Safer scoring? Cryptomarkets, threats to safety and interpersonal violence

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Note: Preliminary findings on these data were reported at http://www.globaldrugsurvey.com/the-global-drug-survey-2015-findings/

Abstract

Background: Cryptomarkets (or dark net markets) are digital platforms that use anonymising software and cryptocurrencies to facilitate trade of goods and services, most notably illicit drugs. Cryptomarkets may reduce violence among drug market participants compared with in-person drug trading because no face-to-face contact is required and disputes can be resolved through a neutral third party. In this paper, we test this proposition by measuring the self-reported threats to personal safety and experiences of violence among cryptomarket drug buyers across multiple sources.

Methods: Through Global Drug Survey 2015, a web survey was completed by a purposive sample who reported accessing drugs through cryptomarkets in the last 12 months (N=3,794). Their median age was 22 years and 82% were male. Three-quarters of the sample reported residence in Germany, UK, France, US, Australia or the Netherlands.

Results: The drug types most commonly obtained through cryptomarkets were MDMA/Ecstasy (55%), cannabis (43%) and LSD (35%). Cryptomarket users reported using a median of 2 sources in addition to cryptomarkets to access drugs, the most common being in-person friendships (74%), in-person dealers (57%) and open public markets (26%). When asked to nominate the main source they would use if cryptomarkets were unavailable, 49% nominated friendships, 34% dealers and 4% open markets. 'Threats to personal safety' (3%) and 'experiencing physical violence' (1%) were less often reported when using cryptomarkets compared with sourcing through friends (14%; 6%), dealers (24%; 10%) or open markets (35%; 15%). Concerns about drug impurities and law enforcement were more prevalent when using the alternative source, while issues concerning loss of money, waiting too long and not receiving the product were more prevalent when using cryptomarkets.

Conclusion: Cryptomarkets are associated with substantially less threats and violence even though most cryptomarket users would otherwise access closed networks to obtain drugs, including social supply networks.

Keywords: Cryptomarkets, drug markets, dark web, violence, social supply, e-commerce

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Introduction

Participants in markets for illegal goods and services are not afforded the usual protections of legal systems that govern fair business conduct. Contracts and agreements within criminal networks are deliberately ambiguous or absent, a result of actors' attempts to evade prosecution, making dispute resolution even more difficult (Reuter, 2009). Given these conditions, violence (e.g. assault, homicide) is utilised as a tool for resolving disputes between networks and within networks (Reuter, 2009), as well as for maintaining reputation, recovering losses and to enact vengeance (Topalli, Wright, & Fornango, 2002). In addition to drug market participants being barred from legal redress, these markets are often characterised by violence because full-time market participants typically come from lower socio-economic backgrounds, where they are more likely to have experienced violence as a normal dispute resolution strategy (Andreas & Wallman, 2009).

It is not always the case, though, that illegal markets involve systemic violence, or that violence will be employed uniformly (Friman, 2009). Specific drug markets that have notorious reputations for violence are not experienced as violent by participants, for example, Australia's Cabramatta heroin market as described by Coomber and Maher (2006). In fact, Pearson and Hobbs (2001) describe violence within drug trading as a sign of market dysfunction: if everything is working well, everyone is making a profit and no-one need to resolve disputes with overt violence, which is likely to attract police attention or rival retaliation. As further evidence that violence signals a dysfunctional market, Werb et al. (2011) found that law enforcement efforts to disrupt markets exasperated the problem of drug market violence by increasing instability within and between criminal networks.

Open drug markets have been described as more susceptible to violence than closed markets (Harocopos & Hough, 2005; Reuter, 2009). Drug markets may be understood as falling on a continuum between more open or more closed: open markets are those that are "open to any buyer, with no requirement for prior introduction to the seller, and few barriers to access", while closed markets are "ones in which sellers and buyers will only do business together if they know and trust each other, or if a third party vouches for them" (May & Hough, 2004, p. 550-1). In an open market, buyers and sellers cannot readily identify each other except at specific public locations, such as a corner or street known to the local community to be used for the purpose of drug trading. In this context, 'turf wars' may erupt where rival actors use violence to intimidate or remove potential challengers to operating in that locality. In contrast, closed markets occupy much less visible spaces, where transactions are conducted in

private homes or in public spaces where individuals make prior arrangements to meet. Social supply, defined as the non-commercial (or non-profit-making) distribution of drugs to non-strangers (Hough et al., 2003), tends to occur within closed market structures (Nicholas, 2008; Taylor & Potter, 2013). Typically, the policing of open markets often transforms them into closed markets, because market participants are forced away from meeting in known public areas by the threat of law enforcement. In turn, closed markets are harder to police but are seen to be less disruptive to public amenities and less prone to systemic violence (Harocopos & Hough, 2005).

