Research Paper

Drug sourcing and motivations among a sample of people involved in the supply of pharmaceutical drugs in Australia

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ABSTRACT

Background: The non-medical use (NMU) of pharmaceuticals is increasing internationally, along with mortality. Previous research indicates that end-users access pharmaceuticals through social networks, however little is known about supplier sources particularly outside the US. This study examined sourcing and motivations among a sample of people involved in pharmaceutical diversion and supply in Australia.
Methods: Semi-structured, telephone interviews were conducted with 51 people involved in supplying pharmaceuticals in the previous six months. Multi-stage recruitment involved the distribution of flyers to participants of two Australian drug-monitoring programs: the Ecstasy and related Drugs Reporting System (capturing regular psycho-stimulant users) and the Illicit Drug Reporting System (capturing people who regularly inject drugs), followed by a screening of interested participants. Interviews were audio-recorded, transcribed and analysed using a mixed methods approach. First, correlates of drug sourcing and motivations were examined including demographics, frequency and quantity of supply. Second, thematic analysis of the qualitative data was undertaken on strategies for obtaining the drugs and motivating factors.
Results: Drug supplies were sourced from a variety of medical and non-medical sources, primarily legitimately obtained prescriptions (47%), friends or family (18%) and dealers (14%). Suppliers using medical sources were more likely to be unemployed/retired and reported supplying for therapeutic purposes, while suppliers using non-medical sources were more likely to be employed/students, earned higher incomes and reported supplying for recreational purposes. Those who sourced via doctor shopping (IRR = 47.5) and friends and family (IRR = 10.1) distributed higher quantities, while those who sourced legitimately obtained prescriptions (IRR = 0.1) and from illicit drug dealers (IRR = 0.0) distributed lower quantities. Similar proportions supplied for financial (65%) and altruistic (61%) reasons, however the latter supplied lower quantities (IRR = 0.1).
Conclusion: This study offers novel insight into the diversion of pharmaceuticals from the supplier perspective. A nuanced policy approach is required to address varied supply practices by source and motive.

Introduction

Pharmaceutical non-medical use (NMU) involves the consumption of a prescription drug for non-therapeutic purposes or other than directed by a registered healthcare professional (Barrett, Meisner, & Stewart, 2008; Larance, Degenhardt, Lintzeris, Winstock, & Mattick, 2011). The process of accessing pharmaceutical drugs for NMU involves diversion, whereby pharmaceuticals are channelled from legal sources to the black market (Inciardi, Surratt, Lugo, & Cicero, 2007). As rates of

pharmaceutical NMU rise around the world including in Australia (AIHW, 2017), Canada (Health Canada, 2012) and the United States (US) (Center for Behavioral Health Statistics & Quality, 2015), so too do the associated harms including morbidity and mortality (ABS, 2017; Canadian Institute of Health Information, 2017; Office for National Statistics, 2017; UNODC, 2018). An understanding of the mechanisms of diversion and supply has thus become a key priority.

There is now a large evidence base examining the source and diversion of pharmaceutical drugs for NMU. Recently Hulme, Bright, and

Nielsen, (2018) consolidated evidence from 149 studies from Australia, Canada, Europe, the US and the United Kingdom (UK) and found that pharmaceutical drugs are overwhelmingly sourced by end-users through friends and family and illicit drug dealers, and the NMU of legitimately obtained prescriptions is also common. Online purchasing and doctor shopping are less common access points reported by end-users (Hulme et al., 2018). However, the majority of research to date has been conducted with end-users so the sources used by people involved in diversion and supply remains largely unknown (Hulme et al., 2018; Inciardi & Cicero, 2009; Inciardi, Surratt, Cicero, & Beard, 2009).

Research that has focused on people involved in diversion and supply is mainly of US origin. Rigg, Kurtz, and Surratt, (2012) conducted research in South Florida with 50 pharmaceutical drug dealers and found that pain clinics were a major source of drugs. The liberal prescribing practices of physicians were targeted by dealers who falsified their symptoms in order to acquire large quantities of drugs (Rigg, March, & Inciardi, 2010). In Inciardi, Surratt, Cicero, Kurtz et al. (2009) uncovered pill brokerage operations involving patients partnering with suppliers to distribute their medications. Similar practices have also been identified elsewhere in the US (Green et al., 2013; Worley & Thomas, 2014). While these studies have been useful in highlighting localised issues, supply-focused research extending beyond the US is lacking. Moreover, these studies were conducted when emerging access points such as the darknet were only in their infancy (UNODC, 2017) and before more recent increases in harms due to pharmaceuticals (ABS, 2017; UNODC, 2018).

While our understanding of the dynamics and structures of the pharmaceutical black market remains limited, international research examining illicit drug markets is growing (Hughes, Chalmers, Bright, & McFadden, 2016; Bichler, Malm, & Cooper, 2017; Caulkins et al., 2016; Hughes, Chalmers, Bright, & McFadden, 2016; Malm & Bichler, 2011; Reuter & Trautmann, 2009). Illicit drug markets are hugely profitable (Caulkins, Gurga, & Little, 2009; Gong, Ritter, Bright, & Doran, 2012; Matrix Knowledge Group, 2007), however scholars have identified various dealer types (Nicholas, 2008; Potter, 2009). This can be broadly categorised to include 'user-dealers' who operate to support their own use, 'social suppliers' who distribute to non-strangers for minimal profit and 'real dealers' who are motivated by financial gain (Coomber & Moyle, 2014; Coomber, Moyle, & South, 2016; Hough et al., 2003; Lenton, Grigg, Scott, & Barratt, 2016; Murphy, Murphy, Sales, & Lau, 2018; Potter, 2009; Taylor & Potter, 2013). It has also been shown that the demographics, motives and modus operandi of suppliers may differ (Caulkins et al., 2016; Coomber & Turnbull, 2007; Hughes et al., 2016a; Matrix Knowledge Group, 2007; Nicholas, 2008; Tzvetkova et al., 2016). For instance, suppliers who are driven by profit motives tend to occupy a higher-level position in the market and seldom use drugs, while lower-level dealers are more likely to operate for the purpose of amassing social capital and engage in use (Desroches, 2007; Johnson, 2003; Nicholas, 2008). Some scholars have argued for lower penalties for social suppliers compared with those who are financially motivated (Coomber et al., 2018; Murphy et al., 2018). In all Australian jurisdictions excepting Queensland, threshold quantities for each drug are the key marker of the seriousness of the offence and motive is not an explicit consideration at sentencing (Hughes, Ritter, Cowdery, & Phillips, 2014).

