



# Internet sourcing and UK end consumer trend interest in the controlled medicines (opioids, sedatives and GABA drugs) in pre and post COVID-19 timeframes

Mark Whitfield<sup>a</sup>, Jennifer Germain<sup>b</sup>, Alice Hillis<sup>c</sup>, Devina Halsall<sup>d</sup>, James McVeigh<sup>e</sup>, Yasir Abbasi<sup>f</sup>, Marie Claire Van Hout<sup>g,\*</sup>

<sup>a</sup> Public Health Institute, Faculty of Health, Liverpool John Moore's University, Liverpool, UK

<sup>b</sup> Public Health Institute, Faculty of Health, Liverpool John Moore's University, Liverpool, UK

<sup>c</sup> Public Health Institute, Faculty of Health, Liverpool John Moore's University, Liverpool, UK

<sup>d</sup> NHS England and NHS Improvement Northwest, UK

<sup>e</sup> Substance Use & Associated Behaviours, Department of Sociology, Manchester Metropolitan University, UK

<sup>f</sup> Maudsley Health, Al Amal Psychiatric Hospital, Dubai, UAE

<sup>g</sup> Public Health Institute, Faculty of Health, Liverpool John Moore's University, Liverpool, UK

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## ABSTRACT

Sourcing and self-medication of medicinal pharmaceuticals including those containing opioids obtained from non-regulated online suppliers is a serious public health issue. The main concerns include a lack of quality control, drug side effects, drug interactions, diversion and possible pathway to drug dependence. The internet offers increased availability and accessibility of these medicines through both legal routes obtaining pharmaceuticals on prescription and illegal routes via websites on both the surface and Dark Web. The impact of the current severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2 or COVID-19) pandemic reduced face-to face access for non-COVID-19 related health conditions and to drug treatment services. This study provides an overview of the extent of online sourcing of UK controlled medicines (opioids, sedatives and GABA drugs) from unregulated suppliers and estimates of customer interest, in particular focusing on the COVID-19 lockdown period in the UK, where access to some healthcare services was limited. Whilst it was not possible to identify an increase for online searches for controlled medicines over the past five years, or during the COVID-19 period, searches remained plentiful, in particular for oxycodone, morphine and diazepam. This study highlights the need for enhanced pharmacovigilance of non-regulated online suppliers and the imperatives of continued health messaging around the potential abuse of these controlled drugs and the dangers of using sites purporting to be regulated pharmacies.

## Introduction

The 2021 World Drug Report has highlighted how online access of drugs continues to flourish, with both contactless drug transactions and major drug markets on the web (Surface and Dark) playing a major role prior to and during the COVID-19 pandemic in global drug markets (United Nations Office on Drugs and Crime, 2021). The internet increasingly supports the legal supply of such pharmaceuticals via online prescription (following brief consultation with an online doctor) and their potential for diversion, and the illegal supply via retail websites located on both the dark and surface web, and more recently through social media (Bachhuber and Merchant, 2017). These online spaces offer direct

retail to the general public, and circumventing regulatory controls for medicinal pharmaceuticals, has broadened the market to a much wider audience (Casati et al., 2012; European Monitoring Centre for Drugs and Drug Addiction, 2013; Foley et al., 2015; European Monitoring Centre for Drugs and Drug Addiction, 2016).

Rising trends in the sourcing and self-directed use of medicinal pharmaceuticals including those containing opioids sourced online are a serious public health concern in Europe (Casati et al., 2012; European Monitoring Centre for Drugs and Drug Addiction, 2013; Foley et al., 2015; European Monitoring Centre for Drugs and Drug Addiction, 2016). Key pharmaceuticals under surveillance by the European Monitoring System

\* Corresponding author at: Public Health Institute, Faculty of Health, Liverpool John Moore's University, Liverpool, U.K.

E-mail address: [m.c.vanhout@ljmu.ac.uk](mailto:m.c.vanhout@ljmu.ac.uk) (M.C. Van Hout).

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for Drugs and Drug Addiction (EMCDDA), and the European Medicines Agency (EMA) early warning system include: opioids; sedatives and gabapentinoid (GABA) drugs (Casati et al., 2012; European Monitoring Centre for Drugs and Drug Addiction, 2016). There is now a strong online interest in opioids (particularly fentanyl) (Socias and Wood, 2017; Hadland and Beletsky, 2018), but also in sedatives and GABA drugs for self-medication of pain, anxiety, depression and insomnia, as well as for intoxication and management of withdrawal purposes (Novak et al., 2016; Van Hout and Hearne, 2017; Public Health England, 2020).

