

COUNTERFEIT PPE: SUBSTANDARD RESPIRATORS AND THEIR ENTRY INTO SUPPLY CHAINS IN MAJOR CITIES¹

Layla Hashemi², Edward Huang³ & Louise Shelley⁴

Abstract

Over 58 million counterfeit respirators of substandard quality unable to protect individuals from infection have been seized globally since the start of the COVID-19 pandemic. These seizures have primarily occurred in urban warehouses and ports around the world according to analysis of public and corporate data shared with the authors. The presence of tens of millions of respirators in storage facilities prior to distribution demonstrates that urban areas are key elements of illicit supply chains. Data suggests that the concept of urban insecurity needs to be reconsidered in light of illicit supply chains for counterfeit respirators and their role in facilitating disease transmission in urban areas. The analysis presented in this article suggests that threats to human life should not be confined narrowly to violent acts or the consumption of drugs. Human life can also be threatened through the massive distribution of counterfeit N95 masks during a pandemic, a problem that has become more acute with more contagious mutations of COVID-19.

Keywords: illicit trade, corruption, financial crime, supply chains, COVID-19

¹ This work has been supported in part by National Science Foundation under Award# 2039779, D-ISN: TRACK 1: Collaborative Research: An Interdisciplinary Approach to Understanding, Modeling, and Disrupting Drug and Counterfeit Illicit Supply Chains.

² Dr. Layla Hashemi, Researcher and Data Analyst, Terrorism, Transnational Crime and Corruption Center (TraCCC), George Mason University, email: lhashem2@gmu.edu, ORCID ID: <https://orcid.org/0000-0003-4906-5756>

³ Dr. Edward Huang, Associate Professor, Terrorism, Transnational Crime and Corruption Center (TraCCC), George Mason University, email: chuang10@gmu.edu, ORCID ID: <https://orcid.org/0000-0003-0893-2112>

⁴ Dr. Louise Shelley, University Professor, Director, Terrorism, Transnational Crime and Corruption Center, George Mason University, lshelley@gmu.edu, <https://orcid.org/0000-0002-8113-796X>

Introduction

For centuries in western literature and historical analyses, the urban environment has been portrayed as one with high levels of insecurity. The novels of Charles Dickens and Victor Hugo paint pictures of cities filled with violent and property crime and oftentimes political instability. At the same time, popular science books such as *Rats, Lice and History* (Zinsser 2007) and more recent scholarship reveal the impact of plagues and disease on urban environments (Engelmann et al. 2018; Barnes 2006; Armus 2011). Therefore, urban insecurity has been conceived as a problem not only of criminality but also one of disease. The same situation can be observed today with not only higher initial rates of COVID-19 infection in heavily populated urban areas of the United States but also higher rates of homicide. The COVID-19 pandemic has not only negatively impacted public health, but also increased violence. There was a sharp rise in domestic violence worldwide during the pandemic (Taub 2020) and the number of homicides in American cities increased 42% from 2019 to 2021 (Rosenfeld and Lopez 2021). But the contemporary health crisis has also been accompanied by the rise of counterfeit and inferior personal protective equipment (PPE) that has likely contributed to the spread of the disease by failing to protect those most exposed to the disease--medical personnel and first responders. These illicit activities are often facilitated by corruption, fraud, and other forms of financial crime.

COVID-19, since its inception, began as an urban problem as the virus was first identified in Wuhan, China. The deadly virus subsequently spread through major cities around the world. As UN Secretary-General António Guterres explained in his COVID-19 policy brief in July 2020, urban areas were ground zero for the pandemic with over 90 percent of reported cases concentrated in cities (UN News 2020). Cities, where over half of the world's population lives, were at the frontline of the crisis with dwindling economic activity, high infection rates and inadequate

resources (World Bank 2021). According to the Center for Disease Control (CDC), COVID-19 infection rates were initially highest in US metropolitan areas and did not spread on a significant scale to rural areas until September 2020 (CDCMMWR 2020).

Compounding the impact of the disease, especially before the availability of vaccines and treatments, was the unavailability of PPE needed on a large scale by medical personnel. Enhanced production of these supplies was required, but legitimate production did not meet demand. Instead, massive inferior counterfeit production rapidly developed, primarily in urban areas in southern China, to meet the global demand. Unfortunately, this PPE, often deceptively marked as known brands was produced of inferior materials as revealed by laboratory reports and could not protect users from the disease (Proffitt, E. 2020). Based on the team's analysis of the supply chains of the seized counterfeit masks, eighty percent of identified counterfeit masks in global supply chains originated from the urbanized southeast of China. Their locales could be identified because almost all sources of counterfeits were registered companies in China.

In the first two months of 2020, almost 9,000 Chinese manufacturers started producing masks according to the business data platform Tianyancha (BBC 2020). These manufacturers included both those producing masks for the general market and those who labelled their goods with the names of established and known manufacturers, thereby producing counterfeits. Our research focuses only on a subset of those 9,000 manufacturers. The percentage of these new manufacturers that were counterfeiting 3M products is unknown, but analyses of supply chains reveal that shipments often consisted of production from different factories and the supply chain could not be traced back to one unique site. These counterfeits, according to invoices, shipping documents, and laboratory investigation reports examined by the researchers, revealed that manufacturers did not just violate intellectual property rights by deceptively labelling and boxing

their products with the names of well-known manufacturers, but these mass-produced counterfeits failed to protect medical and emergency providers, their intended market. Counterfeit masks examined under a microscope revealed that some were comprised of sometimes no more than tissue paper. Although the direct impact of the counterfeit medical masks on human life cannot be precisely calculated, there were many deaths of medical personnel from COVID-19. From January through May 2021, between 80,000 and 180,000 medical workers globally lost their lives (UN News 2021). This rate might have been lower if medical personnel had access to highly effective masks.

Counterfeit masks were distributed on a massive scale. The scale of confiscations of these counterfeit products suggests the enormity of the global illicit supply chain, a distribution that was enhanced by sale through online platforms, marketplaces, and social media sites. By October 2021, over 55 million counterfeit and inferior medical-grade masks fraudulently labelled 3M were seized globally, often through raids or customs seizures, particularly in larger cities. The figure of 55 million is likely a small proportion of the total number of counterfeit masks that were produced and shipped globally if the low confiscation rate for other illicit products provides insight into the low likelihood of disrupting illicit supply chains. The marketing of counterfeit PPE also benefited from existing supply chains for illicit commodities, as the research done for this study found that the illicit trade in PPE sometimes converged with other forms of illicit trade such as counterfeit pharmaceuticals and controlled substances in the United States such as Xanax whose possession without a prescription is illegal.

This article focuses on how urban areas are major conduits for the entry of counterfeit and inferior masks into the legitimate supply chains of hospitals and medical facilities. Insecurity from counterfeit N95 masks represents a new type of urban threat by increasing the risk of disease

through the distribution of counterfeits. The CDC (Center for Disease Control) suggests 60% of KN95 medical respirators in the United States are counterfeit and do not meet NIOSH requirements (CDC 2020) although many respirators are deliberately falsified to state that they are “NIOSH-approved” when they did not meet the standards of the CDC (CDC 2021). This research reveals that insecurity occurs not just in “hotspots of crime” with elevated levels of violence and ordinary crime (Eek et al. 2005). Insecurity was compounded during the pandemic by the storage of large quantities of counterfeit medical grade masks in warehouses in urban and exurban areas. Therefore, the city in the COVID-19 pandemic was not just the locale of intense infection but also a key hub of a crime rarely associated with criminal insecurity in the developed world. Whereas many cities in Africa and elsewhere confront the sale of harmful counterfeit medicines and vaccines (Bhalla, 2021) needed for the treatment of infectious diseases, the harmful health consequences of counterfeits for contagious diseases were not a significant challenge in the cities in developed world previously as tight controls have been maintained on the supply chains for medical products in most industrialized countries. In addition, as consumers increasingly purchase products online and through third-party distributors, counterfeit respirators in industrialized countries received increasing public attention during the pandemic. While the PPE industry is legal, abuse of legitimate brands producing respirators has resulted in increased threats to public safety during a global health crisis.

