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Abstract | This bulletin provides a snapshot of the sale and distribution of fentanyl and its analogues across several popular illicit darknet markets. Data collected daily from six darknet markets between 2 January and 23 February 2019 reveal the amount, types and physical forms of fentanyl available.

Of more than 123,000 unique drug listings identified, nearly 7,400 were opioids, of which 439 (0.347% of all drugs listed) were fentanyl products. Between 15 and 22 kilograms of fentanyl was available on any day and the average price per gram varied between A\$30 and A\$301, depending on the physical form. The data also reveal the shipping methods, cross-market operations and product specialisation of the 102 active fentanyl vendors on these six darknet markets.

How much fentanyl is available on the darknet?

Matthew Ball, Roderic Broadhurst and Harshit Trivedi

A substantial share of the internet traffic operating in the encrypted 'deep web' is on illicit darknet markets (or 'cryptomarkets'), which are e-commerce style websites specialising in the sale and distribution of illicit items. Typical products offered on darknet markets include illicit drugs, pharmaceuticals, fraudulent identity documents, malware and hacking kits, counterfeit goods, weapons and other contraband. Europol estimates that two-thirds of the products listed on darknet markets between 2011 and 2015 were drug related and these markets are 'one of the engines of organised crime' in Europe (EMCDDA & Europol 2017: 15).

Search engines such as Google and Bing cannot access darknet markets. The darknet is commonly accessed via 'The Onion Router', which operates an overlay network of anonymous servers (onion routers), masking the original IP address of the user. Anonymity is further ensured by the use of cryptocurrencies such as Bitcoin or Litecoin for electronic payments.



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Darknet marketplaces mimic conventional e-commerce services such as eBay, having three main actors: vendors, buyers, and market administrators. Buyers can leave reviews, send messages to vendors, and dispute transactions. Vendors give product descriptions and basic details such as quantities, prices, and shipping services. Administrators typically receive a commission of between three and eight percent from each sale and provide escrow services and overall supervision of the website and market operation.

Fentanyl, a potent synthetic opioid, has entered illicit drug markets worldwide, leading to a new opioid epidemic. The presence of fentanyl on darknet markets makes it effortless to acquire in a variety of physical forms. Fentanyl's potency allows it to be shipped in significantly smaller quantities than other opioids. This makes it attractive to vendors, who specialise in stealth packaging and use ordinary postal and courier services. All these factors make it difficult to regulate the manufacture and distribution of fentanyl. The fact that fentanyl is relatively easy to modify has also led to the production of even more potent derivatives (or analogues) such as carfentanil, furanylfentanyl, methylfuranylfentanyl, methoxyacetylfentanyl, and acrylfentanyl (O'Connor 2018).

The potency of different opioids is measured relative to morphine's potency as a pain suppressant. Fentanyl is about 80 to 100 times stronger than morphine, depending on user tolerance and purity. The derivatives of fentanyl are also potent. Carfentanil, for example, is 10,000 times stronger than morphine. Carfentanil is distinguished by its extraordinary potency and lethality.

Method

This bulletin draws on the darknet data collected by the Australian National University's Cybercrime Observatory, with a focus on fentanyl products. Data were collected over 51 days (from 2 January to 23 February 2019) from 36 'scrapes' of six omnibus darknet markets: Berlusconi, Dream Market, Empire, Tochka, Valhalla, and Wall Street. Each of these markets posts at least 1,000 products. All markets except Berlusconi experienced some downtime over the data collection period. This bulletin includes only unique product listings across all markets.

Darknet markets are vulnerable to distributed denial of service attacks, exit scams (where a business stops sending orders but continues to accept payment for new orders), voluntary closures, and occasionally hacks, de-anonymisation or seizure by law enforcement (EMCDDA & Europol 2017: 8). Markets are typically short lived, mostly operating for less than 12 months (EMCDDA & Europol 2017: 16). However, apart from Empire, the darknet markets included in this data capture have been operating longer (eg Dream Market since 2013 and Tochka since 2015).