As the degree of openness of a market is a key factor in understanding drug market violence, how can we characterise the degree of openness of cryptomarkets? According to Martin (2014), cryptomarkets are "online forum(s) where goods and services are exchanged between parties who use digital encryption to conceal their identities", distinguishable from other websites due to their reliance on anonymising networks (e.g. Tor), third party hosting, use of postal service to deliver goods, vendor and buyer rating systems, decentralised exchange networks, and use of cryptocurrencies (e.g. Bitcoin) (pp. 2-3) (also see editorial this volume). The combined use of anonymising networks, cryptocurrencies and the encryption of communications between market participants results in a system that enables features of both open and closed markets: arguably, from the perspective of market participants, providing the 'best of both worlds'. In Table 1, we summarise the features of open markets, closed markets and cryptomarkets.

[Insert Table 1 about here]

Cryptomarkets are like open markets in the sense that barriers to access are reduced or eliminated: that is, if the participants have access to the appropriate technology and technical skills required. Once market participants access the specified dark net location, they need no prior introductions, and additionally, they can access historical data about the reliability of the buyer/vendor and the quality of the product. However, unlike open markets conducted in person, it is comparatively more difficult for law enforcement to disrupt cryptomarket transactions, and the cryptomarket digital architecture provides ways of determining actor trust and resolving disputes via the escrow system, a digital interim account/cache where

funds are kept until the ordered products are received by the buyer.[1] While they have features of open markets, cryptomarkets are also like closed markets because the information required to develop trust between operators (e.g. the historical data described above) is held by the marketplace infrastructure (Moyle & Coomber, 2015). For example, cryptomarkets have been described as "super brokers" (Martin, 2014, p. 56) or "virtual brokers" (Aldridge & Décary-Hétu, 2014, p. 16), due to their facilitation of user feedback resulting in the development of trust between thousands of vendors and buyers, or between lower, middle and upper market levels.

The existing academic literature regarding cryptomarkets characterises them as an opportunity to reduce much of the violence associated with conventional in-person illicit drug distribution (Aldridge & Décary-Hétu, 2014; Buxton & Bingham, 2015; Martin, 2014; van Hout & Bingham, 2014). Cryptomarkets are associated with a reduced likelihood of violence because a different set of skills and subcultural capital is required of cryptomarket vendors to succeed (e.g., good customer service, writing skills) compared with conventional dealers who can utilise physical intimidation to maintain market share (Aldridge & Décary-Hétu, 2014). Cryptomarket vendors may, therefore, arise from a rather different population than street market dealers, a population that is highly technically skilled and may not share a preference for violence as a dispute resolution strategy (c.f., Andreas & Wallman, 2009). Furthermore, cryptomarkets have unique features that reduce the likelihood of violence occurring (see Table 1): there is never any in-person contact between actors in the market, making physical violence difficult if not impossible to enact, and there is a dispute resolution system operated by the cryptomarket administrators that provides an independent governance structure (Aldridge & Décary-Hétu, 2014; Buxton & Bingham, 2015; Martin, 2014; van Hout & Bingham, 2014).

Missing in these characterisations (Aldridge & Décary-Hétu, 2014; Buxton & Bingham, 2015; Martin, 2014; van Hout & Bingham, 2014) is a full comparison between cryptomarkets and a variety of conventional market structures (Barratt, 2015b). Instead, a dichotomous comparison is made between online and offline trading, or between cryptomarkets and

[1] Assuming that the buyer does not 'finalise early', a practice which is often required of buyers new to the marketplace who have not amassed sufficient trust with vendors.