The pharmaceutical black market is under researched and it remains unclear to what extent its structure and operations differ to that of the illicit drug market. In order to inform effective policies that do not inadvertently result in displacement to black markets and do not jeopardise therapeutic benefits for complaint populations, supply-focused research is needed (Pacula & Powell, 2018). An understanding of the Australian context is particularly important at a time when governments are planning or implementing new policies to curb diversion and NMU, including real-time prescription monitoring programs (PMPs) (ACT Health, 2018; State Government of Victoria, 2017) and the up-scheduling of codeine to a prescription-only medication (TGA, 2018b).

The purpose of this study was twofold. First, to identify the sources used by people involved in unlawful pharmaceutical supply in Australia and their motivations to supply. Second, to explore correlates of drug sourcing and motivations including demographics, quantity and frequency of supply.

Methods

A mixed methods approach was employed in this study, involving quantitative and qualitative data collection and analysis.

Data collection

Semi-structured, telephone interviews were conducted in Australia with 51 people involved in supplying prescription drugs to another person in the previous six months. In this study, supply included the process of giving away, selling or trading prescription drugs, to allow for the capture of supply that was not commercially driven.

Participants were recruited through a multi-stage process that was used to successfully recruit ecstasy dealers in previous research (Bright & Ritter, 2011). First, flyers were distributed to participants of two Australian drug monitoring programs coordinated annually by the National Drug and Alcohol Research Centre (NDARC) at the University of New South Wales (UNSW) – the Ecstasy and related Drugs Reporting System (EDRS), which involves interviews with approximately 800 regular ecstasy and psycho-stimulant users (Uporova, Karlsson, Sutherland, & Burns, 2018) and the Illicit Drug Reporting System (IDRS), which involves interviews with around 900 people who regularly inject drugs (Karlsson & Burns, 2018). Recruitment occurred Australia-wide, except for Victoria where no flyers were distributed. Notably, using the EDRS and IDRS meant that our sample primarily comprised user-dealers. While we utilised the EDRS and IDRS to raise awareness of our research, the data collection processes were separate and it was not a requirement of our study that participants had completed the EDRS or IDRS interviews, with recruitment also possible through snowballing. Second, interested participants contacted the researchers and answered five screening questions to confirm eligibility. Eligible participants were those who met the following criteria: (i) English-speaking; (ii) currently living in Australia; (iii) over 18 years old; (iv) involved in giving away, selling or trading a prescription drug on more than two occasions in the prior six months; and (v) able to identify the type of prescription drug supplied. Participants were reimbursed for their time ($40 AUD).

Telephone interviews were undertaken because research has shown that participants may be more likely to disclose sensitive information over the telephone compared with face-to-face, possibly due to a greater sense of anonymity (Novick, 2008) and there is lower non-response to drug and alcohol related questions (1994, Aquilino, 1992). Moreover, other methods such as direct observation were not appropriate given the covert nature of the behaviours of interest (Desroches, 2007; Pearson, Hobbs, Jones, Tierney, & Ward, 2001).

Interview protocol

A semi-structured interview protocol was administered to capture consistent information from each participant, whilst allowing for the exploration of emergent themes. The protocol was adapted from a study undertaken by Bright and Ritter (2011) on ecstasy supply and is provided in the supplementary materials. Information was collected on participant demographics, drug and alcohol use, supply practices, motivations, and perceptions of pharmaceutical NMU and diversion. Data collection took place between March and June 2017. Interviews were audio-recorded and transcribed verbatim. This study received ethical approval from UNSW (#HC16926).

Analysis

Semi-structured questions on demographics, source, motive, drug type, quantity and frequency of supply were captured quantitatively and coded. The quantitative analyses involved first, examining frequency distributions for sample characteristics and supply practices. Second, Fischer's exact tests and independent samples t-tests were used to explore correlates of drug sourcing and motivations that included: demographics (gender, age, criminal history, employed/student, unemployed/retired, income), drug type (opioids, sedatives, stimulants, other), intended purpose of drugs supplied (recreational, therapeutic) and frequency of supply (once or twice monthly, daily to weekly). Additionally, the relationship between source and motivations were explored using Fischer's exact tests. There was no significant relationship for drug class, so the results are in Table S1 of the supplementary.

In order to standardise the quantity of drugs supplied by participants, given the variety of drug types, we calculated the number of defined daily doses (DDD) supplied by participants in the six months prior to interview. The DDD is not a recommended prescription dose, but rather a technical unit of measurement allocated by the World Health Organisation (WHO) that corresponds to the assumed average maintenance dose per day for a drug used for its main indication in adults (WHO Collaborating Centre for Drug Statistics Methdology, 2018). The DDD is commonly used to assess trends in drug utilisation and to perform comparisons across population groups (see for example Berterame et al. (2016)) (Table S2 in the supplementary presents the DDDs for the drugs supplied by participants). Because DDD data were skewed and over dispersed, negative binomial regressions were used to examine the relationship between the number of doses supplied and source and motivations. To avoid contaminating the analyses due to suppliers' tendencies to use repeat sources to access multiple drugs, comparisons focused on the drug most often supplied by participants (rather than all drugs supplied). The source and motivation categories were not mutually exclusive; hence separate analyses were carried out for each. All statistical analyses were performed using Stata version 15.0 (StataCorp, 2017).

