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Title: New Psychoactive Substances (NPS) on cryptomarket fora: an exploratory study of characteristics of forum activity between NPS buyers and vendors.

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Abstract

Background The continual diversification of new psychoactive substances (NPS) circumventing legislation creates a public health and law enforcement challenge, and one particularly challenged by availability on Hidden Web cryptomarkets.

Methods This is the first study of its kind which aimed to explore and characterise cryptomarket forum members' views and perspectives on NPS vendors and products within the context of Hidden Web community dynamics. An internal site search was conducted on two cryptomarkets popular with NPS vendors and hosting fora; Alphabay and Valhalla, using the search terms of 40 popular NPS in the seven categories of stimulant/cathinone; GABA activating; hallucinogen, dissociative, cannabinoid, opioid and other/unspecified/uncategorised NPS. 852 identified threads relating to the discussion of these NPS were generated. Following exclusion of duplicates, 138 threads remained. The Empirical Phenomenological Psychological method of data analysis was applied. Four themes and 32 categories emerged.

Results 120 vendors selling NPS were visible on Alphabay, and 21 on Valhalla. Themes were '*NPS Cryptomarkets and Crypto-community interest in NPS*'; '*Motives for NPS use*'; '*Indigenous Crypto Community Harm Reduction*'; and '*Cryptomarket Characteristics underpinning NPS trafficking*', with two higher levels of abstraction centring on '*NPS vendor reputation*' and '*NPS transacting for personal use*'. NPS cryptomarket characteristics centred on generation of trust, honesty and excellent service. Users appeared well informed, with harm reduction and vendor information exchange central to NPS market dynamics. GABA activating substances appeared most popular in terms of buyer interest on cryptomarkets. Interest in sourcing '*old favorite*' stimulant and dissociative NPS was evident, alongside the sequential and concurrent poly use of NPS, and use of NPS with illicit drugs such as MDMA.

Conclusion. Continued monitoring of new trends in NPS within Surface web and cryptomarkets are warranted. A particular focus on the rising market in prescribed benzodiazepine and Z-hypnotic drugs should be included.

Key Words

New Psychoactive Substance; Hidden Web, Cryptomarket; Internet

Introduction

Increasing trends in the diversification, development, trafficking and sale of New Psychoactive Substances (NPS) continue to present a global public health and law enforcement challenge (European Monitoring Centre for Drugs and Drug Abuse, EMCDDA, 2015). The umbrella term NPS describe the multitude compounds marketed as legally ambiguous alternatives to conventional illicit drugs. The United Nations Office on Drugs and Crime (UNODC) and the European Union (EU) define NPS as “*Substances of abuse, either in a pure form or a preparation, that are not controlled by the 1961 Single Convention on Narcotic Drugs or the 1971 Convention on Psychotropic Substances, but which may pose a public health threat*” (UNODC, 2013; Council of the European Union decision 2005/387/JHA, 2005; Martinotti et al., 2015: 295). The NPS marketing phenomenon of non-controlled substances such as cathinone derivatives, synthetic cannabinoids, pyrovalerones, NBOMe series, methoxetamine to name a few has however gathered momentum since 2007 (Caudevilla, 2016). The EMCDDA identified 101 NPS in 2014, in addition to the total number of 450 monitored NPS (EMCDDA, 2015). Scientific research and surveillance struggle to keep up with the ever increasing range of new designer NPS continuously adapted to circumvent legislative control, and with undocumented toxicological and psycho-activity risks (EMCDDA, 2015; Caudevilla, Ventura, Indave Ruiz, & Fornís, 2013; Caudevilla, 2016).

Recent Eurobarometer surveys indicate that 8% of youth report experience of NPS (Eurobarometer, 2014). Typical NPS users are young males (Werse & Morgenstern, 2012), with more mature and experienced ‘*psychonautic*’ users operating on the internet (Soussan & Kjellgren, 2014; Van Hout & Bingham, 2013a:b). Motivations for use potentially overlap with that of conventional illicit drug use motives and centre on availability and legality, curiosity and sensation seeking, pleasure, self-exploration, coping, spiritual attainment, cognitive enhancement and habit (Soussan & Kjellgren, 2016; Van Hout, 2014; Van Hout & Hearne, 2015). The Global Drug Survey (GDS) (2016) has indicated a shift in motivations

due to ease of online access, perceived value for money and poor quality of available conventional illicit drugs. Preferences for certain NPS in other studies appear not dependant on legal status, but on the desired and duration of effects, but are not viewed as superior to conventional illicit drugs, and are not viewed as safer (GDS, 2016; van Amsterdam, Nabben, Keiman, Haanschoten, & Korf, 2015).

The Internet is driving change in contemporary drug markets (EMCDDA, 2016), and with social media is playing a major role in the marketing and sale of illicit drugs, prescription medicines and NPS (Orsolini, Francesconi, Papanti, Giorgetti, & Schifano, 2016). Online retail is reported to be one sourcing route for NPS, in addition to offline interactions via friends and local contacts (Sande, 2016; Soussan & Kjellgren, 2016; van Amsterdam et al., 2015). The Surface Web is used in the accessing of information around retail, synthesis and cultivation processes, and how to circumvent national legislative controls (Lavorgna, 2014:2016; van Amsterdam et al., 2015). Growing use of online drug fora for support and information sharing is observed (Hearne & Van Hout, 2016; Rosino & Linders, 2015; Soussan & Kjellgren, 2015: 2016; Van Hout, 2014; Van Hout & Hearne, 2015a:b). Sale of NPS retailed in cryptomarkets located on the Hidden Web and which are only accessed through use of TOR browsers or proxies however appear limited (EMCDDA, 2016). However, cryptomarkets have enhanced user access to information and NPS via fora information exchange and the establishment of direct links between users and producers or synthesisers of NPS (EMCDDA, 2016; Lavorgna, 2016).

