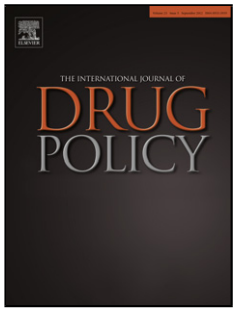

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PII: S0955-3959(16)30132-3
DOI: http://dx.doi.org/doi:10.1016/j.drugpo.2016.04.019
Reference: DRUPOL 1781

To appear in: *International Journal of Drug Policy*

Received date: 31-8-2015
Revised date: 28-4-2016
Accepted date: 29-4-2016

Please cite this article as: Barratt, M. J., Ferris, J. A., and Winstock, A. R.,Safer scoring? Cryptomarkets, social supply and drug market violence, *International Journal of Drug Policy* (2016), http://dx.doi.org/10.1016/j.drugpo.2016.04.019

Safer scoring? Cryptomarkets, social supply and drug market 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 are digital platforms that use anonymising software (e.g. Tor) and cryptocurrencies (e.g. Bitcoin) to facilitate trade of goods and services, most notably illicit drugs. Cryptomarkets may reduce systemic violence 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 describe the purchasing behaviour of cryptomarket users and then compare the self-reported experiences of threats, violence and other drug-market concerns when obtaining drugs from cryptomarkets with obtaining drugs through friends, known dealers and strangers.

Methods: The Global Drug Survey was completed in late 2014 by a self-selected sample who reported accessing drugs through cryptomarkets in the last 12 months (N=3,794).

Results: Their median age was 22 years and 82% were male. 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 markets/strangers (26%). When asked to nominate the main source they would use if cryptomarkets were unavailable, 49% nominated friends, 34% known dealers and 4% strangers. 'Threats to personal safety' (3%) and 'experiencing physical violence' (1%) were less often reported when using cryptomarkets compared with sourcing through friends (14%; 6%), known dealers (24%; 10%) or strangers (35%; 15%). Concerns about drug impurities and law enforcement were reported more often when using the alternative source, while loss of money, waiting too long and not receiving the product were more often reported when using cryptomarkets.

Conclusion: Cryptomarkets are associated with substantially less threats and violence than alternative market types used by cryptomarket customers, even though a large majority of these alternatives were closed networks where violence should be relatively less common.

Keywords: cryptomarkets; drug markets; dark web; violence; social supply; e-commerce

Word count body = 4581

Abstract = 299

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) may be 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). This kind of drug-related systemic violence was defined by Goldstein (1985) as the traditionally aggressive patterns of interaction within the system of drug distribution and use. In addition to drug market participants being barred from legal redress, these markets may be 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 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 more recent work, Coomber (2015) compared two heroin/crack markets located in different UK cities, finding that the extent of market violence was contingent on the local cultural circumstances, rather than predicted by systemic conditions. In fact, Pearson and Hobbs (2001) describe violence within drug trading as a sign of market dysfunction. They argue that if everything is working well, everyone is making a profit and no-one needs 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 exacerbated 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).

The scholarship reviewed above indicates that the degree of openness of a market influences the character and extent of violence associated with that market. Therefore, if we are to assess and characterise violence associated with cryptomarkets, we need to 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" (pp. 2-3), distinguishable from drug vendors operating in the 'clear' or 'surface' web through their reliance on anonymising networks (e.g. Tor), third party hosting, vendor and buyer rating systems, decentralised exchange networks, and use of cryptocurrencies (e.g. Bitcoin).. 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'. That is, cryptomarkets are neither open nor closed, but are rather a hybrid of each. Aldridge & Décary-Hétu (this volume) have suggested that the anonymity mechanisms of cryptomarkets allow any potential buyer to approach the marketplace, and characterise these markets as 'anonymous open' in this regard.

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 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, who Andreas & Wallman (2009) describe as resorting to violence for dispute resolution due to violence being more normative and a lack of alternative options. Furthermore, cryptomarkets have unique features that reduce the likelihood of violence occurring: there is rarely 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, 2015). Instead, a dichotomous comparison is made between online and offline trading, or between cryptomarkets and 'street' markets, without reference to social supply or to other structures ranging between fully open and fully closed market structures (but see Aldridge & Décary-Hétu, this volume, who also tease out these market structure differences). 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 relatively minimal?