In addition to the quantitative data, the interviews also collected qualitative responses to a series of open-ended questions and prompts aimed at eliciting further information on drug sourcing and motivations. Responses to these questions were initially extracted from the transcripts using in-vivo or verbatim coding (Manning, 2017) and were then analysed for key themes to identify strategies for obtaining the drugs and factors driving their supply activity (Terry, Hayfield, Clarke, & Braun, 2017). An inductive approach was undertaken to allow for the linking of themes with the data themselves (Fereday & Muir-Cochrane, 2006; Terry et al., 2017). The qualitative data has been used in this paper to contextualise the findings from the quantitative analysis.

Results

Sample characteristics

A total of 51 participants were interviewed, with a mean age of 34 years. Two-thirds (63%) were male, around half (53%) were unemployed and the median income of participants was less than $20,000 per annum (AUD). There were only three participants from rural or regional areas, reflecting the recruitment methods for the EDRS and IDRS (Karlsson & Burns, 2018; Uporova et al., 2018). Just over half (51%) of the sample had a criminal history, the majority of which involved possession (n = 18) or supply (n = 5) related drug offences. Almost two-thirds (61%) indicated that they had supplied an illicit drug in the previous six months, in addition to pharmaceutical drugs. Of those who also supplied illicit drugs, 65% indicated they supplied to the same people as who they supplied pharmaceuticals to, 36% supplied to different people and 8% supplied to a combination of both. All but one participant (98%) reported the recent use of illicit drugs and around

Table 1
Sample characteristics (n = 51).

Characteristic	n (%)
EDRS	26 (51)
IDRS	25 (49.1)
Gender	
Male	32 (62.7)
Female	19 (37.3)
Age (mean)	34 years
Employment status	
Employed / student	23 (45.1)
Unemployed / retired	28 (54.9)
Highest year of school (mean)	11
Further education or training	26 (51)
Personal annual income (before tax)	
Mean	$26,108
Median	$19,000
State / territory	
ACT	10 (19.6)
NSW	9 (17.6)
NT	7 (13.7)
QLD	8 (15.7)
SA	12 (23.5)
TAS	3 (5.9)
VIC	–
WA	2 (3.9)
Capital city	48 (94.1)
Regional / rural area	3 (5.9)
Recent illicit drug use [a]	50 (98)
Recent illicit drug supply [a]	31 (60.8)
Recent pharmaceutical NMU [a][b]	26 (51)
Treatment status	
Previously in treatment	12 (23.5)
Currently in treatment	13 (25.5)
Criminal history	26 (51.0)
Drug-related criminal history [c]	21 (41.2)
Possession	18 (35.3)
Supply	5 (9.8)
Driving under the influence	2 (3.9)
Cultivation	1 (2.0)
Not stated	1 (2.0)

Notes:
a) Past six months.
b) NMU of a pharmaceutical drug that the participant also reported supplying.
c) Participants may have multiple drug-related past offences, so totals do not add to 100.

half of the sample (51%) reported recently misusing a pharmaceutical drug that they had also supplied (Table 1).

Supply practices

The supply practices reported by participants are presented in Table 2. Almost half (49%) of the sample reported most often supplying hypnotic-sedative drugs, mainly diazepam (e.g. Valium) and alprazolam (e.g. Xanax). Equal proportions reported most often supplying pharmaceutical opioids (24%) and stimulants (24%). There were two participants who primarily supplied anti-psychotic medications (4%). The single drug type most often supplied was diazepam (37%), followed by dexamphetamine (10%) and oxycodone (8%) (Table S3 in the supplementary provides a list of all the drugs supplied).

Over half of the sample (59%) reported accessing the drugs directly from the medical system – either through legitimately obtained prescriptions (47%) or less commonly, through practices such as doctor shopping, prescription forgery or faking symptoms (12%). Just under half of the sample (41%) used non-medical sources for accessing their drugs, most commonly friends or family (18%), followed by illicit drug dealers (14%), third parties (10%) and online (10%). Third parties were distinct because they were considered neither friends nor family of the participant, nor did they supply illicit drugs. Where online purchases

Table 2
Supply practices (n = 51).

	n (%)
Supplied to	
Friend or family	40 (78.4)
Acquaintance	25 (49.0)
Stranger	5 (9.8)
Perceived use of drugs supplied [a]	
Therapeutic	21 (41.2)
Recreational	20 (39.2)
Study aid	8 (15.7)
To mitigate withdrawal	7 (13.7)
Supply	2 (3.9)
Manufacture illicit drugs	2 (3.9)
Unknown	3 (5.9)
Primary drug supplied	
Opioid	12 (23.5)
Sedative	25 (49.0)
Stimulant	12 (23.5)
Other	2 (3.9)
Source of primary drug [a]	
Medical	30 (58.8)
Legitimate medical source	24 (47.1)
Illegitimate medical source [b]	6 (11.8)
Non-medical	
Friend or family	9 (17.6)
Illicit drug dealer	7 (13.7)
Third-party [c]	5 (9.8)
Online	5 (9.8)
Motivation for supply [a]	
Financial	33 (64.7)
Altruistic	31 (60.8)
Number of doses supplied [d]	
Mean	1447
Median	30
Frequency of supply	
Daily to weekly	20 (39.2)
Fortnightly to monthly	31 (60.8)

Notes:
a) Categories are not mutually exclusive, so totals do not add to 100%.
b) Includes doctor shopping, prescription forgery or faking symptoms.
c) Third parties were unique from other sources because they were not known to the supplier (i.e. not friends/family), nor were they involved in supplying illicit drugs (e.g. cocaine or ecstasy).
d) Number of doses supplied in the prior six months, has been calculated using the defined daily dose (DDD) for each drug (WHO Collaborating Centre for Drug Statistics Methdology, 2018).

were made, this included both open access (n = 3) and darknet (n = 2) websites. Participants that sourced their drugs through other non-medical sources were asked to provide information on where they believed the drugs were initially obtained. Where stated, the most commonly cited source used by intermediaries was the medical system via legitimate prescriptions (n = 6), followed by illegitimate prescriptions obtained via doctor shopping (n = 5) and online (n = 4).

