EXHIBIT 8

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Use of Silk Road, the online drug marketplace, in the United Kingdom, Australia and the United States

Monica J. Barratt[1], Jason A. Ferris[2] & Adam R. Winstock[3,4]

National Drug Research Institute, Curtin University, Fitzroy, Victoria, Australia,[1] Institute for Social Science Research, University of Queensland, Brisbane, Queensland, Australia,[2] South London and Maudsley NHS Trust/Kings College London, London, UK[3] and Global Drug Survey, London, UK[4]

ABSTRACT

Aims To investigate the prevalence of awareness of the online illicit drug marketplace Silk Road (SR), consumption of drugs purchased from SR and reasons for use and non-use of SR. **Design and setting** Global Drug Survey: purposive sample collected in late 2012. **Participants** The base sample (n = 9470) reported recent drug purchase and resided in the United Kingdom (n = 4315, median age 24, 76% male), Australia (n = 2761, median age 32, 76% male) or the United States (n = 2394, median age 21, 80% male). **Measurements** Online questionnaire. **Findings** A total of 65% of US, 53% of Australian and 40% of UK respondents had heard of SR; 18% of US, 10% of UK and 7% of Australian respondents had consumed drugs purchased through SR. Across the three countries, 3,4-methylenedioxy-N-methylamphetamine (MDMA) was the most commonly purchased drug (53–60%), followed by cannabis (34–51%), lysergic acid diethylamide (LSD) (29–45%) and the 2C family (16%–27%). The most common reasons for purchasing from SR were wider range (75–89%), better quality (72–77%), greater convenience (67–69%) and the use of vendor rating systems (60–65%). The most common reasons for avoiding SR purchase were adequate drug access (63–68%) and fear of being caught (41–53%). Logistic regressions found that, compared with people from the UK, Australians [odds ratio (OR) = 3.37; 95% confidence interval (CI) = 2.29, 4.97) and Americans (OR = 1.46; 95% CI = 1.10, 1.94) were more likely to use SR due to lower prices; and to avoid SR purchase due to fear of being caught (Australia: OR = 1.65; 95% CI = 1.39, 1.96; USA: OR = 1.62; 95% CI = 1.37, 1.92). **Conclusions** While reasons for Silk Road use accord with broader online commerce trends (range, quality, convenience, ratings), its appeal to drug purchasers is moderated by country-specific deterrents and market characteristics.

Keywords Cryptomarket, drug market, internet, new drug trends, online marketplace, Silk Road.

Correspondence to: Monica J. Barratt, National Drug Research Institute, Curtin University, 6/19-35 Gertrude Street, Fitzroy, Vic. 3065, Australia. E-mail: m.barratt@curtin.edu.au
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INTRODUCTION

From February 2011 [1] to October 2013 [2], the online illicit marketplace Silk Road (SR) enabled the international trade of illegal drugs and other goods and services [3–9]. Online illicit marketplaces, or 'cryptomarkets' [7], are located in the 'deep web' and accessed via Tor [10]. In the deep web, site owners, vendors and buyers are able to remain relatively anonymous as their IP addresses are masked. Purchases are made using the decentralized virtual currency Bitcoin [11], which can also be used relatively anonymously.

In October 2013, the US Federal Bureau of Investigation (FBI) shut down the original SR and arrested its alleged founder [2]. In their criminal complaint the FBI, who had infiltrated the SR servers, outlined the scale of its operation over its 2.5-year life-time: 'several thousand drug dealers' distributed 'hundreds of kilograms of illegal drugs . . . to well over a hundred thousand buyers' generating sales revenue equivalent to US$1.2 billion in sales and US$80 million in commissions ([12], p. 6). Despite this event, indicating that encryption technologies relied upon by cryptomarkets may have serious security weaknesses [13], a new SR was launched in November 2013 [14] and is currently expanding its operations (author's observations, November 2013).

While not the only drug cryptomarket, the original SR was the largest and most well known. We first described the marketplace within the academic literature [6], and since then it has been explored through analyses of

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publicly available marketplace data [7–9] and qualitative online interviews with both buyers [3,5] and vendors [4]. SR has also been used as a tool for drug trend monitoring [15–17].

