

A Literature Review of the United States of America's Reliance on Imported Covid Personal Protective Equipment During the Pandemic

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ABSTRACT

This paper provides a literature review of United States of America's reliance on imported Covid Personal Protective Equipment (PPEs) during the Covid pandemic. The abstracted and cited articles show that the United States was too reliant on imported PPEs, primarily imported from Asia which led to shortages as the cases of Covid surged at various points during the waves of Covid cases. This supply and demand imbalance was not just an inconvenience such as the toilet paper shortage and other supply chain disruptions of basic commodities; this supply and demand imbalance had life and death impacts for many first responders, health care workers, nurses, doctors, and the general public in the US. There was a US Congressional Report prepared on US reliance on imported PPEs due to the national impact of overreliance on imported PPEs. Also, Federal Covid Pandemic policymakers, like Dr. Fauchi, one of the lead members of the White House Coronavirus Task Force were questioned during Congressional Hearings on the matter. This paper presents key graphs to visually display the changes in supply and demand over the duration of the pandemic. As many health professionals predict the possibility of future pandemics, there is a continued need to have US self-reliance on domestic produced PPEs. The paper concludes with an assessment that the US still needs to make further changes in federal manufacturing and health care public policy to become less reliant on imported PPEs for the next pandemic occurrence.

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Introduction

This paper provides a literature review of United States of America reliance on imported Covid Personal Protective Equipment (PPEs) during the Covid pandemic. The abstracted and cited articles show that the United States was too reliant on imported PPEs, primarily imported from Asia which led to shortages as the cases of Covid surged at various points during the waves of Covid cases. This supply and demand imbalance was not just an inconvenience such as the toilet paper shortage and other supply chain disruptions of basic commodities; this supply and demand imbalance had life and death impacts for many first responders, health care workers, nurses, doctors, and the general public in the US. There was a US Congressional Report prepared on US reliance on imported PPEs due to the national impact of overreliance on imported PPEs. Also, Federal Covid Pandemic policymakers, like Dr. Fauchi, one of the lead members of the White House Coronavirus Task Force were questioned during Congressional Hearings on the matter. This paper presents key graphs to visually display the changes in supply and demand over the duration of the pandemic. As many health professionals predict the possibility of future pandemics, there is a continued need to have US self-reliance on domestic

produced PPEs. The paper concludes with an assessment that the US still needs to make further changes in federal manufacturing and health care public policy to become less reliant on imported PPEs for the next pandemic occurrence.

Literature Review

This paper presents a literature review of articles and reports related to US reliance on imported PPEs during the Covid Pandemic. Given the overlap in content of various articles, a few selected articles are presented in an abstracted format. Relevant graphs and charts from the articles and reports are included to visualize the US PPEs supply and demand imbalance over the duration of the Covid Pandemic.

As difficulties with domestic PPE production and distribution persist as a challenge, it has become increasingly clear that the US needs to consider diverse policy options to effectively address future pandemics. The American Medical Manufacturers Association (AMMA), an organization that helps sustain domestic ownership and production of PPE production advocates for PPE reshoring in order to prevent countries like China from suffocating the PPE manufacturing industry. The AMMA states that China undermines the success of American companies by flooding US markets with low-cost PPE products [1]. During the pandemic in

2020, the US immediately recognized that prevalent outsourcing of the medical sector might not be the best approach as demand for protective equipment and testing supplies reached a historic peak. The US government aimed to refine future readiness levels in late 2020, as the Department of Health and Human Services (HHS) launched seed investments in roughly 60 companies within the following categories: PPE capacity and raw materials (\$1,284 Million), therapeutic supplies and Materials (\$272 Million), vaccine supplies and materials (\$213 Million), and testing capacity and materials (\$2,023 Million) [2]. These allocations were set to initiate reshoring in order to ensure a modest amount of domestic production for vital medical equipment for future pandemic-like events.

Despite the early signs of progress with greater activity surrounding reshoring manufacturing for critical medical supplies, most commercial buyers have completely shifted back to purchasing cheap imports from Southeast Asia. China is currently a dominant supplier of PPE to the US and has achieved a high percentage of market share through a blend of greater production capacity and sharply low prices. Figure: 1 displays how China strategically used pricing in late 2021 to offer lower rates than competing countries and ultimately increase their market share.