Cryptomarkets are defined as anonymous online marketplaces which host multiple vendors, use cryptocurrencies for transactioning, provide feedback via customer ratings, and are primarily focused on the commodities of illicit drugs (Barratt and Aldridge 2016; Van Buskirk et al., 2016a). The most recent estimation of annual global turnover of cryptomarkets by Soska & Christin (2015) exceeds US\$100 million. The GDS in 2016 reported on a rise in last year cryptomarket purchasing of drugs from 4.5% to 6.7%, with most common drugs

including MDMA, cannabis, new or novel substances (including 2C-B and DMT) and LSD. In terms of operational characteristics, cryptomarkets employ advanced encryption in the form of the virtually untraceable cryptocurrency Bitcoin (and others including Litecoin, Dogecoin, Darkcoin); the Onion Router (TOR) service; encryption of private messages, files and e-mails using the Pretty Good Privacy (PGP) cryptosystem to ensure user and administrator anonymity, and sometimes as an option, the Tails or The Amnesiac Incognito Live System (Aldridge & Décary-Héту, 2016; Bancroft & Scott Reid, 2016; Bright Planet, 2013; Broséus et al., 2016). These protective tools when combined with an escrow and customer feedback system have revolutionised online drug trading (Aldridge & Décary-Héту, 2014; Martin, 2014a:b; Tzanetakis, Kamphausen, Wersé, & von Laufenberg, 2016). Cryptomarket benefits for vendors and consumers include security, global marketing, product availability and information, and product quality (Broséus et al., 2016). Physical risks associated with real world drug dealing are also significantly reduced, due to anonymous online purchasing, third party mediation and vendor feedback (Aldridge & Décary-Héту, 2014; Broséus et al., 2016; Barratt, Ferris & Winstock, 2016; Soska & Christin, 2015; Tzanetakis, Kamphausen, Wersé, & von Laufenberg et al., 2016; Van Hout & Bingham, 2014).

Interest in the expanding online drug trade is not confined to researchers, and includes law enforcement agencies, media and public interest (Martin & Christin, 2016). The surveillance and investigation of cryptomarkets has formed into a research field of its own (Barratt and Aldridge, 2016; Rhumorbarbe et al 2016). Activity to date has explored marketplace dynamics and activity on Silk Road 1 (Barratt, Ferris, & Winstock, 2014; Christin, 2012; **Martin, 2014a**; Phelps & Watt; 2014; Soska & Christin, 2015; Van Hout & Bingham, 2013a:b; 2014), Agora (Tzanetakis et al., 2016; Van Buskirk et al., 2016b), Silk Road 2 (Broséus et al., 2016; Dolliver, 2015; Martin, 2014b; Soska & Christin, 2015) and Evolution (Rhumorbarbe et al 2016). Particular efforts also have focused on monitoring listings (Aldridge & Décary-Héту, 2014: 2016; Burns, Roxburgh, Bruno, & van Buskirk, 2014; Christin, 2013; Dolliver, 2015), analysis of vendor reputation (Hardy & Norgaard, 2015), user

and vendor perceptions of quality, trust, impacts of drug cryptomarkets on drug use trajectories, and forum harm reduction (Bancroft & Scott Reid, 2016; Barratt et al., 2016; Tzanetakis et al., 2016), changing political content on cryptomarkets (Munksgaard and Demant 2016) and the combination of digital, chemical and physical information to reconstruct vendor activity (Rhumorbarbe et al 2016).

Changing legislative environments affect the 'greyzone' between internet markets for legal and illegal drugs, especially the expanding markets for NPS, and have stimulated the change in NPS online markets from fully visible and easily accessible to that of a more diverse, mixed (consisting of openly accessible surface web segments, and hidden web concealed elements) and the cryptomarket presence (European Commission, 2016). Whilst NPS research activity on the Surface Web drug fora is growing, and has primarily focused on forum analysis used to analyse user posted data relating to emerging drug trends, motivations for use, and cyber folk pharmacology (Hearne & Van Hout, 2016; Kjellgren, Henningson, & Soussan, 2013; Moro & Raaz, 2013; Soussan & Kjellgren, 2015: 2016; Van Hout, 2014; Van Hout & Hearne, 2015a:b), less is known about discourses in NPS purchasing on cryptomarkets. Wholesale activity on cryptomarkets stimulates diffusion and diversity of new drugs, alongside a wider range of drugs (Dolliver, 2015; Aldridge and Décary-Héту, 2016). Van Buskirk et al., (2016a) have reported on the profile of cryptomarket drug purchasers, who tend to be younger, and have used a greater repertoire of drugs in the past six months, particularly NPS and psychedelics. In contrast with Surface Web fora, cryptomarket fora permit discussions around vendors, sourcing and NPS product quality (Hearne & Van Hout, 2016) and host knowledge around enhancing effects and indigenous harm reduction practices (Barratt and Aldridge, 2016). This is the first study of its kind which aimed to explore and characterise cryptomarket forum members' views and perspectives on NPS vendors and products within the context of Hidden Web community dynamics.