In this paper, we extend this research by presenting results from a quantitative analysis of international survey data from a purposive sample of drug purchasers. We describe the prevalence of awareness of SR and consumption of drugs purchased from SR; demographic characteristics; drug types consumed; and reasons for use and non-use of SR. As our survey was conducted in 2012, our analyses refer to use of the original SR marketplace.

METHODS

Design

An anonymous, annual online survey of drug use was designed and conducted by Global Drug Survey (GDS). A total of 22 289 responses were received between 15 November 2012 and 2 January 2013. The sample used in this paper was restricted to those who indicated that they usually bought their own amphetamine, cannabis, cocaine, 3,4-methylenedioxy-N-methylamphetamine (MDMA), ketamine or mephedrone, or who reported buying 'legal highs'/'research chemicals' or any drugs online during the last 12 months (n = 11 848). Without this restriction, alcohol-only and other non-drug-purchasers were asked why they did not use SR, which was usually because they did not normally buy illicit drugs and therefore had no need to utilize the site. The base sample was further restricted to comprise only respondents who resided in or used the currency of Australia, the United Kingdom or the United States (n = 9470). These countries were chosen because the majority of vendor listings from drugs on SR come from English-speaking countries [8], SR is only available in the English language, the GDS survey was only available in English and these three countries were the best represented in the overall GDS. Where country of origin was missing and a relevant currency was nominated (n = 555, 5.9%), we recoded country of origin to United Kingdom where the UK pound was nominated, Australia where the Australian dollar was nominated and United States where the US dollar was nominated.

The survey was promoted in partnership with the dance music magazine *Mixmag*, the *Guardian* and Fairfax Media, and also distributed through Facebook, Twitter, the social news website Reddit and drug discussion forums. GDS successfully engaged mainstream media partners in the United Kingdom and Australia, where 60 and 80% of respondents, respectively, reported hearing about the survey through mainstream media. With no core media partner in the United States, the majority of recruitment occurred through the social news website Reddit (50%). The sample is purposive, and should therefore not be seen as representative of drug purchasers more generally. Ethical approval was received from the Joint South London and Maudsley and Institute of Psychiatry NHS Research Ethics Committee.

Measures

We designed questions that were informed by ongoing digital ethnographic research of SR being conducted by M.B., which has involved participating in online discussions and monitoring the marketplace. Based on these observations, predetermined responses were provided for questions about why drug purchasers did or did not consume drugs from SR. An 'other' field was also provided but was used only by up to 10% of respondents, indicating that the predetermined responses were relatively adequate. Question wording can be found at the 'Internet drug access and legal highs' section of https://www.globaldrugsurvey.com/mixmag2013/survey.php.

Other variables we used included: age, sex, employment status (employed and/or studying versus neither), educational attainment (university degree versus no degree), frequency of clubbing (attending nightclubs: four or more times per annum versus less often), ethnicity ('white' versus 'other'), sexual orientation (heterosexual versus other) and how they found out about the survey.

Analysis

Due to the sensitive nature of the information collected, IP addresses were not collected and therefore it was impossible to eliminate multiple entries from the same IP address. The data set was scanned for identical entries, but none were found. We consider it unlikely that anyone would complete the survey more than once, as this would entail large amounts of time (from 15 minutes to 1 hour or more) for no obvious gain, as no material incentives were offered.

Of the 14 variables reported, there was a median of 1.2% missing data [interquartile range (IQR) 0.7–2.2%, range 0.5–4.9%]. Due to the relatively low level of missing data, we have used available-case analysis rather than imputing missing data. The gain of undertaking more complex imputation is not usually justified if the proportion of missing data is minimal [18]. For multivariable analysis, variables were retained in the final model if the grouped effect of the variable was significant at an alpha level of 0.10.

Descriptive statistics are provided in this paper to provide a snapshot of respondents and responses. Unless statistical comparisons are undertaken, we have not included P-values or confidence intervals (CIs) for

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descriptive statistics. Notably, as the data presented here are drawn from a purposive sample, where we have reported 95% CIs for the estimates in our models these should be interpreted with caution when generalizing to broader populations.