In June 2018 Dream Market, although a major market for illicit drugs, banned the sale and listing of fentanyl and its analogues. However, Dream Market was included in this study because it is the largest market and because occasional rogue listings of fentanyl and other 'forbidden products and services' are still observed (eg assassinations; weapons of mass destruction; other weapons; poisons; child pornography; and audio, video or images of people being hurt or murdered).

Details of products, prices and vendors were captured by web crawlers designed to function in The Onion Router. These crawlers circumvent defences designed to prevent denial of service attacks, a common way to disrupt a market competitor. For example, most darknet markets use 'captcha' logins that restrict botnet and automated browser activity and limit the number of web-pages or product listings a visitor may access in a single session. Once the markets are accessed, the text describing the products is copied ('scraped') and stored in an external database for analysis. Details of the data capture method are provided in a technical report titled 'Data capture and analysis of darknet markets' (Ball et al. 2019).

Table 1: Market share by all unique products, drugs, opioids and fentanyl listings				
Markets	All unique listings n (%)	Drugs n (%)	Opioids n (%)	Fentanyl n (%)
Berlusconi	38,673 (15.5)	13,079 (10.6)	420 (5.7)	64 (14.6)
Dream	167,217 (67.1)	88,905 (72.3)	5,495 (74.3)	30 (6.8)
Empire	9,483 (3.8)	2,765 (2.2)	104 (1.4)	34 (7.7)
Tochka	6,336 (2.5)	3,312 (2.7)	72 (1.0)	38 (8.6)
Valhalla	10,765 (4.3)	7,110 (5.8)	511 (6.9)	45 (10.3)
Wall Street	16,866 (6.8)	7,861 (6.4)	795 (10.8)	228 (51.9)
Total	249,340	123,032	7,397	439

Note: Percentages refer to column totals. Percentages may not total 100 due to rounding

Products, prices and weights

Each day, at least 15.55 kilograms of fentanyl products were available to buyers visiting the darknet markets included in this study. Over half (54%) of the available fentanyl was listed on Wall Street, followed by Berlusconi (15%), Valhalla (10%), Tochka (9%) and Empire (8%). A small number of fentanyl products (n=30, or 7%) were found on Dream Market, which dominates the market for opioids (74%) and drugs (72%) and has the largest number of overall listings (67%).

The average price of fentanyl was calculated excluding extreme outliers (eg vendors offering free samples or charging extremely high prices for 'pure' product). Vendors typically sell fentanyl in small quantities—micrograms or milligrams—but offerings in grams and occasionally larger quantities are also observed.

Figure 1 shows the number of unique listings of opioids observed and the relative share of various opioids. Heroin, oxycodone, tramadol, fentanyl and codeine account for the majority of opioid products available.