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

1. To determine the common drug types obtained through cryptomarkets in a large sample, in order to validate the use of this sample against previous work (Barratt, et al., 2014; Soska & Christin, 2015).
2. To determine the mix of drug market sources used by recent cryptomarket users and which of these sources is preferred should cryptomarkets no longer be available,

which is necessary to assess the potential reduction in violence by shifting one's supply to cryptomarkets.

3. To compare the extent that recent cryptomarket users 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 measuring cryptomarket 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, this volume). The measures included in this paper covered demographic characteristics, drug use characteristics, use of cryptomarkets to obtain drugs, other drug sources used in the last 12 months, the preferred alternative drug source, and experiences of a list of issues and concerns arising from the use of cryptomarkets and their preferred drug source. Our definition of the use of cryptomarkets to obtain drugs included respondents who reported (a) personally purchasing drugs through cryptomarkets for their own consumption, (b) arranging for someone else to purchase drugs through cryptomarkets

for them, and/or (c) purchasing drugs through cryptomarkets on behalf of somebody else or with the intention to supply to somebody else. The complete 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 (see Table 2) 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. Odds ratios were calculating by treating the unit of event as the response for either cryptomarkets or the alternative source. Treating cryptomarket responses as 'cases' and alternative source responses as 'controls', tests of difference were calculated using Stata's *cci* command. Pearson's χ^2-tests were used to test differences between groups, using an alpha level of significance of 0.05. All 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%). Most 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. More than half (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% 20 or more 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. 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.

Table 1 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%) (see Table 1 footnote for definitions).

[Insert Table 1 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%; labelled hereafter as 'strangers'), 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%) (see volume editorial for definition), 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/strangers, 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 reported whether they had experienced a list of 20 issues when using (1) cryptomarkets and (2) their alternative source to obtain drugs. In Table 2, these issues are sorted from smallest to largest odds ratio, treating experiences with cryptomarkets as 'cases' and experiences with alternative drug sources as 'controls'.

[Insert Table 2 about here]

Respondents were at significantly increased odds of reporting threats to their personal safety when obtaining drugs through their alternative drug source, compared with obtaining drugs

through cryptomarkets (Inverse OR = 7.06 (5.33–9.46), p < .001). They were also at significantly increased odds of reporting experiencing physical violence when obtaining drugs through their alternative drug source (OR = 6.53 (4.24–10.45), p < .001). Respondents were also at significantly increased odds of reporting obtaining a low purity product, a product that does not contain the expected substance or a product of variable purity from their alternative drug source, compared with drugs obtained cryptomarkets. In addition to issues related to violence and drug content and purity, respondents were at significantly increased odds of reporting lower availability, paying more than a reasonable price, spending money they could not afford, being caught by law enforcement, being blackmailed, having their identity revealed, and experiencing health harms from use when obtaining drugs through their alternative source compared with cryptomarkets (see Table 2). There were also some other issues that respondents were at significantly increased odds of reporting when obtaining drugs through cryptomarkets compared with their alternative source. These issues included losing money due to volatile currency markets or market seizure/scam/theft, customs seizure of product, being asked to finalise payment before receiving the product, paying for but not receiving the product, and waiting too long to receive the product (see Table 2).

When considering reports of threats and violence from each alternative source separately (see Figure 1), 3.0% of participants reported threats to personal safety when obtaining drugs through cryptomarkets, 14.2% of participants cited threats to personal safety when obtaining drugs from friends, 23.6% of participants cited threats to personal safety when obtaining from known dealers in-person, and 35.0% of participants cited threats to personal safety when obtaining drugs from open public markets, including unknown dealers in the street or at festivals. Regarding experiencing physical violence, 1.2% reported this associated with obtaining drugs through cryptomarkets, 5.8% reported this occurred when obtaining drugs from friends, 9.8% when obtaining drugs from known dealers, and 15.0% when obtaining drugs from strangers.

