

## BRIEF REPORT

## The availability and acquisition of modafinil on the internet

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### Abstract

**Introduction and Aims.** Prescription medications are readily accessible on both the dark and surface web. This study focuses specifically on modafinil. Modafinil is a medication that is used to treat sleepiness due to a range of sleep disorders, but is also used off-label as a cognitive enhancer. This study aimed to evaluate surface websites which sold modafinil to Australia to provide an overview of and to document the characteristics of surface web retailers. **Design and Methods.** An online search to identify online retailers selling modafinil was performed using three search engines. Retailers were included if they sold modafinil to Australia, as verified through the purchasing process. Thirteen retailers were included in the final sample. **Results.** Most retailers sold more than one product, with products being sold in tablet form the most common (88%). Retailers offered products of multiple strength, with the 200 mg product most common (51%). Most retailers included information on the side effects of the substances (77%), few listed any supporting evidence. Few listed information regarding legal status (24%). Most retailers used a number of features to indicate legitimacy. **Discussion and Conclusion.** This is the first study to document the characteristics of surface web retailers purporting to sell modafinil to Australia. Future studies may analyse purchased samples to identify potential counterfeit or poor-quality medications. [Dursun S, Dunn M, McKay FH. The availability and acquisition of modafinil on the internet. *Drug Alcohol Rev* 2019]

**Key words:** modafinil, surface web, prescription drugs, internet.

### Introduction

The rise of the Internet has led to profound shifts in the sale and distribution of illicit and prescription substances. Much of the focus has been given to anonymous marketplaces on the so-called dark web known as ‘cryptomarkets’, which are accessible using specially configured browsers [1]. However, the surface web (the area of the internet that is accessed by the general public and searchable through standard browsers) continues to play an important role in drug sales; as Raubenheimer and Barratt [2] note, more regular psychostimulant users in Australia reported purchasing drugs from the surface web than from the dark web [3]. As such, the study of drug markets on the surface web are equally important. In the context of prescription substances, research has shown that these can be readily obtained through the surface web without a prescription [4,5]

and that these sites are often pro-drug and lacking legitimate medical advice.

The use of prescription medications to enhance attention, memory, cognition and performance has received increased attention in recent years. While traditionally much of the focus has been given to prescription stimulants such as methylphenidate and amphetamine, modafinil has become one of the more widely used substances for cognitive enhancement. Modafinil is classified as Schedule 4 prescription-only medicine in Australia and is indicated to improve wakefulness in narcolepsy, to treat excessive sleepiness associated with shift work sleep disorder, and as an adjunct therapy for sleep apnoea [6]. Due to its reported cognitive benefits, including increased alertness and concentration, its non-medical use has been reported in a number of groups, most notably tertiary education student populations [7,8].

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The Global Drug Survey found Australia to be the fourth leading country with regards to prescription stimulant use, with the prevalence of modafinil increasing in Australia from 2.1% in 2015 to 5.5% in 2017 [9], suggesting that further examination of modafinil use in this country may be warranted. Given the attention online drug markets have received in recent years, the overarching aim of this study was to evaluate the possibility of purchasing modafinil from the perspective of an ordinary Australian internet user, to provide an overview of Internet retailers selling modafinil to Australia, and to document their various characteristics.

## Method

The project followed the methodology of the Psycho-naut Web Mapping Project [10]. Three search engines (Google.com.au; bing.com.au; Metacrawler.com) were used to perform a search using the search term 'buy modafinil'. Pilot searches to identify retailers were conducted once a month between January and May 2018; a final search was conducted on 3 April 2019 in Melbourne, Australia. Searches to saturation (100 sequential searches returning no new websites) were conducted using all three search engines. The search focused on websites which sold modafinil directly to the consumer in Australia; a retail site was confirmed by attempting to purchase a product through to the 'checkout' stage, though no product was purchased. Websites which required a prescription, were solely online discussion forums, or websites which were advertisements only were excluded.