To compare differences between drug buyers, we created three outcome groups based on knowledge and utilization of SR: (i) those who had never heard of SR, (ii) those who had heard of, but never consumed drugs purchased from, SR and (iii) those who had consumed drugs purchased from SR. We used multinomial logistic regression (see equation 1) to compare differences between three countries— United Kingdom, Australia and United States—and users of SR first as an unadjusted analysis (no additional covariates) and then adjusted analysis adding additional covariates. We also compare reasons for why respondents had or had not consumed drugs purchased through SR. To undertake this analysis we used logistic regression for both unadjusted and adjusted models, which uses the same formula as presented in equation 1; however, j^* is the baseline ('no' response) category.

$$log\left(\frac{\pi_{ij}}{\pi_{ij^*}}\right) = a_j + x_i^T\beta_j, \text{ where } j \neq j^*, \quad (1)$$

where j^* is the baseline category (never heard of SR), a_j is a constant and β_j is a vector of regression coefficients for $J = 1, 2, \ldots, J-1$, for variables x_i.

The demographics of interest we adjusted for included age, sex, ethnicity, employment status, sexual orientation, educational attainment and clubbing experience. Due to the skewed distribution of age we also included age as a squared term. For the multinomial logistic regression analyses, we present data for all covariates in the model. For the logistic regression analysis, we present results only for country differences, but list at the bottom of each model a list of the retained covariates. We retained covariates in the adjusted model if they were significant at an alpha level of 0.10. All analyses were conducted using Stata 12 (StataCorp, College Station, TX, USA).

RESULTS

Exploring country differences

Prevalence of SR awareness/purchase and demographic characteristics of the three samples are shown in Table 1. Overall, half (50%) the sample had heard of 'the online drug marketplace Silk Road', but the percentage was not the same across the three countries, with the majority in the United States having heard of SR (65%) compared to approximately half of Australian respondents (53%) and 40% of UK respondents. Of respondents who had heard of SR, approximately one-quarter of UK and US respondents reported having consumed drugs purchased from SR, while only 14% of Australian respondents reported doing so. Of those who had consumed drugs purchased from SR, similar proportions across countries reported having purchased drugs themselves as opposed to having a friend purchase them on their behalf.

Regarding demographic characteristics, the Australian sample was older (and somewhat more normally distributed) than either the UK or US sample (see Supporting information, Fig. S1). This pattern may be an artefact of Fairfax Media being the primary recruitment tool in Australia. While the UK and US samples were younger, the age distribution for these countries was greatly right-skewed. As shown in Table 1, both the UK and Australian sample were more likely to report employment and/or studying, and to have completed a university degree, compared with the US sample. The UK sample was more

Table 1 Prevalence of Silk Road (SR) awareness/purchase and selected demographics (%) [number missing] of full sample by country ($n = 9470$).

SR use and demographics	*UK (n = 4315)*	*Australia (n = 2761)*	*USA (n = 2394)*
SR	[41]	[16]	[14]
Never heard of	60	47	35
Heard of: never consumed drugs purchased through SR	29	46	47
Heard of: has consumed drugs purchased through SR	10	7	18
Self purchased	50	56	55
Age (median—IQR)	24 (20–32) [42]	32 (25–41) [31]	21 (19–26) [37]
Male	76 [171]	76 [197]	80 [100]
Employed and/or studying	78 [40]	75 [31]	65 [35]
Educational attainment: degree	49 [73]	54 [59]	37 [78]
Ethnicity: 'white'	93 [55]	92 [35]	86 [39]
Sexual orientation: heterosexual	81 [47]	78 [37]	79 [38]
Clubbing: 4+ times per annum	66 [106]	39 [81]	36 [83]

Base sample = respondents who usually buy their own drugs (including 'legal highs'). IQR = interquartile ratio.

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likely to report attending nightclubs, probably reflecting the reach and readership of *Mixmag*, a UK dance music online and print publication, in recruitment. Distributions of sex, ethnicity and sexual orientation were relatively similar between countries.

Table 2 presents results of the multinomial logistic regression comparing country differences between respondents hearing about, and consuming drugs from, SR. The unadjusted model shows that, compared to respondents from the United Kingdom, the relative risk ratio (RRR) of hearing about, but not consuming drugs from SR, over not hearing of SR is greater for respondents from both Australia and the United States. In addition, the comparison between the United States and Australia was also significant [RRR = 1.36; 95% confidence interval (CI) = 1.21, 1.53; $P < 0.001$]. The probability (and CI) of not hearing about SR for each of the three countries was: United Kingdom (RRR = 0.60: 95% CI = 0.59, 0.62), Australia (RRR = 0.47; 95% CI = 0.45, 0.49) and United States (RRR = 0.35; 95% CI = 0.33, 0.37). By contrast, the probability of hearing about but not consuming drugs purchased from SR for each of the three countries was: United Kingdom (RRR = 0.29; 95% CI = 0.28, 0.31), Australia (RRR = 0.46; 95% CI = 0.44, 0.48) and United States (RRR = 0.47; 95% CI = 0.45,0. 49).

