The relationship between fake news and fake medicines: how misinformation has fuelled the sale of COVID-19 substandard and falsified medical products

Oksana Pyzik (a,b,c), John Hertig (d), Hoda Kanso (b), Anika Chamba (b) and Sofia Khan (b)
a. UCL School of Pharmacy, University College London, UK
b. UCL Fight the Fakes, University College London, UK
c. Commonwealth Pharmacists Association, London, UK
d. Butler University College of Pharmacy and Health Sciences, Indianapolis, IN, USA

Abstract
As waves of COVID-19 continue to threaten public health, an increasing volume of disease-related information is widely accessible, and not all of it is accurate or reliable. The World Health Organisation (WHO) described this overabundance of information, misinformation, and disinformation as an "infodemic", making it difficult for many to distinguish fact from fiction. These definitions are complex and transitional; however, misinformation is defined as the "inadvertent sharing of false information", whereas disinformation is more sinister in origin and constitutes "the deliberate creation and sharing of information known to be false." The infodemic encapsulates both intentional and unintentional erroneous sources. Ultimately, the patient safety consequences remain the same, including amplifying vaccine hesitancy and propagating dangerous "coronavirus cures" myths, leading to higher COVID related mortality rates. Disinformation, desperation, and panic drive the production and sale of falsified medical products. The WHO estimates 1 in 10 medical products in low-and-middle-income countries (LMIC) settings are substandard or falsified (SF), which may worsen diseases, cause disability or even death. Ultimately, SF products undermine public trust in COVID-19 vaccines and treatments, all sectors must come together in this crisis to ensure quality COVID medical products are distributed safely and fairly to end the pandemic sooner rather than later.

Key words: *COVID-19; falsified medical products; infodemic; pandemic.*

A parallel pandemic of misinformation has spread worldwide, faster than COVID-19 itself, and continues to outpace law enforcement and regulatory bodies as it grows exponentially online. The ultimate cost of misinformation is loss of life and even further deterioration of trust in health care systems and science. As waves of COVID-19 continue to threaten public health, an increasing volume of disease-related information is widely accessible, and not all of it is accurate or reliable. The World Health Organisation (WHO) described this overabundance of information, misinformation, and disinformation as an "infodemic", making it difficult for many to distinguish fact from fiction. These definitions are complex and transitional; however, misinformation is defined as the "inadvertent sharing of false information", whereas disinformation is more sinister in origin and constitutes "the deliberate creation and sharing of information known to be false". The infodemic encapsulates both intentional and unintentional erroneous sources. Ultimately, the patient safety consequences remain the same, including amplifying vaccine hesitancy and propagating dangerous "coronavirus cures" myths, leading to higher COVID related mortality rates.

Address for correspondence: Oksana Pyzik, UCL School of Pharmacy, 29-39 Brunswick Square, Room 336 London, WC1N 1AX, UK.E-mail: o.pyzik@ucl.ac.uk.

Disinformation, desperation, and panic drive the production and sale of falsified medical products. The WHO estimates 1 in 10 medical products in low-and-middle-income countries (LMIC) settings are substandard or falsified (SF), which may worsen diseases, cause disability or even death (1). There is an essential distinction between the two definitions. Substandard medical products stem from poor manufacturing practices or supply chain gaps and can be described as "out of specification". In contrast, falsified medical products encompass those that have a fraudulently misrepresented identity, composition or source. These products historically thrive on shortages and crises. Both are important but have different origins and solutions. The global burden of SF COVID-19 medical products is difficult to capture, but estimates surpass pre-covid projections. From organised criminal groups selling falsified vaccines on the black market to scammers peddling unproven alternatives to the vaccine online, both take advantage of fear, shortages, and mistrust to target vaccine-hesitant populations alongside regions without access for lucrative profits.

In July 2020, United Nations Office on Drug and Crime (UNODC) released a research brief on "COVID-19-related trafficking of medical products as a threat to public health" detailing emerging trends and how the COVID-19 crisis has opened a window of opportunity for organized criminal groups to exploit fearful populations, particularly those in various phases of lockdown or quarantine. The initial drug shortages caused by the crisis, misinformation and disinformation campaigns created ideal conditions for SF medicines to fill the online and offline gaps in demand. As a result, securing pharmaceutical supply chains and fighting disinformation has become a national security issue for countries seeking to control the flow of products into - and out of - their borders.