Four in five (78%) reported supplying to friends or family, while one in five (10%) reported supplying to strangers. Moreover, three in five (61%) reported they supplied for altruistic reasons. A similar proportion (65%) reported they were motivated for financial reasons, including nine (18%) who supplied to generate resources to support their own substance use and five (10%) who reported supplying to procure illicit drugs, most commonly methamphetamine, cannabis and ecstasy. There were eight participants (16%) who indicated both altruistic and financial motives.

The majority reported that they were involved in supplying directly to end-users (96%), with only two participants reportedly supplying to people who they believed where involved in on-supply. Almost equal proportions believed that the drugs they supplied were being used for therapeutic purposes (41%) – to assist with pain relief, anxiety and sleep, and recreational purposes (39%) – to facilitate a high or in combination with alcohol or other drugs. Other reasons for use of the

drugs supplied included as a study aid (16%) and to mitigate the effects of withdrawal (14%).

The median number of doses supplied by participants in the six months prior to interview was 30, equating to approximately a one-month supply of medication. However, the number of doses supplied by participants ranged widely from less than one[1] to 50,000, and there were a small number (12%) of participants who supplied over 1000 doses in the last six months. Three in five (61%) participants supplied once or twice per month, while two in five (39%) supplied on a daily or weekly basis.

Correlates of drug sourcing and motivations

Correlates of drug sourcing are presented in Table 3. Suppliers who accessed their drugs directly from the medical system were more likely to be unemployed/retired. In contrast, suppliers who accessed their drugs through non-medical sources were more likely to be employed/students and to earn on average, a higher annual income ($35,304 cf. $18,554 per annum, t (25.5) = −2.2938, p < 0.05). The drugs supplied from legitimate medical sources were reportedly more likely to be for therapeutic purposes, whereas drugs supplied from non-medical sources were reportedly more likely to be for recreational purposes. The frequency of supply varied across the sources. Those sourcing through doctor shopping and friends and family were more likely to supply on at least a weekly basis, whereas those supplying legitimately obtained prescriptions were more likely to supply once or twice per month.

Correlates of supplier motives are presented in Table 4. Suppliers who indicated that they were altruistically motivated were more likely than those not altruistically motivated to be employed/students and less likely to have a criminal history. Those who supplied for financial reasons were less likely than those without financial incentive to report that they supplied drugs for therapeutic purposes.

The regression analyses examining quantity supplied by source and motive are presented in Table 5. Overall those sourcing from the medical system distributed on average, a higher number of doses (IRR = 21.6, SE = 12.6) in the prior six months than those not using medical sources. Those involved in illegitimately obtaining prescriptions through doctor shopping supplied significantly higher average quantities (IRR = 47.5, SE = 38.3), than those supplying legitimately obtained prescriptions (IRR = 0.1, SE = 0.1). There was further variation in the mean number of doses supplied from non-medical sources. Participants who sourced through friends or family supplied on average a higher number of doses than those not sourcing from friends or family (IRR = 10.1, SE = 7.9) and those sourcing through illicit drug dealers supplied on average the lowest average number of doses (IRR = 0, SE = 0). Finally, suppliers who indicated that they were altruistically motived supplied on average a lower number of doses than those not altruistically motivated (IRR = 0.1, SE = 0.1).

Contextualising supply practices

We present here the findings from the thematic analysis on strategies for supply via medical and non-medical sources and purported supplier motives. In regards to medical sources, a key theme that emerged was the availability of legitimately obtained, leftover drugs and that created an opportunity for supply. Participants cited a number of reasons for their surplus drug supplies including that the medications had not achieved the desired result or that they experienced unpleasant side effects. As two participants explained:

"I tried them [diazepam] to help with my issues and they didn't help

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[1] Those involved in supplying less than one DDD still met the eligibility criteria for this study because they were involved in supplying a prescription drug, albeit a low dosage pharmaceutical opioid (i.e. 5mg Oxycodone tablets, less than 1 DDD), on more than two occasions in the last six months.

Table 3
Factors associated with drug sourcing.

Source	Medical [a]			Legitimate medical			Illegitimate medical			Non-medical [b]		
	Yes	No	p	Yes	No	p	Yes	No	p	Yes	No	p
Number	30	21		24	27		6	45		23	28	
Demographics												
Gender: male	56.7	71.4	0.381	58.3	66.7	0.659	50.0	64.4	0.649	69.6	57.1	0.398
Age (mean, years)	37.6	30	0.071							30	38	0.055
Age (SD, years)	14.4	14.7								3	2.75	
Employed / student	30.0	66.7	0.012*	62.5	48.1	0.400	0.0	51.1	0.027*	65.2	28.6	0.012*
Unemployed / retired	70.0	33.3	0.012*	37.5	51.9		100.0	48.9		34.8	71.4	
Income (mean, per annum)	$19,450	$35,619	0.052							$35,304	$18,554	0.03*
Income (SD, per annum)	$11,647	$34,885								$7031	$1975	
Criminal history: yes	50.0	52.4	1.000	45.8	55.6	0.579	66.7	48.9	0.668	52.2	50	1.000
Motivation												
Financial: yes	60.0	71.4	0.553	58.3	70.4	0.396	66.7	64.4	1.000	73.9	57.1	0.251
Altruistic: yes	60.8	66.7	0.566	66.7	55.6	0.567	16.7	66.7	0.029*	65.2	57.1	0.580
Purpose of drugs supplied												
Therapeutic: yes	60.0	14.3	0.001**	66.7	18.5	0.001**	33.3	42.2	1.000	17.4	60.7	0.004*
Recreational: yes	30.0	52.4	0.148	20.8	55.6	0.021*	66.7	35.6	0.195	52.2	28.6	0.149
Frequency of supply												
Fortnightly to monthly	70.0	47.6	0.148	83.3	40.7	0.004**	16.7	66.7	0.029*	47.8	71.4	0.149
Daily to weekly	30.0	52.4		16.7	59.3		83.3	33.3		52.2	28.6	