Compared to respondents from the United Kingdom, the relative risk of hearing about, and consuming drugs from, SR over not consuming drugs from SR was significantly less for respondents from the Australia, but not different for respondents from the United States. In addition, the comparison between the United States and Australia was also significant (RRR = 2.44; 95% CI = 2.02, 2.94; $P < 0.001$). The probability of hearing about and consuming drugs purchased from SR for each of the three countries was: United Kingdom (RRR = 0.10; 95% CI = 0.09, 0.11), Australia (RRR = 0.07; 95% CI = 0.06, 0.82) and United States (RRR = 0.18; 95% CI = 0.16, 0.20). After adjusting for the covariates (presented in Table 2) the patterns seen with the unadjusted model remained, with one exception. In the unadjusted model, compared to respondents from the United Kingdom, the RRR of hearing about, and consuming drugs from, SR over not hearing of SR, for Australian respondents, was not statistically different between the two countries. However, after adding the covariates to the model this now becomes statistically significant.

Table 2 Multinomial logistic regression for hearing about, and consuming drugs from, Silk Road (SR): relative risk ratio (and 95% CIs).

	Unadjusted model (n = 9399)			*Adjusted model (n = 8597)*		
	$\chi^2_{(4)} = 522$, $P < 0.001$			$\chi^2_{(18)} = 1260$, $P < 0.001$		
	Not heard of versus heard of: not consumed	*Not heard of versus heard of: consumed*	*Heard of: not consumed versus consumed*	*Not heard of versus heard of: not consumed*	*Not heard of versus heard of: consumed*	*Heard of: not consumed versus consumed*
UK	1.00	1.00	1.00	1.00	1.00	1.00
Australia	2.02 (1.82, 2.24)[c]	0.93 (0.77, 1.11)	0.45 (0.38, 0.55)[c]	2.35 (2.10, 2.65)[c]	1.69 (1.38, 2.07)[c]	0.72 (0.58, 0.88)[b]
USA	2.75 (2.46, 3.07)[c]	3.07 (2.63, 3.59)[c]	1.12 (0.96, 1.31)	2.39 (2.11, 2.70)[c]	2.62 (2.19, 3.13)[c]	1.09 (0.92, 1.31)
Age (in 5 years)				0.71 (0.63, 0.81)[c]	0.44 (0.34, 0.57)[c]	0.62 (0.48, 0.80)[c]
Age^2 (in 5 years)				1.01 (1.00, 1.02)[c]	1.03 (1.01, 1.02)[b]	1.02 (1.00, 1.04)
Male				2.46 (2.18, 2.77)[c]	3.17 (2.58, 3.91)[c]	1.29 (1.04, 1.61)[a]
Degree				0.89 (0.80, 0.98)	0.87 (0.74, 1.02)	0.98 (0.83, 1.15)
'White'				1.16 (0.98, 1.37)	1.35 (1.04, 1.74)[a]	1.17 (0.90, 1.46)
Heterosexual				0.91 (0.81, 1.03)	0.83 (0.69, 1.00)[a]	0.91 (0.76, 1.09)
Clubber				0.79 (0.71, 0.87)[c]	1.08 (0.92, 1.27)	1.37 (1.17, 1.61)[c]

Employed and/or studying—removed as not significant ($\chi^2_{(2)} = 1.26$; $P = 0.534$). [a]$P < 0.05$; [b]$P < 0.01$; [c]$P < 0.001$. CI = confidence interval.

What drugs were purchased on SR?

Table 3 presents the top 20 drugs purchased from SR by country of residence. MDMA was the most commonly purchased drug. More than half of respondents, in each country, reported purchasing it, mainly in powdered (crystal) form. Cannabis was ranked in the top four drugs

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Table 3 Top 20 drugs purchased from Silk Road (SR) by country of residence ($n = 1036$).

