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America's Global Medical Supply Chain: Painful Lessons from the Covid-19 Pandemic with Single-Source Supply Chains and Challenges of Global Supplier Integration

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Introduction

Throughout February and March 2020, the COVID-19 pandemic generated shock waves worldwide as hospitals struggled to provide the required medical personal protective equipment (PPE) to safeguard their staff and emergency personnel. Fragile medical logistics infrastructure only exacerbated the crisis. Changes to medical supply chains had transformed almost unnoticeably in the quest for low-cost suppliers and rested on precarious single-source international manufacturing centers. Multinational companies dominated discussions as countries and politicians shifted attention and resources internally while instituting protectionism and threats to restrict foreign sales. Around the world, many governments continue to review the existing logistics framework and stockpiling standards to streamline processes and prevent a repeat in the future.

This essay will highlight some of the challenges of contemporary medical supply chains, specifically PPE such as face masks, surgical gloves, and medical gowns. The focus is primarily on masks, with the 3M company serving as a case study. This paper will review three proposed alterations to the existing system and the costs and benefits associated with each to improve PPE logistics infrastructure. They are as follows: multi-nodal production sites for critical materials located in different geographic regions, government-coordinated public-private partnerships to map crucial medical supply chain networks, and establishing trusted partners. Rather than creating tariffs and more stringent regulations in the medical supply

industry, this paper argues that a loosening of American trade would better establish a global cooperative framework to lessen the impact of a crisis in the future. The U.S. government should remove barriers and encourage companies to promote transparent supply chains and identify potential choke points and risks while creating backup systems to support distribution when disaster strikes. Medical and other critical global supply chains must be multimodal with manufacturing sites in different countries. These changes will help alleviate the loss of life in the future as much as is practicable.

American Protectionism?

Protectionism is not new to this country. U.S. trade history has waffled back and forth between eliminating trade barriers and imposing tariffs and quotas to prevent other countries from accessing American markets. In 1776 Adam Smith advocated free markets, with protectionism—famously advocated by Alexander Hamilton—shortly after that. Hamilton’s exhaustive *Report on the Subject of Manufactures* (1791) was later incorporated into Henry Clay’s Whig party platform under the phrase the “American System” and served as the foundation for protectionist policies since the early days of the American Republic; Hamilton argued that there were natural disadvantages to beginning new industries. Congress eventually adopted most of the tariffs cited in the report in 1792, although many of the recommendations were not implemented (Irwin, 2020). While the previous Trump administration raised the specter of protective tariffs and started a trade war with

China, the COVID-19 pandemic further exacerbated an already strained relationship. The Trump administration's protectionist response created frictions in the global supply chain while highlighting the interconnected nature of international medical PPE manufacturers. It is well established that open markets and minimal taxes are better methods to stimulate economic development. Nevertheless, key or critical industries—such as telecommunications and defense—might represent an exception.

Protectionism and tariffs would harm the medical supply chain. Meredith Broadbent, a senior advisor for the Center for Strategic and International Studies (CSIS), recently wrote, “Our view is that extensive reshoring and nationalization policies would present many costs and added risks. Several case studies support this conclusion” (2020, p.7). External controls directly manufacturing into America inserts mechanisms that work against free and open markets. There are many examples in the pharmaceutical industry, for example, where Canadian and American companies cooperate on shared research that only strengthens domestic manufacturing. Pfizer's success with the COVID-19 vaccine was primarily defined by its ability to utilize the international market to maximize research, manufacturing, and distribution while also collaborating with BioNTech SE in Europe (Broadbent, 2020, p.17).

Supply chains

While the United States maintains stockpiles of essential commodities such as crude oil and some medical supplies, the pandemic revealed that America's system contained insufficient quantities of surgical masks and also contained discontinued items that were unable to be stocked due to oversight. One example is the discontinued 3M triple-layer molded face masks required to support the medical infrastructure (FDA.gov). A recent study conducted by the McKinsey Global Institute (MGI) projected that every 3.7 years, disruptions lasting over 30 days would become the norm; the potential causes would vary widely from severe climate stress, pandemics, trade disputes, cyber-attacks, terrorism, as well as supplier bankruptcy (Lund et al., 2020). In other words, interruptions in logistics supply chains will be part of the modern globalized world's fabric. The financial costs will be significant, even jeopardizing the viability of some companies that cannot weather the storm.

Shortages of PPE were very common worldwide, despite the extensive stockpiles in countries, such as America, accustomed to large-scale disasters. As of September 2020, the U.S. government provided 92.4 million N95 respirators, although the Federal Emergency Management Agency (FEMA) reported that there were over 6 million N95 requests from state and local governments unfilled as of August 4, 2020; suppliers were projected to meet demands in January 2021 (Broadbent, 2020, p. 15). The onset of COVID-19 caught the United States flat-

footed with gross shortages of medical supplies and insufficient medical infrastructure to meet sharp increases in demand.