'street' markets, without reference to social supply or to other structures ranging between fully open and fully closed market structures. The omission of social supply from these analyses is all the more striking because user surveys (Barratt, Ferris, & Winstock, 2014) and longitudinal measurement of multiple markets (Soska & Christin, 2015) indicate MDMA and cannabis are the most-often traded substances in cryptomarkets, and in these markets, 'friends' are most often nominated as the main source of supply (Belackova & Vaccaro, 2013; Jacinto, Duterte, Sales, & Murphy, 2008; Nicholas, 2008). Therefore, we ask to what extent does cryptomarket drug buying reduce experiences of drug market violence if the population using cryptomarkets would otherwise be sourcing from social supply networks, where such violence is minimal? Do cryptomarkets actually even compete with 'street' markets, at a retail level, as implied by the bulk of existing commentary on the topic?

In this paper, we present data from a survey of cryptomarket drug buyers to address the following descriptive aims:

1. To confirm our previous results (Barratt, et al., 2014) regarding the mix of drugs people report obtaining through cryptomarkets.
2. To determine the mix of drug market sources used by cryptomarket drug buyers.
3. To determine which of these sources is preferred by cryptomarket drug buyers should cryptomarkets no longer be available.
4. To compare the extent that cryptomarket drug buyers have experienced a list of issues and concerns, including threats to personal safety and violence, in relation to both cryptomarkets and their preferred alternative source.

Method

Global Drug Survey annually designs and conducts anonymous, online surveys to investigate trends in illicit drug use. In collaboration with media partners (see acknowledgements), the survey is actively promoted via social networking sites such as Twitter, Facebook and Reddit for a period of 1 to 2 months from its launch in mid-November each year. The study received ethical approval from the Kings College London Psychiatry, Nursing and Midwifery Research Ethics Subcommittee (PNM RESC).

Between 9 November 2014 and 3 January 2015, a total of 101,311 responses were submitted. After preparing the data, 3,456 records were excluded due to data capture glitches, duplicate entries, reporting no psychoactive drug use at all, and reporting the use of a fake drug. Of the remaining 97,855 respondents, 5,370 (5.5%) reported ever buying or arranging others to buy

drugs from cryptomarkets while 91,318 (93.3%) reported never doing so, with 1.2% missing. Of the 5,370 respondents reporting some use of cryptomarkets, 3,794 (70.7%) reported obtaining drugs from cryptomarkets in the last 12 months (defined as 'recent' in this paper). These 3,794 recent cryptomarket users form the sample for analysis here.

Measures were constructed based on previous surveys (Barratt, et al., 2014) and to address the research questions specified above. No validated measures were available for use, so questions were constructed based on literature review of cryptomarket research and known concerns and issues associated with drug buying, gleaned from the first author's digital ethnographic work within the original cryptomarket, Silk Road (Barratt, Maddox, Lenton, & Allen, under review for this volume). The questionnaire module can be accessed at http://www.globaldrugsurvey.com/GDS2015/survey_display_version.php?showsection=darknet.

Respondents were asked to what extent they had experienced a list of 20 issues when they, or someone on their behalf, purchased drugs through cryptomarkets and through their nominated alternative drug source, using a scale of 1 to 10, with 1 meaning 'none of the time' through to 10 meaning 'all of the time'. Prior to analysis, experience ratings were dichotomised with any rating above 1 indicating at least some experience with the issue, and the proportion of the sample reporting experience with the issue was expressed as a ratio.

The analyses conducted were descriptive, as the research questions did not warrant the use of inferential statistics. Percentages reported use the number of valid cases as their denominator. The percentage of missing values for all variables reported is available in the Supplementary Table. All analyses were conducted using Stata 14.

Results

Demographic characteristics

Fifty-seven different countries of residence were represented. Six countries, Germany (21.6%), United Kingdom (18.3%), France (11.9%), United States (11.4%), Australia (6.3%) and the Netherlands (5.3%) made up three-quarters (74.8%) of the sample. The median age of the recent cryptomarket user sample was 22 years (Interquartile Range [IQR] 20–27). Most participants (82.3%) identified as male, with the remainder identifying as female (17.0%) or transgender (0.7%). Almost all identified their ethnicity as 'White' (91.5%). Over half (55.0%) reported that they were in paid employment, a third (35.0%) were students who were

not in paid employment, and 7.3% were unemployed and looking for work (2.7% other). Most (84.8%) reported completion of secondary school, including 38.0% who reported completion of a university degree. Most (59.3%) reported 'going clubbing' at least once a month, including 21.4% who reported clubbing weekly or more often.