Source	Friend or family			Illicit drug dealer			Third-party			Online		
	Yes	No	p	Yes	No	p	Yes	No	p	Yes	No	p
Number	9	42		7	44		5	46		5	46	
Demographics												
Gender: male	55.6	64.3	0.711	57.1	63.6	1.000	80	60.9	0.639	100	58.7	0.143
Age (mean, years)				`								
Age (SD, years)												
Employed / student	66.7	40.5	0.268	71.4	40.9	0.221	60	43.5	0.647	80	41.3	0.162
Unemployed / retired	33.3	59.5		28.6	59.1		40	56.5		20	58	
Income (mean, per annum)												
Income (SD, per annum)												
Criminal history: yes	66.7	47.6	0.465	42.9	52.3	0.703	60	50	1.000	40	52.2	0.668
Motivation												
Financial: yes [c]	66.7	64.3	1.000	85.7	61.4	0.398	80	60	0.645	60	65.2	1.000
Altruistic: yes	88.9	54.8	0.072	57.1	61.4	1.000	60	60.9	1.000	60	60.9	1.000
Purpose of drugs supplied												
Therapeutic: yes	33.3	42.9	0.72	14.3	45.5	0.217	20	43.5	0.391	0	45.7	0.069
Recreational: yes	55.6	35.7	0.289	71.4	34.1	0.096	20	41.3	0.636	80	34.8	0.071
Frequency of supply												
Once or twice per month	22.2	69.1	0.020*	71.4	59.1	0.690	40	63	0.369	60	60.9	1.000
Daily to weekly	77.8	31		28.6	40.9		60	37		40	39.1	

Notes:
Significance levels * p < 0.05, ** p < 0.01. Participants may use multiple sources to access their primary drug supplied.
a) Includes the obtainment of drugs for the treatment of legitimate illness or injury, as well as illegitimately via doctor shopping, prescription forgery or faking symptoms.
b) Includes friends or family, illicit drug dealers and third-parties (who are neither friends, family nor involved in the supply of illicit drugs).

me so much and I didn't want to abuse them myself for no reason and get hooked, so I thought I'd just keep them and give them to someone who might need it" (Interviewee 30,792).
“I didn't need all the ones [methylphenidate] I had and it's a nice thing to do” (Interviewee 62,596).

Other suppliers who accessed through medical sources explained how they exploited previous illness or injury to continue receiving prescriptions, even though they no longer suffered symptoms or required the medication. This was a common strategy among people involved in doctor shopping, as one participant explained:

“You need to be diagnosed with depression or something in order to get the drugs in the first place” (Interviewee 23,973)

While another described how they “have had injuries” and this allowed them “to get what you want” (Interviewee 00,947). Participants involved in doctor shopping also highlighted the importance of maintaining a clean and well-presented appearance to reduce suspicion and targeting practitioners with a ‘soft touch’ who would be more likely to

prescribe the drugs out of compassion. As one participant explained:

“I go to ten different doctors…you have to find a good doctor. It still is hard to get Valium, but you just gotta find a doctor. Because a lot of doctors aren't allowed to write any medications like that, you see on the outside of their doctor's office ‘we do not sell [prescribe] benzos’…I get a lot of that, but they do sell [prescribe] to me if I get the right doctor…. Cause I look like a normal person. I take good care of myself and so they never question me” (Interviewee 18,497).

Among participants supplying from legitimate medical sources, it was common for their supply practices to be described in the context of the suffering or pain of the end-user. For instance, one participant described supplying oxycodone to his wife “to relieve her pain and because I love her” (Interviewee 43,758), while another participant explained supplying pregabalin to his friend because “I could see that he wasn't well, he was suffering.” (Interviewee 23,849). These suppliers highlighted that strict regulations and treatment stigmas, precluded access and shifted these end-users to the black market. For instance, one participant explained how changes in availability via the medical

Table 4
Factors associated with supplier motives.

Motivation	Altruistic			Financial [a]		
	Yes	No	p	Yes	No	p
Number	31	20		33	18	
Demographics						
Gender: male	54.8	75.0	0.235	66.7	55.6	0.547
Age (mean, years)	31.7	39.7	0.1041	31.8	39.2	0.093
Age (SD, years)	14.7	14.4		14.4	15.0	
Employed / student	61.3	20.0	0.005**	45.5	44.4	1.000
Unemployed / retired	38.7	80.0		54.5	55.6	
Income (mean, per annum)	$27,016	$24,700	0.751	$27,000	$24,272	0.735
Income (SD, per annum)	$21,080	$30,870		$28,959	$16,436	
Criminal history: yes	38.7	70.0	0.045*	54.6	44.4	0.565
Purpose of drugs supplied						
Therapeutic: yes	48.4	30.0	0.250	24.2	72.2	0.001**
Recreational: yes	35.4	45.0	0.565	45.5	27.8	0.247
Frequency of supply						
Once or twice per month	71.0	45.0	0.083	57.6	66.7	0.565
Daily to weekly	29.0	55.0		42.4	33.3	

Notes:
Significance levels * p < 0.05, ** p < 0.01. There were 8 participants who indicated that they were motivated both altruistically and financially.
a) Includes where drugs are supplied for the purpose of obtaining resources, including other drugs.