Methods and Data

This study is based on over eight months of intensive research using data provided regularly to the authors by 3M. This partnership followed a data sharing agreement between 3M in the United States and our research team. Data was also provided by Legit Script, a compliance company that

monitors online platform and payments in high-risk industries such as pharmaceuticals for illicit or other problematic activities. Our access to data was also enhanced by a public-private partnership agreement. The purpose of this data sharing agreement was to introduce advanced data analytics to help understand and dismantle the complex and often sophisticated supply chains for counterfeit masks threatening public health in the midst of the pandemic. Global business data provided under contract by Sayari Graph helped us analyze cross-border corporate structures. This data allowed us to the location of seizures, the timing and quantity of seizures.

Apart from the actual data concerning the intercepted shipments, 3M provided intercepted masks to the George Mason team. A detailed microscopic analysis was done of the counterfeits and compared to the structure of an actual 3M medical mask. This analysis revealed that the counterfeit masks lacked the complex structure of authentic 3M masks needed to prevent the disease. In the most extreme cases, the counterfeit mask was composed only of tissue paper.

To unravel the supply chains, the authors used both public, online and corporate data to determine how counterfeit respirators were transported from source, through transit and ultimately entered legitimate supply chains to reach markets. Data was global including reported seizures of 3M masks in China, the US and global markets. As in most cases of counterfeits and other illicit products, only a subset of total supply was confiscated. Therefore, we have necessarily only a partial picture of the locales where counterfeits were seized. Seizures were greatest in countries with well-equipped and trained law enforcement but was by no means confined to those locales.

The following process was used to analyze the role of urban areas in counterfeit supply chains. First, data on customs, seizures, investigative case files, business registry records and open-source intelligence were collected from corporate partners as well as public records. This data was then analyzed in conjunction with transport and shipping data to reconstruct supply chains of

counterfeit PPE to understand the role of urban areas in this illicit trade and identify key points of production, transit, and entry. Four primary sources of data were analyzed to examine counterfeit supply chains: corporate hotline and investigations data; customs and seizures reports; investigative case files and business registry records; and public or open-source data including but not limited to social media, marketplace, and online activities.

The research focused on a wide range of counterfeit manufacturers. Analysis of producers allowed us to determine that some had engaged in counterfeit activity previously, usually in the clothing and handbag sector. Others were new to the production of counterfeit goods and entered the production of counterfeit PPE shortly. The analysis of their length of involvement in the counterfeit market was done using corporate registry data. This included information from corporate databases such as Sayari Graph which allow for analysis of the links between businesses and the creation of network graphs. The authors used complex data packages that allowed us to track domain names and business registry records of companies in the US, China, Hong Kong, and Taiwan identified in counterfeit supply chains. In these analyses we could see that some companies engaged in counterfeiting shifted their business scope after the advent of the pandemic.

Many counterfeit masks were initially identified through hotlines established by 3M for customers to report on the inferior quality of products purchased. These hotlines helped to specify the infiltration of counterfeits into legitimate supply chains. Authentication methods including test purchases and evaluation by subject matter experts and referencing known lot codes to distinguish false products from genuine. Examined documents included seizures notices from customs agencies and relevant elements of case files including invoices, bills of lading, purchase orders and court documents.

To complement the analysis of customs, seizure and investigative reports, the authors also analyzed domain and other electronic data associated with the counterfeit products sold through online platforms, marketplaces and social networking sites. Domain investigations included analysis of online communication, standalone websites, sales platforms and marketplaces and social media data. Online fora and other websites used to advertise and sell counterfeit medical products were also examined.

The collected data was used to construct counterfeit supply chains by analyzing related shipping, invoice transactions financial records and certification or authentication documents. The authors investigated individual cases and constructed their supply chains. For example, hotline reports helped us to specify the infiltration of counterfeits into legitimate supply chains. The authors also investigated shipping records to identify the transshipment hubs and further trace products back to the original producer. Analysis of the whole process helps us to construct the illicit supply chain from the producers to the infiltration of counterfeits into legitimate supply chains and to identify distribution networks.

To determine the impact of counterfeit supply chains on urban areas, seizure reports comprised the bulk of the data analyzed and were examined at the country and city-level. The researchers also analyzed city-level locations of over 20 million masks in the United States and nearly one million mask seizures in China. Approximately one-third of US seizures and three-quarters of China seizures are omitted from the analysis due to data limitations including the non-reporting of specific city locations and the fact that many of these cases are open and ongoing federal investigations and thus not available for analysis. As previously mentioned, the detection rate for counterfeit commodities is low. Therefore, the actual number of counterfeits entering

supply chains is likely much higher. Nearly all the respirators seized in the data included in this study originated from China.

The Rise of Counterfeit PPE During the Pandemic

The growth of the sale of counterfeit PPE in urban areas was facilitated by a variety of conditions. Increased production, rarely impeded by local law enforcement, nimble distributors, and the growth of e-commerce internationally made it possible to more easily source needed materials and products. Unfortunately, there was limited capacity among platforms to distinguish counterfeits from authentic products. The illicit trade in counterfeit medical masks, often distributed by air transport, managed to reach consumers, and did not face the disrupted supply chains that characterized much of the licit trade during the pandemic. The trade in counterfeit PPE is part of a larger pattern. Counterfeiting has been on the rise in recent years, and it is now the largest form of illicit trade in the world (OECD 2019, Shepard 2018). According to the U.S. Department of Homeland Security (DHS), between 2000 and 2018 seizures of infringing goods at U.S. borders increased 10-fold, from 3,244 seizures per year to 33,810 (DHS 2020). Trade in fake goods was 2.5% of world trade in 2013 and rose to 3.3% in 2019 (OECD 2019). Many counterfeit supply chains originate in Asia, more specifically, China. Eighty percent of the world's counterfeits are produced by China and the U.S. consumes approximately 60-80% of these products (Shepard 2018).

Counterfeit medical masks fit these patterns. According to testimony to the US Congress in late June 2021, the majority of counterfeit respirators and other COVID-related counterfeit products entering US supply chains since the start of the pandemic originated from China (International Trademark Association 2021). The millions of respirators seized, represent only a

small subset, of the counterfeit masks that were imported. Apart from counterfeit PPE, there was also a massive distribution of counterfeit and inferior medicines produced in China and India, especially to the developing world, a business estimated at \$4.4 billion annually (Reitano and Shaw 2021, 134-5).

The incentive for counterfeit production was not just motivated by demand. The profit motive for the production of counterfeit masks was great as significant returns could be made quickly by producing and shipping counterfeit PPE globally (Basu, 2014). Much of the production was in the Guangdong area of Southeastern China, a heavily urbanized area with a long tradition of criminality dating back to the opium wars. There were few restraints in this area on counterfeiting in the period prior to the pandemic and many producers switched from producing one type of counterfeit. This shift was observed through open source and website listings where companies recruited new employees and boasted about expanding their production capabilities through the purchase of new machinery. Although the outcome of this counterfeit production was very different from that of clothing and purses previously produced, some sellers, as seen through posts in Chinese on LinkedIn, Facebook, Shopee, eBay, and other social media platforms in English such as Instagram. Posts on LinkedIn, Facebook, and Instagram sold counterfeit and substandard medical masks with the understanding that they would be acquired by medical distributors who had long-term contracts with hospitals and other medical facilities. Our research revealed that LinkedIn posts linked producers with medical distributors during the PPE shortage of the early stages of the pandemic. Despite complaints by trademark holders in the west to Chinese law enforcement bodies there were few cases of governmental intervention except when the substandard masks were produced and intended for domestic distribution within China. The Chinese government asserted in Spring 2020 that there would be inspection of outgoing shipments

of medical supplies (Bradsher 2020). But the large number of counterfeit seizures internationally after this announcement reveal that there was not the promised level of intervention by the Chinese state. Therefore, for Chinese manufacturers there was little disincentive to participate in either the production or distribution of counterfeit PPE as the government allowed many shipments to leave the country. There were few prosecutions of counterfeiters.