	UK (n = 422)		*Australia (n = 193)*		*USA (n = 421)*	
Rank	*Drug*	*%*	*Drug*	*%*	*Drug*	*%*
1	MDMA (all)	56	MDMA (all)	60	MDMA (all)	53
2	Cannabis (all)	51	MDMA powder	47	MDMA powder	45
3	MDMA powder	43	Cannabis (all)	34	LSD	45
4	Cannabis skunk	39	LSD	33	Cannabis (all)	34
5	LSD	29	MDMA pills	27	NBOMe (all)	29
6	Cannabis resin	29	Cocaine	25	2C (all)	27
7	MDMA pills	29	Cannabis skunk	24	Magic mushrooms	27
8	2C (all)	23	2C (all)	16	Cannabis skunk	24
9	2C-B	22	Amphetamine (all)	16	DMT	24
10	Cannabis grass	21	NBOMe (all)	15	25I-NBOMe	22
11	Prescription drugs (all)	18	Prescription drugs (all)	15	MDMA pills	21
12	Ketamine	17	DMT	15	Prescription drugs (all)	20
13	NBOMe (all)	13	Cannabis grass	14	2C-B	18
14	DMT	11	2C-B	13	Cannabis resin	17
15	25I-NBOMe	11	Magic mushrooms	13	25C-NBOMe	16
16	Benzodiazepines	10	Amphetamine	13	Ketamine	15
17	Magic mushrooms	9	25I-NBOMe	12	Benzodiazepines	12
18	Cocaine	9	Ketamine	9	Methoxetamine	11
19	Amphetamine (all)	9	25C-NBOMe	9	2C-E	11
20	Amphetamine	9	Benzodiazepines	9	Cannabis grass	10

Base sample = respondents who usually buy their own drugs (including 'legal highs') and report having consumed drugs that were purchased through SR ($n = 1060$; missing = 24; sample for analysis = 1036). Definition of composite variables: 3,4-methylenedioxy-N-methylamphetamine (MDMA) (all) = MDMA powder or MDMA pills. Cannabis (all) = cannabis skunk or cannabis grass or cannabis resin or cannabis oil. N-benzyl-oxy-methyl (NBOMe) (all) = 25I-NBOMe or 25C-NBOMe or 25B-NBOMe. Prescription drugs (all) = benzodiazepines or opioid pain killers or dexamphetamine or ritalin or viagra or buprenorphine or etizolam or methadone or zopliclone or modafinil or tramadol. Amphetamine (all) = amphetamine or methamphetamine. 2C (all) = 2C-C or 2C-D or 2C-T-7 or 2C-B or 2C-E or 2C-I or 2C-P. DMT = N,N-dimethyltryptamine; LSD = lysergic acid diethylamide.

across countries and lysergic acid diethylamide (LSD) in the top five. Drugs from the 2C family were ranked in the top six to eight across countries. Cocaine, amphetamines and N-benzyl-oxy-methyl (NBOMe) were ranked differently across countries. Cocaine was ranked sixth in Australia, while ranking 18th in the United Kingdom and outside the top 20 for the United States. Similarly, amphetamines (including methamphetamine) was ranked ninth in Australia, 19th in the United Kingdom and outside the top 20 for the United States. In contrast, NBOMe (all types) was ranked fifth in the United States, 10th in Australia and 13th in the United Kingdom.

Why purchase from SR?

We provided respondents with eight reasons for why they had consumed drugs purchased from SR (see Table 4). The top four reasons for purchasing from SR were in the same rank order across countries (with percentages presented in order of United Kingdom, Australia and United States): (i) 'SR has a wider range of drugs than I can usually access' (75, 77, 89), (ii) 'SR drugs are better quality than I can normally access' (72, 72, 77), (iii) 'it is more convenient to order drugs online' (67, 69, 69), and (iv) 'I feel more comfortable buying from sellers with high ratings' (60, 64, 65). Compared to respondents from the United Kingdom, both Australian and US respondents were significantly more likely to favour using SR due to lower prices and inadequate access to drugs through own networks (see Table 4). Moreover, compared to UK respondents, the respondents from the United States were more likely to report using SR due to access to a wider range of drugs and anonymity. No other statistically differences between each of the three countries were observed.