Table 5
Negative binomial regression for predictors of doses^ supplied in the last six months.

	Mean doses supplied		IRR	SE	p
	Yes	No			
Source [a]					
Medical	2382	111	21.6	12.6	0.000**
Legitimate	322	2446	0.1	0.1	0.003**
Illegitimate [b]	10620	224	47.5	38.3	0.000**
Non-medical	2276	765	3.0	3.3	0.332
Friend or family	5604	556	10.1	7.9	0.001**
Illicit drug dealer	39	1671	0	0	0.006**
Third-party [c]	120	1590	0.1	0.1	0.074
Online	237	1578	0.1	0.2	0.160
Motive [a]					
Altruistic	435	3013	0.1	0.1	0.002**
Financial	2073	299	6.9	8.1	0.098

Notes:
^ Number of doses has been calculated using the DDD for each drug, allocated by the World Health Organisation (WHO). Significance levels ** p < 0.01, * p < 0.05 IRR = Incidence Rate Ratio, SE = Standard Error.
a) Participants were able to indicate multiple sources and motivators, so totals do not add to 100%.
b) Illegitimate medical includes doctor shopping, prescription forgery and faking symptoms.
c) Third parties were unique from other sources because they were not known to the supplier (i.e. not friends/family), nor were they involved in supplying illicit drugs (e.g. cocaine or ecstasy).

system was a motivation to supply:

> "Mainly [I supply because] I feel sorry for people, because drugs and alcohol [services] nowadays are very strict on their medications, the last five years especially. They've had people on high doses and then all of a sudden, instead of weaning them off, they just cut them, cut them in half or to a third" (Interviewee 14,149).

Another participant justified their supply because of the stigma surrounding access to mental health treatment in some communities:

> "Some of my friends, they actually have real mental conditions like ADHD [attention deficit hyperactivity disorder], OCD [obsessive compulsive disorder] and depression, but their families refuse to allow them to get further treatment…for fear of stigma. I am

actually kind of glad I can supply a few drugs to help my friends, because they really need it" (Interviewee 95,728).

Supply practices via non-medical sources differed. Of note, suppliers who sourced from non-medical sources discussed that the drugs they supplied were often used recreationally including in pursuit of a high or in combination with other substances, as one participant explained:

> "If you have the Xannies [Xanax] 10–20 minutes before you have heroin, it makes the heroin so much better" (Interviewee 18,497).

There was evidence of convergence of the pharmaceutical black and illicit drug markets. Participants who sourced their drugs from illicit drug dealers described how the procurement of pharmaceutical drugs often arose opportunistically when they were visiting their dealer for illicit drugs. Most of the drugs sourced through dealers were sedatives that were often given to participants for free or at a minimal cost in conjunction with illicit drugs such as ecstasy and methamphetamine to aid with comedown. As two participants explained:

> "I didn't actually pay for the Valium, but I did pay for the MDMA pills. He [the dealer] just chucked in a couple of Valium and then a bunch of people just came up to me…and I sold them" (Interviewee 47,298).

> "A guy we go to for other stuff [illicit drugs]…was talking about the Xannies [Xanax] and how cheap they are each…A few times he would just give away a lot in bulk, pharmaceuticals…I didn't pay for them" (Interviewee 22,315).

The small number of participants who accessed their drugs online consistently highlighted the convenience and variety of products available. One participant described their preference for sourcing drugs online:

> "It's like eBay. You can go on there and shop at your pleasure. There are different sellers, different prices, different delivery methods" (Interviewee 32,080).

Another explained how darknet dealers guaranteed the replacement of goods if the shipments were seized, which mitigated the risks of sourcing online.

Suppliers who indicated that they were financially motivated highlighted the minimal costs associated with obtaining the drugs and thus the high potential for profit. Given that the majority of our sample were people who use drugs, it was also common for participants to talk about how the money they earned from supplying could help them to

support their own use. One participant discussed the monetary aspects of supply:

> "It's so cheap to get a prescription…take out your \$6.20 for your prescription costs and then you can pay for your own and make a bit extra. The money that you're making, you get to pay for your own habit. I never give them away. There are a lot of people that deal drugs just to enable them to pay for their own habit, it makes sense" (Interviewee 19,357).

Discussion

To our knowledge, this is the first Australian study to examine drug sourcing and motivations among a sample of people involved in the diversion and supply of pharmaceuticals. This study found that drugs are accessed for supply from a variety of medical and non-medical sources, primarily legitimately obtained prescriptions, friends or family and illicit drug dealers. Less commonly cited sources included online purchasing and doctor shopping or prescription forgery. This study also found that supply practices, including the quantity and frequency supplied, differed significantly by supplier source and motive.

Drugs sourced through the medical system were distributed on average in higher quantities than those not sourced directly from the medical system. However, this was driven by the high quantities distributed by those involved in illegitimately obtaining prescriptions though practices such as doctor shopping, rather than those supplying legitimately obtained prescriptions. Moreover, those involved in doctor shopping distributed more frequently. Suppliers who accessed their drugs via the medical system typically did so for the treatment of legitimate symptoms of illness or injury. Even when the drugs were illegitimately obtained, the participants highlighted that a history of illness or injury was a requisite for successfully obtaining the drugs, in addition to presenting with a well-kept appearance to ameliorate any risk of suspicion. This presents a considerable challenge for practitioners in trying to prevent potential diversion, because those at-risk are not necessarily clearly identifiable or absent of observable symptoms.