The supply of medical equipment, particularly PPE, is complex and opaque. It took some time for U.S. leaders to realize that only a few countries provided most of America's PPE, with China being the largest supplier (Broadbent, 2020, p. 10). As reality sank in, American leaders, determined to focus on products manufactured in the continental United States, quickly discovered the complexity of modern logistics supply chains with few domestic manufacturing facilities. In the 21st century, supply value chains are spread globally, maximizing low-cost labor in regions worldwide, propelling the value of intermediately traded goods to over \$10 trillion (U.S.) annually as of 2020 (Lund et al., 2020).

The pandemic challenged infrastructure everywhere, and lessons learned are still accumulating. Recently Shannon K. O'Neil (2021) wrote in *Foreign Affairs*: "The COVID-19 pandemic has revealed the risks posed by the global concentration of production sites for even relatively mundane goods such as ventilators, personal protective equipment, and pharmaceutical ingredients; last March, the United Kingdom had just a few weeks' worth of aspirin left within its borders" (pp. 154-55). The 2020 pandemic prompted all countries to reexamine their policies, generating conversations between the private and public arenas in all industries worldwide to prevent shortages in the future. Supply practices that promote "just-in-time" deliveries are being examined, generating reduced overhead warehousing

costs, creating smaller inventories, and minimizing stockpiles of goods. It appears that the most efficient and low-cost systems might not always be the best choice in the post-pandemic world.

The future of supply chains

MGI published a report in August 2020 that outlined the risk of global supply chains across all industries while demonstrating a new trend whereby “only 13 percent of globally traded goods are now exported from low-wage to high-wage countries” (Lund et al., 2020). In other words, China, for example, used to export more goods than it consumed internally, but that is no longer the case due to their growing middle class. However, China is still the world’s factory, with more and more consumer goods staying within its borders than leaving. Low-cost skilled labor continues to drive economic decisions for all companies. Yet, these considerations are balanced with shipment speed, location to major markets, resource availability, and resilience for logistics infrastructure. Although demographic changes continue to alter the landscape for medical logistics, it helps depict the existing supply network.

After the outbreak of COVID-19, global shortages of PPE, specifically face masks, revealed strategic miscoordination in policies of the U.S. government and the American company 3M. Based in Minnesota, 3M is a top American manufacturer of M95 face masks and supplier for many industries and countries worldwide, with factories in both the United States and China. Before the

pandemic, the monthly production of M95 masks was 35 million, although only 5 million remained in the United States, with most exported internationally (Gereffi, 2020). The company anticipated an increased demand signal and increased production across all locations in early 2020. Even so, the Trump administration quickly criticized them for putting other countries ahead of American healthcare workers. As Gary Gereffi (2020) noted, the “waves of economic nationalism and populism since 2016, and the COVID-19 pandemic in 2020 all portend a more fragmented, multipolar, and regionally oriented international system. While effective forms of globalization are likely to be the most constructive and sustainable response in the post-crisis era, de-globalization is not a viable long-term vision for the future” (Ibid.).

Protectionist reactions

On April 2, 2020, an executive order cited the Defense Production Act (DPA) from 1950 to force 3M to stop exporting N95 masks (Gereffi, 2020). Lawyers at 3M highlighted the nature of integrated markets and globalized supply systems contingent upon imports from other countries that would reciprocate, leading to a deterioration of desperately required medical supplies in the market (Gereffi, 2020). Reluctantly, and somewhat surprisingly, White House supply chain coordinator Peter Navarro relented, allowing 3M to continue exporting. The crisis was averted, and other countries, notably China, were poised to reciprocate and backed off. The company rapidly stepped up production, doubling its global capacity to over 2

billion masks by the end of 2020 (Gereffi, 2020). The lessons learned from Hurricane Maria are also helpful in the need for multiple sources for medical supplies. When the hurricane hit Puerto Rico in 2017, hospitals quickly exhausted supplies and drugs while the island struggled to provide essential medical services. It appears that medical supply chains operate best only “when any single company or country doesn’t dominate production. Indeed, Washington may find that strengthening access to critical goods means more, rather than less, international collaboration” (O’Neil, 2021, p. 157).

The ability exhibited by 3M to rapidly expand production represents an American success story, but it also demonstrates policy failures and a lack of understanding of supply systems. Just-in-time or on-demand manufacturing systems drove skeletal systems that reduced waste and global inventories. Simultaneously, transportation costs and accessibility to other markets decentralized production facilities, allowing greater scalability given the decentralized nature of some manufacturing processes, albeit relying on external suppliers and labor often in other countries. The 3M case also demonstrates the importance of maintaining multiple production sites and runs counter to arguments advocating locating critical manufacturing, particularly products deemed “crucial” within the United States, or any other country for that matter. While it is necessary to increase domestic production for PPE, there is also a strong need to maintain open markets without imposing tariffs; this allows operations to flow naturally in

regions more beneficial for production costs. Excessive regulation would have further exacerbated the impact of COVID-19 and must serve as a lesson for politicians going forward.