The primary objective of the study was to evaluate each site for the types of products sold (product name, form, strength, other substances) as well as the type of information contained on each site (legal information, health information, side effects, precautions, promotions). Data on price was also collected. A coding framework was developed by the three authors and pilot tested prior to the final search. The information was coded independently by the first two authors, with no discrepancies. All data were entered into the statistical software package Stata and descriptive statistics generated.

## Results

Twenty-five initial retailers were included after the primary search. Two retailers were removed because they were the same as other stores but branded differently, leaving 23 sites. One retailer had their website suspended during the coding process, and two retailers did not sell to Australia. After initial coding, six further websites had their websites suspended or were blocked. Therefore, 13 retailers make up the final sample.

The characteristics of the retailers are included in Table 1. Most retailers sold a number of products, and of the 41 separate products not accounting for the

**Table 1.** Characteristics of online retailers selling modafinil to Australia

	<i>n</i> (%)
Product ( <i>n</i> = 13)	
Modalert	7 (54%)
Modvigil	7 (54%)
Artvigil	6 (46%)
Waklert	5 (38%)
Modafinil	5 (38%)
Provigil	3 (24%)
Armodafinil	2 (15%)
Modawake	1 (8%)
Modafresh	1 (8%)
Strength of products (mg) ( <i>n</i> = 41)	
100	3 (7%)
150	13 (32%)
200	21 (51%)
300	2 (5%)
No set strength	2 (5%)
Product form availability ( <i>n</i> = 41)	
Tablet	36 (88%)
Capsule	3 (7%)
Powder	2 (5%)
Information about drug effects ( <i>n</i> = 13)	10 (77%)
Information on side effects ( <i>n</i> = 13)	7 (54%)
Evidence used for claims ( <i>n</i> = 13)	8 (62%)
Academic references	2 (15%)
User reviews	5 (38%)
Both	1 (8%)
Recommend seeking physician advice ( <i>n</i> = 13)	5 (38%)
Promote modafinil as 'safe' ( <i>n</i> = 13)	8 (62%)
Information on legal status ( <i>n</i> = 13)	3 (24%)
Sell drugs other than modafinil ( <i>n</i> = 13)	12 (92%)
Promotions ( <i>n</i> = 13)	
Free modafinil with purchase	2 (15%)
Free alternate drugs with purchase	2 (15%)
Discounts on purchase with bulk purchase	4 (31%)
Information on manufacturer ( <i>n</i> = 13)	9 (69%)
Proof of originality ( <i>n</i> = 13)	2 (15%)
Website 'trust' features present ( <i>n</i> = 13)	
Credit card seals	9 (69%)
Certificates	3 (24%)
Internet security seal	7 (54%)
Shipping seal	6 (46%)
Payment options ( <i>n</i> = 13)	
Credit card	4 (31%)
Bitcoin	1 (8%)
Both	8 (62%)
Top-level domain ( <i>n</i> = 13)	
.com	11 (84%)
.net	1 (8%)
.cc	1 (8%)
Estimated shipping time to Australia ( <i>n</i> = 13)	
Not listed	6 (46%)
24–48 h	1 (8%)
6–7 working days	1 (8%)
Between 6 and 12 days	3 (23%)
Between 7 and 30 days	2 (15%)

variations in quantity, 36 ( $n = 36$ ; 88%) were in tablet form. The 200 mg ( $n = 21$ ; 51%) and 150 mg ( $n = 13$ ; 32%) products were most prevalent. While most retailers included information on the effects of the drug ( $n = 10$ ; 77%) and the potential side effects ( $n = 7$ ; 54%), the most common form of evidence was user reviews ( $n = 5$ ; 38%). Some retailers listed promotions, such as discounts on bulk purchases ( $n = 4$ ; 31%). Most retailers used a number of features on their website to indicate legitimacy, including credit card seals ( $n = 9$ ; 69%) and Internet security seals ( $n = 7$ ; 54%). Few listed information regarding legal status ( $n = 3$ ; 24%). Eight retailers (62%) offered both Bitcoin and credit cards as payment options.