We report here from the United Kingdom (UK). Access to medication including opioids; sedatives and GABA drugs is controlled through the *Misuse of Drugs Act (1971)* which restricts access and unlawful possession and supply of controlled drugs whilst the *Misuse of Drugs Regulation (2001)* permits use if prescribed by a regulated professional and supplied by a General Pharmaceutical Council regulated pharmacy. Opioid prescriptions were prescribed to approximately 5% of the UK population during 2015, with prescriptions increasing by 34% in England between 1998 and 2016 (Curtis et al., 2019; Levy et al., 2021). However when adjusting for opioid strength, the increase was 127% (from 190 000 mg to 431 000 mg per 1000 population) with prescriptions being particularly high in surgeries with large patient list sizes (Curtis et al., 2019). Most recent estimates suggest that around 13% of the UK adult population are prescribed opioids (Hockenhuil et al., 2021) with opioid related deaths also found to be increasing (Stevens, 2019), comparably to US rates (Häuser et al., 2021) and impacting disproportionately on those living in the most deprived areas (Stevens, 2019). This has led to the UK Medicine and Healthcare Products Regulatory Agency (MHRA) issuing guidelines to clinicians when prescribing opioids to discuss risks and having robust plans in place for end of treatment (Levy et al., 2021). Despite this, and a recent review finding no evidence of the UK experiencing an opioid crisis (van Amsterdam et al., 2021), concerns are still evident regarding opioid use in the UK and particularly regarding the online sourcing of medicinal and illicit drugs (Office for National Statistics, 2017; Public Health England, 2020).

It is useful to consider these context and drug market dynamics alongside the current severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2 or COVID-19) pandemic. The World Drug Report (2021) has reported that global drug markets, whilst briefly disrupted due to the pandemic, adapted and resumed operations quickly, triggering a proliferation of trafficking mechanisms and routes, including a surge of contactless methods of drug despatch to the consumers (United Nations Office on Drugs and Crime, 2021). COVID-19 may have impacted in many ways on the end consumers and patients, firstly due to the restrictions on face to face health services, including delays and cancellations of elective surgeries and other procedures which could lead to individuals taking opioids for longer than initially intended (Mudumbai et al., 2020). Secondly there were challenges in maintaining treatment services for those who use substance misuse therapies (Dunlop et al., 2020; Whitfield et al., 2020), and thirdly due to concerns over accessing substance misuse medication (Green et al., 2020) potentially leading those in need to seeking medication elsewhere. Across Europe, for older drug users and those with severe mental health issues, a lack of digital literacy meant there were additional struggles in navigating online services, with patient drop-out being higher as a result (EMCDDA, 2021). Furthermore, EMCDDA (2021) noted concern over small increases in hospital admissions related to opioid use (excluding heroin) as well as increases in benzodiazepine consumptions in a range of populations. This increase in hospital admissions relating to opioid overdose has also been reported elsewhere (Rodda et al., 2020). In England, concerns have been raised relating to the surge in both alcohol and drug use following the COVID-19 pandemic and questions asked about whether services would be able to manage following extensive cuts to funding and services since 2013/14 (Royal College of Psychiatrists, 2020). Finally, there are also concerns relating to how the impact of COVID-19 has affected both licit and illicit opioid use routine surveillance, and whether opioid surveillance has been neglected due to the pandemic (Osborne, 2021).

There is a distinct need to undertake research on these drugs as accessed on the internet via legal and illegal routes, given the rising prescription trends, street diversion, illicit manufacture, and implications in poly drug deaths in the UK and elsewhere. To date, research activity has primarily focused on the misuse of legally supplied prescription and over-the-counter opioids (such as codeine), both in community pharmacies and regulated online or distance selling pharmacies (Casati et al., 2012; Foley et al., 2015; European Monitoring Centre for Drugs and Drug Addiction, 2016). We present here a unique study which provides an overview of the extent of illicit online sourcing of UK controlled medicines (opioids, sedatives and GABA drugs) and provides estimates of end customer trend interest, in particular focusing on the COVID-19 lockdown period in the UK, where access to some healthcare services was limited. It forms part of a larger study which overall aims to advance knowledge on the extent of public accessing of information on these habit forming medicinal pharmaceuticals, consumer sourcing, motives, health awareness, and purchasing experiences and trends.

## Materials and method

Our study aimed to provide an overview of online opioid drug markets and consumer interest during pre and post COVID-19 UK restrictions. Online research is a valuable method when exploring hard to reach or hidden populations (Germain et al., 2017; Harris et al., 2020) and has been used successfully in previous research exploring online drug communities (Kjellgren and Soussan, 2011; Kjellgren et al., 2013; Van Hout, 2014; Van Hout and Hearne, 2016a; Van Hout and Hearne, 2016b; McVeigh et al., 2017) and marketplaces (Gilbert and Dasgupta, 2017; Duxbury and Haynie, 2018; Koenraadt and van de Ven, 2018). Ethical approval for both stages of the study was granted by a University Ethics Committee.

Online searches were carried out to identify online drug markets as well as establish consumer trend interest and the prevalence of searches conducted online concerning controlled medicines (opioids, sedatives and GABA drugs) in the UK in pre and post COVID-19 timeframes (2020).

**Stage 1:** Twenty five substances were identified from the British National Formulary which included all controlled pain relief medication, and benzodiazepine based tranquilisers and “Z drugs”, which include sleep aids such as Zolpidem and Zopiclone. A systematic approach was then undertaken to identify relevant online drug marketplaces using the name of the substance such as “fentanyl” (including spelling variations, brand names and slang terms) + “buy online UK”, “online pharmacy UK”, “for sale UK”. Slang terms were identified through their use in online forums and websites, with more added if found on marketplaces during the searches. Searches were conducted online via the surface web using Google search engine and a full list of drugs searched for are provided in [Table 1](#). Marketplaces were deemed relevant if they sold the substances under investigation, did not require a prescription for purchase and shipped to the UK. Duplicate online sites were removed, and information was tabled for each online site in terms of type of controlled drugs being sold, price points, dosage and website’s global ranking (if provided).