This study found that while the drugs sourced legitimately from the medical system were reportedly more likely to be used for therapeutic purposes, such as the treatment of pain or mental health problems, suppliers who accessed their drugs via non-medical sources were more likely to report that these were supplied for recreational purposes. The absence of observable symptoms of illness or injury to enable the obtainment of drugs via the medical system, may explain some participants use of non-medical sources. Suppliers using non-medical sources were more likely to be employed/students and earned higher incomes. In part, this may reflect the higher cost of drugs obtained through intermediaries in the absence of subsidised drugs available from the medical system under the Pharmaceutical Benefits Scheme (PBS).

The most commonly cited non-medical source was friends and family who on-supplied their legitimately or illegitimately obtained prescriptions. Interestingly, these suppliers distributed 10 times as many doses than those not using friends or family and also supplied more frequently, suggesting that there are reasonable quantities of prescription drugs being exchanged within social networks. Where illicit drug dealers were used, these transactions typically involved the poly-supply of pharmaceutical drugs in conjunction with other illicit drugs, most commonly ecstasy and methamphetamine. Here, pharmaceuticals were often provided for free by dealers, as an offering to mitigate the negative effects of illicit drug consumption. Only a small proportion of participants cited the Internet as a source of drugs, suggesting this is still an emerging access point in Australia, at least among user-dealers who comprised the bulk of our sample.

Almost two-thirds indicated that their supply practices were altruistically motivated, and these suppliers distributed lower quantities than those who were not altruistically motivated. Most of our sample supplied to friends, family or acquaintances. In contrast, one in five

reported supplying to strangers. Much of the supply activity was sporadic, with three in five reporting monthly distribution. These supply practices are consistent with conceptualisations of social supply that has been widely discussed in the context of illicit drugs (Bright & Ritter, 2011; Coomber & Moyle, 2014; Coomber & Turnbull, 2007; Coomber et al., 2016, 2018; Grigg, Lenton, Scott, & Barratt, 2015; Lenton, Grigg, Scott, Barratt, & Eleftheriadis, 2015, 2016; Murphy et al., 2018; Potter, 2009; Taylor & Potter, 2013; Werse & Bernard, 2016) and less frequently, for pharmaceuticals (Daniulaityte, Falck, & Carlson, 2014; Murphy et al., 2018; van de Ven & Mulrooney, 2017). This study revealed that a minority of the sample sourced their drugs through illegitimate practices such as doctor shopping, however these suppliers were less likely to be altruistically motived and their distribution patterns were more frequent and in higher quantities. These practices are less consistent with notions of social supply.

Limitations

This study had several limitations. First, while this is the first Australian study to examine sources used by people higher in the supply chain than end-users, recruiting via the EDRS and IDRS meant that we primarily sampled people who use drugs, thus limiting our ability to comment on supply by people who do not use drugs. This is a relevant limitation as studies of illicit drug markets have shown that high-level drug traffickers seldom use drugs (Desroches, 2007; Johnson, 2003), thus future research is warranted with such populations. Second, while telephone interviews were the most practical mode for data collection and may have improved responses to sensitive questions (1994, Aquilino, 1992; Novick, 2008), as with all self-report data, there may be social desirability biases. Third, while the DDD is the best available metric for comparing the quantity of prescription drugs supplied by participants in this study, previous research suggests there are limitations with DDDs for opioids that do not have 'typical' doses (Nielsen et al., 2017). Fourth, the sample size restricted our ability to conduct multivariate analyses. Fifth, these data are largely drawn from capital cities, limiting generalisability. Future research may consider exploring pharmaceutical diversion in regional and rural areas where there are indications of burgeoning NMU (ACIC, 2018). Finally, participants were self-selecting, potentially biasing the sample.

Implications for research and policy

Unlike end-users who mainly source their drugs for NMU from friends and family (Hulme et al., 2018), most of the suppliers in our sample accessed their drugs directly from the medical system and this is consistent with what is known internationally (Green et al., 2013; Inciardi, Surratt, Cicero, Beard et al., 2009, 2009b; Rigg et al., 2012, 2010; Worley & Thomas, 2014). However, unlike the prominent role of pain clinics in the US context, we found that most of the participants interviewed were involved in distributing leftover medications. This draws parallels to the motivations of cannabis growers described in a Finnish study, whereby cannabis was shared and traded with friends when production exceeded the quantity desired for personal use (Hakkarainen & Perala, 2011). The supply of leftover drugs might be a unique aspect of cannabis and pharmaceutical black markets, differentiating them from the supply of other drugs such as methamphetamine, ecstasy and cocaine.

The susceptibility of leftover drugs to diversion and the high proportion of suppliers who distributed for therapeutic purposes raise some important implications. First, there may be a need for further education among the general population in relation to the risks associated with medication sharing and self-diagnosis (Beyene, Sheridan, & Aspden, 2013). Second, it highlights the importance of prescribing quantities that better align with therapeutic needs as a strategy to prevent diversion (The Royal Australasian College of Physicians, 2009; The Royal Australian College of General Practitioners (RACGP) (2015)). Finally,

demand may reflect stigma-related treatment barriers among marginalised populations, which adds to previous research on the stigmas associated with substance use disorders and medication assisted treatment (Digiusto & Treloar, 2007; Luoma et al., 2007; Room, 2005). In fact, our research suggests that there is a perceived undersupply of pharmaceutical drugs among some people, which is paradoxically being met by an oversupply among others.

Our study has highlighted the prominence of social supply for pharmaceutical drugs. Many involved in social supply justified their behaviour on the basis that they were providing medication to those that did not have access to the drugs. This adds to what is already known about buprenorphine-naloxone diversion from people in treatment to others in need of the drugs for therapeutic purposes, such as to mitigate the effects of withdrawal (Johanson, Arfken, di Menza, & Schuster, 2012; Johnson & Richert, 2015; Kenney, Anderson, Bailey, & Stein, 2017). This finding encourages further discussion in Australia around whether an explicit acknowledgement of supplier intent should be used in conjunction with threshold quantities for determining appropriate penalties for drug supply, including pharmaceuticals (Coomber et al., 2018; Hughes et al., 2014).