Figure 1: Opioids available on darknet markets, by type of opioid

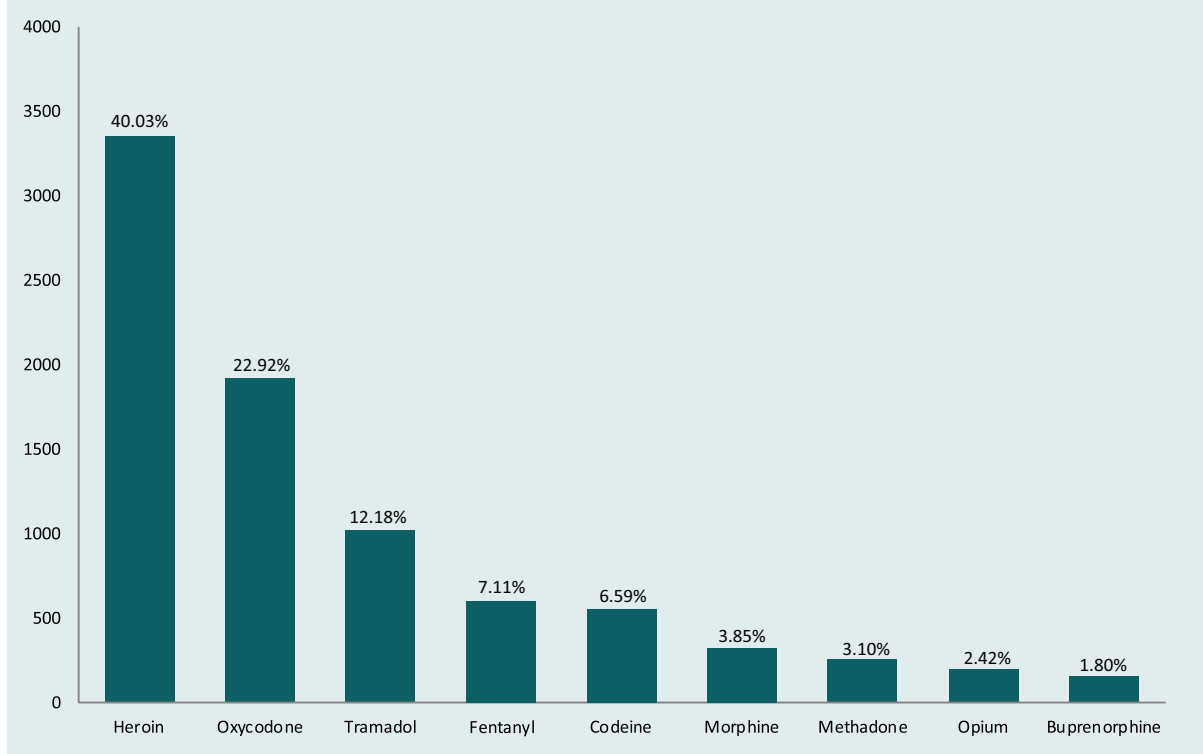


Table 2 compares the physical forms, the average price per gram and overall quantities found in the six markets. For the purposes of comparison, the street price in New South Wales of a 100 microgram patch of fentanyl is estimated to range from A\$50 to A\$400 (Australian Criminal Intelligence Commission 2018).

For about one in five listings (n=88 or 20% of the sample), weight values were not available. Adjusting for these missing values using the median and average weight of known listings as proxy values, an estimated 21.95 kilograms of fentanyl was available. This is likely an underestimate because only products strictly labelled as fentanyl or its derivatives were captured and classified. Products listed under colloquial names (eg 'Apache', 'China White', 'Bear', 'TNT'), whose potency and exact chemical composition are unknown, were not included in this analysis. In addition, nine propriety prescription fentanyl products were identified, including seven Sandoz and two Duragesic transdermal patches with a total weight of 0.0079 grams. Two of these products were listed on a market that had banned fentanyl.