[Insert Figure 1 about here]

It may be the case that respondents who nominated an alternative source more often associated with violence and threats, like open markets/strangers, may also be more likely to report violence and threats when obtaining drugs through cryptomarkets, perhaps due to differences in those individuals' propensity for violence, different drug types being traded, or differences in the environments. Due to the question design, it was not possible to conduct analyses by drug type. Instead, we compared experiences of violence and threats to safety by

the kind of alternative source the respondent nominated (see Figure 2). Respondents nominating friends as their alternative source of drugs were less likely to report threats to their personal safety when obtaining drugs through friends (14.2%) compared with the remainder of the sample who obtained from other sources (22.3%; $\chi^2(2)= 22.87$, $p<.001$). Those who would obtain drugs from known dealers were more likely to report threats to safety when obtaining from dealers (23.6%) compared with the remainder of the sample who obtained from other sources (14.8%; $\chi^2(2)=25.01$, $p<.001$). Respondents who would obtain drugs from open markets or strangers were more likely to report threats to safety in this context (35.0%) compared with the remainder of the sample who obtained from other sources (17.4%; $\chi^2(2)=16.10$, $p<.001$). In none of these cases were reports of threats to safety significantly different when obtaining drugs from cryptomarkets. Identical analyses using experiences of violence as an outcome variable followed a similar pattern (see Figure 2).

[Insert Figure 2 about here]

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 are best compared with closed markets rather than open or 'street' markets, given that these drug types are most often distributed through social supply 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 and in-person known dealers (both being examples of closed markets). 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.

Cryptomarket drug buyers surveyed here overwhelmingly nominated closed networks (friends or known dealers) as their preferred supply source if cryptomarkets were unavailable. Therefore, to the extent that cryptomarket supply is used as a substitute, anticipated reductions in drug market violence from cryptomarket use should be measured against closed markets. We found that '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 some may be surprised 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 obtaining drugs from friends certainly appeared less risky than obtaining drugs from either known dealers or strangers. Regardless of the alternative source they nominated, respondents' experiences of drug market violence through cryptomarkets remained consistently low.

Although experiences of drug market violence through the use of cryptomarkets were consistently low, there were other problems that were reported more regularly in association with cryptomarkets than with alternative drug sources. These issues included: financial losses due to volatile currency markets (related to the nature of cryptocurrencies); customs seizure of products (related to reliance on the postal delivery system across international borders); paying for the product prior to purchase, having to wait and in some cases never receiving the product (related to the distance in time and space between buyer and seller); and financial loss resulting from seizures of markets, scams and theft (related to the dynamic and ephemeral nature of the dark net environment). The extent of scams and fraud in the dark net environment has been well documented (Ormsby, 2014). These are examples of digital or online forms of violence that can occur in cryptomarkets even in the absence of the capacity to enforce physical injuries (see also Tzanetakis, Kamphausen, Werse & von Laufenberg, and Aldridge & Décary-Hétu, this volume).

Other clusters of issues around drug impurities, law enforcement and identification-related concerns were reported as more prevalent when using the alternative source. It was beyond the scope of this paper to analyse these issues in more detail.

Limitations

Although this is the largest known sample of cryptomarket users available, the sample is self-selected, and therefore, we cannot test the representativeness of this sample of the total population of cryptomarket drug users. The sample is also more likely to contain end-buyers and some retailers, rather than wholesalers. Further research would be needed to determine whether these findings are typical of the wider group, although the confirmation of previous

results through this sample lends some confidence to the findings. It should be noted that by virtue of those using cryptomarkets favouring anonymity, designing a representative study would be next to impossible. 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. 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 lower income countries due to the sample biases of Global Drug Survey. 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 one of the main drug market related harms. Cryptomarkets are associated with substantially less threats and violence than alternative market types used by cryptomarket customers, even though a large majority of these alternatives were closed networks where violence should be relatively less common. These conclusions are limited by only being applicable to drug market participants who access cryptomarkets: this currently being only a small proportion of all drug market participants. Furthermore, if the ease of cryptomarket purchase increased overall drug market transactions by this group (e.g., by decreasing 'search cost', see Kleiman, Caulkins, Hawken & Kilmer, 2012), or provided additional drug supply to wider drug market networks (see Aldridge & Décary-Hétu, this volume), net harm from switching to cryptomarkets may increase overall compared with conventional drug markets. Future research that describes and quantifies drug flows between conventional and crypto- markets is a next step to answering these questions. Future research could also explore the nature and extent of threats and experiences of different kinds of drug market related harms through in-

depth qualitative interviews and ethnographic observation, which could inform future large-scale survey studies.