During the pandemic there has been significant global disruption of licit supply chains. Container ships were backed up at ports and many consumer items as well as items needed by manufacturers were in short supply. Container prices have more than doubled since the pandemic began, placing further strain on global supply chains. Importers reported serious shortages of computer chips, kitchenware and toys for children. Yet illicit supply chains for counterfeit PPE thrived in urban areas in many regions of the world as licit supply chains experienced heavy disruption. Many of the masks were so lightweight that they were often transported by air which meant that they were not affected by the slowdown of shipments by sea. The Customs and Border Patrol reports that most counterfeit seizures in the US are of goods arriving by air. Documentation on the seizures reveals that they occurred at or in close proximity to airports which meant they were consistently in urban areas according to documentation provided with the shipments.

Not only were licit supply chains disrupted in the early stages of the pandemic, but businesses were forced to shut down and local stores experienced shortages of supplies. To compensate for the absence of local businesses, individuals shifted purchases to online marketplaces. Overall, global e-commerce sales jumped to \$26.7 trillion in 2019, up four per cent from 2018 (UNCTAD 2021). During the pandemic, growth was even greater in the United States. In the first year of the pandemic, e-commerce was up 36.1% in the third quarter of 2020 over the previous period in the same year and sales totaled about \$200 billion (US e-commerce sales growth

slows down in 2021). These online marketplaces have been highly conducive to the global sale of counterfeit products because it is much more difficult to know the producer and source of the goods and to trace the entire supply chain. Moreover, there is no present legal requirement that online platforms police their sellers to ensure that the products that they are selling are genuine. Therefore, the US Congress is now considering The SHOP SAFE Act that “that seeks to combat the sale of unsafe counterfeit products by providing incentives for online platforms to engage in best practices for screening and vetting sellers and products. This legislation seeks to eliminate counterfeiter sellers, from sales platforms and help consumers make informed decisions in their online purchases (SHOP SAFE Act 2021).

As illicit supply chains were thriving, licit supply chains experienced heavy disruption. Container prices have more than doubled since the pandemic began, placing further strain on global supply chains. Importers reported serious shortages of computer chips, kitchenware, and toys for children. In contrast to these disrupted legal supply chains, exponential growth occurred globally in counterfeit PPE including face masks for medical personnel. These masks were intended to protect medical personnel and emergency responders who were often in close proximity to COVID-19 patients and therefore at heightened risk for exposure and infection. “In 2018, the most recent year for which global trade data are available, China was the estimated source of more than 50 percent of the world’s imports of respirator and surgical masks, medical goggles, and protective garments” (Brown 2020). Our research shows that Chinese vendors have continued to dominate PPE supply chains not only with legitimate products (OECD 2020 “The face mask global value chain in the COVID-19 outbreak”; Xie 2020; Fok 2020), but also through massive production and distribution of counterfeit N95 respirators and medical equipment. Many producers, according to the research conducted through the examination of invoices, shipping

documents and laboratory reports, switched from the production of other areas of counterfeiting such as handbags, shoes and clothing to counterfeiting Covid-related supplies. This is not just an opportunistic switch but it also represents a change in harm from products that are “copies” to those items such as counterfeit PPE that can result in grave harm to end users. Disruptions of legitimate supply chains will likely continue globally, making counterfeit supply chains of PPE during the pandemic an ongoing problem.

Participants Behind this Trade

Many producers, according to the research conducted through the examination of invoices, shipping documents and laboratory reports, as well as corporate registry documents of registered sellers that switched from the production of other areas of counterfeiting such as handbags, shoes, and clothing to counterfeiting Covid-related supplies such as respirators, hand sanitizers, gloves, gowns, test kits and medicines and other medical products. A very limited number offered COVID-19 vaccines. This is not just an opportunistic switch but it also represents a change in harm from products that are “copies” to those items such as counterfeit PPE that can result in grave harm to end users.

Much of the global production and distribution of counterfeit respirators was not tied to organized crime. Rather, this crime was committed and facilitated largely by registered companies such as manufacturers, logistics companies and authentication and certification organizations. Sellers often used multiple shell companies or wholesalers to hide their real identity and avoid detection.

Convergence of illicit trade with other illicit activity was evident in a small subset of the online sellers of counterfeit PPE. For example, one online vendor, not an authorized seller,

advertised the Moderna vaccine alongside listings for marijuana and weapons. Research conducted in coordination with an analyst of online illicit pharmaceutical sites revealed that some sites also advertised illegitimate, fake, or counterfeit medical products and medicines. One social media user advertised fake Xanax and counterfeit respirators on the same account. These results demonstrate that some criminal networks merely switched or added illegal products during the COVID-19 pandemic. While some vendors actually shipped counterfeit products, other sellers ran non-delivery scams to gather personal and banking information for future financial crimes (Schotte and Abdalla 2021). Much of this trade is currently operating on an ad hoc basis.

At a later stage in the supply chain, counterfeit masks and other products were distributed by a variety of actors in different locales. Many distributors in the United States bought large quantities online on sales platforms and then arranged for the transport of the counterfeit masks through third-party logistics companies. Almost all distribution was facilitated through legitimate companies. Very rarely did a person with a criminal record figure in this activity. In contrast to the drug trade, the distribution network in the United States was not facilitated by criminal networks or gangs although some online sellers of drugs did also list counterfeit PPE, as previously mentioned. While some of the counterfeit activity might involve organized crime, much of the trade is occurring through licit channels, demonstrating the harmful consequences of legitimate industries (Passas and Goodwin 2004). Often there was nothing to arouse the suspicion of purchasers that they were dealing with counterfeit product until it entered their supply chains and inferior products were distributed to purchasers who upon receipt determined that the masks were of inferior quality. The American experience contrasts with some examples described in *Criminal Contagion* that draws on analyses of distribution networks in the developing world. In Kenya, for example, criminal gangs were identified as distributors of counterfeit COVID-19 products and

Interpol confiscated counterfeit drugs in 90 countries falsely claiming to treat those affected by the pandemic (Reitano and Shaw, 18-19). In Romania, a known organized crime group was involved in the purchase and distribution of counterfeit masks directly from Asia. Investigators found that 70% of counterfeit masks in Romania were made in China and 90% of products entered the market with non-compliant certificates (Rise Project 2020; RFE 2020). This demonstrates the different types of urban crime, including threats to public health and government misconduct, and the corruption that facilitated the sale of counterfeit PPE in the country.

Therefore, the producers of counterfeit PPE and many of the distributors are not associated with established transnational criminal networks but are rather legitimate Chinese businesses with registered businesses and can be identified through Chinese corporate registries. They are registered and operating in major cities or urbanized areas of China (CDC 2022) and most have not been impeded in their activities by Chinese export regulations and new criminal laws against counterfeiting. Since 2021 in China, the crime of counterfeiting can be punished by up to 10 years in confinement and a fine (Wang and Zhang, 2021). Some counterfeiters of PPE conform to elements of the definition of organized crime within the United Nations Convention on Transnational Organized Crime (UNTOC) Article 2. They consist “of a group of three or more persons that was not randomly formed; existing for a period of time; acting in concert with the aim of committing at least one crime punishable by at least four years' incarceration; in order to obtain, directly or indirectly, a financial or other material benefit” (UNODC 2022).

The Modus Operandi of Illicit Supply Chains

Most counterfeit respirator sales were conducted online during the pandemic. Digital marketplaces and communication platforms were used to advertise products, identify buyers, and complete

financial transactions. Yet many buyers cannot identify the products they order as counterfeits as many closely match the authentic product and cannot be distinguished with only superficial examination from authentic goods unless reviewed by brand owners or experts using a microscope. Also facilitating the sale of counterfeits was the credibility of the source. In 2018, before the pandemic global trade data revealed that China was the source of more than 50 percent of the world's imports of respirator and surgical masks, medical goggles, and protective garments" (Brown 2020).