Obtaining drugs through cryptomarkets

The median number of times that participants reported ever obtaining drugs through cryptomarkets was 4 (IQR 2–10), including 17.6% who reported only doing so once and 10.9% at least 20 times. The median length of time between first time and last time they obtained drugs through cryptomarkets was 7 months (IQR 1–18). The median number of cryptomarkets (for example, Silk Road, Evolution, Agora, etc.) that participants reported ever accessing drugs through was 2 (IQR 1–3). While 42.8% reported use of only one cryptomarket, 6.6% reported using 5 or more cryptomarkets. In the last 12 months, most of the sample reported obtaining drugs through cryptomarkets either 'once or twice a year' (46.5%) or 'every few months' (32.1%), with the remainder reporting 'about once a month' (14.7%) or 'about once a fortnight' or more often (6.7%). While the entire sample reported use of cryptomarkets to access drugs in the last 12 months, participants engagement with cryptomarkets differed, see Figure 1. More than half (58.0%) reported personally purchasing drugs through a cryptomarket for their own consumption, including 25.4% who also reported buying drugs on behalf of somebody else or with the intention to supply to somebody else. A similar proportion (55.6%) reported arranging for someone else to purchase drugs through cryptomarkets on their behalf, including 39.3% who reported *only* accessing drugs through cryptomarkets in this way (that is, they did not buy the drugs themselves). Only 1.3% reported *only* buying drugs on cryptomarkets that were not for their own consumption.

[Insert Figure 1 about here]

Table 2 shows the drug types participants reported using for non-medical purposes during their lifetime and in the last 12 months, alongside the drug types they reported ever obtaining through cryptomarkets. Participants were asked to report their use of 153 drugs or drug forms, with a selection of the most prominent displayed here. The drug most commonly obtained through cryptomarkets was MDMA/Ecstasy (54.6%), followed by cannabis (42.9%) and LSD (34.8%). Within this sample of recent cryptomarket users, two thirds (67.4%) of those who reported lifetime use of MDMA/Ecstasy reported obtaining it through cryptomarkets (the highest proportion across drug types). Other drug types that more than

half of lifetime users reported obtaining through cryptomarkets included NBOMe drugs (59.4%), LSD (58.5%), DMT (55.4%) and 2C drugs (52.5%).

[Insert Table 2 about here]

Cryptomarkets in context with other drug sources

Recent cryptomarket users reported using a median of 2 sources in addition to cryptomarkets to access drugs (excluding alcohol, tobacco, caffeine & prescription drugs prescribed by their doctor) in the last 12 months (IQR 1–3). The median proportion of last-12-month drug consumption obtained through cryptomarkets was 23% (IQR 5–64%). Only 6.4% reported accessing drugs *only* through cryptomarkets during that period. The most commonly reported additional sources were in-person friendships (73.8%) and in-person known dealers (57.1%). The median proportion of last-12-month drug consumption was 19% (IQR 0–49%) for friends in-person and 9% (IQR 0–30) for dealers in-person. Other sources included open public markets (e.g. street, festival; 25.9%), shop fronts (e.g. adult stores, head shops, coffee shops, smoke shops, cannabis shops; 16.5%), made or grew their own (13.3%), the surface web (normal, not encrypted websites; 10.6%), known online dealer (without the use of a cryptomarket; 6.6%), and other source not elsewhere specified (8.8%).

Preferred alternative source to cryptomarkets

Participants were asked which of these sources they would be most likely to use to replace cryptomarkets if they were no longer available. Most participants chose in-person friendships (49.3%) or in-person known dealers (34.0%), while 3.8% nominated open public markets, 3.4% would make or grow their own, and 3.0% would use known online dealers, 1.9% the surface web, 1.3% shop fronts, 0.9% other. Some 2.5% said they would not use another source if cryptomarkets were unavailable; that is, they would no longer access drugs. Among those who nominated an alternative source, the median number of times that they had ever obtained drugs through that source was 10 (IQR 3–51), including 13.3% who nominated an alternative source they had never used before and 20.0% who reported they had used this source over 100 times before.