**Stage 2:** Secondly, searches were conducted using Google Trends to identify baseline trends in searches for controlled drugs between 2016 and 2020 pre COVID-19 as well as enable comparison between COVID-19 lockdown periods and previous years. The searches were limited to the UK and the drug names searched for are provided in [Table 1](#).

## Results

We present the analytic process with results in the form of several key themes; ‘types of controlled drug’; online marketplaces; customer feedback; medication characteristics; and online interest.

**Table 1**

List of controlled drugs searched.

Fentanyl/Fentanil		Oxycodone		Tramadol		Gabapentin		Pregabalin		Diazepam	
Abstral	Apache	Abtard	Oxy	Maneo	Chill Pills	Neurontin	Gabbies	Alzain	Budweiser	Diazemuls	Eggs
Actiq	China Girl	Armoneve	OC's	Maxitram	Trammies		Johnnies	Axalid		Stesolid	Jellies
Actiq	China White	Carexil	Oxycet	Skudexa	Ultras			Lecaent		Valium	Moggies
Breakyl	Dance Fever	Leveraxo	Oxycotton	Tilodol				Lyrica			Vallies
Bufyl	Friend	Longtec	Hillbilly heroin	Tradorec				Rewisca			Blues
Durogesic	Goodfella	Lynlor	Berries	Tramacet							
Effentora	Jackpot	Myloxifin	Killers	Tramquel							
Fencino	Murder 8	Onexila	Percs	Tramulief							
Fentalis	Tango and Cash	Oxeltra	Roxi's	Trapadex							
Instanyl	TNT	Oxyact	Oxone	Ultram							
Ionsys		Oxyargin		Zamadol							
Matrifen		OxyContin		Zeridame							
Mezolar		OxyNorm		Zydol							
Mylafent		Reltebon									
Opiodur		Shortec									
Osmanil		Targinact									
PecFent		Zomestine									
Sublimaze											
Victanyl											
Yemex											
<b>Nitrazepam</b>		<b>Loprazolam</b>		<b>Lormetazepam</b>		<b>Bromazepam</b>		<b>Clobazam</b>		<b>Clonazepam</b>	
Mogadon	Moggies					Lexotanil		Frisium		Rivotril	K
								Perizam		Klonpin	K-Pin
								Tapclob			Pin
											Super Valium
<b>Lorazepam</b>		<b>Chlordiazepoxide</b>		<b>Alprazolam</b>		<b>Oxazepam</b>		<b>Temazepam</b>		<b>Triazolam</b>	
Activan	Candy	Librium	Candy	Xanax	Bars			Normison	Tems		
	Downers		Downers		Bicycle HandleBars				Temazies		
	Sleeping Pills		Sleeping Pills		Footballs				Jellies		
	Tranks		Tranks		French Fries						
					Hulk						
					Ladders						
					School Bus						
					Xan						
					Xanies						
					Zan						
					Zannies						
					Zanbars						
					Z-Bars						
<b>Flunitrazepam</b>		<b>Flurazepam</b>		<b>Zolpidem</b>		<b>Morphine</b>		<b>Dihydrocodeine</b>			
Rohypnol	Circles	Dalmane		Oratika orodispersible		Morphgesic	God's Drug	Co-Dydramol			
	Date Rape Drug			Stilnoct		MST Continus	M	DF118 Forte			
	Forget me Pill			Zolpidem		MXL	Miss Emma	DHC Continus			
	La Rocha					Oramorph	Monkey	Dypracet			
	Lunch Money					Sevredol	Morpho	Paramol			
	Mexican Valium					Zomorph	White Stuff				
	Mind Eraser					Cyclimorph					
	Roofies					Duramorph					
	Wolfies										



Fig. 1. Medication Interest.

### Types of controlled drugs

The first search resulted in a substantial number of legitimate<sup>1</sup> regulated pharmacies being returned in the results, which would not supply a medicine without having received a doctor's prescription. For the purposes of this analysis, these were removed and no further details captured because although online, the barriers to receiving prescribed medication were as substantial as a face-to-face consultation with a general practitioner (GP) and it would not be possible to order medication without an existing prescription.

After removing these pharmacies from the search results, 118 sites in total appeared across the searches, which when aggregated for duplicates, was narrowed down to a list of 64 sites. The highest number of successful searches were as a result of the word "Fentanyl" (10 sites), "Tramadol" (9 sites) and "Diazepam" (8 sites; Fig. 1).

### Online marketplaces

In many cases, the geographic base for the site was unclear, and in some cases the URL or title had no relation to the country of origin. For example, <https://www.canadapharma.biz/> was registered in Texas, USA to Eranet International Limited. All, however, shipped to the UK. Many companies with different site names and URLs had identical front-ends suggesting that some sites use different identities, meaning that even if the store is taken down from one hosting provider, it will still be accessible from others. The misleading naming of certain online pharmacies gives the customer the impression that they are regulated by the country in which they claim to be based when this will often not be the case (The Partnership for Safe Medicines, 2020).