Methods

The recent Editorial in the International Journal of Drug Policy by Barratt and Aldridge (2016) has underscored the ethical complexities in engaging in cryptomarket research. Martin & Christin (2016) have also noted the distinct ethical challenges and difficulties in attaining ethical consensus in accessing cryptomarket data, underpinned by large scale data collection, encryption, surveillance of illegal activity and geographical separation from participants. Challenges encountered in cryptomarket research are uniquely underpinned by conventional criminological ethical tenets in protection of those engaging in criminal behaviours with unique ethical complexities centring on the continued debate around public versus private space in conducting ethical research on the Hidden Web spaces (Barratt and Aldridge, 2016). We concur with Martin & Christin's (2016: 3) observations around '*the many shades of grey*'. Hence whilst we recognise the subjectivity in researcher and member interpretation of the online forum as private space, we adopted the ethical position that Hidden Web space and its cryptomarkets are public in nature due to the low barriers to entry or membership, the presence of large numbers of individuals accessing the vendor pages and discussion forums on our chosen cryptomarkets, and the member understanding that these sites would be under surveillance by external parties and monitoring of communications (Christin, 2013; Dolliver, 2015; Dolliver & Kenney, 2016; Martin & Christin, 2016; Soska & Christin, 2015). In contrast to Bancroft and Scott Reid (2016) we are explicit about the cryptomarkets from which the data is drawn from (as are van Buskirk et al. 2016b; Tzanetakis et al. 2016), and decided not to create fictional names for the cryptomarkets used in this study. Our initial ethical and methodological considerations centred on decisions whether to use digital trace analyses of markets, analysis of discussion forum data, or active participatory approaches to engaging with the cryptomarket community in gleaning unique and useful information (Barratt, Maddox, Lenton, & Allen, 2016). We decided to uphold observational status of the selected cryptomarket fora in collecting the data and were not in contact with cryptomarket fora members. However given the emergent concerns around the potential linking of published results to anonymised profile names, we removed screen

pseudonyms and paraphrased the quotes significantly to achieve full anonymization (Bancroft and Scott Reid, 2016; Barratt and Aldridge, 2016; Décary-Héту et al. 2016). Ethical approval for the protocol was subsequently granted by Waterford Institute of Technology, Ireland, as part of a larger European internet monitoring project funded by the European Commission.

A listing of popular NPS in the stimulant/cathinone; GABA activating; hallucinogen, dissociative, cannabinoid, opioids and other/unspecified/uncategorised NPS was generated in 2016, and was based on the EMCDDA (2015) trends and developments report (Table 1). This listing was cross referenced with NPS available on cryptomarkets at the time, the EMCDDA Early Warning reports, and up to date reviews on NPS trends (Schifano , Orsolini, Papanti, & Corkery, 2015; Soussan & Kjellgren, 2016; Zawilska & Andrzejczak, 2015).

Insert Table 1 'Categories and Compounds' about here

Four cryptomarkets (Alphabay; Valhalla; Nucleus; Dreammarket) which had the most vendors selling NPS in April 2016 were selected. Subsequently, the study was restricted to those hosting user discussion fora. The cryptomarkets (Nucleus; Dreammarket) were excluded as they did not host discussion fora. Table 2 and 3.

Insert Table 2 'Range of NPS retailed on Valhalla Marketplace' about here

Insert Table 3 'Range of NPS retailed on Aphabay Marketplace' about here

Each cryptomarket fora was searched internally using the NPS terms contained in Table 1. 852 threads were downloaded relating to **cryptomarket member** discussion around NPS on the two cryptomarkets. Following exclusion of duplicates, 100 threads on Alphabay and 38 Threads on Valhalla remained for analysis. Duplicates were threads that showed up in

searches for more than one NPS. One thread was included in the data set, categorised for relevant NPS categories and analysed.

701 distinct user pseudonyms were documented. Vendor posts represented 27% of posts on Alphabay, and 18% on Valhalla (see Tables 4-7). Background information on NPS buyers, vendors and interested cryptomarket members such as gender, age, and country of residence was not stated. Some countries mentioned as locations by prospective NPS forum members were Australia, USA, UK, Canada, the Netherlands, and Spain.

Insert Table 4 'Popular NPS discussed on Valhalla Marketplace' about here

Insert Table 5 'Popular NPS discussed on Alphabay Marketplace' about here

Insert Table 6. 'Posts per category of NPS on Alphabay Marketplace' about here

Insert Table 7. "Posts per category of NPS on Valhalla Marketplace' about here

We used the Empirical Phenomenological Psychological (EPP) five step method (Karlsson, 1995) to guide the collection and computer assisted analysis of the data in a careful and unbiased approach to describing NPS conversations and experiences within these cryptomarkets. This approach involves a series of sequential steps 1) reading the data file three times to familiarise and create an overview in the absence of any predetermined hypothesis; 2) sub dividing the text into meaning units within regard to syntax and each time a new meaning, topic or focus was introduced; 3) restating these meaning units in objectivised terms; 4) collectivising these restated meaning units into coherent categories supported by repeated consultation with the original data set and ensuring that categories were maintained and considered in terms of contrasts and similarities with phenomenological experiences, and 5) situation of these categories into general themes.

Results

Four themes ‘NPS Cryptomarkets and Crypto-community interest in NPS’; ‘Motives for NPS use’; ‘Indigenous Crypto Community Harm Reduction’; and ‘Cryptomarket Characteristics underpinning NPS trafficking’ emerged.

During the final step of the EPP analysis, two additional higher levels of abstraction emerged above the theme level, whereby these abstract concepts were described by the majority of cryptomarket members in distinct ways. The first concept centred on ‘reputation’ of the NPS vendor in the form of honesty, fast shipping and product quality as central to NPS decision-making processes to purchase followed by development of relational trust thereafter.

“My superior customer service and high ratings, do you realise how hard that is to maintain? Considering every xxx customer will try to rob you? You can’t fake feedback. Customers are happy with my products and service”.

Vendor investment in the generation of reputation and customer networks appeared fundamental to cryptomarket operation. The second concept centred on NPS transacting for personal use, in the form of ‘business to customer’ relations characterised by purchasing of small amounts, and **cryptomarket member** investment in informed decision-making around product quality and quality testing.

“Got a-PVP from XXX [Vendor], best I ever had, excellent stealth and weight. Hope he doesn’t run out, I am a regular buyer.”