The prices of products are listed in Table S1 (Supporting Information). Prices varied considerably by product, quantity and strength. Six sites presented prices in US Dollars, four in Australian Dollars, and one in UK Pound; two sites did not list the currency. For those sites which listed their prices in Australian dollars, descriptive statistic for the three most prevalent quantities for the 100 and 200 mg products were generated. For the 150 mg product, the mean price for 90 tablets was \$150 (median = \$118; SD = 54.2; range \$113–240); the mean price for 120 tablets was \$153 (median = \$45; SD = \$39; range \$125–220); and the mean price for 300 tablets was \$281 (median = \$275; SD = \$77; range = \$155–399). For the 200 mg product, the mean price for 90 tablets was \$139 (median \$115; SD = 43; range = \$113–213; the mean price for 200 tablets was \$176 (median \$180; SD = \$17; range = \$155–190); and the mean for 300 tablets was \$269 (median = \$240; SD = \$76; range = \$199–399).

The characteristics of the sites by retailer are listed in Table S2.

## Discussion

The increased accessibility that the Internet has given to both surface and dark web drug marketplaces has led to concerns regarding the consequences of unsupervised prescription substance use. The current study found that the prescription substance modafinil was highly accessible on the surface web, with online retailers offering a number of different products, brands, forms and strengths without a prescription. Of concern is that while many of the retailers included information regarding effects and side effects, few included links to research that supported these statements. Modafinil was presented as being safe to use, with two-fifths of retailers including the suggestion that use should be informed by medical advice; furthermore, few retailers included information regarding the legal status of modafinil.

The Internet has led to profound changes in the distribution and acquisition of licit and illicit substances. As Walsh [11] notes, ‘...the Internet is a medium through which “white,” “grey” and “black” drug markets flourish.’ (p. 56). Policy reforms and law enforcement activities that may have traditionally interrupted supply or demand may now be circumvented through online purchasing. Indeed, research with illicit substance consumers has found the main motivations for purchasing online include cheaper prices, convenience, perceived higher quality of substances and the greater availability of substances online or access to substances than can normally be accessed [12,13]. Data collected for the current study shows that modafinil was sold for a range of prices which varied depending on product name, quantity and strength. No other study, to our knowledge, has published data on the price of modafinil sold on the surface web, dark web or in pharmacies, so situating this data is difficult; however, a cursory review of the websites of major chemists does suggest that the prices collected for this study are lower than those for product purchased using a valid prescription. Future research may wish to investigate this in more detail. Online drug marketplaces also allow people greater accessibility to medications which may require a physician’s prescription in their own country but are more accessible in other countries [11]. This may be due to a person deciding to self-medicate or to access cheaper medication for those who do have prescriptions but have trouble affording their medications. This raises several concerns, including harm that may result from the absence of the monitoring a person may receive when being prescribed a medication under a physician’s care; the purchasing of poor quality medications; and the limited evidence that substances like modafinil have the intended off-label effect [14–16].

There has been a concentrated effort in attempting to address the rise of surface web retailers and illicit or rogue pharmacies. The death of an 18-year-old US college student in 2001 from an overdose of Vicodin which was purchased online led to the Ryan Haight Online Pharmacy Consumer Protection Act, which provided regulatory provisions to prevent the illegal distribution and dispensing of controlled substances on the Internet [17]. The effectiveness of this legislative response is unknown, although the proliferation of these sites since that time suggests that it has not had a major impact. Most actions seek to shut down online sites; indeed, through the period of data collection for the current study several sites were shut down or were blocked. Despite these legislative responses, retailers do seek alternative ways to sell and market these products and continued vigilance in the regulatory space is needed.

### Limitations

The findings from this study reflect one point in time, and future studies may wish to collect data over a longer period of time to account for any changes that can occur in the online space, such as websites shutting down or being suspended. Unlike other studies, we did not purchase or analyse product and thus quality of substances cannot be concluded, nor can it be assumed that any purchased products would arrive to the purchaser.

