Centralised	30/10/2014	Ongoing	Active
Alphabay	Multisignature	12/02/2015	Ongoing	Active
Mr Nice Guy (now Dr D.)	Centralised	19/03/2015	Ongoing	Active
Cryptomarket	Centralised	23/04/2015	Ongoing	Active
The Real Deal	Multisignature	14/05/2015	Ongoing	Active
East India Company	Centralised	28/05/2015	Ongoing	Active
Tochka	Centralised	16/07/2015	Ongoing	Active
Python	Multisignature	23/07/2015	Ongoing	Active
Hansa	Centralised	13/08/2015	Ongoing	Active
Darknet Heroes League	Centralised	9/10/2015	Ongoing	Active
Closed During Monitoring Period				
Agora	Centralised	30/01/2014	16/07/2015	Closed due to security concerns
Middle Earth	Centralised	7/03/2014	29/10/2015	Apparent exit scam
Abraxas	Centralised	08/01/2015	05/11/2015	Apparent exit scam
Amazon Dark	Multisignature	16/07/2015	10/09/2015	Apparent exit scam
Oxygen	Multisignature	16/07/2015	27/08/2015	Down for unknown reasons

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

Figure 1: Number of retailers across the largest seven marketplaces by time point. **NB:** missing data points indicate temporary marketplace outages. Empty markers indicate permanent closure of marketplace.

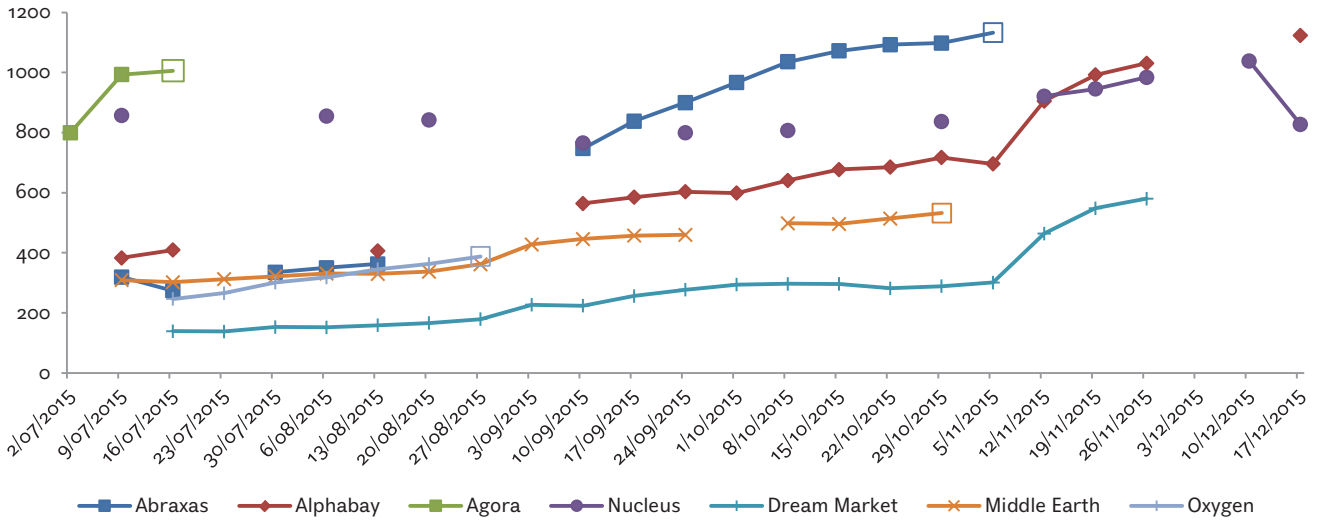
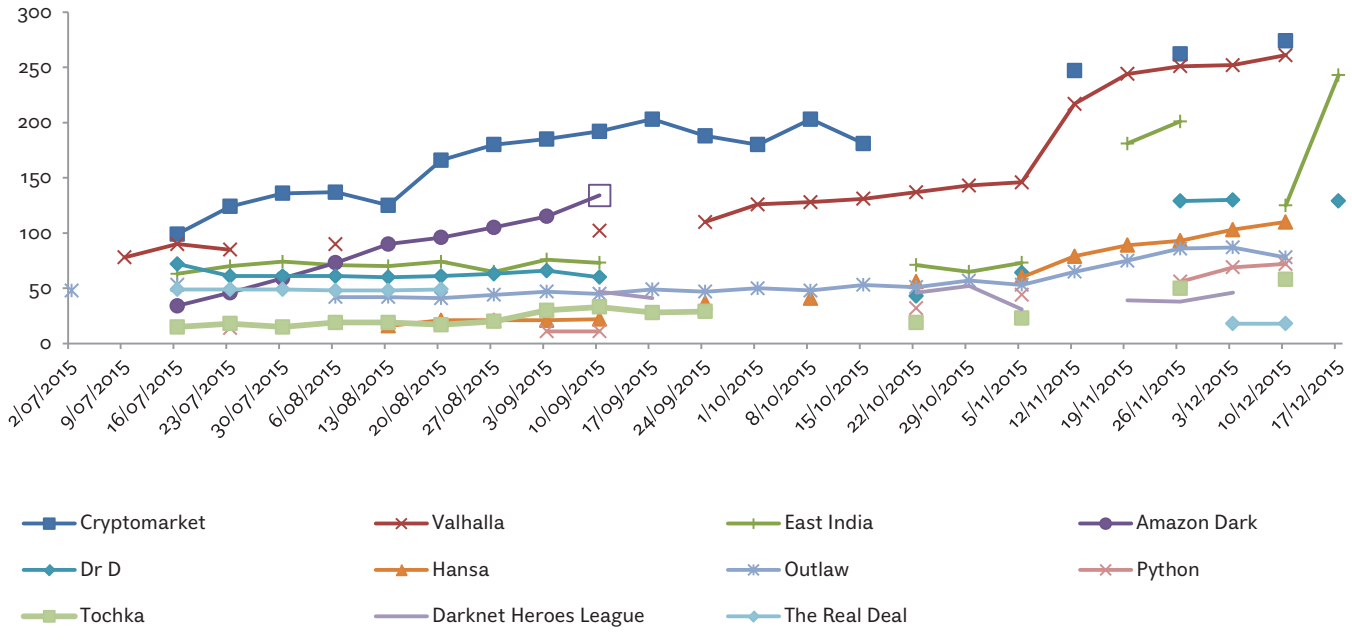