Sources of misinformation are varied and complex, ranging from troll farms flooding social media news feeds to the highest political office, as some leaders touted the effectiveness of hydroxychloroquine and chloroquine despite a lack of randomised clinical trials supporting their efficacy. Following the high-profile international media coverage of these claims, authorities in Cameroon seized falsified chloroquine from at least 300 pharmacies and hospitals in April 2020 (2). More recently, misinformation about the effectiveness of ivermectin to treat COVID-19 without evidence has been touted by celebrities and podcasters, in direct opposition to public health advice. Unprecedented publicity around such unlicensed products has led to extensive shortages, self-treatment, and overdoses, leading to patient safety issues and increasing the risk of substandard and falsified medical products entering all countries.

The rise of SF medical products alongside anti-science scams has led the UN to launch a "Verified" campaign to flag dubious sources and content on social media and traditional media outlets. The initiative provides science-backed content and urges the public to become "information volunteers" to help spread reliable information to combat the COVID-19 communication crisis. Overall, the campaign has reached 1 billion people in 130 countries, with approximately 300 million being reached via social media, thereby yielding a total of 70,000 "information volunteers" (3). However, more awareness and coordinated strategic action across public health, regulatory, and law enforcement domains are needed to specifically tackle the SF issue.

The Fight the Fakes (FTF) Alliance is a multi-stakeholder, non-profit association that is wholly dedicated to addressing SF threats by raising global awareness in partnership with members and youth groups. UCL Fight the Fakes is the first academic chapter founded by Oksana Pyzik and aims to fill the current SF knowledge gap by connecting key actors to develop education and training programmes, disseminate research and increase awareness via social media campaigns globally. However, it is not feasible for any organisation to reduce SF alone and requires governments and public, private sectors to come together to fight the fakes, both fake medicines and "fake news."

Social media platforms and digital technology are the driving force that accelerates the speed of misinformation spread around COVID-19 medical products and the wider pandemic without sufficient regulation. A *BMJ* study by Li *et al.* published in May 2020 found that out of the most-watched COVID-19 related YouTube videos, 1 in 4 contains incorrect and unreliable information (4). As some social media sites have overtaken mainstream media within certain demographics it has become more challenging to debunk rumours and cultural stigmas with science-based guidance alone. The American Journal of Tropical

Medicine and Hygiene concluded that approximately 5,876 hospitalisations were attributable to COVID-19 related misinformation on online platforms during the pandemic, yielding 800 patient deaths reported globally. Reports of rumours that drinking concentrated methanol or bleach can kill the virus emerged across nations, subsequently causing 60 cases of total blindness, 30 deaths in Turkey and 12 instances of harm in India (5). In April 2020, this led to the WHO advising governments to enforce restrictions on access to and consumption of alcohol during lockdowns (6). On another occasion, falsified "coronavirus cures" in the United States (US) contained potassium thiocyanate and hydrogen peroxide, and users were instructed to rinse their mouths with these corrosive chemicals (7). Other instances of potentially harmful COVID-19 related misinformation include the consumption of cow urine to cure or prevent the virus. Overall, 2,311 reports of COVID-19 misinformation with serious consequences were identified, spanning over 87 countries globally, many more go unreported and unidentified (5).

Thus far, Operation STOP, a World Customs Organisation-led initiative supported by WHO, UNODC, INTERPOL, Europol and OLAF has reported 1,233 cases out of a total of 1,683 seizures and detentions by 51 Member States containing SF medicines and medical devices. In the UK over 307,215,524 items of illicit medicines valued at £9 million have been seized or detained via Operation Pangea (1). To counter this the UK's Medicines and Healthcare products Regulatory Agency (MHRA) has launched its own #FakeMeds campaign to educate the public on registered seller marks and verification logos, as well as use of the yellow card scheme to report suspected falsified medical products.

Chaotic and slow responses by some Governments heightened global bidding wars for Personal Protective Equipment (PPE), vaccines, treatments and therapeutics further exacerbating covid inequities that criminals capitalized on for example, in Pune, India, four people were arrested in May 2021 for selling fake vials of Remdesivir for Rs. 35,000, far above the official Rs. 2,000 ($27) price cap for the genuine medicine. Counterfeiters deceive people simply by replicating the product packaging, while filling with inactive or even harmful contents inside the vial/packing.