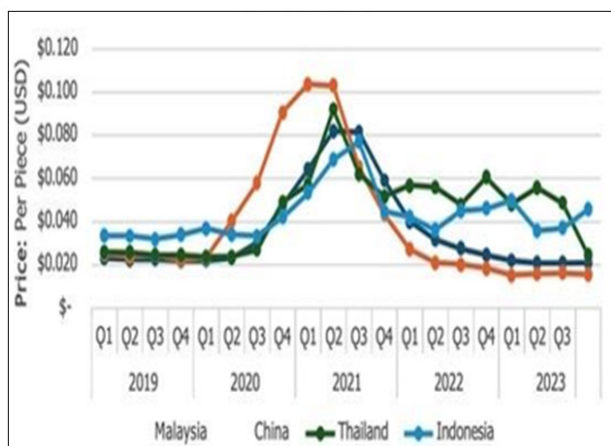


Figure 1: Medical Nitrile Gloves Pricing Trend by Country, US Consumption of Imports 2020-2023
Source: American Medical Manufacturers Association, 2024

Additionally, Figure: 2 illustrates how China eventually overtook Malaysia in the market share of medical nitrile gloves, a market historically dominated by Malaysia with a 70% share.

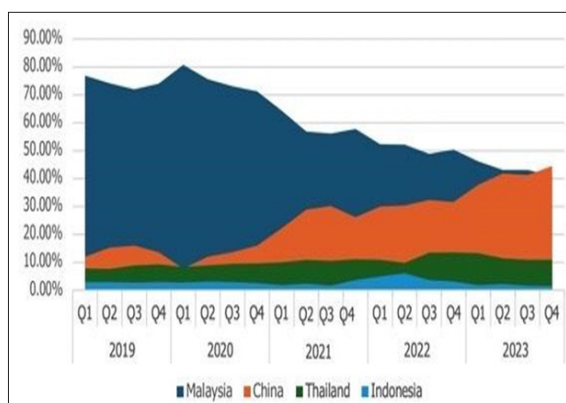


Figure 2: Medical Nitrile Gloves Market Share by Country, US Consumption of Imports 2020-2023

Source: American Medical Manufacturers Association, 2024

As long as price remains the primary consideration for PPE in U.S. healthcare organizations, domestic production will be constrained by low-cost imports. In the medical industry, Group Purchasing Organizations (GPOs) largely control the buying model by negotiating pricing terms on behalf of healthcare organizations and deciding which products and manufacturers to engage with. Medical distributors such as 3M do not set the rates for branded products, the GPOs do.

To address the low profitability of branded products, all distributors have developed a diverse range of private label products, which are produced by contract manufacturers on their behalf. Since distributors have more control over the pricing of their private-label products, their main strategy is to negotiate the lowest possible price with the contract manufacturers. This is why all the major distributors have substantial sourcing teams based in China or Southeast Asia. Since GPOs drive down prices of branded supplies, this creates a market for lower-cost alternatives, which is where private-label products from distributors come in. The distributor is incentivized to sell private-label products as they can achieve a higher profit margin.

Additionally, it is important to note that GPOs benefit hospitals by providing products at the lowest prices while ensuring they meet required quality standards. Domestic manufacturers will struggle to sell their products through GPOs due to the price disparity between U.S.-made goods and low-cost imports. Hospitals are also encouraged to increase their purchases through GPOs due to the rebates or discounts they receive. Healthcare organizations may be reluctant to buy goods from domestic manufacturers as it could reduce their benefits from GPOs.