### Conclusion

While the dark web has been the focus of scholarly attention in recent years, drug markets on the surface web are equally important to understand. Our findings indicate that modafinil appeared to be readily available on the Internet without a prescription, with limited information about the use of and potential harms related to the drug. As there is evidence to suggest that the non-medical use of these substances is increasing in Australia, further research into this area may be warranted.

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### Conflict of interests

The authors have no conflicts of interest.

### References

- [1] Barratt MJ, Aldridge J. Everything you always wanted to know about drug cryptomarkets\* (\*but were afraid to ask). *Int J Drug Policy* 2016;35:1–6.
- [2] Raubenheimer JE, Barratt MJ. Digital era drug surveillance: quo vadis, Australia? *Drug Alcohol Rev* 2018;37:693–6.
- [3] Uporova J *et al.* Australian trends in ecstasy and related drug markets 2017: findings from the ecstasy and related drugs reporting system (EDRS). Sydney: National Drug and Alcohol Research Centre, UNSW, 2017.
- [4] Brennan BP, Kanayama G, Pope HG. Performance-enhancing drugs on the web: a growing public-health issue. *Am J Addict* 2013;22:158–61.
- [5] Bachhuber MA, Cunningham CO. Availability of buprenorphine on the internet for purchase without a prescription. *Drug Alcohol Depend* 2013;130:238–40.
- [6] Murillo-Rodriguez E, Barciela Veras A, Barbosa Rocha N, Budde H, Machado S. An overview of the clinical uses, pharmacology, and safety of Modafinil. *ACS Chem Neurosci* 2018;9:151–8.
- [7] Ram SS, Hussainy S, Henning M, Jensen M, Russell B. Prevalence of cognitive enhancer use among New Zealand tertiary students. *Drug Alcohol Rev* 2016;35:345–51.
- [8] Singh I, Bard I, Jackson J. Robust resilience and substantial interest: a survey of pharmacological cognitive enhancement among university students in the UK and Ireland. *PLoS One* 2014;9:e105969.
- [9] Maier LJ, Ferris JA, Winstock AR. Pharmacological cognitive enhancement among non-ADHD individuals—a cross-sectional study in 15 countries. *Int J Drug Policy* 2018;58:104–12.
- [10] Psychonaut Web Mapping Research Group. Psychonaut web mapping project: alert on new recreational drugs on the web; building up a European-wide web scan monitoring system. London: Institute of Psychiatry, King's College, 2010.
- [11] Walsh C. Drugs, the internet and change. *J Psychoactive Drugs* 2011;43:55–63.
- [12] Van Buskirk J *et al.* Characterising dark net marketplace purchasers in a sample of regular psychostimulant users. *Int J Drug Policy* 2016;35:32–7.
- [13] Barratt MJ, Ferris JA, Winstock AR. Use of silk road, the online drug marketplace, in the United Kingdom, Australia and the United States. *Addiction* 2014;109:774–83.
- [14] Levaggi R, Marcantoni C, Filippucci L, Gelatti U. Not a good buy: value for money of prescription drugs sold on the internet. *Health Policy* 2012;106:241–5.
- [15] Gelatti U, Pedrazzani R, Marcantoni C *et al.* You've got m@il: fluoxetine coming soon!?: accessibility and quality of a prescription drug sold on the web. *Int J Drug Policy* 2013;24:392–401.
- [16] Haukka J, Kriikku P, Mariottini C, Partonen T, Ojanperä I. Non-medical use of psychoactive prescription drugs is associated with fatal poisoning. *Addiction* 2018;113:464–72.
- [17] Mackey TK, Liang BA, Strathdee SA. Digital social media, youth, and nonmedical use of prescription drugs: the need for reform. *J Med Internet Res* 2013;15:e143.

### Supporting information

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

**Table S1.** Prices of modafinil

**Table S2.** Characteristics of online retailers selling modafinil to Australia by vendor