NPS Cryptomarkets and Crypto-community interest in NPS

Members accessing both cryptomarkets appeared to have knowledge and experience with a wide variety of NPS such as a-PVP, Methoxetamine, 5-MeO-MIPT, bk-2C-B, 1P-LSD, Etizolam, and U-47700, prescribed drugs (Zopiclone) and illicit drugs such as heroin, MDMA, LSD, and cannabis/weed. Motivation for use of cryptomarkets for the sourcing of NPS was not clearly stated as members discussions centred primarily on decision-making processes

around which NPS and which vendor to use, and cryptomarket characteristics in the form of NPS product feedback, vendor and product reviews, and vendor reputation.

“My only request is that you leave a short description of the transaction so as I can get a good reputation on here.”

Common trends in interest based on number of posts appeared higher for the NPS categories as follows; GABA activating substances, stimulants/cathinones, phenethylamines, dissociatives, and to a lesser extent tryptamines, opioids, synthetic cannabinoids, and other/unspecified/uncategorised NPS. Of note is that despite member interest in synthetic cannabinoids and opioids, these were only sold on one of the two marketplaces [Alphabay].

Many vendors advertised with extensive lists of a variety of different types of NPS as their sales ‘pitch’

“thj-2201, thj-018, jwh-018, Apvp, Aphp, Apvt, , 3cmc, 3mmc, 4cmc, 4bmc, 4mmc, BB-22, DOC, am2201, 2fa, Ab-pinaca, Ab-chminaca, Methylone, 4fa Etizolam, Ethylphenidate EP, 4-Aco-dmt, 4F-PV8, Ethylone, , 25i-nboh, 25I-NBF, 25C-NBF, SDB-006, SDB-005, 25C-nbome, 25D-NBOMe, EAM-2201, 4-MEC AKB-48, 5F-AKB-48, 5F-UR-144, 5F-PB-22, Butylone, met, 25i-nbome Ab-fubinaca, Methoxetamine mxe, mam-2201, nm-2201, FUB-PB-22, FAB-144,.”

GABA activating substances were most frequently discussed by interested parties, vendors and users (Etizolam, Flubromazepam, Diclazepam, Deschloroetizolam, Phenibut) and were also most advertised by vendors for sale. Both cryptomarkets discussed interest in Zopiclone, a nonbenzodiazepine hypnotic agent used in the treatment of insomnia. User interest toward purchasing GABA activating substances on both cryptomarkets appeared to centre on the attractiveness of potential availability online, in comparison to more conventional routes to purchasing via medical prescribers and Surface web pharmacies.

“As a person who has in the past had struggles with an addiction to Xanax (® [Etizolam], and after some time experimenting with this new chemical, I can tell you it is almost the same but a little less drowsy.”

Changes in user patterns of use for certain NPS were evident, with some discussions relating to the search for ‘old favourite’ NPS such as Mephedrone (4-MMC), Methoxetamine (MXE) and Methoxphenidine (MXP);

“I really wish somebody would create real 4MMC again. Can you please forward those samples quickly so that we can consider some unbiased views on this.”

“Are you suggesting [vendor name] is marketing MXE or Psilo as MXP? I only ask as their vendor feedback is great on their MXE. Would a person not be able to differentiate between MXP and MXE? They appear to be quite different.”

Many members appeared to act as NPS connoisseurs, with reservations around the purchasing of popular NPS.

“Nobody has genuine Mephedrone. Any substance that is produced or sold as Mephedrone isn’t genuine Mephedrone. The reality that the so-called best ‘Mephedrone’ is not great quality should be a distinct sign.”

Dissociative NPS were frequently discussed by both interested parties and users, and advertised by vendors on both cryptomarkets. The majority of discussions were focused on methoxetamine (MXE), methoxphenidine (MXP), 3-MeO-PCP, and 2-MeO-ket.

“Has anybody confirmed that the MXP they received is actually MXP? It might possibly be a shitty mixture of MXE, or even the mixture that we have all sampled of MXP is different like with MXE the same thing occurs.”

User and vendor interest in phenethylamines (bk-2C-B, 25-I, 25I-NBOMe, 4-FA) was not as prominent as GABA activating substances but more common than dissociatives. Vendors who advertised this category of NPS as mimicking the effects of LSD and in some cases as legally available.

“We have now listed 25i nBOH, our new product. It is similar to NBOMe, but with slightly longer duration of effects, has less body, and is nearly legal worldwide.”

Some cryptomarket members did not advocate the use of the 'N-bomb' substances as traditional LSD was available and preferred by communities on both cryptomarkets.

"I just don't understand why users on this area of the internet would have interest in taking N-bombs. I just can't comprehend why as LSD is available here."

Stimulant/cathinone NPS were discussed by interested parties and users within the context of NPS users purchasing MDMA, and on marquis testing the product reporting the presence of NPS compounds, Methylenedioxypropylvalerone (MPDV), bk-MDMA (Methylone) and 4-MMA (Paramethoxymethamphetamine). Other stimulant/cathinone NPS discussed were a-PVP, 5-APB, bk-MDEA (Ethylone), MDA, 4-MEC, 3-FPM, and Pentedrone.

"I am unsure about your MDMA. Your test shot should not be yellow. It is not MDMA – it is methylone."

"I ordered MDMA quite some time ago from [vendor] and it fizzled yellow on the marquis test, seems it was Methylone."

Cannabinoid discussions centred on NPS buyers searching for specific types of synthetic cannabinoids (FUB-AKB, FUB-AMB, MAB-CHIMINACA, DB-FUBINACA, JWH-018, 5F-PB-22, 5F-AMB, and UR-144).