Figure 2: Number of retailers across smaller marketplaces by time point. **NB:** missing data points indicate temporary marketplace outages. Empty markers indicate permanent closure of marketplace.



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During the period July to December 2015, six new marketplaces were identified, and a total of 18 marketplaces actively monitored during this time. Of these, five were closed, three (Abraxas, Middle Earth and Amazon Dark) due to apparent exit scams, one (Oxygen) due to unknown reasons, and one (Agora) taken down voluntarily due to security concerns. Interestingly, though Amazon Dark (and Evolution before it) both offered multi-signature escrow, and yet both ended up closing due to exit scams. However, on these marketplaces (as well as all multi-signature markets), multi-signature escrow was offered alongside centralised escrow, with the latter more widely used. Agora is of special interest, due to its status as the largest market of the time. The site was down from the end of July 2015 with deposits and withdrawals delayed, causing many users to suspect an exit scam. In August, however, a note was posted by the moderators to the market explaining that all operations were to cease until suspected security vulnerability was resolved. All parties were asked to withdraw funds being held on the marketplace, and to date it has not resumed trading. At the end of the monitoring period, the two main marketplaces remaining were Alphabay and Nucleus, operating at 1123 retailers and 827 retailers, respectively. While these numbers are considerable, no marketplace has returned to retailer numbers seen on Evolution (1512 retailers operating two weeks prior to exit scam) the largest darknet marketplace to date (in terms of unique retailer numbers) (Van Buskirk, Roxburgh, Bruno, & Burns, 2015b). For further detail, please see Appendix B for an extended version of Figure 1, with monthly time points dating back to June 2014.