Key to facilitating the sales and distribution process, as our cyber analysis revealed, were social media platforms run mostly by major technology companies in the US and China. Many vendors cross-listed their products on marketplaces, social media platforms, websites and fora, often using pseudonyms to avoid detection and hide their identities. Analysis of social media led to the take down of over 26,500 fraudulent e-commerce offerings, nearly 25,000 false social media posts and over 400 deceptive internet addresses as of October 2021 advertising counterfeit masks (3M 2021).

Counterfeit trade is often facilitated by false authentication, certificates of origin and other documents in an attempt to make counterfeits appear to be legitimate products and to deceive buyers and customs officials. Vendors often copied official announcements and documents of reputable brands and added fake information and content with varying levels of technical sophistication. Some of these documents certifying the authenticity of products were produced by large registered companies, mostly based in Europe, without examining the quality or legitimacy of products. Much of this false documentation was circulated online. Therefore, many buyers unknowingly purchased fake medical products as online platforms were not properly vetting products being sold and consumers presumed that advertised products were genuine. Because

many sellers used false certificates of authenticity, payment processors were not aware that they were providing services for counterfeit sellers.

The Problem of Counterfeiting as a Form of Illicit Trade

Counterfeiting has been on the rise in recent years and it is now the largest form of illicit trade in the world (OECD 2019, Shepard 2018). According to the U.S. Department of Homeland Security (DHS), between 2000 and 2018 seizures of infringing goods at U.S. borders increased 10-fold, from 3,244 seizures per year to 33,810 (DHS 2020). Trade in fake goods was 2.5% of world trade in 2013 and rose to 3.3% in 2019 (OECD 2019). Illicit trade causes problems for and threatens the security of nearly all countries across the globe. The rapid rise in counterfeits signals that more research is needed to develop effective detection and disruption strategies.

Understanding the trade in counterfeit medical products requires the investigation of illicit supply chains from source through transit and onto destination markets. Many counterfeit supply chains originate in Asia, more specifically, China. Eighty percent of the world's counterfeits are produced by China and the U.S. consumes approximately 60-80% of these products (Shepard 2018). The issue of counterfeiting in China is not new but it has become increasingly important during the COVID-19 pandemic. China plays a particularly large role in the production and export of counterfeit respirators and other medical products. According to testimony to the US Congress in late June 2021, the majority of counterfeit respirators and other COVID-related counterfeit products entering US supply chains since the start of the pandemic originated from China (International Trademark Association 2021). Apart from the counterfeit PPE, there was also a massive distribution of counterfeit and inferior medicines produced in China and India, especially to the developing world, a business estimated at \$4.4 billion annually (Reitano and Shaw 2021,

134-5). Many counterfeits are produced to closely match the authentic product and cannot be distinguished with only superficial examination from authentic goods unless reviewed by brand owners or experts using a microscope. Other authentication methods included test purchases and evaluation by subject matter experts and referencing known counterfeit lot codes to identify false products.

As of August 2021, over 52 million counterfeit 3M respirators were seized globally. Millions more counterfeit respirators have been prevented from entering legitimate supply chains, seized since late August, with over 58 million pieces seized as of May 2022 (3M 2022). The authors' analysis of global transport trade methods documents and trade routes showed that most counterfeits were transported by air to major transport hubs. Most of the seizures in the United States occurred in major cities such as New York, Los Angeles and Baltimore at warehouses near major international airports and more rarely near ports as shipment of masks by ship was relatively rare. This could be explained by the supply chain disruptions to shipping during the pandemic. The United States was also successful in confiscating counterfeit PPE by using advanced data analytics as the corporate world shared data with US law enforcement and the judicial process effectively. This public-private partnership allowed for efficient analysis and investigation of counterfeit PPE cases and improved the development of effective enforcement and disruption strategies.

In China, the country with the second most seizures after the US, counterfeits are mostly confiscated in major cities, close to their production site. Distribution out of China is facilitated by platforms based in the United State and China, reflecting the important role of internet and social media companies in facilitating illicit supply chains. This is seen through the take down of over

26,500 fraudulent e-commerce offerings, nearly 25,000 false social media posts and over 400 deceptive internet addresses as of October 2021 advertising counterfeit masks (3M 2021).

Most counterfeit respirator sales were conducted online. Digital marketplaces and communication platforms were used to advertise products, identify buyers, and complete financial transactions. Cyber analysis revealed that social media platforms, run mostly by major technology companies in the US and China, were widely used to facilitate the trade. Many vendors cross-listed their products on marketplaces, social media platforms, standalone websites and forums, often using pseudonyms to avoid detection and hide their identities. Much of the trade out of China is facilitated by Chinese communication technology services such as WeChat and QQ as well as Chinese marketplaces such as 1688. To reach foreign markets, counterfeit mask sellers also entered global supply chains through advertisements on the platforms of American technology companies such as Facebook and LinkedIn whose services have been used to sell and arrange shipment of these products.

Analyzing Supply Chains for Counterfeit Masks in Urban Areas

Analyses of the illicit supply chains of PPE demonstrate clear geographical patterns and trade routes for these counterfeit products. As shown in Table 1, the major exporter of seized counterfeit respirators was China, while South Korea and Hong Kong were major transshipment points from Asia. Shipments from China and Hong Kong represented over 90 percent of products seized between September 2020-February 2021. Transshipment often occurred through Free Trade Zones (FTZs) to obfuscate trade activity. For example, in several investigated cases, counterfeit supply chain routes included stops in the South Korean FTZ near Incheon Airport. With their limited inspections and lax regulations, free trade zones are also used for transshipment of other counterfeit

and illicit goods and to launder the shipment's provenance by creating false documents to make the products appear to be authentic (OECD 2018).

Transit countries, with high levels of corruption in their customs services, can also serve as key transit hubs. For example, Peru was a frequent transshipment hub and counterfeit masks that transited through Peru were stamped with a suspicious and unauthorized Peru 3M seal that provided a veneer of legitimacy. Of the 28 shipments seized in Peru, 26 were from warehouses in Lima, Peru, thereby conforming to the pattern of the centrality of cities to the counterfeit mask trade. These transportation facilities are common seizure locations and are thus key in the disruption of illicit supply chains. Moreover, in urban locales there is more concentration of law enforcement helping to facilitate more seizures in these areas.

Table 1 - Major Supply Chain Countries

Major Source Country	Major Transit Countries	Major Destination Countries
China	Hong Kong, Peru, South Korea	United States, United Kingdom, countries of EU, Japan, UAE

The majority of counterfeit masks entered the United States via air shipment due to the low weight, and hence relatively low shipping costs, of masks. After arriving as air cargo, masks, usually delivered as part of e-commerce orders, were subsequently transferred to warehouses within urban areas or in exurbia, often close to international airports. However, in some cases, seized respirators entered through maritime vessel shipment.

Respirators entering through major ports are often intended for distribution to hospitals and first responders. Because the masks were needed across the country, many counterfeit masks whose ultimate destination was not identified before entering the US supply chain were subsequently transferred to smaller urban areas. While most of the counterfeits were seized in

urban areas of the United States and China, a small percentage of counterfeit masks were seized in warehouses located in smaller cities where storage rates are lower. In some cases presently under investigation where masks were seized in rural warehouses, it is apparent that there had been several intermediate transfers from the initial point of entry.

Geographic data available from China for approximately one million (of the over four million total) masks seized is presented in Table 2 to determine key seizure locales. In China, the country with the second most seizures after the US, counterfeits are mostly confiscated in major cities, close to their production sites.

Table 2 - China Seizures 2020

Exporting City	Province	Pieces Seized
Ningbo City	Zhejiang Province	303,187
Shenzhen City	Guangdong Province	298,149
Shekou City	Guangdong Province	182,380
Huangpu port	Guangdong Province	160,200
Tianjin City	Tianjin City	21,600
Khorgas	Xinjiang Uyghur Autonomous Region	4,100
Shanghai City	Shanghai City	3,120
Beijing	Beijing City	50
Total		972,786

Almost two-thirds of seizures in China took place in heavily urbanized areas such as Guangdong province, a long-time hub of illicit trade. Shekou, Shenzhen and Huangpu, key hubs of counterfeiting, are all located in southern Guangdong province near Hong Kong, an important transshipment points for counterfeit masks.