"I am specifically looking for research chemicals and synthetic cannabinoids. I would love to see good quality potpourri or spice like 5F-AMB or the AB series."

Fora discussions on the remaining types of opioids, tryptamines, lysergamides, and other/unspecified/uncategorised NPS were scant. Discussions primarily centred on vendors advertising for sale and prospective and repeat buyers reviewing these products. Tryptamines mentioned by cryptomarket users were 4-HO-MET, 5-MeO-MIPT, and 4-AcO-DMT, and opioids were U47700, W-18 and MT-45.

"The Tryptamines are an incredibly fun class of drugs. 5-MEO-DMT in a brew of Ayaheusca is amazing."

"This is my JAM! [U-47700]. If you are a lover of opiates, you should do your research on this one. You will be glad."

Motives for NPS use

Individuals operating within cryptomarket fora appeared primarily to be interested to purchase NPS for personal use. Common reported reasons to seek and use the most popular NPS category of GABA activating substances centred on use for the self-medication of anxiety and insomnia. Some user and interested party discussions also centred on the use of GABA activating substances to counteract the negative effects of stimulant NPS and illicit stimulant drugs, and assist in dealing with ‘comedown’ symptomatology.

“Youths that are purchasing this stuff like to have it handy so they can make their comedown easier after party drugs/stimulants they have taken at the weekend.”

Some discussions referred to the use of Etizolam when self-medicating mental health issues such as depression, anxiety, emotional pain and social anxieties.

“Drugs that are used to help me with social anxiety are the main reason I come to the Dark Net. I have social problems.”

Those with experience of NPS reported the use of dissociative, phenethylamine, tryptamine & lysergamide NPS primarily for psychonautic practices with many references to effects, best route of administration, and best value for Bitcoin. Dissociative NPS were the most commonly discussed and popular after GABA activating substances.

“MXP makes my lips feel numb and kind of warm. It takes a greater dose to get the same feeling as half the dose of MXE.”

One user reported the use of the dissociative 3-MeO-PCP to help with self-esteem and confidence issues in a social setting.

“for sure....it made me come out of my shell.” [3-MeO-PCP]

While opioid NPS were not referred to often in discussion activity, when used, were consumed for pleasure and psychonautic purposes.

“Secondly, I recommend U-47700. It is a research chemical but its high is wonderful. I think it is one of the most euphoric opioids at the moment.”

Stimulant/cathinone NPS were generally used by individuals intrigued about their effects in comparison to other NPS and also illicit stimulant drugs.

“Anyone who is curious about A-PVP, it’s a powerful stimulant. It is best smoked like with meth however it can also be snorted. If it is overheated it can taste disgusting so be careful.”

Poly substance using motives were evident with some users discussing the benefits of and advocating combinations of NPS to achieve a more pleasurable ‘high’ effect. This was seemingly effective with combinations of synthetic cannabinoids, and stimulant/phenethylamine mixtures, and tryptamines/MDMA.

“I find that a mixture of UR-144 and JWH-018 is great.”

“Within minutes of snorting 120mgs of Mephedrone I saw the walls warping and everything was pear shaped. I then added 120mgs of 2CB. This was the most profound feeling I have had in a very long time.”

“Tryptamines such as 4HO-DiPT (or 4-AcO-DiPT), 5-MeO-MiPT, 4-AcO-DMT, and 4HO-MiPT (or 4-AcO-MiPT) mix very well with MDMA.”

Indigenous Crypto Community Harm Reduction

Similar to communal folk pharmacology and harm reduction conversations between users and interested parties on the Surface Web, cryptomarket discussions between interested parties, users and vendors centred on the sharing of general harm reduction advice to consumers and potential users, and the investment of research time in scrutinising the choice of vendors and their status around NPS product quality prior to purchase. Many more experienced users advocated home testing of NPS (and other cryptomarket sourced illicit drug products) given concerns for verification of content and potential potency.

“All drugs are dangerous for the record, and it’s dangerous and bordering insanity digesting substances that you have bought anonymously from strange people. You should never feel comfortable purchasing drugs online.”

“I find it suspicious that on the marquis test your pill showed no reaction.”

Some NPS consumers and those interested in purchasing were reluctant to purchase products that had not been tested and confirmed to be a particular NPS. These included MDPV, a-PVP, MXP and MXE.

“Has anyone tested this MDPV? The previous time it tasted and acted strangely so I gave it to someone else. On reading an alternative review it seems that it is instead a-PVP. I would purchase more, if it has been tested.”

Harm reduction around poly use of NPS was widely discussed with some members advising against; some offering harm reduction advice; and many discussions around sequential and concurrent poly use of NPS, prescribed and illicit drugs in optimising desired effects and counteracting negative outcomes.

“Combining MDMA with other substances can create a more profound, deeper, visual experience. If you are a novice, do take it slow.”

NPS product reviews were frequently posted and seemed to be the leading factor in the NPS vendor’s reputation, and also impacted on NPS user decision-making processes, experiences and harm reduction practices.

“I have ordered MDMA and Methylone from this particular vendor. However I did not receive the product that was advertised. I know what they are as I have used both before. His product made me feel extremely ill and I did not recover for 3 days.”

A majority of discussions particularly centred on the negative experiences encountered with synthetic cannabinoids.

“I would not take crappy synthetic cannabinoids as in general they are quite dirty. I was using them for some time and found them pretty harmful.”

Cryptomarket Characteristics underpinning NPS trafficking

Reputation around customer services and NPS products sold, recommendation to others, vendor honesty, and development of relational trust on repeat transactioning were all considered significant by the community in supporting reciprocity between NPS vendors and

buyers. Member descriptions of the distinct operational functions of cryptomarkets referred to feedback, resolution, speedy shipping, and quality products, and were fundamental to purchasing decisions. The majority of NPS network discussions, consumerism and trends in particular NPS of interest within both cryptomarkets appeared to be centred in *'business to customer'* transacting for personal consumption, and in member interest in purchasing and testing of smaller amounts (1-2g).