The closure of Evolution following an exit scam in March 2015 saw an immediate increase in the number of unique retailers operating on other markets. Following the closure of Agora, however, the increase retailers on other markets was delayed by approximately two months. Recovery of marketplaces in the wake of major disruptions appears to have slowed. This may be due, in part, to the instability of access to the larger marketplaces, Alphabay and Nucleus. Access to Alphabay and Nucleus appeared to be difficult across the monitoring period, with missing data a common occurrence. This may be a result of servers not being able to accommodate large volumes of traffic attempting to access these markets as an alternative, post closure of large scale markets such as Agora. It is also possible that marketplace moderators specifically blocked the account that was used to login and access the marketplaces. This may have been the case with Dream Market, for which access stopped in December 2015, and was not regranted until a new user account was created. While repeated attempts are made to access a marketplace if a complete snapshot cannot be taken, these are done with the same user account. Future monitoring will attempt repeated access using multiple accounts when markets are inaccessible to account for this possibility. It is difficult to say whether access issues impact on consumer activity and confidence in the remaining markets. There appears to be fewer missing data points for many marketplaces in the latter part of the monitoring period, which may reflect expansion of these markets and increased capacity to accommodate large volumes of traffic.

Substances for Sale

Total Substances Available

Table 3 outlines the substances available from the six largest marketplaces ranked by the number of unique retailers identified selling each substance. Consistent with previous findings (Van Buskirk, Roxburgh, Bruno, & Burns, 2014), 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.

Table 3: Total number of retailers on the top six marketplaces with proportions of total unique retailers indicated, in order of unique retailer count by substance type

	Abraxas		Alphabay		Agora		Nucleus		Dream Market		Middle Earth	
Substance	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Cannabis	554	39%	806	42%	450	37%	658	41%	362	41%	257	44%
Pharmaceuticals	491	35%	745	39%	418	34%	592	37%	313	35%	185	31%
MDMA	403	28%	479	25%	299	25%	481	30%	234	26%	175	30%
Cocaine	362	26%	465	24%	226	19%	377	23%	205	23%	127	22%
Methamphetamine	269	19%	368	19%	169	14%	305	19%	173	19%	102	17%
NPS	184	13%	292	15%	189	16%	238	15%	134	15%	95	16%
LSD	155	11%	189	10%	119	10%	191	12%	92	10%	78	13%
Illicit Opioids	164	12%	213	11%	121	10%	163	10%	91	10%	56	9%
Magic Mushrooms	98	7%	116	6%	69	6%	96	6%	60	7%	43	7%
Ketamine	93	7%	105	6%	53	4%	98	6%	62	7%	29	5%
PIEDs	62	4%	88	5%	76	6%	65	4%	26	3%	18	3%
Synthetic Cannabinoids	21	1%	35	2%	19	2%	10	1%	8	1%	8	1%
Weight Loss	17	1%	24	1%	33	3%	15	1%	0	0%	3	1%
GHB	23	2%	40	2%	20	2%	27	2%	14	2%	1	0%
Total Unique	**1417**		**1907**		**1217**		**1605**		**893**		**590**	

NB: NPS = New Psychoactive Substances; PIEDs = Performance and Image Enhancing Drugs; Asterisks denote marketplaces that were closed during the monitoring period. Percentages listed reflect the proportion of Australian retailers selling each substance class as a percentage of total retailers selling that substance. As retailers often sell multiple substance classes, percentages do not add up to 100%. For a further clarification of the categories used in the above table, please see Appendix B.

NPS Available

Novel Psychoactive Substances (NPS), though only accounting for 10-15% of listings in marketplaces, are of special interest given the pace of change in new types of NPS available. In addition, the DNeT monitoring of surface web retailers specifically aims to quantify the availability of NPS online, with dark net NPS availability providing a contrast to this availability. NPS on dark net marketplaces also appear to more accurately reflect consumer preferences for NPS, as indicated by other monitoring systems (Sindicich & Burns, 2015).

Table 4 details the ten most commonly sold NPS on the top six marketplaces (ranked by unique retailers selling NPS). The categories of 2C-x, NBOMe family and 5-MeO family (5-methoxy-substituted) 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, McLaren, Gerostamoulos, & Beyer, 2012). Additionally, synthetic cannabinoids were often sold as blends, consisting of different combinations of many chemicals, making classification more complex. Although forum discussions appear to 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 from the 2C-x, DMT and NBOMe categories were the most commonly sold, with some variation across marketplaces. This represents a slight change in popularity from previous findings in which DMT or NBOMe were most commonly sold. This monitoring period saw a slightly higher proportion of retailers selling synthetic cannabinoids across marketplaces, and lower numbers of retailers selling mephedrone and methoxetamine. The ranking of NPS as a category overall among retailers appeared stable.