Guangdong's involvement in large-scale illicit trade dates back to the first half of the 19th century. The historical importation sites of opium in China have been Guangdong and Fujian first involved in the drug trade and then the export of Chinese labor to the United States in the mid to late 19th century, the so-called "coolie trade". Individuals were packed on ships in Guangdong through force and deception to be sent to California as laborers (Mei 1979). This activity would now be referred to as the crime of human trafficking. The intensely urbanized area of Guangdong is now the locus of large numbers of factories producing a diverse range of counterfeit goods (Levin 2013). In January 2020, three sets of production equipment, plus 175,000 fake N95 masks and 80 cases of raw materials were seized in Guangdong province by the Guangdong Provincial Department of Public Security (Zheng 2020). Yet analysis of illicit supply chains reveals that most production facilities for counterfeit PPE have not been seized or raided by the Chinese authorities. They are still capable of producing tens if not hundreds of millions of masks for global distribution despite detailed reports provided to authorities in the PRC of the locales and involvement of known companies. The 4.7 million masks seized in China were initiated at the behest of the 3M team. They represent just a small fraction production which totaled in the hundreds of millions if not billions of masks.

As shown in Table 3, urban seizure locales were identified for 20 out of the 30 counterfeit million masks seized in the US. Many of the seizures occurred in large cities such as Los Angeles, Houston, Chicago and New York. This means that they were confiscated close to their initial point of entry. Several US cities also served as key transit points for supply chains of counterfeit respirators. These include coastal cities such as Los Angeles (LAX airport), New York (JFK airport) and Baltimore. Other major import cities included Detroit, El Paso, Cincinnati, Houston and Chicago.

Table 3 - US Seizures by City and State (September 2020- September 2021)

City	State	Quantity
Los Angeles	California	10,521,180
Portland	Maine	2,000,000
Hagerstown	Maryland	1,900,000
Queens	New York	1,788,340
Houston	Texas	1,502,380
New York	New York	1,145,520
Seattle	Washington	1,064,000
Chicago	Illinois	965,000
Detroit	Michigan	622,000
Baltimore	Maryland	120,244
El Paso	Texas	100,000
Long Beach	California	57,000
Phoenix	Arizona	38,840
Boston	Massachusetts	24,600
	Total	21,849,104

Based on 2020 and 2021 seizure data, Los Angeles was the top import city for counterfeit respirators, demonstrating the importance of urban areas in facilitating counterfeit supply chains. Los Angeles's location on the west coast made it closer to Asian suppliers. While most US seizures occurred in large metropolitan cities, some key raids were made in smaller urban areas such as Long Beach, California and Eugene, Oregon. With the exception of a large seizure of 1.9 million

masks in Hagerstown, Maryland in early 2021⁵ (Barr 2021), the quantity of masks seized in smaller cities was much lower.

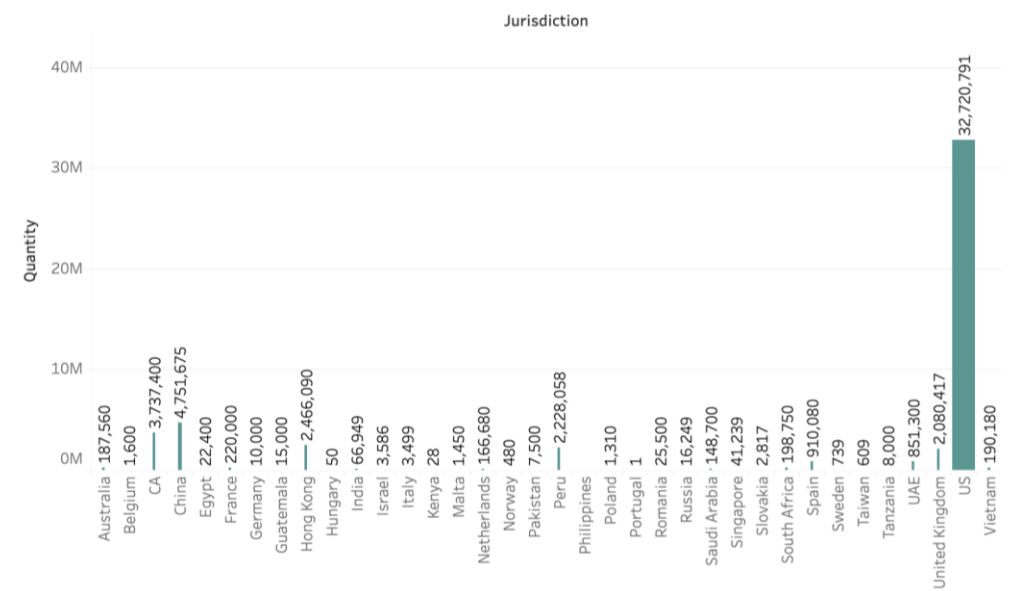
Illustrative of these large seizures are the following cases which have been discussed in the popular press. On September 10, 2020, customs officials at Chicago O'Hare Airport seized a shipment of 500,000 counterfeit N95 respirators being transported from China to New Jersey (Associated Press 2020). At the beginning of 2021, federal agents seized more than 10 million fake 3M N95 masks, including a seizure at an East Coast warehouse nearby a major airport that were sold to hospitals, medical facilities, and government agencies. "Investigators also notified about 6,000 potential victims in at least 12 states including hospitals, medical facilities and others who may have unknowingly purchased knockoffs" (Long 2021). Invoices examined by the research team revealed that hundreds of thousands of dollars were spent by major hospitals in Canada to purchase substandard counterfeit masks. In May 2021, Med-Tech Resource LLC of Eugene, Oregon tried to sell approximately 2 million fake respirators to Portland, Maine (Associated Press 2021). On June 16, 2021, Homeland Security Investigations (HSI) seized the counterfeit masks and recovered over \$3.6 million in state funds used to purchase these PPE materials (ICE 2021). Large seizures continued through the fall of 2021. In August 2021, HSI Chicago agents "interdicted and seized more than 400,000 counterfeit N95 masks valued at \$2 million" before they entered the supply chain and caused further harm to the American public (Velazco 2021, [HSI Chicago Twitter 2021](#)). Counterfeit respirators often abuse legitimate and well-known brands of respirator manufacturing companies such as 3M and Makrite, which is one of the largest respirators companies in Taiwan. More recently, on September 30 2021, federal officials conducted a seizure

⁵ According to the US Census Bureau, Hagerstown, MD has a population of approximately 40,000.

of 622,000 fake N95 masks at a warehouse in Detroit, Michigan. The counterfeit masks were intended for distribution to Detroit’s hospital system (Hicks 2021).

Based on global data on over 52 million seizures presented in Figure 1, top seizure jurisdictions were the US and China. Other regions with a high quantity of seizures include Latin America (e.g., Peru, Colombia) and Europe (e.g., UK, France, and Spain). During this timeframe, over 200,000 respirators exported from Hong Kong were seized in Baltimore, Maryland and El Paso, Texas, both major US cities. South Korea was the third largest exporting country, with a shipment of 127,440 respirators seized in Los Angeles, a small fraction of the total. Our original research on domains and social media accounts confirms China as the top producer and exporter of counterfeit goods. With a particularly large client-base in the United States, Chinese vendors have continued to dominate the global counterfeit market through mass production and manufacturing of respirators and medical equipment (OECD 2020).

Figure 1 - Global Raids and Seizures (February 2020-September 2021)



Based on the global raids and seizures data presented in Figure 1, China is not only the top exporter but also one of the top seizure jurisdictions. China's total number of raids and seizures by quantity, approximately 4.7 million, is second only to that of the United States, which seized over 32 million respirators (over 60% of the global total) as of August 2021.