Comparing issues of concern between cryptomarkets and alternative source

Participants who nominated an alternative drug source that they had used at least once before were asked to report the extent that they had experienced a list of 20 issues when using (1) cryptomarkets and (2) their alternative source to obtain drugs. The proportion of the sample

reporting any experience with the issue was expressed as a ratio (see the last two columns of Table 3). For 13 issues, the alternative source rated as more likely, 1 issue was about equal, and cryptomarkets were rated as more likely to be associated with the remaining 6 issues.

[Insert Table 3 about here]

Reports of 'threats to personal safety' (3.0%) and 'experiencing physical violence' (1.2%) when using cryptomarkets were substantially less prevalent compared to their nominated main alternative source (18.0%; 7.5%). For both threats to safety and experiences of violence, participants were 6 times more likely to report these issues with their alternative source than with cryptomarkets, and this was the highest ratio for any issue. When considering reports of threats and violence from each alternative source separately (see Figure 2), 14.2% of participants cited threats to personal safety when buying drugs from friends, 23.6% of participants cited threats to personal safety when buying from known dealers in-person, and 35.0% of participants cited threats to personal safety when buying from open public markets, including unknown dealers in the street or at festivals. Regarding experiencing physical violence, 5.9% reported this occurred when buying from friends, 9.8% when buying from known dealers, and 15.0% when buying from open public markets.

[Insert Figure 2 about here]

A separate cluster of issues that were more often reported for the alternative source related to product quality (see Table 3): 'product not containing the expected substance' (4.1 times more likely for alternative source), 'low purity product' (2.8 times more likely for alternative source), and 'variable purity product' (twice as likely for alternative source). It was also 2.9 times more likely that participants would report being caught by law enforcement using the alternative source compared with using cryptomarkets. Interestingly, participants were 80% more likely to report spending money they couldn't afford when using the alternative source. On the other end of the scale, issues that significantly more prevalent when using cryptomarkets compared with the alternative source included loss of money due to volatile currency markets (7.2 times more likely when using cryptomarkets), customs seizure of product (4.4 times more likely when using cryptomarkets), loss of money due to market seizure, scam or theft (2.5 times more likely with cryptomarkets), being asked to pay before receiving the product (2.1), paying for but not receiving the product (60% more likely with cryptomarkets) and waiting too long (30% more likely with cryptomarkets).

Discussion

The drug types most commonly obtained through cryptomarkets by this sample were MDMA/Ecstasy, cannabis and LSD. These data support previous findings published from the same annual survey collected two years earlier (Barratt, et al., 2014) and by more recent longitudinal analyses of cryptomarket feedbacks across multiple marketplaces (Soska & Christin, 2015). The confirmation of these data also support our argument that cryptomarkets may actually be competing with social supply networks rather than 'street' markets, given that these drug types are most often distribution through social networks (Belackova & Vaccaro, 2013; Jacinto, et al., 2008; Nicholas, 2008). We confirmed this hypothesis, finding that cryptomarket users report using a median of 2 additional sources to access illicit drugs in the last 12 months, and as predicted, these additional source were in-person friendships (that is, social supply) and in-person known dealers (that is, closed market structures). One quarter of the sample reported accessing drugs in the last 12 months from open public markets, such as 'street' dealers or buying from strangers at festivals or nightclubs. This latter source could be categorised as an open market structure. Cryptomarket drug buyers surveyed here overwhelmingly nominated closed networks (friends or known dealers) as their preferred supply source if cryptomarkets were unavailable. Thus, these data support our contention that cryptomarkets are not typically competing with open street markets at a retail level, even though this comparison is implied by most of the existing literature on this topic.

Our study also aimed to compare experience with a list of concerns/issues between cryptomarkets and the respondent's nominated alternative drug source. 'Threats to personal safety' and 'Experiencing physical violence' followed a dose-response-like relationship with cryptomarkets associated with the lowest prevalence, then the alternative source associated with a greater prevalence as the market options became more open. This relationship was predictable, but it was somewhat surprising that 14% of participants who nominated in-person friendships as their preferred alternative source reported experiencing threats to their personal safety associated with this route of supply. Social supply may not always be 'risk-free' in this regard (also see Belackova & Vaccaro, 2013), although this source certainly appeared less risky than obtaining drugs from either known dealers or street dealers. Other clusters of issues around drug impurities, law enforcement and identification-related concerns were reported as more prevalent when using the alternative source, while issues around loss of money, waiting too long to receive the product and not receiving the product at all were more prevalent when using cryptomarkets.