According to the Harvard Business Review, a diverse supply chain which includes domestic manufacturers can reduce risks but typically carries a greater cost [3]. The merging of GPOs has largely increased their market control, indicated by the U.S.'s unwillingness to pay higher prices for domestic supply despite India's export ban of 26 pharmaceuticals in February 2020. The purchasing power of GPOs significantly commands product availability and pricing for US buyers, with 80% of generic drugs being acquired through GPOs for pharmaceutical purchasing. The procurement of personal protective equipment generally goes through GPOs such as Premier, HealthTrust's Healthcare Group Purchasing Industry Initiative (HGPII) and Vizient. Premier oversees more than \$67 billion in purchasing, HGPII is responsible for \$45 billion, and Vizient supplies more than 50% of U.S acute care providers, 95% of academic medical centers, and over 20% of ambulatory providers, with a total purchasing power of \$100 billion. The main goal of these organizations is to reduce prices, which leads them to source from offshore manufacturers in India and China who deliver more affordable solutions, instead of focusing on domestic sources. Shawmut, a Massachusetts-based domestic producer, completed all orders under its emergency contract with the Defense Logistics Agency, but production ceased on February 15, 2021 when the agency no longer required gowns. This closure led to lay-offs among Shawmut's workforce and its coalition members. The incident with Shawmut highlights that if the US intends to develop domestic capacity, they must identify a solution to make domestic production sustainable.

Conversely, Health Enterprises, an affiliate of Premier-one of the largest GPOs in the U.S.-states that GPOs are actively

developing initiatives to stimulate domestic production [4]. Premier has developed partnerships with three major domestic PPE manufacturers: N95 masks and surgical masks from Prestige Ameritech, level II isolation gowns from DeRoyal, and exam gloves from Honeywell [5].

In May of 2020, Premier made the decision to increase domestic PPE production via Prestige Ameritech in part of a long-term strategy to guarantee that a larger portion of medical supplies are protected from shortages and accessible during critical times [6]. As per the agreement, Premier members pledge to buy a share of their annual face mask supply from Prestige Ameritech for up to six years, with a three-year renewal option. Premier President Michael J. Alkire observed that past crises, such as SARS, H1N1, and Ebola, followed a consistent pattern where the government aimed to boost domestic manufacturing but reverted to overseas markets once the crisis was over. "This move is the latest step in our long-term commitment to changing the way we source critical products so that we never again experience shortages as a result of overreliance. Our economic prosperity can no longer be tied to things we buy – it must also come from things we make." - Michael J. Alkire [7].

During November 2020, Premier collaborated with DeRoyal to strengthen the domestic production of isolation gowns through long-term arrangements to purchase a share of annual isolation gowns from the joint venture. Brian DeBusk, CEO of DeRoyal, highlighted that domestic manufacturers experience substantial barriers due to international competitors leveraging inexpensive labor and supply chains. "One way we can restore diverse, on-shore and near-shore manufacturing is by investing in automation combined with assurances of long-term purchasing volume at globally competitive prices." - Brian DeBusk, CEO of DeRoyal [7]. Premier's investment in DeRoyal supports the company's overarching goal of building a more resilient supply chain.

As of July 2021, Honeywell and Premier have teamed up to further develop U.S. production of nitrile exam gloves. This recent partnership is expected to generate 750 million domestically manufactured nitrile exam gloves within the first year. With 80 Premier health systems committed to buying a set percentage of Honeywell gloves over the next five years, this deal supports Premier's long-term strategy to stimulate the U.S. private sector [5].

In order for domestic production manufacturers to really take hold, further help from the US government is required. President Biden mandated his Trade Representative to boost tariffs on \$18 billion worth of Chinese goods under Section 301 of the Trade Act of 1974. As of 2024, tariffs on syringes and needles have been raised from 0% to 50%. For respirators and face masks, tariffs will rise from 0 - 7.5% to 25% in 2024. Meanwhile, tariffs on rubber medical and surgical gloves will be raised from 7.5% to 25% in 2026 [7]. Tariffs strongly incentivize PPE buyers to choose domestic products, and the revenue from these higher tariffs can be reinvested in programs that support domestic manufacturing. Eric Axel, the executive director of AMMA, noted that the White House is aware of the difficulties presented by underpriced, low-quality Chinese imports, which undermine high-quality American manufacturers and jeopardize the safety of healthcare workers and patients. In November, the FDA launched an investigation into reports of plastic syringes from China breaking and leaking. By March, the agency verified the quality problems and subsequently recommended that consumers and healthcare providers discontinue

the use of plastic syringes from particular Chinese manufacturers.