China represents less than 10% of counterfeit mask seizures worldwide, according to the data assembled by the authors, although it is the source of production of over 80% of such masks, suggesting that local authorities have significant tolerance for counterfeiting in urban areas as production is a driver and employer in the local economy. The quantity of seizures in China and at transshipment hubs are proportionally low as compared with the total seizures. Available data reflects that there were few arrests of the makers of counterfeits and sanctions imposed were light compared to general sentencing patterns in China. For example, a case where a Chinese counterfeiter produced and sold nearly 100,000 respirators, the individual was found guilty of violating national counterfeiting laws but only sentenced to 1 year and 5 months in prison and subject to a RMB210000 (USD\$3,3047) fine.

Canadian, Hong Kong, Peruvian and UK authorities all seized over 2 million counterfeit masks as of August 2021. Hong Kong and Peru were important transshipment points while Canada and the UK were major importers, and their law enforcement capacity has the capacity to detect and seize counterfeit goods. The UAE and Spain also seized nearly 1 million respirators. Other cases involved several European countries including Austria, Romania and Germany, showing the global scope of the trade. In mid-2020, Romanian hospitals purchased approximately one million non-compliant masks, a transaction that was facilitated by a \$860,000 USD bribe made to Adrian Ionel, CEO of Unifarm, the company responsible for handling COVID-19 procurement (Poenariu 2020). The use of bribes to promote the purchase of protective masks that do not meet safety

standards reveals the importance of domestic factors, including corruption, in establishing and maintain counterfeit PPE supply chains in some locales with high levels of corruption.

Conclusion

Urban areas have long been the site of intense epidemics and high rates of mortality such as the bubonic plague during and before the 17th century and subsequently the Spanish flu and polio epidemics. Therefore, city life was insecure as disease might wipe out large proportions of the population. Concurrently, crime and violence are historically higher in urban centers compared to rural locations. Therefore, the COVID-19 pandemic recalled earlier historical periods as COVID had devastating effects on many around the world with high rates of infection and mortality. At the same, the often high levels of urban insecurity from crime became more pronounced as elevated homicide rates were noted in many locales during the pandemic.

Therefore, the analysis presented in this article of the intense rise of harmful counterfeits represents a different paradigm of urban insecurity in the industrialized world. In the past, urban insecurity was compromised by two separate phenomena--high rates of contagious disease and high rates of ordinary criminality--violent and property crime. But during the COVID-19 pandemic, the massive growth and dissemination of counterfeits to and through cities in the industrialized world resulted in a linked phenomenon. Health outcomes were negatively impacted by the distribution of substandard masks. Therefore, the crime of disseminating counterfeit PPE compounded the harmful outcomes of the pandemic.

The ability of the United States to confiscate the largest number of counterfeit respirators in the world was not just a consequence of the country being a likely market for large quantities of counterfeit PPE. The United States was also successful in confiscating this massive amount of

PPE because advanced data analytics conducted in cooperation with the corporate world was shared with US law enforcement and the judicial process effectively. This allowed for the seizure of counterfeits before they left urban storage facilities and entered into the supply chains for hospitals and medical providers. Many other developed countries were far less successful in preventing the entry of the products although counterfeit masks were confiscated in Montreal, Canada and airports in Australia (Greene 2020). But in several European countries imported masks were removed from circulation only in a late stage of the supply chain shortly before large-scale distribution to retailers (BBC 2021).

This research on the massive entry of counterfeit masks into urban supply chains requires us to think about threats to human security and urban life in a new way. While much attention has been paid to the rise of urban violence (Reitano and Shaw 2021) and drug use (Kenney 2021) during the pandemic, another important source of urban insecurity - the importation of unprecedented quantities of counterfeit and life-threatening products into supply chains - has been generally overlooked except by law enforcement. While problems related to counterfeit medical products have historically plagued the developing world, the COVID-19 pandemic had a strong negative impact on urban security in both the developing and developed world. The rise and dissemination of counterfeit respirators to medical personnel reflects a need to expand the understanding of IPR beyond that of a trademark violation to include related health and safety risks and a broader concept of urban insecurity, not based solely on threats of violence. Our understanding of the centrality of urban warehouses in developed countries as entry points to the supply chains for hospitals and medical providers of counterfeit and inferior products that are harmful to life also makes us rethink what policing must be done to increase human security in affluent societies.

The research forces us rethink the actors engaged in transnational crime, the enablers and the role that corruption plays in their ability to engage in illicit commerce. The trade in counterfeit medical masks analyzed in this article falls under the United Nations definition of transnational organized crime. But it is not committed by actors with criminal records or those traditionally associated with criminal activities. Our research and analysis reveal that almost all involved in this illicit trade along the entire supply chain were registered companies. This research has identified a serious and significant global problem. Online platforms can sell substandard goods that are labelled as reputable brands but lack the quality control of these legitimate producers. This makes it harder for consumers to prevent buying harmful and dangerous counterfeit products. On some platforms, the sale of counterfeit goods converges with other forms of crime. Therefore, we are seeing a problem not adequately addressed in the criminological or policy literature—the role of registered companies in the trade of counterfeits.

Recommendations

This study led to several important findings which can help inform future investigation of illicit supply chains, and in particular, the trade in counterfeit medical products. They lead to the following recommendations:

- 1) Expand the Concept of Urban Insecurity. The concept needs to be expanded beyond health pandemics, violent crime and political unrest. Interpol through its Pangea operations has focused significant efforts only on removing counterfeit medicines from supply chains, in urban areas in the developing world. Law enforcement action must also include counterfeit products and medical equipment disseminated throughout the world.

- 2) Expand our Concept of Counterfeiting Beyond the Concern for Intellectual Property Rights (IPR). The problem of counterfeit medical products and supplies needs to be reconceptualized not just as a problem of IPR rights but as a serious threat to global health and human security. Trading in counterfeit medical supplies must be viewed as a crime that can contribute to the death and illness of medical personnel. Dissemination of these products may contribute to the spread of disease and the case of counterfeit medicines, may create resistance to effective treatments.
- 3) Illicit Supply Chain Analysis Must be Expanded. Responses to-illicit supply chains needs to be more proactive and more data-driven. More attention must be paid to the whole illicit supply chain starting at the source and to its entry into legitimate supply chains. Addressing the facilitating corruption must also be prioritized.
- 4) Legislation to Address Online Sales of Counterfeits. Proposed American legislation such as The Integrity, Notification, and Fairness in Online Retail Marketplaces for Consumers (INFORM Consumers) Act that requires the vetting of third-party sellers on platforms and the SHOP Safe Act intended to help regulate online platforms and hold them accountable for facilitating the distribution of counterfeit products are important first steps (Lima 2021). Such laws are needed not only in the United States but globally.
- 5) Greater Regulation of Free Trade Zones and Transshipment Locations. Many harmful counterfeits pass through Free Trade Zones used as transshipment points in order. Proper inspection of goods in transit and the ability of governments to seize harmful products in transit to other countries is needed to ensure that quality products enter global supply chains.

- 6) Need to Use and Apply Large Scale Data Analytics. Massive global illicit supply chains can only be addressed through large scale data analytics. Advanced analytic products and methods facilitate efficient processing and evaluation of large datasets and help to quickly and efficiently identify counterfeit producers, their supply chains, and their networks-
- 7) Augment Resources and Training for Law Enforcement in IPR Criminal Activity. Law enforcement needs to be trained to use and apply large scale data analytics and must have the resources to pursue counterfeits, especially those that threaten health, safety, and security. They must focus not just on criminal networks but also the registered legal companies involved in producing harmful counterfeits and the enablers of this trade (Vogl 2021).
- 8) More Active Role of The World Trade Organization and other IGOs. The World Trade Organization (WTO) and other intergovernmental organizations (IGOs) must take a more active role in addressing the counterfeit trade, especially the trade in counterfeit medical supplies.
- 9) Technology Companies Must be More Proactive. Technology companies must move rapidly and proactively to remove counterfeit products from their platforms and social media sites. Technology companies should also enter into data sharing agreements with academia and other sectors to tackle the problem upstream before dangerous products are listed and advertised for purchase.
- 10) Foster Public-Private Partnerships and Cross-Sector Collaborations. Partnerships among academia, government, and the private sector are key in providing data for analysis as seen through the findings in this article. They need to be replicated for other counterfeits and products.