"I ordered 2g of a-PVP for the first time recently from [vendor name]. Firstly can I say that I am somewhat a connoisseur with a-PVP? I have used it several times and sourced it from different vendors many times."

Customer feedback systems were viewed by buyers to boost and support online vendor reputations and relational trust between market players. Marred reputation was found to be difficult to revert once negative feedback had been posted.

"The customer had been refunded but they did not adjust their feedback. I'm guessing that on alphabay feedback is permanent for negative reviews."

Sustainability of vendor reputation in providing quality NPS products at competitive pricing and with superior customer service, was viewed by the community as central to continued credibility and required intensive and continued effort on the part of vendors.

"Negative accusations should only be submitted with and ABUNDANCE of proof and sent initially to the vendor so they can attempt to reconcile first. Following no reconciliation, admin should then be contacted. If this does not create reconciliation, it is only then that it should be made public. It is unnecessary to ruin a vendor's reputation when it can possibly be resolved."

Buyers described difficulties encountered in the form of shipping delays, which the community itself frowned upon and raised concerns around potential *'scamming'* by vendors. Many disputes occurred particularly in relation to delays in shipping where express shipping was paid for and guaranteed or when NPS products didn't arrive.

"Still no package after 16 days waiting. I was informed after 8 days that it was not shipped and then it was shipped as priority. Obviously this was untrue. This

vendor is dishonest with bad communication who did not apologize or admit fault.”

Cryptomarket forum administrators were quick to intervene when disputes (scamming, delayed dispatch, refusing to give a tracking number to buyer, etc) relating to transactions occurred.

“If you do not send him a working tracking number within 48hours, you will be banned.”

“My order status was marked shipped, since Monday night, however as I had not received it by Wednesday I private messaged the vendor requesting my package tracking number. The vendor said that he would not give tracking numbers out. However after pressing him he admitted that the order was never shipped. I got my money back but my time had been wasted.”

Pricing of certain NPS (MXE, Mephedrone) was described by some buyers as higher and with better consistency of product quality, than when retailed on previous cryptomarkets such as Silk Road 1 and 2. Many buyer discussions centred on vendors increasing profit margins with excessive shipping costs, despite offering discount prices for larger amounts.

“Drugs back then were only a fraction of today’s prices and the quality was high.”

Competition between NPS vendors was apparent and widely discussed by interested NPS users and buyers, with vendors seeking to ‘undercut’ each other with deals such as: cheaper prices; free shipping; and free samples (sometimes in exchange for positive feedback/reviews) in order to enhance their market position and vendor reputation. Competition dynamics were intensified when vendors created time limits on special offers so as to gain more customers

“From Easter Friday a new system is in place where anyone who finalises early will earn a 20% bonus.”

Discussion

This is the first study of its kind which explored cryptomarket forum members' views and perspectives on the NPS market within the context of Hidden Web community dynamics in two cryptomarkets 'Alphabay' and 'Valhalla' selling NPS in the second quarter of 2016. We describe here the particular community dynamics as they relate to NPS activity between cryptomarket members (interested parties, buyers and vendors). Key discussion themes central to these NPS cryptomarkets are NPS buyer evaluations of vendors and the quality of their NPS products, vendor bids for NPS market positioning and reputation, and information exchange around optimal use and harm reduction. In this way, this study contributes to both the growing research base on the NPS phenomenon itself, but also the surveillance of NPS supply within cryptomarkets. Validity in the form of "trustworthiness" of the data garnered was supported by horizontal and vertical similarities across both cryptomarkets in the reporting of NPS trend interest, motives to use NPS, indigenous harm reduction dynamics, and operational systems supporting vendor-buyer dynamics. That said, we recognise the potential for reporting of multiple user accounts (Martin & Christin, 2016) affecting our observational view.

Of interest was that whilst drug trafficking observed on Silk Road 1 at the beginning of 2011 was described as personal drug consumerism with transactions best described as '*business to customers*' (Barratt, 2012; Christin, 2012; Martin, 2014a:b; Van Hout & Bingham, 2013a:b; 2014), later studies on Silk Road highlighted a paradigm shift toward '*business to business*' innovation, with cryptomarkets largely in competition with street dealing networks (Aldridge & Décary-Héту, 2014; Soska & Christin, 2015). We speculate that user interest in and purchasing of NPS within the cryptomarket domain in this study occurred largely within '*business to customer*' transacting. Similar to other earlier cryptomarket studies (Van Hout & Bingham, 2013a:b; 2014), NPS consumers appeared well versed in a variety of NPS, prescribed and illicit drug use, and appeared to purchase NPS for personal use characterised by sourcing of small amounts of particular NPS, and home testing.

Cryptomarkets in this way appear to serve the market needs of NPS users. These markets have been observed to cater for users of well-known conventional illicit drugs and pharmaceuticals (Bancroft & Scott Reid, 2016; Barratt, Maddox, Lenton, & Allen, 2016; Barratt, Ferris, & Winstock, 2016; van Buskirk et al., 2016a). Most cryptomarket drug use described by Barratt et al. (2016) can be characterised as recreational, with some dependent or problematic use also described. Rational discourses in use are however described by both recreational and more problematic users operating within the cryptomarket domain (Bancroft and Scott Reid, 2016).