The Biden administration asserts that the United States is now better positioned for self-reliance on Personal Protective Equipment (PPE) in 2024 compared to the start of the pandemic. This enhanced preparedness stems from the Make PPE in America Act of 2022 [8]. The Act mandated concrete actions from the Department of Homeland Security (DHS), Department of Health and Human Services (HHS), and Department of Veterans Affairs (VA) to ensure the growth and maintenance of domestic PPE production. To ensure sustained demand that drives domestic production, contracts for PPE procurement made by a covered Secretary must have a minimum term of two years, including any necessary option periods. Additionally, these contracts must be for PPE that is produced or sourced in the United States.

Conversely, NPR reports that the U.S. remains no more self-reliant on PPE than at the start of the pandemic, despite government efforts to bolster domestic production. NPR cited Blue Star, a domestic producer of NBR—a crucial raw material for medical exam gloves—as an example of a company that used a \$123 million federal grant to build a new facility [9]. While this funding was meant to promote raw material production, Blue Star also aimed to develop a glove factory, which failed to receive funding. As a result, the plant is currently inactive, and Blue Star's contract only covered the construction of the plant, not its operation or the production of finished gloves. Despite the potential of the site to manufacture NBR, the limited market for domestic glove manufacturers suggests that the project might not be economically practical.

When asked whether the U.S. is better prepared now than at the start of the pandemic in terms of secure access to PPE during an international crisis, Greg Burel, director of the federal Strategic National Stockpile, responded, "No, I don't think so" [9]. Burel further expressed that although there has been a rise in government investment towards domestic PPE, the US healthcare sector lacks specific incentives for the US market to consistently make domestic purchases. A representative from the Department of Health and Human Services (HHS) states that they have allocated roughly \$574 million to expand the domestic production capability for medical gloves by 7.2 billion gloves per year [9]. Scott Maier, CEO of Blue Star, mentioned to NPR that he was unaware of any glove manufacturers receiving government funding who are currently expanding their production capacity. When asked about Maier's comment, the HHS reported that their contributions "are driving the growth of domestic production, enabling the manufacture of 2.3 billion nitrile gloves each year by March 2024, plus an additional 133 million annually by September 2024" [9].

Burel, the former stockpile director, acknowledges that while the government does stockpile some emergency resources, sufficient funding will not be available to obtain all essential resources for a pandemic and store them long-term, meaning reliance on market procurement during an event is inevitable. Eric Toner from the Johns Hopkins Center for Health Security explains that American PPE producers face a tough challenge, as they battle against more affordable foreign products. Major hospital networks and medical suppliers, who favor cost-saving solutions, will prefer a glove costing a penny to one costing a nickel, Toner says [9]. When asked about possible solutions for companies like Blue Star that had received grants but were unable to finish their projects, the HHS stated that agency officials have recently carried out a comprehensive review, deploying staff on-site where necessary,

to assess the most effective use of remaining contract resources and, if necessary, adjust the scope of projects that were lagging or over budget. Burel is adamant that we are still not in a better position, as a lack of domestic production capability means the same issue of insufficient PPE manufacturing will resurface in future pandemics.

Given the persistent issues with domestic production and the competition with cheaper foreign PPE, the initial demand for PPE during the beginning of the pandemic revealed the critical need for reliable and adaptable domestic manufacturing to maintain a strong supply chain. According to the U.S. Government Accountability Office (GAO), there was a significant increase in imports from January 2019 to August 2020, as it is shown in Figure: 3, indicating a surge in demand for COVID-19-related products likely driven by the pandemic [10].