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 than any other market type in our sample. Furthermore, our data suggest 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 including violence experienced by drug market participants 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 is nothing further 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.

Acknowledgements

We would like to thank the participants who gave so generously of their time to complete the Global Drug Survey 2015. We are grateful for the promotion of GDS by a long list of world media partners, see www.globaldrugsurvey.com. We are also indebted to Stuart Newman for his programming skills and patience, and we acknowledge the useful contribution of Alexia Maddox to the development of the cryptomarket questionnaire module.

Funding

No external funding was received specifically for this study. The National Drug and Alcohol Research Centre at UNSW Australia and the National Drug Research Institute in the Faculty of Health Sciences at Curtin University are supported by funding from the Australian Government under the Substance Misuse Prevention and Service Improvement Grants Fund. M.B. is a recipient of a National Health & Medical Research Council Early Career Researcher Fellowship (APP1070140). M.B. gratefully acknowledges the contribution to this work of the Victorian Operational Infrastructure Support Program received by the Burnet Institute. J.F. is a recipient of a National Health & Medical Research Council Early Career Researcher Fellowship (APP1089395). The funders played no further part in the research process, and the views expressed in this paper should not be seen as representative of the views of the funders.

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Figure 1: Experiencing physical violence and threats to personal safety when obtaining drugs through cryptomarkets, friends, dealers and strangers (%) (N=2,053)