Table 2: Total weight and unit prices of fentanyl and its analogues

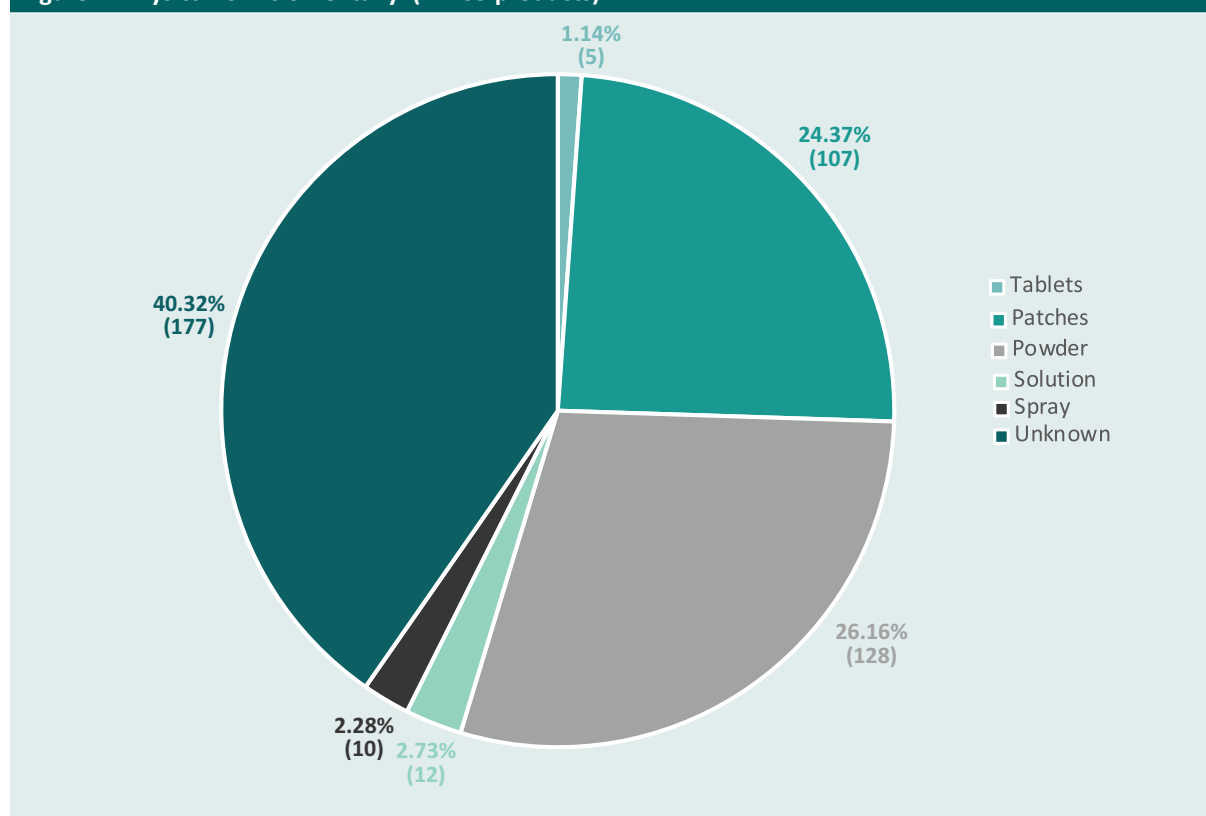
	Weight (grams)	Market share (%)	Average price (A\$ per gram)	Common physical forms
Fentanyl	6,189.82	39.81	79.17	powder, patches
Carfentanil	5,669.69	36.47	300.90	powder, solution
Methylfentanyl	2,100.97	13.51	36.14	powder
Fentanyl	1,501.91	9.66	122.90	powder
Methoxyacetylfentanyl	84.99	0.54	29.75	powder
Acrylfentanyl	0	0	0	unknown

Note: Acrylfentanyl appeared on Dream Market prior to the 2018 ban and is included here because of an expectation that it would appear on other markets

Physical form

The dataset revealed five physical forms: tablets, patches, powder, solutions, and sprays. Patches and powder dominated, with about 88 percent of the total share after adjusting for missing values (177 out of 439 product listings did not describe physical form).

Figure 2: Physical forms of fentanyl (n=439 products)



Vendors

Preliminary results identified 5,445 unique vendors across the six darknet markets surveyed. Among these, 102 vendors (2% of all vendors) were identified as selling fentanyl, and only eight of these operated in multiple markets. On average, each vendor offered 215.6 grams of fentanyl, with half (the median) offering less than 53.0 grams. However, the top seven vendors, each of whom offered over 1,000 grams, accounted for 62 percent (13.66 kg) of all the available fentanyl.

Of the 102 fentanyl vendors, 58 offered worldwide shipping (including to Australia), but the other 44 vendors did not provide details about shipping and packaging services. The data suggest that a small number of vendors reported shipping from Australia, although their location is unable to be verified.

Most vendors appear to be generalists, listing many types of drugs. However, several vendors seem to specialise in fentanyl and carfentanil, often selling significantly larger quantities of these drugs.

Conclusion

Despite the limited scale and duration of this data collection, a small but significant fentanyl market was identified on the darknet, including large amounts of carfentanil. Over one-third (36.5%) of the estimated 15.55 to 21.95 kilograms of fentanyl products for sale were the extremely potent carfentanil analogue, in solution or powder form. Fentanyl products are typically sold in very small quantities (micrograms or milligrams) as patches or a powder, but larger quantities (5–10 grams or more) are also offered by several vendors who appear to specialise in fentanyl products. Further monitoring of darknet markets could explore smaller single vendor markets that may arise as larger omnibus markets become increasingly wary of the unwanted attention fentanyl products invite from law enforcement agencies.

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URLs correct as at February 2019

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