Table 4: Number of retailers from the top six marketplaces selling the ten most common NPS.

	Alphabay		Abraxas		Agora		Nucleus		Dream Market		Middle Earth	
Substance	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
2C-x	60	20%	53	28%	39	20%	51	21%	29	21%	28	29%
DMT	50	16%	39	20%	44	23%	42	17%	21	15%	17	17%
NBOMe	42	14%	23	12%	30	15%	31	13%	16	12%	14	14%
Synthetic Cannabinoids	35	12%	21	11%	19	10%	10	4%	8	6%	8	8%
Methoxetamine	18	6%	15	8%	24	12%	20	8%	8	6%	8	8%
Mephedrone	25	8%	6	3%	17	9%	20	8%	15	11%	4	4%
MDA	18	6%	17	9%	19	10%	17	7%	4	3%	5	5%
A-PVP	18	6%	13	7%	19	10%	11	5%	6	4%	12	12%
5-MeO Family	18	6%	17	9%	14	7%	15	6%	5	4%	4	4%
Ethylone	13	4%	16	8%	14	7%	12	5%	6	4%	4	4%
Total Unique	**304**		**192**		**195**		**241**		**136**		**98**	

NB: Percentages indicate proportion of unique NPS retailers on the listed marketplace, while the final row percentage denotes proportion of all unique retailers on that marketplace. For further information on the substances and categories listed, please see Appendix A

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SUMMARY

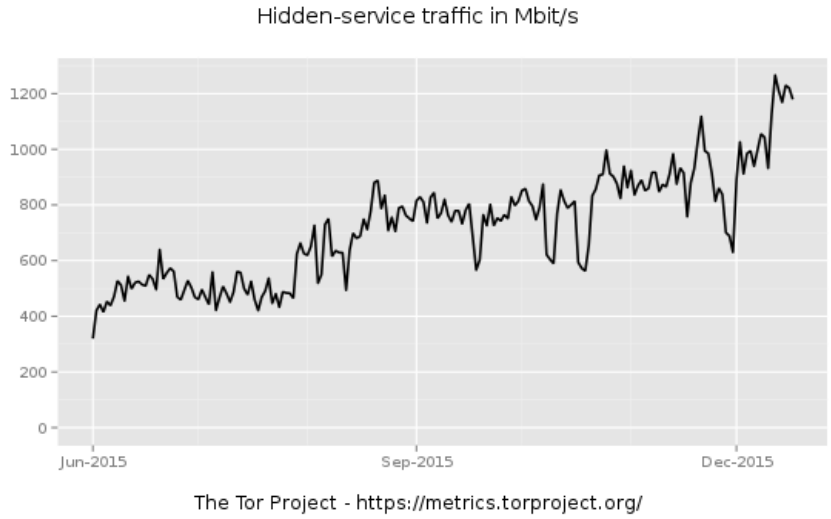
- The two largest marketplaces still operating at the end of the monitoring period were Alphabay and Nucleus, though both were operating with retailer numbers lower than those seen on Evolution before it closed (27% and 31% less retailers than Evolution, respectively).
- As of the 25th of August, Agora closed due to security concerns and at the time of writing it remains closed.
- Despite downtime in access to marketplaces, there was continued growth in smaller marketplaces, with increased retailer numbers observed across all of them during the period.
- 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 darknet marketplaces were largely consistent with those observed in earlier bulletins, with mephedrone and methoxetamine declining slightly in availability, and synthetic cannabinoids increasing slightly.
- Consistent with previous findings, the most commonly available substances on these marketplaces are largely traditional illicit substances (cannabis and ecstasy) and pharmaceuticals, rather than NPS, reflecting findings from surveys on people who use drugs.

As in previous bulletins, it is not possible from these results to determine how often, and in what amounts, illicit and emerging substances are being purchased online in Australia. The 2014 EDRS report suggested low usage of the internet for purchasing drugs among existing ecstasy consumers. Only 7% of the sample had used the internet for their most recent drug purchase, preferring instead to purchase from friends and dealers (Sindicich & Burns, 2014). Consistent with this, published findings from the Global Drug Survey (GDS – an online survey of people who use drugs) also reported that 7% of Australians had purchased drugs on the Silk Road (Barratt, Ferris, & Winstock, 2014).