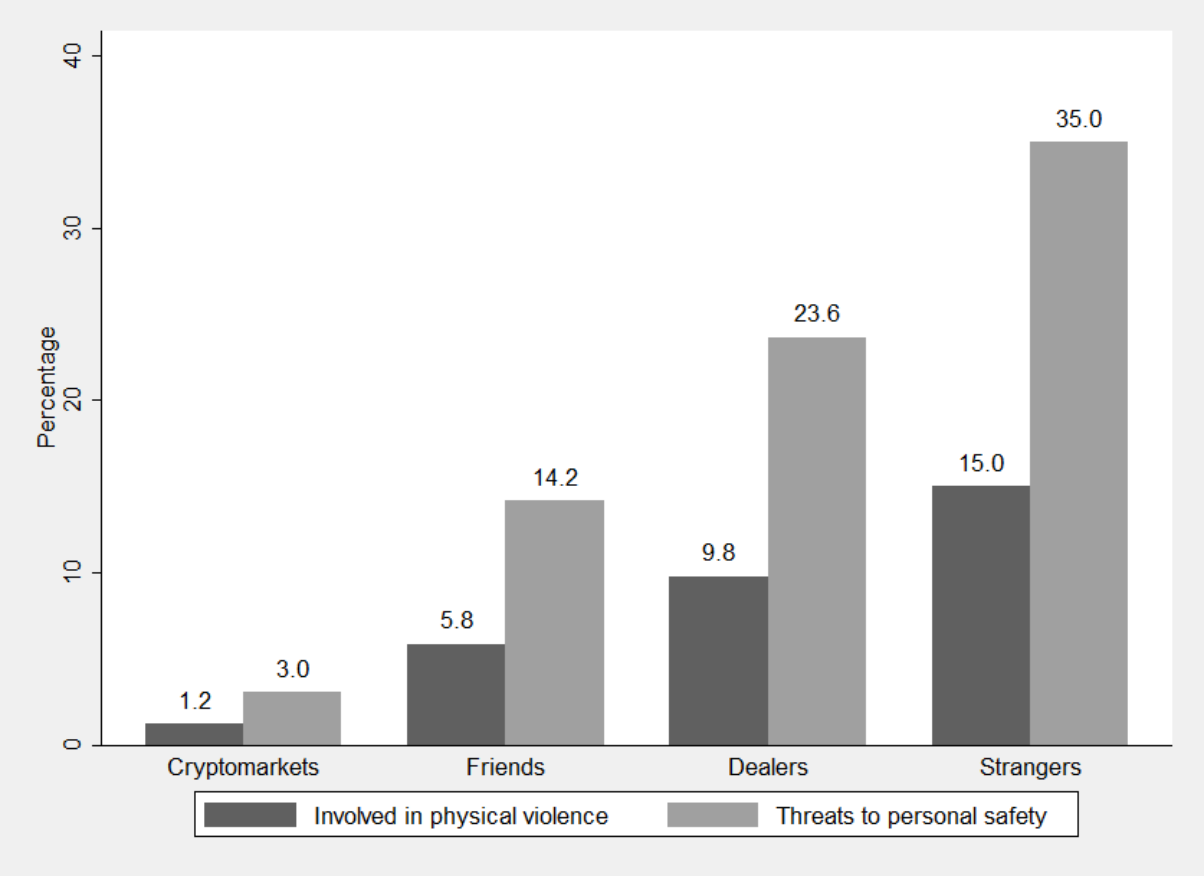

Figure 2: Experiences of physical violence and threats to personal safety grouped by type of alternative source (N=2,045)

Note: ~ = p>.05, * = p<.05, ** = p<.01, *** = p<.001. n=8 did not nominate friends, dealers or strangers as an alternative source, reducing the total n to 2,045.

Figure(s)

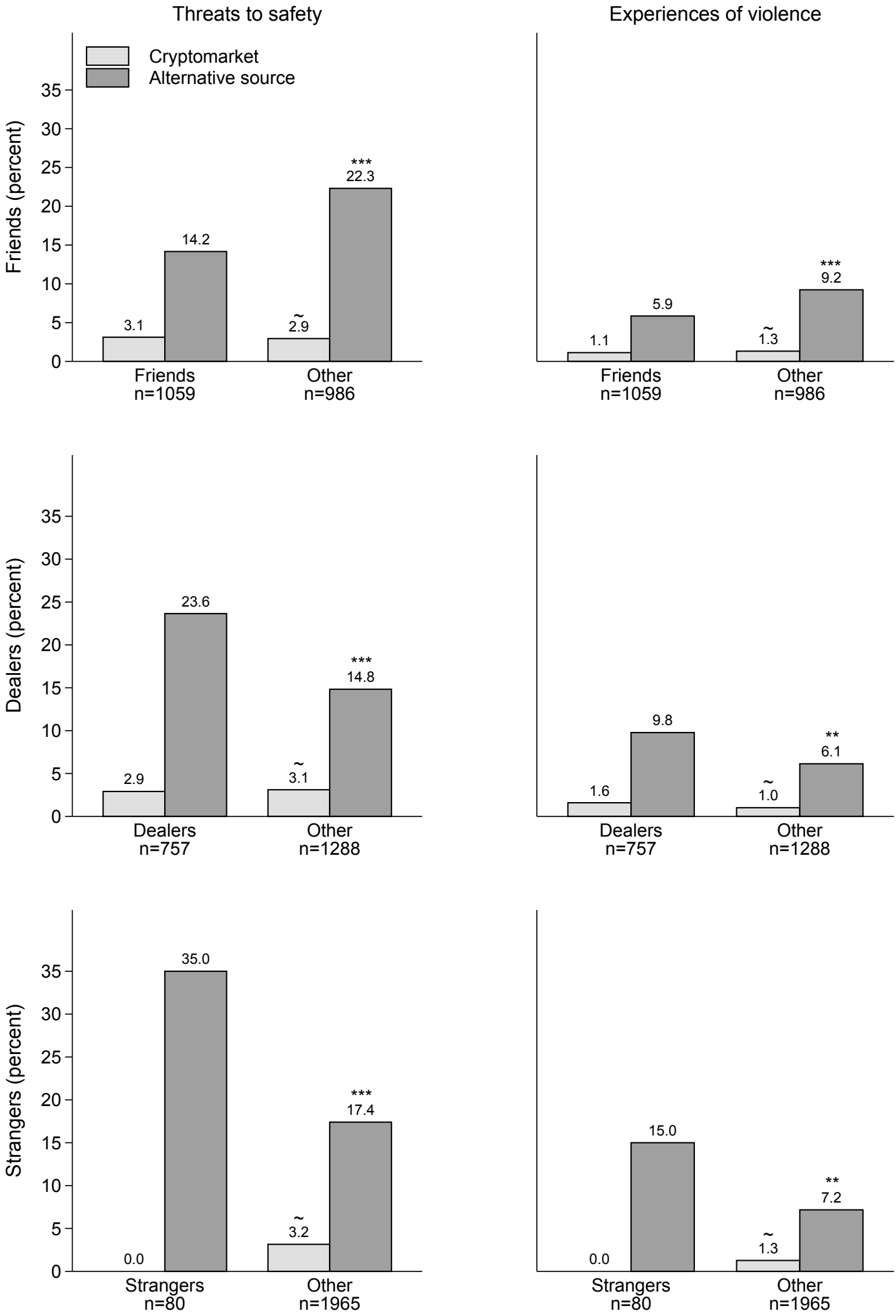
Threats to safety
Experiences of violence
Cryptomarket
Alternative source
Friends (percent)
Dealers (percent)
Strangers (percent)
0
5
10
15
20
25
30
35
3.1
14.2
~2.9
***
22.3
1.1
5.9
~1.3
***
9.2
2.9
23.6
~3.1
***
14.8
1.6
9.8
~1.0
**
6.1
0.0
35.0
~3.2
***
17.4
0.0
15.0
~1.3
**
7.2
Friends n=1059
Other n=986
Dealers n=757
Other n=1288
Strangers n=80
Other n=1965