<sup>1</sup> Pharmacies with a registration number for the country in which they operate from

Table 2

- Sites with Alexa Global Ranking.

Home page	Times found	Alexa global ranking
<a href="https://www.sleepingpills4uk.com/">https://www.sleepingpills4uk.com/</a>	4	10,631,006
<a href="https://rxpainkiller.com/">https://rxpainkiller.com/</a>	1	8295,970
<a href="http://norxpharmastore24.com/">http://norxpharmastore24.com/</a>	1	8145,180
<a href="https://www.modafinilprovigil.com/">https://www.modafinilprovigil.com/</a>	1	6739,150
<a href="https://www.sleeping-tablets.org/">https://www.sleeping-tablets.org/</a>	1	6217,000
<a href="https://insomniameds365.com/">https://insomniameds365.com/</a>	1	6176,535
<a href="https://ukmedsnorx.com/">https://ukmedsnorx.com/</a>	1	5781,290
<a href="https://worldpharm365.com/">https://worldpharm365.com/</a>	1	5407,032
<a href="http://pharmshoptop.com/">http://pharmshoptop.com/</a>	1	4108,226
<a href="https://www.uksleepingpills.com/">https://www.uksleepingpills.com/</a>	1	4051,245
<a href="https://www.canadapharma.biz/">https://www.canadapharma.biz/</a>	1	3635,351
<a href="http://pillsonlineservices.com/">http://pillsonlineservices.com/</a>	1	3331,408
<a href="https://fentanylworld.com/">https://fentanylworld.com/</a>	2	3038,396
<a href="https://legalkets.com/">https://legalkets.com/</a>	1	2962,193
<a href="https://nembutal.online/">https://nembutal.online/</a>	2	2755,951
<a href="https://www.directsleepingpills.com/">https://www.directsleepingpills.com/</a>	4	2147,090
<a href="https://sleepingtablets-uk.com/">https://sleepingtablets-uk.com/</a>	1	2073,785
<a href="http://optimusrx.com/">http://optimusrx.com/</a>	1	1647,393
<a href="https://silkroad-pharmacy.to/">https://silkroad-pharmacy.to/</a>	2	1623,299
<a href="https://www.ms-online.in/">https://www.ms-online.in/</a>	2	1527,980
<a href="https://www.flymedishop.com/">https://www.flymedishop.com/</a>	1	1405,572
<a href="https://euro-pharma24x7.com/">https://euro-pharma24x7.com/</a>	1	1063,963
<a href="http://meds4uonline.com/">http://meds4uonline.com/</a>	2	1036,251
<a href="http://md.pro-articles.com/">http://md.pro-articles.com/</a>	1	982,769
<a href="https://pharmaris.net/">https://pharmaris.net/</a>	1	834,806
<a href="https://www.unitedpharmacies-uk.md">https://www.unitedpharmacies-uk.md</a>	1	751,214
<a href="https://pharmrx-1.com/">https://pharmrx-1.com/</a>	2	551,614
<a href="https://pharmshopspec.com/">https://pharmshopspec.com/</a>	2	547,057
<a href="https://family24rx.com/">https://family24rx.com/</a>	1	465,560
<a href="https://uksleepingtablets.com/">https://uksleepingtablets.com/</a>	1	227,000

Thirty of the 64 sites had enough traffic to appear in Alexa's global ranking, which measures popularity against sites when ranked in order, ranging from the ranking 10,631,006 to 227,000 (Table 2).

**Table 3**

- Medication form, price range and amount available to order.

Substance	Form available	Price range	Maximum order of tablets
Alprazolam	tablets, 1mg	£1.89 per tablet (minimum order 30) - £574.83 for 300 tablet	300
Chlordiazepoxide	tablets, 5 mg, 10 mg and 25mg	\$110 - \$484 for 240 - 1920 capsules	1920
Clobazam	tablets, 5 mg - 20mg	£375 for 100 5 mg tablets - £1200 for 500 20 mg tablets	500
Clonazepam	tablets, 2mg	£125.40 for 30 tablets - £563.20 for 300 tablets	300
Diazepam	tablets, 5 mg, 10 mg	£34.99 for 30 10 mg tablets - £350 for 180 10 mg tablets	180
Fentanyl	tablets/vials/powder/lozenges, various strengths	\$6 per 800mcg pill to \$29,500 for 1 kg powder	90
Flunitrazepam	tablets, 2mg	\$0.90 per tablet	not stated
Flurazepam	tablets, 2mg	£1.11 per tablet (minimum order 30)	not stated
Gabapentin	tablets, 100 mg - 800mg	£0.45 to £2.02 per tablet (minimum order 10 tablets)	not stated
Lexotanil	tablets, 3mg	\$0.27 - \$2 per tablet	not stated
Lorazepam	tablets, 2.5mg	£1.93 for 30 tablets to £4.29 for 160 tablets	160
Oxazepam	tablets, 10mg	\$250 (AUD) for 500 tablets	500
Oxycodone	tablets, 5 mg, 10 mg and 20mg	\$0.50 per 10 mg tablet - \$124.88 for 100 tablets	100
Pregabalin	tablets, 300mg	\$128.80 for 56 tablets - \$389.76 for 224 tablets	224
Temazepam	tablets, 20 mg, 30mg	£39 for 14 tablets - \$1600 for 1000 tablets	1000
Tramadol	tablets, 50 mg - 225mg	£16 for 20 50 mg tablets - £296.40 for 240 pills	240
Triazolam	tablets, 0.25mg	\$0.25 per tablet - \$190 per 50 tablets	50
Zolpidem	tablets, 5 mg, 10mg	£32.99 for 30 tablets - \$349 for 90 tablets	90
Zopiclone	tablets, 7.5mg	£17 for 10 tablets to £199 for 250 tablets	250