Acknowledgements: This work was supported by the National Science Foundation in the United States under Award D-ISR-2039779: Collaborative Research: An Interdisciplinary Approach to Understanding, Modeling, and Disrupting Drug and Counterfeit Illicit Supply Chains. The research for this article was made possible by a data sharing agreements and partnership between 3M, Legit Script, and George Mason University (GMU).

References

- 3M (2021) *3M PPE How to identify fraudulent offers, counterfeit products and price gouging*. Available at: https://www.3m.com/3M/en_US/worker-health-safety-us/covid19/covid-fraud/.
- Anzoom, R., Nagi, R. and Vogiatzis, C. (2021) 'A Review of Research in Illicit Supply-Chain Networks and New Directions to Thwart them', *IISE Transactions*, pp. 1–59. Doi:10.1080/24725854.2021.1939466.
- Armus, Diego. (2011) *The Ailing City: Health, Tuberculosis, and Culture in Buenos Aires, 1870-1950*. Durham ; London: Duke University Press.
- Associated Press (2020) *Officials: 500,000 counterfeit N95 masks seized in Chicago, AP NEWS*. Available at: <https://apnews.com/article/health-virus-outbreak-archive-chicago-8b265381079292b7d6eee6a2fcbd7d5b>.
- Associated Press (2021) "Feds Seize \$3.6M from Company over Sale of Fake N95 Masks." AP NEWS. May 18, 2021. <https://apnews.com/article/coronavirus-pandemic-health-41c122c09411d9c179ed9700464d9b81>.
- Barnes, David S. 2006. *The Great Stink of Paris and the Nineteenth-Century Struggle against Filth and Germs*. Baltimore: Johns Hopkins University Press.
- Barr, L. (2021) *DHS seizes 10 million counterfeit 3M N95 masks, some possibly headed to hospitals, ABC News*. Available at: <https://abcnews.go.com/Politics/dhs-seizes-10-million-counterfeit-3m-n95-masks/story?id=75968574>.
- Basu, Gautam (2014) "Concealment, Corruption, and Evasion: A Transaction Cost and Case Analysis of Illicit Supply Chain Activity." *Journal of Transportation Security* 7 (3): 209–26. <https://doi.org/10.1007/s12198-014-0140-8>.
- BBC (2020) *Coronavirus: French police seize 140,000 black market masks – BBC News*. Available at: <https://www.bbc.com/news/world-europe-52430738>.
- Bhalla, N. (2021) 'Vaccine Grabbing' Seen Fueling Risk of Fake Covid-19 jabs in Africa," April 9, Available at: <https://www.reuters.com/article/us-health-coronavirus-vaccine-africa/vaccine-grabbing-seen-fueling-risk-of-fake-covid-19-jabs-in-africa-idUSKBN2BW231>.
- Bichler, G., Malm, A. and Cooper, T. (2017) 'Drug supply networks: a systematic review of the organizational structure of illicit drug trade', *Crime Science*, 6(1), p. 2. Doi:10.1186/s40163-017-0063-3.
- Bradsher, Keith. 2020. "China Delays Mask and Ventilator Exports After Quality Complaints – The New York Times." April 11, 2020. <https://www.nytimes.com/2020/04/11/business/china-mask-exports-coronavirus.html>.

- Brown, C. (2020) *China should export more medical gear to battle COVID-19*, PIIE. Available at: <https://www.piie.com/blogs/trade-and-investment-policy-watch/china-should-export-more-medical-gear-battle-covid-19>.
- CDC (2022) “Counterfeit Respirators / Misrepresentation of NIOSH-Approval | NPPTL | NIOSH CDC.” January 31, 2022. <https://www.cdc.gov/niosh/npptl/usernotices/counterfeitResp.html>.
- CDC (2020) *COVID-19 and Your Health*, Centers for Disease Control and Prevention. Available at: <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/types-of-masks.html> (Accessed: 5 October 2021).
- CDCMMWR (2020) ‘COVID-19 Stats: COVID-19 Incidence, by Urban-Rural Classification — United States, January 22–October 31, 2020’, MMWR. Morbidity and Mortality Weekly Report, 69. Doi:10.15585/mmwr.mm6946a6.
- Cho, S.-H., Fang, X. and Tayur, S. (2015) ‘Combating Strategic Counterfeiters in Licit and Illicit Supply Chains’, *Manufacturing & Service Operations Management*, 17(3), pp. 273–289. Doi:10.1287/msom.2015.0524.
- DHS (2020) *Combating Trafficking in Counterfeit and Pirated Goods*. Available at: https://www.dhs.gov/sites/default/files/publications/20_0124_plcy_counterfeit-pirated-goods-report_01.pdf (Accessed 13 February 2022).
- Dickens, C., Tillotson, K. and Gill, S. (2008) *Oliver Twist*. Reissued. Oxford: Oxford Univ. Press (Oxford world’s classics).
- Eck, J.E. *et al.* (2005) ‘Mapping Crime: Understanding Hot Spots’, p. 79.
- Engelmann, Lukas, John Henderson, and Christos Lynteris, eds. 2018. *Plague and the City*. 1st ed. Abingdon, Oxon ; New York, NY : Routledge, 2018. | Series: The body in the city: Routledge. <https://doi.org/10.4324/9780429450044>.
- Fok, Patrick. 2020. “China Dominates the Pandemic PPE Market. What Does That Mean for U.S. as Virus Surges?” PBS NewsHour. October 27, 2020. <https://www.pbs.org/newshour/show/china-dominates-the-pandemic-ppe-market-what-does-that-mean-for-u-s-as-virus-surges>.
- Greene, A. (2020) “‘Dodgy’ coronavirus protective equipment from China seized at Australian border”, ABC News, 1 April. Available at: <https://www.abc.net.au/news/2020-04-01/coronavirus-chinese-ppe-border-force-intercepted/12085908>.
- Hicks, M. (2021) *Feds find 622K fake N95 masks intended for hospital system at Detroit warehouse*, The Detroit News. Available at: <https://www.detroitnews.com/story/news/local/wayne-county/2021/09/30/feds-find-622-000-fake-n-95-masks-detroit-storage-facility/5938924001/>.
- Hugo, V. (1964) ‘*Les misérables*’, Washington Square Press.
- ICE (2021) *Millions of counterfeit masks seized during operation in Maine*. Available at: <https://www.ice.gov/news/releases/millions-counterfeit-masks-seized-during-operation-maine>.
- International Trademark Association (2021) *Congressional Trademark Caucus Briefing: Addressing the Impact of Counterfeiting on Brand Owners and Consumers During the COVID-19 Pandemic*, International Trademark Association. Available at: <https://www.inta.org/events/congressional-trademark-caucus-briefing-addressing-the->

[impact-of-counterfeiting-on-brand-owners-and-consumers-during-the-covid-19-pandemic/](#).