Table 4 also presents adjusted odds ratios after taking into account the collection of covariates highlighted in Table 1. Overall, no new significant relationships were identified. However, the significant result in the unadjusted model, between Australia and the United Kingdom for using SR due to better access to drugs, was lost; and the significant relationship between the United States and the United Kingdom for using SR as the prices were lower was weakened.

Why not purchase from SR?

Respondents who had heard of SR but had not purchased were asked for reasons why they had not yet purchased (Table 5). The most common response across all countries

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Table 4 Logistic regressions predicting reasons for using Silk Road (SR) ($n = 1060$).

Reasons for use	*Unadjusted odds ratios OR*	*Adjusted odds ratios OR**
SR prices are lower	($n = 1060$)	($n = 1044$)
UK	1.00	1.00
Australia	2.14 (1.52, 3.02)[b]	3.37 (2.29, 4.97)[b]
USA	1.63 (1.24, 2.14)[b]	1.46 (1.10, 1.94)[a]
*Retained covariates: age, age^2, heterosexual		
SR has a wider range of drugs than I can usually access	($n = 1060$)	($n = 1001$)
UK	1.00	1.00
Australia	0.91 (0.62, 1.34)	1.08 (0.70, 1.67)
USA	2.37 (1.63, 3.43)[b]	2.31 (1.56, 3.44)[b]
*Retained covariates: age, sex, degree, work-study		
It is more convenient to order drugs online	($n = 1060$)	($n = 1060$)
UK	1.00	1.00
Australia	1.04 (0.72, 1.49)	1.04 (0.72, 1.49)
USA	0.93 (0.70, 1.23)	0.93 (0.70, 1.23)
*Retained covariates: nil		
I want to avoid physically meeting with drug dealers	($n = 1060$)	($n = 1001$)
UK	1.00	1.00
Australia	1.24 (0.88, 1.73)	0.92 (0.63, 1.34)
USA	0.89 (0.68, 1.16)	0.80 (0.60, 1.08)
*Retained covariates: age, age^2, sex, heterosexual, clubber		
SR drugs are better quality than I can usually access	($n = 1060$)	($n = 1030$)
UK	1.00	1.00
Australia	1.03 (0.71, 1.49)	1.34 (0.89, 2.03)
USA	1.34 (0.99, 1.82)	1.26 (0.90, 1.76)
*Retained covariates: age, heterosexual, clubber, work-study		
I feel more comfortable buying from sellers with high ratings	($n = 1060$)	($n = 993$)
UK	1.00	1.00
Australia	0.86 (0.61, 1.21)	0.76 (0.53, 1.10)
USA	1.09 (0.83, 1.45)	0.94 (0.70, 1.27)
*Retained covariates: sex, degree, clubber		
I don't have adequate access to drugs through my own networks	($n = 1060$)	($n = 1035$)
UK	1.00	1.00
Australia	1.86 (1.32, 2.62)[b]	1.44 (1.00, 2.08)
USA	2.12 (1.61, 2.79)[b]	1.90 (1.41, 2.54)[b]
*Retained covariates: age, clubber		
It is more anonymous to buy through SR	($n = 1060$)	($n = 1034$)
UK	1.00	1.00
Australia	1.31 (0.94, 1.83)	1.18 (0.83, 1.67)
USA	1.57 (1.20, 2.06)[a]	1.38 (1.04, 1.83)[a]
*Retained covariates: heterosexual, clubber		

Base sample = respondents who usually buy their own drugs (including 'legal highs') and report having consumed drugs that were purchased through SR ($n = 1060$; missing = 53; sample for analysis = 1007). Dependent variable = respondent reports this statement as a reason they or someone purchased drugs through SR on their behalf. *Covariates retained had a P-value less than 0.10. See Table 1 for definitions of covariates. [a]$P < 0.01$; [b]$P < 0.001$.

(with percentages reported in order of the United Kingdom, Australia and the United States) was 'I have adequate access to drugs through my own networks' (63, 67, 68) and the next most common response was 'I fear being caught by police/customs if drugs are sent to my own address' (41, 51, 53). Compared to respondents from the United Kingdom, both Australian and US respondents were significantly more likely to favour 'fear of being caught' as a reason for not purchasing drugs from SR. There was no significant difference in the odds ratio between the United States and Australia. Compared to respondents from the United Kingdom, US respondents were significantly more likely not to use SR to buy drugs as they found accessing Bitcoins too difficult, were concerned

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Table 5 Logistic regressions predicting reasons for not using Silk Road (SR) ($n = 3445$).