Whilst initial searches were conducted between March and June 2020, when the URLs were visited again in September 2020, 17.1% were found to either go to a dead link or have a notification on the site, posted by the internet service provider (ISP), stating that the account had been suspended.

#### Customer feedback

Trustpilot is a consumer review website founded in Denmark in 2007, which hosts reviews of businesses worldwide, and is extensively used in the UK. Many businesses have the Trustpilot logo on their site with their star rating out of 5 to indicate positive feedback from customers who have used them already. We scrutinised the top 30 sites from their Alexa global ranking and entered their URL into Trustpilot. Less than half, 46.6% ( $n = 14$ ) of them, had reviews on the site, while the rest did not; indicating that they were either very new sites or not used extensively. Two sites had Trustpilot entries, which indicated that they were not accepting any more reviews as the businesses had now closed.

From the 14 sites which had reviews left for them, five had relatively high scores (>4.0 out of 5) from a considerable number of reviews. However many of the positive reviews were from individuals who had only reviewed that company on Trustpilot, while the negative reviews tended to be from individuals who had reviewed multiple companies on Trustpilot offering different types of services. This may indicate that the positive reviews are not genuine, and indeed this was frequently alleged in the comments in poor reviews. The main two complaints from individuals leaving poor reviews were that the drugs sent were fake, or that no goods at all were sent, despite payment having been made. Less common complaints were that the wrong amount of drugs were sent, or that customers alleged that their card details were then “cloned” and used without permission. In one case, a customer alleged that an individual from a site had threatened them if they left a bad review on Trustpilot.

#### Medication characteristics

**Table 3** illustrates the price range, dosage and quantity of medication, which are available for individuals to order online. Most medication was available in tablet form, and all websites displayed the dosage of tablets clearly. While some sites offered tablets with no minimum order, allowing potentially the order of a single tablet, most sites stipulated effectively a minimum order by offering specific multiples of tablets, which could be bought such as 30 or 60. Many sites offered discounts for ordering larger numbers of tablets, sometimes significantly so. Be-

cause of this, some sites offered a very high level of medication, with one site offering 1920 Chlordiazepoxide tablets as part of a deal.

No site stated a maximum amount of medication, which could be ordered. None of the sites required any form of prescription or doctor's consultation although many of the sites featured images of doctors and other medical professionals. Although most sites took payment by credit or debit card, some stated that payment was either only possible with bitcoin or that a reduction would be offered for payment by Bitcoin, sometimes as much as 50%. Most sites also offered payment by direct bank transfer or money transfer by services such as Western Union.

#### Online interest

Google analytics was used to identify the prevalence of searches conducted online for each of the drugs of interest (see [Figs. 2-4](#)). This was restricted to the UK and between the time period January 1st 2016 to December 31st 2020. Each drug was searched individually and then combined to generate a final score for each week between that period. Overall searches have stayed consistent over the five-year period ranging from 54,689 searches in 2016 to 59,141 in 2021. When focusing on searches during 2019 and 2020, whilst searches did increase slightly near the start of the first UK COVID-19 lockdown (April), and again in October and November during local lockdowns, overall the trend stayed relatively steady with a slight downward turn. When focusing on the 2020 period, most commonly searched for was Oxycodone (7572), followed by Morphine (6506) and Diazepam (3880).

#### Discussion

The study provides a unique overview of online pharmaceutical drug markets and end consumer UK trend interest in sourcing the controlled medicines (opioids, sedatives and GABA drugs) in pre and post COVID-19 timeframes. The analysis suggests that whilst it was not possible to identify an increase for online searches for controlled medicines over the past five years, or during the COVID-19 period, searches for these drugs remained plentiful, in particular for oxycodone, morphine and diazepam. This is in line with the World Drug Report 2021 trend analysis, and indicates that coupled with the abundance of pharmacies and online doctors, a highly lucrative, in demand online market continued to flourish during COVID-19.