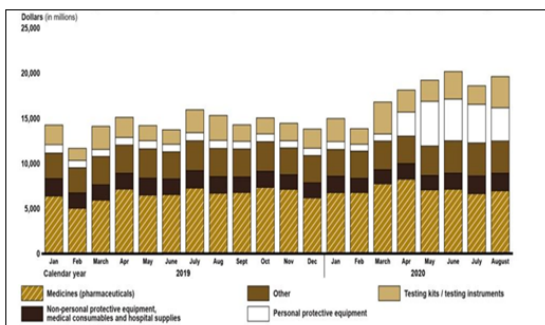


Figure 3: Monthly U.S. Imports of Categories Containing Covid-19-Related Products by Type, January 2019-August 2020
Source: Government Accountability Office, 2020

This spike in demand, coupled with persistent supply chain challenges, is evident in the high number of unfulfilled requests, directly reflecting the shortfall in meeting market needs. The Get Us PPE database illustrates the total PPE units supplied compared to the total units requested from January 21, 2021, to July 2, 2021 [11]. As Figure: 4 illustrates, high levels of unfulfilled requests throughout the period indicate that demand exceeded available supply, suggesting a substantial shortage.

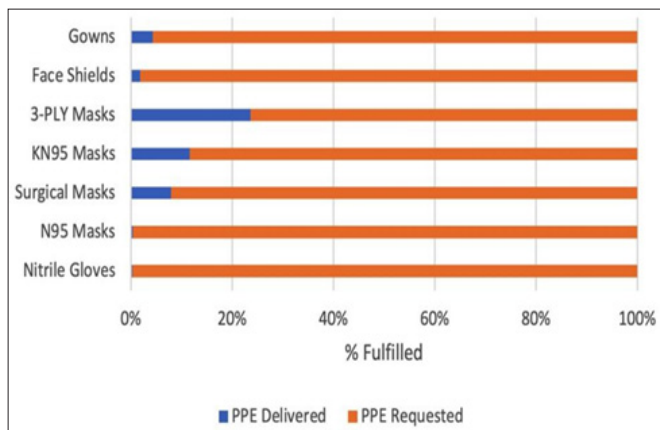


Figure 4: PPE Delivered VS. Requested, January 2021-July 2021
Source: Faust, Raj, Ranney, Gupta, and He, 2021

Considering the past challenges with PPE shortages and unmet demand, the evolving landscape of PPE supply and demand from 2024 onwards is impacted by recent developments. According to Grand View Research, government regulations that require

employers to prioritize worker safety are increasing demand for PPE [12]. Companies have a financial incentive to invest in PPE to prevent accidents and lower healthcare costs. Major retailers such as Walmart and Target are enhancing access to PPE, which could boost supply. Additionally, anticipated government support for PPE is forecasted to support an estimated compound annual growth rate (CAGR) of 7.8% from 2024 to 2030, as indicated by Fig. 5 [13].

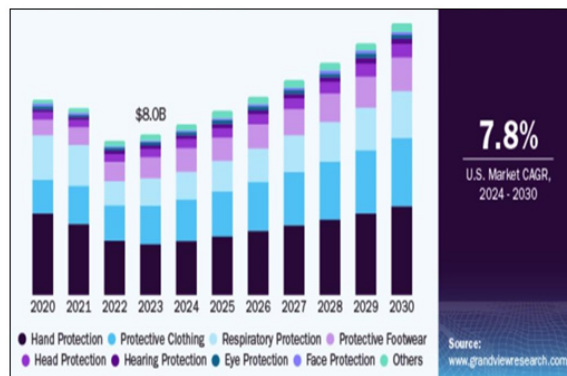


Figure 5: U.S. Personal Protective Equipment Retail Market Size, by Product, 2020-2030 (USD Billion)
Source: Grand View Research, 2024

Expanding on these findings, it is important to examine how the supply and demand of domestically produced PPE have shifted in relation to the overall U.S. PPE market. According to IBISWorld, the U.S. PPE market size surged by 15.5% from 2019 to 2020, a substantial rise compared to the relatively minor variations of 4.6% observed before the pandemic. This data indicates a rise in both supply and demand, as U.S. domestic PPE manufacturers are scaling up production to meet the increasing demand. The market size of US PPE production during the pandemic experienced very little fluctuations, with the largest recorded change being a 2.6% increase from 2020 to 2021. This suggests that once production capacity was scaled to meet the increased demand, the market size stabilized. The steady market size of U.S. PPE production throughout the pandemic reflects a favorable balance between supply and demand as consumer purchases align with the rate of production. Additionally, it is important to note that the market advantages leveraged by Chinese manufacturers have contributed to the constraints on U.S. PPE production. This restricted domestic supply supports a stable market size.