Lastly, operational factors supporting interest in NPS sold on cryptomarkets are similar to those identified in earlier cryptomarket investigations, and centre on the range of NPS products available, the role of professional vendor ratings and product reviews, vendor reputation building, and development of relational trust between vendor and consumer and online convenience and anonymity (Bancroft & Scott Reid, 2016; Barratt et al. 2014; Cox, 2016; Hardy & Norgaard, 2015; Tzanetakis et al., 2016; Van Hout & Bingham, 2013a:b; 2014). This study describes the intense market activity in the realm of NPS underpinned by market competitiveness in attracting NPS buyers, maintaining positive high ratings and superior customer service in the form of fast dispatch globally. NPS vendor identities are grounded their status, the promotion of excellent customer services and honesty, credibility of products and their contents, and evidence of repeated trade. Systems rewarding vendors selling '*good stuff*' and indicators of superior NPS drug quality were evident (Caudevilla, 2016; Jeffries, 2014; Ormsby, 2014; Van Hout & Bingham, 2014). As is the case for other conventional illicit drugs, feedback rankings for NPS underpin the cryptomarket operation, and require significant investment on the part of new vendors in building relational trust (Martin, 2014a; Tzanetakis et al., 2016). Cryptomarket administrators are quick to intervene in the event of sub-standard vending practices. Similiar to Décary-Hétu, Paquet-Clouston, and Aldridge (2016), cryptomarket vendors selling NPS appeared willing to risk international shipping of their products. We speculate that this is due to the ordering of small amounts of

NPS for personal use. According to Barratt and Aldridge (2016), willingness to ship internationally is associated with lower perceived effectiveness of law enforcement in the country of shipping, less optimal vendor ratings and smaller packages.

Van Buskirk et al., (2016a) have reported that cryptomarket consumers typically are a more '*entrenched*' consumer group and with more diverse substance use repertoires specifically psychedelics and NPS. Poly use of NPS compounds (sequential and concurrent), and NPS with conventional illicit drugs was described and similar to extant literature on the NPS user populations. Common trends in NPS user interest appeared higher for the sourcing of NPS with GABA activating properties, followed by stimulant.cathinon, phenethylamine, dissociative, and to a lesser extent, tryptamine, opioid, cannabinoid, and other/unspecified/uncategorised NPS. Motives for use and interest in sourcing of particular types of NPS were similar to those reported by Soussan & Kjellgren (2016). NPS discussions within these cryptomarkets often included reference to prescribed drugs such as benzodiazepine and Z-hypnotics, LSD and MDMA. Prior investigations have highlighted the user interest in MDMA, the 2-C hallucinogen drugs, cannabis, and LSD on the cryptomarket, Silk Road 1 (Barratt et al., 2014; Christin, 2013; Van Hout & Bingham, 2013b). Trends in NPS user interest were observed in relation to the sourcing of prescribed benzodiazepine and Z-hypnotic drugs and strong interest in GABA activating substances, alongside psychonautic interest in the sourcing for old NPS favourites such as Mephedrone (4-MMC), Methoxetamine (MXE) and Methoxphenidine (MXP). Similar trends relating to 4-MMC/4-MEC and MXE/MXP are described on drug fora on the Surface Web in post legislative timeframes (Van Hout, 2014; Van Hout & Hearne, 2015).

Cryptomarket fora discussing NPS operate similarly to Surface web indigenous harm reduction information exchange (Bancroft & Scott Reid, 2015; Barratt et al., 2016; Martin 2014b, Rhumorbarbe et al 2016; Van Hout, 2014; Van Hout & Hearne, 2015). Sharing of information on NPS product quality in this study appeared supported by cryptomarket

mechanisms of product review, user home testing of quality and user reporting of experiences. In terms of NPS product quality, our study supports that of Bancroft and Scott Reid (2016), who stated that quality itself is better understood in terms of effectiveness for the consumer, rather than the pharmacological quality of the compound, and with combinations of certain compounds valued. Similarly, Evrard, Legleye and Cadet-Taïrou (2010) have described how within the street market, perceived quality of cocaine is dependent on its price and information provided by the dealer. Concerns were evident within these communities with regard to unpleasant effects of synthetic cannabinoids and inconsistent content of MDMA, often containing other NPS such as MDPV, Methylone and 4-MMA. Similar trends are reported in GDS (2016) and by Soussan & Kjellgren, (2016).

Conclusion

The continual diversification of NPS markets creates a public health and policy challenge, particularly challenged by displacement into cryptomarkets. Barratt and Aldridge (2016) in their Editorial have illustrated how cryptomarket research activity provides us with emergent criminal, drug trend and supply side indicators, both within the Hidden Web domain, but also with commercial and social drug supply markets, and similar to Surface Web fora provides us with a unique insight into online harm reduction community activity. Our study on NPS builds on earlier NPS studies within the Surface Web, and that of cryptomarket activity around conventional illicit drug trade, and provides us with an indicator of potential emergent trends. Given the potential toxicological harms associated with certain NPS, user interest in NPS and prescribed benzodiazepine and Z-hypnotic drugs sold on cryptomarkets is concerning, and reflective of the rising trends in pharmaceutical abuse elsewhere. Further research and surveillance is warranted in the monitoring of new trends in these NPS, particularly within cryptomarkets.