The online marketplace is not without risk to the consumer. It is unregulated and puts the consumer at a genuine risk through the potential of being scammed, whereby companies can take large amounts of money, through payment methods such as bitcoin, which do not have



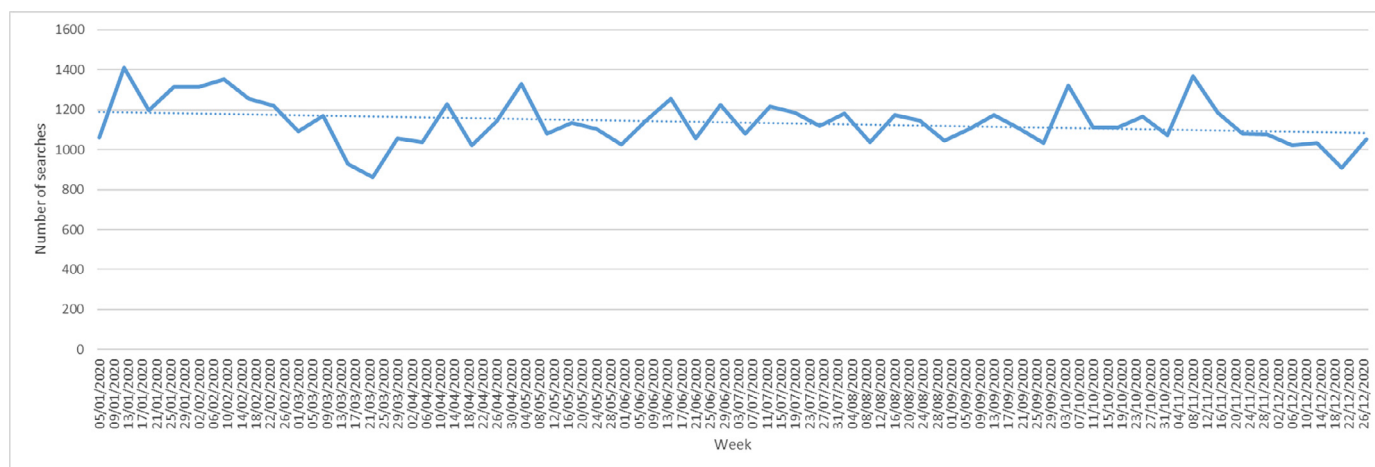


Fig. 2. Trend Interest -General.

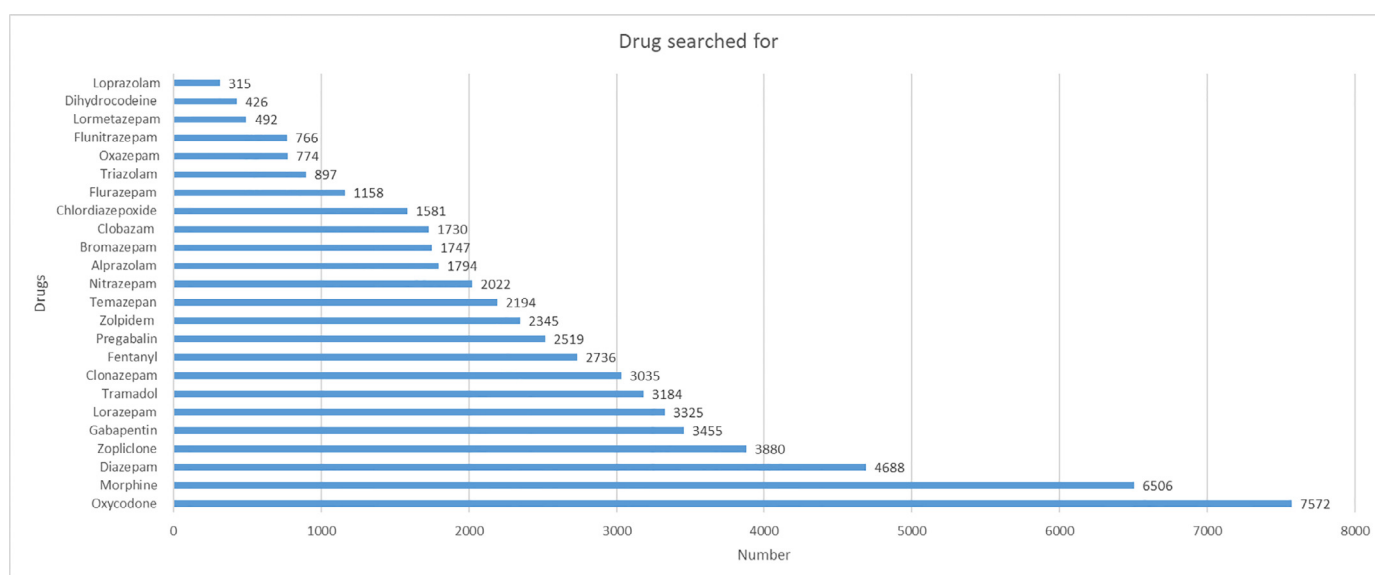


Fig. 3. Trend Interest per Drug Type.

the consumer protections of credit cards. This may impact individuals who are vulnerable financially, and/or at risk of habit forming use of these medications. End consumers may receive medication that is fake and potentially containing innocuous ingredients, which have no effect; or receive medication which is fake and containing ingredients that are potentially hazardous /fatal and/or illegal in the UK. Further, the end consumer could be allergic/sensitive to adulterated products through substitution or accidental contamination with another active ingredient, and they then may not receive medical care for the effects of such substances. Many of these products have the potential for fatal overdose through respiratory arrest. Illicitly manufactured substances are often over strength due to poor manufacturing practice, have the potential for habit forming use and dependence and are being provided without medical supervision or controls.