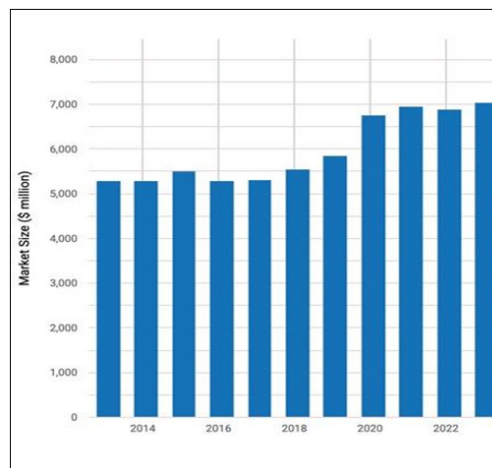


Figure 6:
Source: IBIS World, 2024

The International Safety Equipment Association predicts that both the supply and demand for domestically produced PPE will rise in 2024 [14]. After a sluggish first quarter due to economic concerns, the PPE sector's M&A valuations recovered in quarter two, with projected growth for the rest of 2024 as the economy recovers. In 2024, a number of key acquisitions by US-based manufacturers highlighted the consolidation trend in the PPE industry. Lakeland Industries, a US producer of protective clothing, purchased Jolly Safety Footwear for \$9.6 million in February, expanding its influence in the sector of first responder footwear and venturing into Europe. Cadre Holdings, renowned for its safety and durability solutions, obtained ICOR Technology for \$40.3 million in January, expanding its product range with explosive ordinance disposal robots for armed forces and explosive ordinance disposal clients. Furthermore, Lawson Products, a U.S. provider of maintenance and repair materials, attained Emergent Safety Supply for \$9.9 million in January, progressing its entry into the market for PPE and safety supplies [14]. With a greater weight on infrastructure spending and geopolitical tensions boosting demand, the outlook for the PPE industry appears favorable.

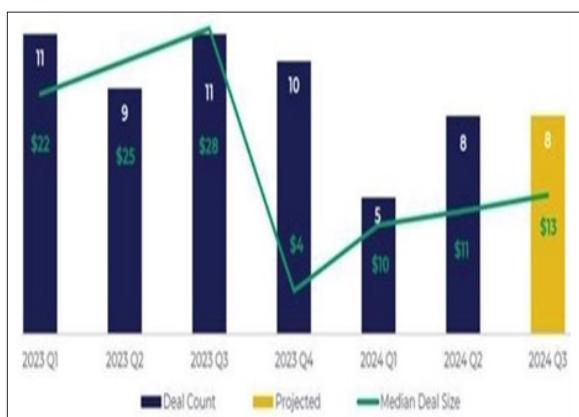


Figure 7: PPE & Safety Equipment M&A Deal Count & Median Size (US & Canada)

Source: Mackey, 2024

Conclusion

This paper provided a literature review of United States of America reliance on imported Covid Personal Protective Equipment (PPEs) during the Covid pandemic. The abstracted and cited articles showed that the United States was too reliant on imported PPEs, primarily imported from Asia which led to shortages as the cases of Covid surged at various points during the waves of Covid cases. This supply and demand imbalance was not just an inconvenience such as the toilet paper shortage and other supply chain disruptions of basic commodities; this supply and demand imbalance had life and death impacts for many first responders, health care workers, nurses, doctors, and the general public in the US. There was a US Congressional Report prepared on US reliance on imported PPEs due to the national impact of overreliance on imported PPEs. Also, Federal Covid Pandemic policymakers, like Dr. Fauci, one of the lead members of the White House Coronavirus Task Force were questioned during Congressional Hearings on the matter. This paper presents key graphs to visually display the changes in supply and demand over the duration of the pandemic. As many health professionals predict the possibility of future pandemics, there is a continued need to have US self-reliance on domestic produced PPEs. The paper concludes with an assessment that the US still needs to make further changes in federal manufacturing and health care public policy to become less reliant on imported PPEs for the next pandemic occurrence.

Relevant graphs and charts from the articles and reports were included to visualize the US PPEs supply and demand imbalance over the duration of the Covid Pandemic.

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