Reasons for not using	*Unadjusted odds ratios OR*	*Adjusted odds ratios OR**
I have adequate access to drugs through my own networks	($n = 3634$)	($n = 3484$)
UK	1.00	1.00
Australia	0.83 (0.70, 0.97)	0.85 (0.71, 1.01)
USA	0.96 (0.81, 1.14)	1.06 (0.88, 1.27)
*Retained covariates: age, degree, clubber		
I fear being caught by police/customs if drugs are sent to my own address	($n = 3634$)	($n = 3599$)
UK	1.00	1.00
Australia	1.50 (1.28, 1.75)[c]	1.65 (1.39, 1.96)[c]
USA	1.67 (1.42, 1.96)[c]	1.62 (1.37, 1.92)[c]
*Retained covariates: age, age^2		
Bitcoins are too difficult to get	($n = 3634$)	($n = 3442$)
UK	1.00	1.00
Australia	0.53 (0.43, 0.65)[c]	0.72 (0.57, 0.90)[b]
USA	1.69 (1.41, 2.02)[c]	1.53 (1.27, 1.85)[c]
*Retained covariates: age, age^2, sex		
I am concerned about getting ripped off	($n = 3634$)	($n = 3599$)
UK	1.00	1.00
Australia	0.96 (0.80, 1.15)	0.96 (0.79, 1.17)
USA	1.42 (1.19, 1.70)[c]	1.44 (1.20, 1.73)[c]
*Retained covariates: age, age^2		
I don't understand the technologies well enough	($n = 3634$)	($n = 3392$)
UK	1.00	1.00
Australia	0.88 (0.71, 1.07)	0.97 (0.77, 1.21)
USA	0.97 (0.79, 1.19)	0.97 (0.78, 1.20)
*Retained covariates: age, sex, degree		
SR prices are too high	($n = 3634$)	($n = 3530$)
UK	1.00	1.00
Australia	0.29 (0.20, 0.43)[c]	0.32 (0.21, 0.47)[c]
USA	1.71 (1.33, 2.20)[c]	1.49 (1.13, 1.97)[b]
*Retained covariates: age, clubber		
Buying on SR is too much effort	($n = 3634$)	($n = 3599$)
UK	1.00	1.00
Australia	0.65 (0.54, 0.79)[c]	0.92 (0.75, 1.12)
USA	1.46 (1.22, 1.73)[c]	1.27 (1.06, 1.52)[c]
*Retained covariates: age		
No reason, I just haven't gotten around to it	($n = 3634$)	($n = 3382$)
UK	1.00	1.00
Australia	0.94 (0.78, 1.12)	0.95 (0.79, 1.15)
USA	0.86 (0.72, 1.04)	0.81 (0.67, 0.99)[a]
*Retained covariates: sex, degree, white		

Base sample = respondents who usually buy their own drugs (including 'legal highs') and have heard of the SR, but have not bought drugs from SR. Dependent variable = respondent reports this statement as a reason they have not purchased drugs through SR. *Covariates retained had a *P*-value less than 0.10. See Table 1 for definitions of covariates. [a]$P < 0.05$; [b]$P < 0.01$; [c]$P < 0.001$.

about being ripped off, thought prices for drugs on SR were too high and believed using SR to purchase drugs to be too much effort. By contrast, compared to UK respondents, Australian respondents were less likely to indicate accessing Bitcoins was difficult, less likely to consider SR prices as being too high and less likely to indicate that accessing drugs via SR was too much effort. No other statistically differences were observed between each of the three countries.

Table 5 also presents adjusted odds ratios accounting for the covariates highlighted in Table 1. The only new significant relationship identified was between respondents from the United States compared to UK respondents. US respondents were significantly less likely to indicate that they 'hadn't gotten around' to purchasing drugs from SR. However, the significant result in the unadjusted model between Australia and the United Kingdom for not using SR to purchase drugs because accessing Bitcoins

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was weakened, as was the difference between US respondents compared to UK respondents in suggesting that SR prices are too high. The significant difference between Australian respondents and UK respondents in considering purchasing drugs from SR to be too much effort was lost after adjusting for significant covariates.