IMPLICATIONS

The current monitoring period saw an increase in uptime across marketplaces after a previous period of volatility. The DDoS attacks observed across markets in the wake of the closure and exit scam of Evolution appear to have diminished. Despite this, some of the larger markets still experienced instability across the period, and full snapshots were not collected consistently. This appears to be due to these marketplaces dealing with increased consumer and retailer traffic following Agora's closure. These increases may be reflected in a general upward trend showing an increase in traffic volume for hidden services on the TOR network that encompasses the monitoring period reported in this bulletin (TOR Project, 2016), shown in **Figure 3**.

Figure 3: Total traffic volume (Mbit/s) on hidden services during the monitoring period (TOR Project, 2016)



Though there were fluctuations throughout the period in numbers of retailers across marketplaces, the overall increase in numbers observed in previous periods was not observed in the current period. Similarly, the time to recovery following major disruptions and market closures appears to have increased, indicating a deceleration of overall activity on darknet marketplaces. This may be driven by consumers moving to private arrangements with retailers, opting to forego darknet markets altogether to avoid the risks that these markets are presented from law enforcement, external parties, and the moderators themselves. While Alphabay and Nucleus saw unique retailer numbers exceeding 1000 at time points throughout the period, their trajectories to these numbers have been neither rapid nor smooth. Indeed, Nucleus recorded 1038 unique retailers on the 10th of December, before dropping to 827 on the 17th of December. This has been typical of larger marketplaces since Operation Onymous (Van Buskirk, Roxburgh, Bruno, & Burns, 2015a) and has especially been the case since Evolution closed in March 2015 (Van Buskirk et al., 2015b). Of interest is whether marketplaces will return to the trend of steady increases in retailer numbers previously observed, or if fluctuation and instability will continue to typify the operation of darknet markets.

There has been a gradual decline over the past year in the proportion of darknet market retailers selling NPS. This is despite the European Monitoring Centre for Drugs and Drug Addiction continuing to identify record numbers of new NPS available (EMCDDA, 2015). Though the number of retailers selling the more popular NPS (i.e. the 2C-x family, NBOMe and DMT) has been relatively consistent over time, other NPS have dropped in popularity. It has been hypothesised that NPS usage is often driven by low purity or availability of traditional psychoactive substances (EMCDDA, 2015). However, the past three years has seen a continuing increase in the purity of seized drugs and number of seizures, potentially indicating increased availability in both Australia and Europe (Australian Crime Commission, 2014; EMCDDA, 2013). In addition, drugs purchased on the darknet have been consistently shown to have an average higher purity than street market drugs (Barratt, Ferris, & Winstock,

2014; EMCDDA, 2016). As awareness of NPS has increased, so too have changes in legislation to control them, removing the legal 'grey area' in which these substances historically existed. This may indicate an overall decline in the popularity of NPS, with consumers less likely to try new substances and only a few NPS with established popularity remaining on offer.

Future bulletins in this series will continue to provide timely and accurate updates on the state of darknet marketplaces and seek to assess their impact on traditional street marketplaces, as well as the impact of the Internet as a whole on illicit drug use in Australia.

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

Table 5: Chemical classification of mentioned NPS

NPS	Category	Subcategory
2C-x	Phenethylamine	Psychedelic
5-MeO Family	Tryptamine	Psychedelic
Alpha-PVP	Other Stimulant	Norepinephrine-Dopamine Reuptake Inhibitor
DMT	Tryptamine	Psychedelic
DOx	Phenethylamine	Psychedelic Amphetamine
Ethylone	Phenethylamine	Entactogen
Mephedrone	Phenethylamine	Amphetamine Type Stimulant
Methoxetamine	Dissociative	Arylcyclohexylamines
Methylone	Phenethylamine	Entactogen
NBOMe Family	Phenethylamine	Psychedelic

Table 6: Glossary of categories and abbreviations used in bulletin

NPS	Category
2C-x	2C-B, 2C-E, 2C-I
5-MeO Family	5-MeO-DMT, 5-MeO-DiPT
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

Appendix B: Figure 1 extended including data from June 2014 to December 2015