Connotations from participants of altruism and therapeutic use of the drugs, suggest that friendship can give rise to the supply of pharmaceutical drugs, particularly in the context of known or perceived barriers to legitimate access routes including regulation and stigma. This further contributes to the social supply discourse and conceptualisations of friendship in the context of cannabis markets, whereby friendship has been found to exist to sustain the distribution chain and "compensate for the risks of the market" in the context of prohibitive drug policy and law enforcement (Belackova & Vaccaro, 2013). Other scholars have discussed the concept of the social supply buffer – that is, a preference for distribution and purchasing within social networks rather than street-based markets because it insulates against the unsavoury and more risky aspects of the drug trade, such as violence and crime (Coomber & Turnbull, 2007; Coomber et al., 2016; Murphy et al., 2018; Nicholas, 2008; Potter, 2009). Future research may further unpack preferences for social supply in the context of pharmaceutical drugs.

This study also adds to the international and domestic literature on illicit drug markets. It shows that consistent with the illicit drug markets, demographics, motivations and modus operandi also affect the supply of pharmaceuticals (Caulkins et al., 2016; Coomber & Turnbull, 2007; Matrix Knowledge Group, 2007; Nicholas, 2008; Tzvetkova et al., 2016). Indeed, the finding that the small number of suppliers (n = 6) who reported sourcing their drugs through doctor shopping distributed 47 times as many doses as other suppliers, demonstrates the importance of examining trafficker motivations and modus operandi both to understanding the behaviour and to develop more targeted policy responses (particularly to target the most harmful forms of behaviour).

In Australia, there has been ongoing discussion of a reduction of pack sizes for some drugs with high abuse potential (TGA, 2018a). Moreover, Victoria recently launched a real-time PMP (State Government of Victoria, 2017), the ACT will launch a similar program in 2019 (ACT Health, 2018) and there have also been calls for a nationally coordinated system (Hendrie, 2018). Such regulations are one lever for reducing diversion through doctor shopping and providing accountability and support for health practitioners (Buchmueller & Carey, 2018; Pacula & Powell, 2018). However, caution should be exercised to ensure that reducing supply through further regulation does not inadvertently result in displacement to the black market for those with unmet needs and jeopardise therapeutic access. Importantly, where PMPs have been introduced in the US, their effects on overdose have been mixed (Buchmueller & Carey, 2018; Fink et al., 2018). This highlights that if such policies are implemented, that they should be delivered in conjunction with the expansion of drug treatment and alternative pain management therapies targeted at people with substance use disorders (Buchmueller & Carey, 2018; Pacula & Powell, 2018).

Moreover, Australian evidence has shown a shift from domestic production to the importation of amphetamine-type stimulants following the introduction of *ProjectSTOP* – an electronic monitoring system targeted at reducing pseudoephedrine diversion (Hughes et al., 2016a). Moreover, restrictions on opioid supply in the US have coincided with increased importation of high potency opioids, which has had drastic public health consequences (Pacula & Powell, 2018).

The high proportion of poly-drug suppliers in our sample is consistent with US research about pharmaceutical suppliers (Rigg et al., 2012), and more generally with illicit drug market research that has shown an increasing trend towards the trade in multiple illicit drugs at once (Hughes et al., 2016a; Malm & Bichler, 2011; Rubin, Pardal, McGee, & Culley, 2013). The trend for dealers to promote the NMU of pharmaceuticals in conjunction with illicit drugs is worthy of continued monitoring given the increased harms associated with poly-drug use. This is one of the first studies to identify the Internet as a source of pharmaceutical drugs used by people involved in diversion and supply, albeit a small proportion of the sample. The convenience, variety and low cost of drugs available online were the key factors influencing suppliers to use this source, which is consistent with drug market preferences described elsewhere (Barratt, Ferris, & Winstock, 2013). Previous research has also shown that online marketplaces, specifically the darknet, are utilised by younger suppliers who have enhanced technological literacy (Winstock, Barratt, Ferris, & Maier, 2017). As both cryptomarkets and the younger generation age, it will be important to monitor the purchasing of pharmaceutical drugs online.

This study reinforces the importance of undertaking further research examining pharmaceutical diversion and supply at all levels, both within and beyond Australia. This should include an examination of all market levels including diversion prior to the drugs reaching the medical system (such as from manufacturing sites), the role of health practitioners and the emergence of online marketplaces.

Conclusion

A multifaceted and nuanced approach is crucial for addressing the myriad of sources used by people involved in pharmaceutical diversion and supply. However, this study revealed some important differences in supply practices depending on where the drugs are sourced and supplier motivations that may be used to inform targeted strategies. The high volume associated with medical sourcing, particularly doctor shopping, and the challenge for practitioners in identifying diversion may warrant compulsory and real-time PMPs. However, to mitigate potential unintended impacts such as displacement, supply-reduction policies should be implemented in conjunction with strategies to identify and reduce barriers to treatment including stigma and address demand for NMU. This study provokes further consideration of social supply within the Australian legal framework, which may reduce disproportionate sentencing for those not commercially motivated, while still enabling serious sanctions for those who are. This study paves the way for further research to better understand the diversion and supply of pharmaceutical drugs, which remains a vastly under researched area despite evidence of increasing harms in Australia and internationally.

Contributors

SH, CH and SN designed the study and provided input on the original research plan and protocol. SH conducted the interviews, transcribed and coded the data, conducted the quantitative and qualitative analyses, and wrote the first draft of the manuscript. SN and CH oversaw the conduct and provided detailed comments on methodology and each version of the manuscript. All authors have contributed to and approved the final manuscript.

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Conflict of interest

SN has received untied education grants from Indivior. Indivior had no knowledge of this study.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.drugpo.2019.01.022.

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