Table 1: Drug types used for non-medical purposes and obtained through cryptomarkets (N=3,362*)

Selected drug types	Ever used		Used last 12 months		Ever obtained from cryptomarkets		Proportion of ever users who obtained from cryptomarkets
	n	%	n	%	n	%	%
Cannabis (all)	3288	97.8	3049	90.7	1443	42.9	43.9
MDMA/Ecstasy (all)	2722	81.0	2379	70.8	1834	54.6	67.4
NPS (all)	2100	62.5	1455	43.3	1000	29.7	47.6
Prescription drugs (all)	2061	61.3	1613	48.0	602	17.9	29.2
LSD	1998	59.4	1451	43.2	1169	34.8	58.5
Cocaine	1950	58.0	1428	42.5	575	17.1	29.5
Amphetamine (all)	1637	48.7	1109	33.0	572	17.0	34.9
Magic Mushrooms	1956	58.2	1103	32.8	456	13.6	23.3
Ketamine	1195	35.5	776	23.1	447	13.3	37.4
2C drugs (all)	1138	33.9	729	21.7	598	17.8	52.5
DMT	655	19.5	455	13.5	363	10.8	55.4
NBOMe drugs (all)	547	16.3	317	9.4	325	9.7	59.4
GHB/GBL	408	12.1	194	5.8	103	3.1	25.2
Heroin	252	7.5	114	3.4	93	2.8	36.9

*Note. 432 (11.4%) did not provide 1 or more drug types ever bought through cryptomarkets. These cases were excluded from the analysis for this table, resulting in N=3,362.

Definition of composite variables: Cannabis (all) = cannabis skunk/hydro, cannabis herbal/normal/bush, cannabis resin/hash, cannabis oil, tobacco mixed with cannabis, butane hash oil. MDMA/Ecstasy (all) = MDMA powder/crystal, MDMA pills. Prescription drugs (all) = atomoxetine, anabolic steroids, benzodiazepines, buprenorphine, carisoprodol, cyclizine, cyclobenzaprine, dexamphetamine, gabapentin, methadone, modafinil, opioid pain killers, pregabalin, ritalin, tramadol, tapentadol, viagra, z-drug. Amphetamine (all) = amphetamine powder/paste/base, methamphetamine. 2C drugs (all) = 2C-B, 2C-C, 2C-D, 2C-E, 2C-I, 2C-T-7. NBOMe drugs (all) = 25I-NBOMe, 25C-NBOMe, 25B-NBOMe. NPS (New Psychoactive Substances) (all) = 2C drugs (all), NBOMe drugs (all), synthetic cannabis, methylone, BZP,

ethylone, AL-LAD, Acetyl fentanyl, Alpha Methyl Trytamine (αMT), 2-AI, 5-IAI, Benzo Fury (5/6 - APB), 5/6-EAPB, C1C, 3,4-CTMP, DOC, DOM (STP), DOI, DPT, 2-DPMP, 4-AcO-DMT, 4-AcO-MiPT, 4-HO-DiPT, 4-HO-MET, 4-HO-MiPT, Camfetamine, D2PM, Dextromethorphan (powder/cough mixture), Dimethocaine, 5-EAPB, DNP, Ethylphenidate, Etizolam, 2-FA, Flephedrone (4-FMC), Fluoroamphetamine, 5-IT, Krokodil (desomorphine), 4-MA, MDA, MDAI, MDAT, MDPV, 4-MEC, 5-MeO-DMT, 5-MeO-DIPT (Foxy), 5-MeO-MIPT (Moxy), Mephtetramine (MTTA), Methcathinone, Methylhexanamine (DMAA), Methylthiopropramine (MPA), Methoxetamine (MXE), Methoxypiperamide (MEXP), MPA, Naphyrone, N-Ethyl ketamine (N-KET / NEK / NENK), Noopept, Phenezapam, Piracetam, Pyrazolam, TFMPP, Tiletamine.