Limitations

Although this is the largest known sample of cryptomarket users available, the sample method used here is purposive, and therefore, we cannot test the representativeness of this sample of the total population of cryptomarket drug users. Further research would be needed to confirm whether these findings are representative of the wider group, although the confirmation of previous results through this sample lends some confidence to the findings. In this study, there were relatively large amounts of missing data. We have not attempted to use any imputation methods as this paper is not trying to reflect a 'true' population, and we are not conducting any statistical models. There are other interesting questions that we were unable to answer with this data, including whether experiences of threats to personal safety and violence differed by drug type purchased, due to the question about violence not delineating by drug type. We are also unable to comment on changes in experiences of violence associated with supply-side market dynamics, nor can the results be applicable to the experiences of people buying drugs in the global south. While it is likely that violence and threats reported would vary by country, we did not run analyses by country nor did we adjust analyses for country clustering. Despite the large sample size, the numbers reporting violence and threats would be too small to model accurately by country.

Conclusions

Participants were less likely to report experiencing threats to personal safety or physical violence resulting from cryptomarket use compared with conventional drug distribution channels: friendships, dealers and open markets. These results are the first reported from a user survey that match existing claims (Aldridge & Décary-Hétu, 2014; Buxton & Bingham, 2015; Martin, 2014; van Hout & Bingham, 2014) that this new form of drug trade can reduce or eliminate one of the main risks associated with buying and selling illicit drugs. Cryptomarkets are associated with substantially less threats and violence even though a large majority of the cryptomarket users surveyed would otherwise access closed networks to obtain drugs, including social supply networks. When combined with other findings from Global Drug Survey that almost all cryptomarket users had used illicit drugs prior to using cryptomarkets (Barratt, 2015a), we can now better answer the questions posed by Christin (2014): cryptomarkets tend to attract existing drug users who report experiencing a reduction in market-related harms from switching to cryptomarket supply.

Soska and Christin (2015) have recently argued that intervention policies against

cryptomarkets should be re-examined, in light of their evidence that law enforcement take-downs of individual cryptomarkets are ineffective at reducing sales across the broad cryptomarket ecosystem. We agree that public policies targeting cryptomarkets should be reconsidered in light of our evidence that cryptomarkets are associated with less violence and threats, as well as more consistent, higher purity drugs (Caudevilla et al., Under review for this volume). Furthermore, our data suggests that almost all cryptomarkets users switch to in-person friends or dealers to access drugs when cryptomarkets are unavailable, suggesting that efforts to disrupt or eliminate cryptomarkets will displace market activity rather than deter it entirely. By displacing cryptomarket activity with conventional in-person drug trading, market-related harms experienced by drug buyers will likely increase. These harms warrant consideration when formulating priorities for public policy around drug market disruption.

Declaration of interest

Dr Winstock is founder and managing director of Global Drug Survey, the independent drug use data exchange hub that conducted the study. There are no further conflicts to declare.

Authors' contributions

M.B. led the development of the cryptomarket questionnaire with assistance from J.F. and A.W. M.B. conceived the idea, reviewed literature and wrote the argument. M.B. and J.F. conducted the statistical analyses. A.W. oversaw the data collection. M.B., J.F. & A.W. contributed to the preparation of the manuscript and approved the final draft.

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References

Aldridge, J., & Décary-Hétu, D. (2014). Not an 'Ebay for Drugs': The cryptomarket 'Silk Road' as a paradigm shifting criminal innovation (May 13, 2014). SSRN. http://ssrn.com/abstract=2436643

Andreas, P., & Wallman, J. (2009). Illicit markets and violence: What is the relationship? *Crime, Law and Social Change, 52*, 225–229.

Barratt, M. J. (2015a, March 26). *'Brought up by and in the internet': First time drug use through cryptomarkets*. Paper presented at the ESRC New Drugs Seminar Series, Durham University, Durham, UK.

Barratt, M. J. (2015b). Review of 'Drugs on the dark net: How cryptomarkets are transforming the global trade in illicit drugs' by James Martin. *Drug and Alcohol Review, 34*, 458–459.