DISCUSSION

This study is the first published description of a large global sample of drug users who were asked about their consumption of drugs purchased through an online drug marketplace. Data from the unadjusted model suggested that, in rank order, those respondents least likely to hear of SR were first from the United Kingdom, then Australia and then the United States. Furthermore, in rank order, those most likely to have consumed drugs from SR were respondents from the United States, followed by the United Kingdom and then Australia. This pattern remained even after adjusting the model to account for age, sex, employment status, educational attainment, ethnicity, sexual orientation and clubbing behaviour. Across the three countries, MDMA was the most commonly purchased drug, followed by cannabis, LSD and the 2C family. Cocaine and amphetamine were purchased more commonly in Australia, whereas the NBOMe family were more commonly reported in the United States. Globally, the most common reasons for purchasing from SR were wider range, better quality, greater convenience and the use of vendor rating systems. Australians and Americans were more likely to be motivated by SR's lower prices and by inadequate drug access through their own sources, compared with the British. Across countries, the most common reasons for not purchasing from SR were adequate drug access and fear of being caught. Australians and Americans were more likely to avoid SR purchase due to fear of being caught. Americans were more likely to be deterred from using SR by high prices, difficulty obtaining Bitcoin and concern about being ripped off.

Fit with wider e-commerce trends

Retailing and consumer research using large-scale surveys has explored the motivations of online shoppers and the predictors of satisfaction with the online shopping experience. Szymanski & Hise [19] produced a conceptual model of e-satisfaction which included convenience, quality and variety of product offerings and product information, site design and financial security. Chiang & Dholakia [20] found that convenience and product type influenced intention to engage in online shopping. In this study, we found that the most commonly mentioned reasons for using SR to buy drugs fitted with wider e-commerce trends: access to a wider variety and better quality of product offerings, the convenience of online shopping and access to more information about the products and the vendors/companies selling them. Further research is required to understand more clearly how the use of this new method of accessing drugs occurs alongside other buying mechanisms, such as open street markets, network or social supply markets and other online purchasing, such as purchase of pharmaceuticals through websites, and the extent to which SR buyers engage in e-commerce more generally.

Country-specific differences

Differences in the kinds of drugs bought from SR by country appear to reflect drug trends in those countries. For example, cocaine and amphetamines were purchased more commonly in Australia. Availability of cocaine through traditional markets in Australia is relatively low and prices relatively high [21], indicating an unmet demand which may explain the attraction of cocaine to Australian buyers. Australia has the highest prevalence of amphetamine use in the world [22], perhaps because of its relatively low access to cocaine. Regular amphetamine users in Australia may continue to seek this drug through SR. Also, emerging evidence from the United States [23–25] suggests that the NBOMe series is of growing concern in that country, a trend we see reflected in the current findings.

After controlling for demographic differences, Australians and Americans were more likely to be motivated by SR's lower prices compared with the British. These findings accord with Australian research which has compared SR prices with street market prices for common substances, finding that prices from international SR vendors were significantly less than street market prices [15]. Of those who did not purchase from SR, Australians and Americans were more likely to avoid SR purchase due to fear of being caught. These findings may reflect reduced perceptions of effective law enforcement activity in the United Kingdom, which may have more difficulty policing drugs through the post given its relatively porous borders with Europe, as well as prominent deterrence campaigns in Australia and the United States.

Limitations

The main limitation of this study is the non-representative sampling method. It is not possible to estimate the extent to which the samples within each country are representative of the general population in each country. Given the findings presented here, and the growing use of cryptomarkets to purchase drugs online, additional research is needed; ideally, research that has a probabilistic sampling design. Nevertheless, the method

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employed by Global Drug Survey has proved itself to be an effective way of accessing large drug-using populations and identifying new drugs trends ahead of their penetration into the wider population [26–28].

CONCLUSIONS

Since these data were collected, the cryptomarket landscape has changed with the arrival of new drug marketplaces, the fall of the original SR and the rise of the new SR. The speed of the marketplace's adjustment to the FBI seizure of SR indicates that cryptomarkets will probably continue to expand, assuming that they still provide utility and satisfaction to their target market. In this context, we need more detailed research from multiple perspectives to understand how this new method of accessing drugs is affecting drug markets more broadly and how increased variety and availability of drugs affects drug use and harm profiles.

Declaration of interests

None.

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Supporting information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Figure S1 Box-plots of age by gender for the United Kingdom, Australia and the United States

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