- Kenney, S. (2021) COVID-19 Pandemic Results in Increased Substance Use Among Regular Drug Users, *Pharmacy Times*. Available at: <https://www.pharmacytimes.com/view/covid-19-pandemic-results-in-increased-substance-use-among-regular-drug-users>.
- Levin, Ned (2013) “China’s Counterfeits in the Spotlight.” *Financial Times*, November 26, 2013.
- Lima, C. (2021) ‘Tech companies face another liability threat, this time over counterfeit goods’, *Washington Post*, 30 September. Available at: <https://www.washingtonpost.com/politics/2021/09/30/tech-companies-face-another-liability-threat-this-time-over-counterfeit-goods/>.
- Long, Colleen (2021) “More than 10 Million Fake N95 Masks Seized by US Government in COVID-19 Probe – Chicago Tribune.” February 21, 2021. <https://www.chicagotribune.com/coronavirus/ct-aud-nw-gov-seize-fake-n95-masks-probe-20210217-xsnneu3alnezlohxhqiqdzoza5e4-story.html> (Accessed 13 February 2022)
- Madancy, J. (2001) ‘Unearthing Popular Attitudes toward the Opium Trade and Opium Suppression in Late Qing and Early Republican Fujian’, *Modern China*, 27(4), pp. 436–483.
- Mei, June (1979) “Socioeconomic Origins of Emigration: Guangdong to California, 1850–1882.” *Modern China* 5 (4): 463–501.
- “Mississippi Pharmacist and Louisiana Marketer Plead Guilty to More Than \$180 Million Health Care Fraud Scheme.” 2021. August 25, 2021. <https://www.justice.gov/opa/pr/mississippi-pharmacist-and-louisiana-marketer-plead-guilty-more-180-million-health-care-fraud>.
- OECD and European Union Intellectual Property Office. 2018. *Trade in Counterfeit Goods and Free Trade Zones: Evidence from Recent Trends*. Illicit Trade. OECD. <https://doi.org/10.1787/9789264289550-en>.
- OECD (2019) “Trade in Fake Goods Is Now 3.3% of World Trade and Rising – OECD.” March 18, 2019. <https://www.oecd.org/newsroom/trade-in-fake-goods-is-now-33-of-world-trade-and-rising.htm>.
- OECD (2020) “E-Commerce in the Time of COVID-19.” OECD. October 7, 2020. <https://www.oecd.org/coronavirus/policy-responses/e-commerce-in-the-time-of-covid-19-3a2b78e8/> (Accessed 13 February 2022).
- OECD (2020) *The face mask global value chain in the COVID-19 outbreak: Evidence and policy lessons*, OECD. Available at: <https://www.oecd.org/coronavirus/policy-responses/the-face-mask-global-value-chain-in-the-covid-19-outbreak-evidence-and-policy-lessons-a4df866d/>.
- OECD (2020) *Trade interdependencies in Covid-19 goods*, OECD. Available at: <https://www.oecd.org/coronavirus/policy-responses/trade-interdependencies-in-covid-19-goods-79aaa1d6/>.
- Passas, Nikos, and Neva R. Goodwin, eds. (2004). *It’s Legal but It Ain’t Right: Harmful Social Consequences of Legal Industries*. Evolving Values for a Capitalist World. Ann Arbor: University of Michigan Press.

- Poenariu, A. (2020) Coronavirus: Test Shows Romania Imported Non-compliant Masks. Available at: <https://www.occrp.org/en/daily/12641-coronavirus-test-shows-romania-imported-non-compliant-masks>.
- Reitano, Tuesday, and Mark Shaw (2021) *Criminal Contagion: How Mafias, Gangsters and Scammers Profit from a Pandemic*. London: Hurst & Company.
- RFE. (2020) “Romanian State-Run Company Boss Faces Graft Charges Over Coronavirus Mask Deal,” June 23, 2020, sec. Romania. <https://www.rferl.org/a/romanian-state-run-company-boss-faces-graft-charges-over-coronavirus-mask-deal/30686939.html>.
- Rise Project (2020) ‘Chinese Invasion’, Rise Project, 29 July. Available at: <https://www.riseproject.ro/articol/invazia-chineza/>.
- Rosenfeld, R. and Lopez, E. (2021) ‘Update: Pandemic, Social Unrest, and Crime in U.S. Cities’, Council on Criminal Justice, 29 July. Available at: <https://counciloncj.org/impact-report-1/> (Accessed: 22 October 2021).
- Schotte, T. and Abdalla, M. (2021) ‘The impact of the COVID-19 pandemic on the serious and organised crime landscape’, European Law Enforcement Research Bulletin, (SCE 5).
- Shepard, W. (2018) *Meet The Man Fighting America’s Trade War Against Chinese Counterfeits (It’s Not Trump)*. Available at: <https://www.forbes.com/sites/wadeshepard/2018/03/29/meet-the-man-fighting-americas-trade-war-against-chinese-counterfeits/?sh=4edc89001c0d>.
- “SHOP SAFE Act of 2021.” (2021) https://judiciary.house.gov/uploadedfiles/shop_safe_2021_-_one_page.pdf.
- Struett, David (2021) “65K Counterfeit N95 Masks Seized at O’Hare Airport - Chicago Sun-Times.” *Chicago Sun Times*, March 5, 2021. <https://chicago.suntimes.com/news/2021/3/5/22315472/counterfeit-n95-masks-seized-ohare-airport-ppe>.
- Taub, A. (2020) A New Covid-19 Crisis: Domestic Abuse Rises Worldwide: The Interpreter, New York Times (Online). New York, United States: New York Times Company. Available at: <http://www.proquest.com/central/docview/2386303659/abstract/A63F5CEA8E464E9E/PQ/1>.
- UNCTAD (2021) *Global e-commerce jumps to \$26.7 trillion, COVID-19 boosts online sales*. Available at: <https://unctad.org/news/global-e-commerce-jumps-267-trillion-covid-19-boosts-online-sales>.
- UN News (2020) Coronavirus: Reshape the urban world to aid ‘ground zero’ pandemic cities, UN News. Available at: <https://news.un.org/en/story/2020/07/1069041>.
- UN News (2021) *Up to 180,000 health workers may have died from COVID-19*, UN News. Available at: <https://news.un.org/en/story/2021/10/1103642>.
- UNODC (2022) “Transnational Organized Crime.” 2022. <https://www.unodc.org/ropan/en/organized-crime.html>.
- US Census Bureau The Website Services & Coordination Staff (2021) *Census Bureau Home Page*. Available at: <https://usatrade.census.gov/>.
- US e-commerce sales growth slows down in 2021 holiday season: Report (2021) December 28, Available at: <https://www.business-standard.com/article/international/us-e-commerce-sales-growth-slows-down-in-2021-holiday-season-report->

- [121122800199_1.html#:~:text=The%20US%20reported%20%24214.6%20billion,of%20Commerce%20on%20November%2018.](#)
- Velazco, Chris (2021) “Finding Reliable Masks Online Can Be Tricky. Here Are Tips That Can Help.” *Washington Post*, August 21, 2021. <https://www.washingtonpost.com/technology/2021/08/21/n95-kn95-masks-online-shopping-tips/>.
- Vogl, F. (2021) *The enablers: how the West supports kleptocrats, facilitates money-laundering and corruption, and endangers our democracy*. Lanham, Maryland: Rowman & Littlefield.
- Wang, Xiao and Zhang, Yan (2021) “Prosecuting Trademark Owners in China, August 19, 2021, Available at: <https://www.managingip.com/article/b1t6m5f7ntq5bx/prosecuting-counterfeiters-by-trademark-owners-in-china#:~:text=Criminal%20Procedural%20Law%20of%20China,to%20criminally%20prosecute%20trademark%20infringement>.
- World Bank (2021) Future of Cities Will Shape Post-COVID-19 World, World Bank. Available at: <https://www.worldbank.org/en/news/feature/2021/03/02/future-of-cities-will-shape-post-covid-19-world>.
- WTR (2021) Collaboration and consumer safety: insights from 3M, WTR’s 2021 North America Team of the Year | World Trademark Review. Available at: <https://www.worldtrademarkreview.com/anti-counterfeiting/collaboration-and-consumer-safety-insights-3m-wtrs-2021-north-america-team-of-the-year>.
- Xie, John. (2020) “World Depends on China for Face Masks But Can Country Deliver?” VOA. March 19, 2020. https://www.voanews.com/a/science-health_coronavirus-outbreak_world-depends-china-face-masks-can-country-deliver/6186071.html.
- Zheng, Caixiong (2020) “Counterfeit Mask Production Base Busted in Guangdong.” *China Daily*. January 21, 2020. <https://www.chinadaily.com.cn/a/202001/31/WS5e33ce45a310128217273df5.html>.
- Zinsser, H. (2007) *Rats, lice, and history*. London: Routledge.