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Table 1. Categories and Compounds

Stimulants/cathinones	Dissociatives	GABA/Benzo	Cannabinoids	Opioids	Tryptamines	Phenethylamines	Other
Mexedrone	MXP	Deschloroetizolam	5F-PB-22	Acetylfentanyl	4-AcO-DMT	25i-NBOMe	1P-LSD
a-PVP	MXE	Etizolam	AB-CHMINACA	W-18	5-MeO-MIPT	3-FPM	MPA (methiopropamine)
Pentedrone	Diphenidine	Flubromazepam	AB-FUBINACA	U-47700	DALT	Isopropylphenidate	Methylmethaqualone
MDPV	DXE (deschloroketamine)	Zopiclone	FUB-AKB	MT-45	MET	Methylallyescaline (MAL)	LSZ
Methylone	3-MeO-PCP	Phenibut	STS-135	Butyrfentanyl	4-HO-MET	4-FA (4-fluoroamphetamine)	ETH-LAD

Table 2. Range of NPS retailed on Valhalla Marketplace

VALHALLA MARKETPLACE							
STIMULANTS /CATHINONES	DISSOCIATIVES	HALLUCINOGENS			GABA Activating	CANNABINOIDS	OPIOIDS
		TRYPTAMINES	PHENETHYLAMINES	LYSERGAMIDES			
MDPV	Methoxetamine	5-MeO-MIPT	bk-2C-B		Deschloroetizolam		
bk-MDMA(methylone)	Methoxphenedine	4-ACO-DMT	25-I				
MDA		5-MeO-DMT	2C-B				
4-MEC			2C-P				
a-PVP			2C-T-7				
5-apb			2C-T-2				
5-APDB			2-FMA				
bk-MDEA(ethylone)			4-FA				

Table 3. Range of NPS retailed on Alphabay Marketplace

ALPHABAY MARKETPLACE							
STIMULANTS /CATHINONES	HALLUCINOGENS				GABA/BENZO	CANNABINOIDS	OPIOIDS
	DISSOCIATIVES	TRYPTAMINES	PHENETHYLAMINES	LYSERGAMIDES			
MDPV	Methoxetamine	4-HO-MIPT	25B-NBOMe	1P-LSD	Etizolam	JWH-018	U-47700
a-PVP		4-ACO-MET	25I-NBOMe		Flubromazepam	AMB-FUBINACA	MT-45
bk-MDMA(methylone)		4-ACO-DET	2C-I		Deschloroetizolam	MAB-CHMINACA	
bk-MDEA(ethylone)		4F-MPH	2CE			MMB-CHMINACA	
4-MMC(mephedrone)		5-MeO-MIPT	2CT2			ADB-CHMINACA	
3F-Phenmetrazine (3-FPM)		4-ACO-DMT				ADBUBINACA	
		4-OH-MIPT				5F-AKB48	
		5-methoxy-m1				5F-PB-22	

Table 4. Popular NPS discussed on Valhalla Marketplace

VALHALLA MARKETPLACE							
		HALLUCINOGENS					
STIMULANT /CATHINONE	DISSOCIATIVE	TRYPTAMINE	PHENETHYLAMINE	LYSERGAMIDE	GABA Activating	CANNABINOID	OPIOID
5-APB	Methoxetamine	4-ACO-DMT	2C-B		Phenibut	JWH-018	MT-45
5-APDB	Methoxphenidine	4-HO-MET	2C-I		Etizolam	AMB-FUBINACA	
MDA	2-MeO-KET	4-ACO-DMT	25C-NBOMe		Flubromazolam	MAB-CHMINACA	
4-MMA	Deschloroketamine (DXE)	5-MEO-DMT	25I-NBOMe			MMB-CHMINACA	
bk-MDEA (Ethylone)	3-MeO-PCP	5-MEO-MIPT	2C-E			ADB-CHMINACA	
bk-MDMA (Methylone)	Diphenidine		2-FMA			ADBUBINACA	
Pentedrone			4-FA			JWH-018	
4-MMC (Mephedrone)			2-FA			AMB-FUBINACA	
Pentylone			25-B			UR-144	
3-MMC			25-C			AM-2201	
						THJ-018	

Table 5. Popular NPS discussed on Alphabay Marketplace

ALPHABAY MARKETPLACE							
		HALLUCINOGENS					
STIMULANT /CATHINONE	DISSOCIATIVE	TRYPTAMINE	PHENETHYLAMINE	LYSERGAMIDE	GABA Activating	CANNABINOID	OPIOID
MDPV	Methoxetamine	4-ACO-DMT	25I-NBOMe	1P-LSD	Deschloroetizolam	AMB-FUBINACA	U-47700
4-MEC	Methoxphenidine	4-HO-MET	2C-I	LSZ	Flubromazepam	Mab-chiminaca	MT-45
bk-MDEA (Ethylone)	3-MeO-PCP	5-MEO-MIPT	2C-B	AL-LAD	Flubromazolam	Db-fubinaca	
bk-MDMA (Methylone)	Deschloroketamine (DXE)	N,N-DMT	2C-E		Etizolam	BB22	
MPA		4-ACO-DET	4-FA			FUB-AKB	
4-EMC		4-HO-DIPT	25I-NBOH			FUB-AMB	
4-MPD		4-ACO-DIPT	25C-NBOMe			JWH-018	
4C-PVP		4-ACO-DET	25D-NBOMe			THJ-018	
4-CMC						5F-UR-144	
4F-PHP						5F-PB-22	
3-MMC						SDB-006	
5-methoxy-methylone						SDB-005	
A-PVP						Ab-pinaca	
APHP						Ab-chminaca	

Table 6. Posts per category of NPS on Alhabay Marketplace

	Stimulants/ Cathinones	Dissociatives	GABA/ Benzo	Cannabinoids	Opioids	Tryptamines	Phenethylamines	other
VENDOR POSTS	19	4	57	4	1	6	13	1
BUYERS/MEMBERS POSTS	104	4	70	3	13	5	20	3
TOTAL POSTS	123	8	127	7	14	11	33	4

Table 7. Posts per category of NPS on Valhalla Marketplace

	Stimulants/ Cathinones	Dissociatives	GABA/ Benzo	Cannabinoids	Opioids	Tryptamines	Phenethylamines	other
VENDOR POSTS	6	12	5	4	3	10	19	0
BUYERS/MEMBERS POSTS	32	28	40	2	0	11	21	0
TOTAL POSTS	38	40	45	6	3	21	40	0

No conflict of interest declared.