The pandemic disrupted and delayed pharmaceutical supply chains worldwide, creating new access points for falsified medicines to reach patients through illegal online channels. According to the Alliance for Safe Online Pharmacies (buysaferx.pharmacy), within weeks of the WHO declaring the COVID-19 pandemic, 100,000 new domain names were registered to contain the terms: "covid," "corona", or "virus." Of these, 122 names also had the string "vaccine", and over 400 contained the string "test." Although some could be considered legitimate, the vast majority were operated by criminals taking advantage of fear and uncertainty, spreading misinformation and harming the public by selling SF products globally.

The infodemic and pervasive use of the internet make SF COVID-19 products widely accessible to higher-income countries. According to NABP (2020), the Rogue Rx Activity Report (2020) identified dozens of illegal online pharmacies run by well-known criminal networks actively marketing prescription-only COVID-19 treatments, primarily chloroquine hydroxychloroquine, azithromycin, and lopinavir/ritonavir. One recent study published in the US found 35.9% of respondents bought COVID-19 medicines or vaccines via the internet and social media sites. The public's false confidence in these sources of medicines has the potential to lead to exponential patient harm. Although online drug sellers target higher-income countries, these problems are not limited to more resourced jurisdictions.

Historically, lower-income countries suffer disproportionately from SF products due to fractured supply chains and resource constraints within health care and regulatory systems. Currently, Africa has the slowest vaccination rate of any continent, with just 12.2 percent of the population receiving at least one dose of a vaccine. The vaccine equity gap will continue to prolong the pandemic in LMICs and breed new variants e.g., Omicron, that will affect vaccine efficacy and progress made in high-income countries (HIC) (8). The trickle-down vaccine donation policy has failed to protect vulnerable populations and health workers in LMICs, with some turning to unlicensed vendors to fulfil unmet needs. The WHO has warned that the vaccine equity gap will continue to be exploited by organised criminal groups for profit as they pivot from PPE and diagnostics towards vaccines. International coop-

eration and political will to expand access to life-saving vaccines are needed to upscale the fight against SF medical products. The Access to the COVID-19 Tools Accelerator was envisioned as a multi-organisation effort to ensure all populations had access to critical diagnostics, therapeutics and especially vaccines through the COVAX financing facility. As of July 2021, 12.9 billion doses of the vaccine were administered globally, with only 2% (270.2 million) of the doses in Low-Income-Countries (9).

The United Nations Office on Drugs and Crime (UNODC) has reported a five-fold increase in cybercrime (10). While all countries are vulnerable to poor quality and falsified medical products, HIC primarily sees this issue manifest in the illegal sale of medicines online through illegal online "pharmacies" and even social media platforms. Law enforcement agencies have shut down over 2,500 illicit websites advertising falsified items associated with COVID-19, including diagnostic tests and the most commonly falsified item, "corona spray." The authorities also seized over 34,000 falsified face masks despite only 2 -10% of all cargo containers undergoing border control inspection (11). The true figure of falsified medical products is likely to be much larger but is silently slipping through porous borders. These illegitimate products may be contaminated, toxic or instil a false sense of security, leading some to take more risks.

In the UK, the MHRA has issued warnings regarding a rise in unauthorised testing kits and medications such as antivirals listed on eBay, leading to arrests however, as soon as one seller is removed another pops up in its place creating a whack-a-mole problem (12, 13). In the US, American's preference for buying medicine via the internet has increased since 2017 (33% to 36% in 2020) and 7 in 10 Americans erroneously believe that if an online pharmacy website appears high up in a search engine search, it is likely to be legitimate. Thus, to tackle the growing issue of the online sale of falsified medical products, the registration of online pharmacy domain names is vital. This simple yet effective step is necessary for tackling at least one aspect of this multi-front war against fake medical products.

Lessons from the early global response to the pandemic demonstrate the continued importance of solidarity, transparency and cooperation to protect populations and economies, and the high price countries have paid in failing to adhere to these principles that unite nations. More specifically, in relation to curbing SF medical products, further strategic coordination is needed across the private sector and Big Tech with governmental bodies to tackle the COVID-19 "infodemic" and provide safe and reliable information to the public in real time. However, at the core of the SF issue remains access to efficacious, affordable and quality life-saving medicines, a fundamental human right. The fight against SF medicines and medical products protects good-health and well-being in line with SDG 3 but will also promote further development goals such as SDG 10 "Reduced Inequalities", SDG 16 "Peace, Justice and Strong Institutions", and SDG 17 "Partnership for the goals".

Ultimately, SF products undermine public trust in COVID-19 vaccines and treatments, all sectors must come together in this crisis to ensure quality covid medical products are distributed safely and fairly to end the pandemic sooner rather than later.

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