Table 2: Issues experienced when obtaining drugs from cryptomarkets and the next alternative source (N=2,053)

	Cryptomarkets		Alternative source		Odds ratio (95% CI) [a, b]	Inverse odds ratio (95% CI)
	N	%	N	%		
Low purity product	547	26.6	1530	74.5	0.12 (0.11-0.14)	8.05 (6.99-9.28)
Threats to personal safety	62	3.0	370	18.0	0.14 (0.11-0.19)	7.06 (5.33-9.46)
Experiencing physical violence	25	1.2	153	7.5	0.15 (0.10-0.24)	6.53 (4.24-10.45)
Product does not contain the expected substance	208	10.1	844	41.1	0.16 (0.14-0.19)	6.19 (5.22-7.35)
Product unavailable	636	31.0	1492	72.7	0.17 (0.15-0.19)	5.93 (5.17-6.80)
Variable purity product	786	38.3	1591	77.5	0.18 (0.16-0.21)	5.55 (4.83-6.38)
Paying more than a reasonable price	765	37.3	1556	75.8	0.19 (0.17-0.22)	5.27 (4.60-6.05)
Being caught by law enforcement	85	4.1	246	12.0	0.32 (0.24-0.41)	3.15 (2.43-4.12)
Blackmail	28	1.4	68	3.3	0.40 (0.25-0.64)	2.48 (1.57-4.01)
Revealing identity	61	3.0	131	6.4	0.45 (0.32-0.62)	2.23 (1.62-3.09)
Spending money I can’t afford (overspending)	366	17.8	653	31.8	0.47 (0.40-0.54)	2.15 (1.85-2.50)
Work/family/friends discovering drug use	275	13.4	443	21.6	0.56 (0.47-0.67)	1.78 (1.50-2.11)
Personal health harms due to drug use	278	13.5	371	18.1	0.71 (0.60-0.85)	1.41 (1.18-1.67)
Product stolen	177	8.6	182	8.9	0.97 (0.78-1.20) *	1.03 (0.83-1.29) *
Waiting too long to receive the product	1044	50.9	819	39.9	1.56 (1.37-1.77)	0.64 (0.57-0.73)

Paying for but not receiving the product	547	26.6	333	16.2	1.88 (1.61-2.19)	0.53 (0.46-0.62)
Loss of money due to market seizure, scam or theft	573	27.9	228	11.1	3.10 (2.61-3.68)	0.32 (0.27-0.38)
Being asked to finalise payment before receiving product	1362	66.3	659	32.1	4.17 (3.65-4.76)	0.24 (0.21-0.27)
Customs seizure of product	279	13.6	64	3.1	4.89 (3.68-6.57)	0.20 (0.15-0.27)
Loss of money due to volatile currency markets	634	30.9	88	4.3	9.98 (7.88-12.74)	0.10 (0.08-0.13)
Other	53	2.6	64	3.1	0.82 (0.56-1.21) *	1.21 (0.83-1.79) *
None	136	6.6	75	3.7	1.87 (1.39-2.53)	0.53 (0.39-0.72)

Note. N=1,741 or 45.9% did not provide a response to either question, or did not nominate an alternative source, or nominated an alternative source that they had never used before. These cases were excluded from the analysis for this table, resulting in N=2,053.

[a] Odds ratios were calculating by treating the unit of event as the response for either cryptomarkets or the alternative source. We used epidemiological case control analysis (Stata command cci), treating cryptomarket responses as 'cases' and alternative source responses as 'controls'.

[b] Chi square tests indicated that all ORs differed significantly from 1.0 at p<.001, except for those marked * which did not reach any level of statistical significance (alpha = .05).

Conflicts 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 nothing further to declare.