The market for consumers is difficult to navigate due to the lack of regulation and transparency of the credentials and integrity of sites, due to the widespread uncertainty around Trustpilot's review system through the high number of positive reviews left by "customers" who appear to have had no other interaction with the website. Most sites are not based within the UK, although some do deliver from within the UK, and the means of contacting them via a phone number or dedicated

postal address is often unclear. While it does appear that there are some genuine sites that have had occasional issues with orders, which is usual for any company, these appear to be in a minority.

Many of the sites that supply substances without a prescription do not have a presence on consumer review sites. This suggests that a rapid turnover of sites, or their identity in the form of their title and URL, making identifying scam sites problematic. The sites with the greater number of reviews have fewer negative comments on average, although most of even these sites have their fair share of negative feedback, which alleges some form of malpractice (Van Hout and Bingham, 2014). Customers are very aware of being sent medication which is not what it purports to be, and there are numerous examples of individuals sending what they received to the Welsh Emerging Drugs and Identification of Novel Substances (WEDINOS) Project's anonymous drug testing service, where they will go on to post the results on Trustpilot. This altruistic form of "rating" vendors in order to warn other customers is long established, with customers of market places such as Silk Road selecting vendors based on trust and transaction reviews (Van Hout and Bingham, 2013).

Even if these websites were legitimate, one concern would be that these sites, due to their presence outside the UK (or even EU) will be

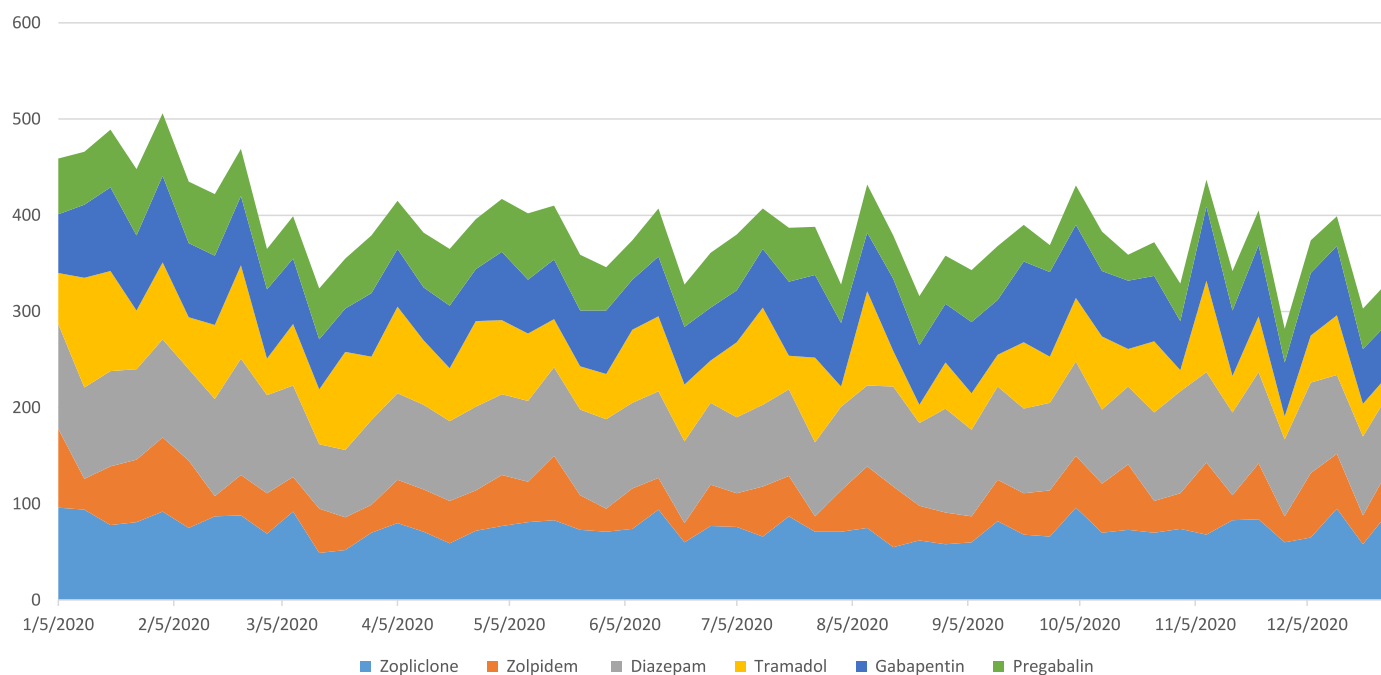


Fig. 4. Trend Interest comparing Drug Type.

difficult to regulate within British or European legislations. However, such websites can be flagged up for the government to take action and restrict access to them, and an existing government managed database exists in the form of the Medicines & Healthcare products Regulatory Agency's Register of authorised online sellers of medicines, which allows consumers to report websites which they believe to be selling medicines illegally (MHRA, 2021). Where this occurs, the MHRA can arrange with ISPs to remove illegal sites.