Barratt, M. J., Ferris, J. A., & Winstock, A. R. (2014). Use of Silk Road, the online drug marketplace, in the UK, Australia and the USA. *Addiction, 109*, 774–783.

Barratt, M. J., Maddox, A., Lenton, S., & Allen, M. (Under review for this volume). 'What if you live on top of a bakery and you like cakes?' – Exploring the drug use and harm trajectories before, during and after the emergence of Silk Road. *International Journal of Drug Policy*.

Belackova, V., & Vaccaro, C. A. (2013). "A friend with weed is a friend indeed": Understanding the relationship between friendship identity and market relations among marijuana users. *Journal of Drug Issues, 43*, 289–313.

Buxton, J., & Bingham, T. (2015). *The rise and challenge of dark net drug markets* (Policy Brief No. 7). Swansea, UK: Global Drug Policy Observatory, Swansea University.

Caudevilla, F., Ventura, M., Fornís, I., Barratt, M. J., lladanosa, C. G., Quintana, P., Vidal, C., Muñoz, A., & Calzada, N. (Under review for this volume). Content and purity data from cryptomarket and conventional drug checking services. *International Journal of Drug Policy*.

Christin, N. (2014). Commentary on Barratt et al. (2014): Steps towards characterizing online anonymous drug marketplace customers. *Addiction, 109*, 784–785.

Coomber, R., & Maher, L. (2006). Street-level drug market activity in Sydney's primary heroin markets: Organisation, adulteration practices, pricing, marketing and violence. *Journal of Drug Issues, 36*, 719–754.

Friman, H. R. (2009). Drug markets and the selective use of violence. *Crime, Law and Social*

Change, 52, 285–295.

Harocopos, A., & Hough, M. (2005). *Drug dealing in open-air markets*. New York: Center for Problem Oriented Policing, US Department of Justice.

Hough, M., Warburton, H., Few, B., May, T., Man, L.-H., Witton, J., & Turnbull, P. J. (2003). *A growing market. The domestic cultivation of cannabis*. York: Joseph Rowntree Foundation.

Jacinto, C., Duterte, M., Sales, P., & Murphy, S. (2008). "I'm not a real dealer": The identity process of Ecstasy sellers. *Journal of Drug Issues, 38*, 419–444.

Martin, J. (2014). Drugs on the dark net: How cryptomarkets are transforming the global trade in illicit drugs. New York: Palgrave Pivot.

May, T., & Hough, M. (2004). Drug markets and distribution systems. *Addiction Research and Theory, 12*, 549–563.

Moyle, L., & Coomber, R. (2015). Earning a score: An exploration of the nature and roles of heroin and crack cocaine 'user-dealers'. *British Journal of Criminology, Early View*. doi: 10.1093/bjc/azu087

Nicholas, R. (2008). The impact of social networks and not-for-profit illicit drug dealing on illicit drug markets in Australia: A discussion paper. Hobart, Australia: National Drug Law Enforcement Research Fund.

Pearson, G., & Hobbs, D. (2001). *Middle market drug distribution*. London: Home Office Research Study.

Reuter, P. (2009). Systemic violence in drug markets. *Crime, Law and Social Change, 52*, 275–284.

Soska, K., & Christin, N. (2015, August 12–14). *Measuring the longitudinal evolution of the online anonymous marketplace ecosystem.* Paper presented at the 24th USENIX Security Symposium, Washington, D.C.

Taylor, M., & Potter, G. R. (2013). From "social supply" to "real dealing": Drift, friendship, and trust in drug dealing careers. *Journal of Drug Issues, 43*, 392–406.

Topalli, V., Wright, R., & Fornango, R. (2002). Drug dealers, robbery and retaliation. Vulnerability, deterrence and the contagion of violence. *British Journal of Criminology, 42*, 337–351.

van Hout, M. C., & Bingham, T. (2014). Responsible vendors, intelligent consumers: Silk Road, the online revolution in drug trading. *International Journal of Drug Policy, 25*, 183–189.

Werb, D., Rowell, G., Guyatt, G., Kerr, T., Montaner, J., & Wood, E. (2011). Effect of drug

law enforcement on drug market violence: A systematic review. *International Journal of Drug Policy, 22*, 87–94.