Supply chain mapping

The pandemic demonstrated that a single-source global supply chain for supplies and pharmaceuticals could not keep up with the demand for a planet with almost 8 billion people, even though such systems may produce the lowest cost for consumers. Some supply chains might be more complex, and supply chain mapping can help provide critical leaders with an overview of material flow to help identify resources from high-risk regions of the world. Mapping can be a useful tool in identifying alternative sources of supply as well as potential substitutes. Distribution disruptions or bottlenecks could trigger alternative pathways for the origination and transportation of the requisite resources. The U.S. Department of Defense began to map all critical suppliers due to COVID-19 challenges to reexamine prime contractors, such as Lockheed Martin and General Dynamics, while mapping supplier chains better to understand potential issues in the critical defense industry well (Clark 2021).

In late 2020, MGI conducted surveys of a broad range of companies and found that many organizations—over two-thirds—are beginning to map production footprints. They are struggling, however, to understand the financial stability of all participants in their value chains (Lund et al., 2020, p. 76). Organizations must

begin to “work more closely with their tier-one suppliers to create transparency; after all, those suppliers are likely to have similar concerns about their vendors. However, some may lack visibility themselves or may consider their sourcing to be proprietary information” (Lund et al., p. 77). Some companies would risk publicizing trade secrets, and their competitors could utilize a heightened awareness of their logistics infrastructure.

Strengthening the supply chain, particularly for companies that manufacture PPE, continues to be a priority. In contrast, a recent Gartner survey among medical companies conducted in February and March of last year revealed that “only 21 percent of respondents considered their supply chains to be highly resilient at the time of the survey, [and] one-quarter of respondents said they have already begun to regionalize or localize supply chains to dampen disruptions and be closer to demand” (Broadbent, 2020, p. 6). In the same survey, 55 percent of the company supply chain specialists responded that their supply infrastructure would become more resilient with shift sourcing, manufacturing, and distribution on demand. It would take, however, another two or three years to complete the process (Broadbent, 2020, p. 6). End-to-end transparency is helpful. Integrating data into the internet can provide real-time data and forecasting to better project material and resource availability while monitoring production and transportation flow up and downstream from production centers. Digitization and system mapping allow for a more comprehensive view of the entire process. However, limited access in remote

markets from subcontractors still creates grey areas where information is not readily available. Increased automation will also reduce labor costs for manufacturing while stimulating companies to locate sites domestically (Broadbent, 2020, p. 6).

Trusted trade partners

Transparency can help provide improved visibility although the federal government will have to work with the United States Trade Representative (USTR) to solidify partnerships with Mexico and Canada, along with several other countries, to achieve a broad network of manufacturing practices as well as the free flow of information to better respond to requirements for PPE in the future. International partnerships can provide flexible networks and arrangements to better support allies and trusted partners during regional or localized events. In the event of another global pandemic, countries will focus on domestic issues first, but complete international supply lines and more extensive diverse networks will support trusted supply chain partners.

North America is an ideal region to establish trusted supplier partnerships with Canada to the north and Mexico just south of the United States as transportation costs are reduced significantly. The manufacture of medical PPE in Canada could serve as a template for future agreements to keep costs low. Similar regulatory requirements and standards, which are sometimes obstacles when importing items from countries with vastly different manufacturing guidelines, would provide better regulatory flexibility and cooperation as well as straightforward

collaboration in the research and development of new drugs. For example, U.S. imports from Canadian for non-medical grade disposable gloves grew by 1000 to 4500 percent, depending on the material (Broadbent, 2020, p. 8). The USTR should lead efforts to streamline trade agreements with other countries interested in upgrading trade and investment relationships with the United States if they can adhere to acceptable manufacturing practices as established by the Food and Drug Administration (FDA) and follow intellectual property requirements. These goods and products required for manufacturing PPE would be outside the scope of tariffs and import/export restrictions that could create bottlenecks during a crisis. Additionally, this oversight will allow for prioritizing raw materials for essential goods, which can better support global supply chain requirements.

Conclusion

The federal government can assist the USTR by coordinating and sharing information between suppliers in different countries to track essential supply chains, performing exercises and tests to stress test logistics infrastructure, and creating a regulatory environment that is conducive to trade and foreign suppliers by promoting transparency and minimal obstacles for external companies. International organizations can also help. As O'Neil (2021) recently pointed out,

Global supply chains are here to stay, and U.S. workers will be left behind if American companies can't take advantage of them. A U.S. industrial policy built on more global cooperation and competition, better U.S. access

to international markets, and public investments at home can mitigate the shortcomings of the Washington consensus and avoid the pitfalls of protectionism. (p. 151)

To better prepare for the next crisis in three years, the U.S. should not impose restrictive tariffs to burden medical supply industries. The government can get involved to remove barriers and encourage companies to promote transparent supply chains. We must identify potential choke points and risks while creating backup systems to support distribution when disaster strikes. Medical and other critical global supply chains must be multimodal with manufacturing sites in different countries. These changes will help alleviate the loss of life in the future as much as is practicable. The restart of America's economy offers an opportunity to retool the U.S. medical supply chain to reduce vulnerabilities exposed by the COVID-19 pandemic and correct other problems. This reset might be fortunate for the United States. It will allow time to correct deficiencies and prepare for the next disaster just around the bend.

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