It appears that sleep aids (Z-hypnotics) are the controlled drugs most accessed online without needing a prescription. This may have become more acute since the 2020 tightening of UK standards of practice with prescribing by online doctors only following consultation, and dispensing by regulated pharmacies, again following an online consultation. (General Pharmaceutical Council, 2019). The result of is that online or distance-selling regulated pharmacies are no longer able to sell controlled drugs without a prescription from the individual's own GP. This may have become more acute since the tightening of UK regulations around prescribing by "legitimate" pharmacies using an online consultation, which were implemented in 2020 (General Pharmaceutical Council, 2019). The result of this new advice from the UK's General Pharmaceutical Council was that online pharmacies with registrations were no longer able to sell controlled drugs online without a prescription from the individual's own GP. To minimise harm, UK clinical guidance strongly recommends supplying no greater than 30 days' supply of controlled drugs (General Medical Council, Royal Pharmaceutical Society). Pain relief medication (including opiate based substances such as fentanyl) and benzodiazepine based tranquilisers were less frequently offered by online sites, although the available quantities when offered were consistently greater than 30-days' supply, thus increasing the risk of overdose, other harms or diversion.

Given the plethora of routes to accessing of controlled medicines, our study underscores the significant public health implications of people in the UK obtaining potentially illicitly (and/or adulterated) manufactured powerful drugs and the potential for acute harm (toxicity, respiratory arrest) and chronic harm (dependence) (PSNC, 2020). In times of stress and isolation such as that seen in the COVID-19 pandemic, policies must include additional vigilance to safety net individ-

uals unable to access services, particularly treatment services for those with mental health and/or substance use disorders (Dunlop et al., 2020, al., 2020; Whitfield et al., 2020; EMCDDA, 2021). Lessons learnt can arise from the United States (US) where the evidence base is strong, and whilst the opioid crisis has not reached the same levels in the UK (Denneny and Cooper, 2018), there are still concerns (The Pharmaceutical Journal, 2017). Over-prescribing and aggressive marketing has led to an opioid dependence and overdose crisis (van Amsterdam et al., 2021), causing reductions in life expectancy (Kerr, 2019), exacerbating stigma (Corrigan and Nieweglowski, 2018) and impacting negatively on the economy (White et al., 2011; Brewer, 2017; Fuhrmann-Berger, 2018). Despite tightening of policies and a reduction in prescribing of opioids in the US, the death rate has still risen, suggesting a displacement into illicit heroin and opioid painkiller sourcing (Kerr, 2019). UK policy makers, drug control specialists and security experts are advised to continue to monitor the growth of online pharmacies serving the country.

We recognise that this is an initial study which did not attempt to look at accessing controlled medication using either the Dark Web or social media sites due to the ethical and practical difficulties of accessing same. Further work in these platforms warrants a multi-disciplinary approach including collaborating with online security experts. The Dark Web requires increasingly specialist knowledge, which would be a barrier to the general public, and social media platforms that offer such services are behind the walls of closed groups. Discussions on forums and other news reports suggest that as with illicit substances such as heroin or cocaine, there are other ways of receiving controlled drugs beyond the sites we have scrutinised in this study (BBC, 2018). During the course of our larger project, we became aware of innovative group chats hosted by Telegram, initiated via Instagram offering interested consumers and users a range of controlled medicines. Similar approaches have also been discussed using Facebook and WhatsApp groups, with WhatsApp and Telegram in particular offering encrypted and private communication platforms. We wish to highlight the need for further investigation of these novel communication platforms using innovative online research methods. Ultimately the proliferation of new routes and mechanism to accessing controlled medicines, beyond the surface web online pharmacies (and the Dark Net) now include these new platforms.

## Conclusion

The study illustrates continued end consumer interest in the online sourcing of controlled medicines before and during COVID-19 timeframes. It highlights the substantial need for enhanced pharmacovigilance and detection of online supply of substances purporting to be genuine controlled drugs from unregulated sites purporting to be pharmacies. It also makes clear the importance of continued health messaging around the abuse potential of these controlled drugs, and the dangers of using these sites. Surveillance and innovative research methodologies are advised to seek to garner greater understanding of the market dynamics and the evolution of new private communication mechanisms which support end consumer access to habit forming medications.

## Declaration of Competing Interest

Funding for this project was provided by Grünenthal Pharma who did not have any role in the study design in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the article for publication.

## CRediT authorship contribution statement

**Mark Whitfield:** Conceptualization, Methodology, Data curation, Formal analysis, Project administration, Supervision, Writing – original draft, Writing – review & editing. **Jennifer Germain:** Conceptualization, Methodology, Data curation, Formal analysis, Writing – original draft, Writing – review & editing. **Alice Hillis:** Conceptualization, Data curation, Formal analysis, Writing – original draft, Writing – review & editing. **Devina Halsall:** Conceptualization, Methodology, Supervision, Writing – review & editing. **James McVeigh:** Conceptualization, Methodology, Supervision, Writing – review & editing. **Yasir Abbasi:** Conceptualization, Methodology, Supervision, Writing – review & editing. **Marie Claire Van Hout:** Conceptualization, Methodology, Project administration, Supervision, Writing – original draft, Writing – review & editing.

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