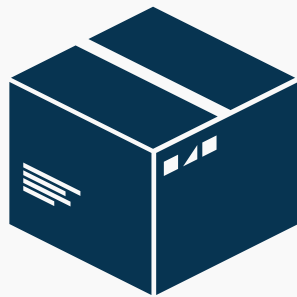


IBM Center for The Business of Government

# Enabling a More Resilient and Shared Supply Chain Strategy for the Nation:

Lessons Learned from COVID-19



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IBM Center for  
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# FOREWORD

**On behalf of the IBM Center for The Business of Government, we are pleased to publish *Enabling a More Resilient and Shared Supply Chain Strategy for the Nation: Lessons Learned from COVID-19*, by Robert Handfield of North Carolina State University.**

Many government programs, including several top priorities of the Biden-Harris administration, can be conceived as supply chains for the production and distribution of goods, services, data, funds, and other public benefits. The national response to the COVID pandemic involved hundreds of federal, state, local, and private sector entities in the exchange and distribution of information, personal protective equipment, testing, and vaccine administration.

The president's FY 2023 budget request to Congress focuses significant attention and investment proposals on strengthening supply chain operations and improving supply chain risk management and resiliency. The execution of these programs can be transformed by leveraging a “whole of government” scope and industry-leading supply chain management and shared services business models to their delivery.

In this report, author Robert Handfield—a leading global supply chain expert and professor at North Carolina State University—outlines how a modern supply chain strategy can leverage shared service models to increase efficiency and productivity. The author coalesces significant insights into the challenges of whole of government supply chain and shared service challenges, using the COVID-19 experience as a proxy and drawing conclusions for larger process, technology, and policy strategies. Among these observations was the tremendous problem-solving capacity coming from networked individuals who step outside assigned roles to bring their collective talent to bear on urgent problems facing the country—addressing what has been learned for how to prepare for the next pandemic, as well as other whole of government management challenges.

The report identifies several pathways for addressing these challenges, which include:

- Improved transparency and information sharing
- Data standardization and interoperability
- Machine learning tools to enhance these capabilities
- Governance for national initiatives and ownership of key assets like stockpiles



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Professor Handfield draws on lessons from an IBM hosted roundtable event, which framed key features of a future state that would leverage industry leading supply chain and shared services business practices to enable world-class whole of government response capabilities. The report also highlights and a set of practical and actionable recommendations for government to close the gaps that exist today and move towards a more responsive and shared supply chain.

We hope that this report support actions that enable an effective, responsive, national supply chain that leverages shared service strategies.

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# INTRODUCTION

**The arrival of the COVID-19 pandemic in January 2020 brought a new form of national disaster to the United States.**

Disaster and emergency events in the U.S. have typically been regional and limited in duration; examples include hurricanes, floods, fires, earthquakes, industrial accidents, or terrorist attacks. In all such cases, events generally evoked immediate action from emergency responders, including the Department of Homeland Security's Federal Emergency Management Agency (FEMA), the Strategic National Stockpile (SNS) led out of the Department of Health and Human Services (HHS), the American Red Cross, private sector organizations, and state agencies. Humanitarian logistics services often required one or two weeks at a national level, after which local parties became involved.



The response to large scale disasters typically involves distribution of critical medical and disaster response supplies to surrounding regions, often following an established procedure for procuring and distributing supplies (e.g., food, shelter, water, and relief goods). Supplies are normally readily available, and past disaster response efforts have involved few problems in identifying qualified local suppliers for immediate contracting, acquisition, and shipping to impacted sites. The sourcing task in such cases was largely tactical, and primary activities involved how to mobilize supplies to meet time-sensitive demand quickly. For these regional disasters, organizations such as FEMA are well equipped to respond, and in some cases the SNS is called in to ship supplies that can fill gaps.

The COVID-19 pandemic was dramatically different. Federal and state agencies were unfamiliar with how to address a disaster of this magnitude, which impacted every state in the country, every industry, every population, every hospital—and continues into its third year. The pandemic revealed significant gaps in the government's response capacity to this crisis, and response efforts have been the subject of many new task forces and inquiries. A recent study of state procurement officials suggests several limitations of the response:<sup>1</sup>

- **Material distribution.** The Strategic National Stockpile was largely underfunded, lacking the supplies and governance needed to forcefully respond to the pandemic. The SNS was also not assigned the right level of oversight priority in terms of resources, staffing, and budget; it was designed mainly for anthrax and biological attacks, not to respond to a pathogen-related pandemic.
- **Economic hardships.** The country was unprepared for the discontinuities in business operations resulting from the pandemic. As stay-at-home orders spread across the country, many individuals working in restaurants, service industries, banks, retail stores, and other locations found themselves out of work, with few options available.
- **Production shutdowns.** As COVID cases spread, material shortages began to recur due to border crossings shutting down, increased COVID-related workforce disruptions, and executive decisions to cease operations due to the unknowns of what a pandemic meant for the economy.
- **Trade flow disruptions.** Trade between countries, including imports into the U.S. and other countries, shut down as countries went into an "isolationist" mode. This was particularly debilitating for U.S. companies that relied on Asian supply chains, with China, Vietnam, Singapore, Taiwan, and others halting all trade into and out of their countries.

In sum, many problems stemming from COVID-19 followed slow responses on the part of government to recognize the massive impact of a pandemic on all facets of the economy. Slow reaction times to enforce border closures, poor development of rapid testing and contact tracing, and unclear communications to the public contributed to the root of the problem of COVID spread at a rapid rate in the U.S. Lessons have been learned about gaps in the current supply chain network that support crisis response, that together provide a set of capabilities for governments to consider. Addressing these gaps can promote a strategy for emerging from the pandemic with stronger, shared supply chain networks to meet future demands.

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1. Based on a study capturing interviews with 47 state chief supply chain officers which identified three primary reasons for the ineffectiveness of a federal response. [https://www.naspo.org/wp-content/uploads/2021/03/2021\\_COVIDReportC.pdf](https://www.naspo.org/wp-content/uploads/2021/03/2021_COVIDReportC.pdf).



# Challenges to the Supply Chain



## Current Gaps in Strengthening the Supply Chain

- **Agile decision-making capability.** During a disaster such as COVID, it is essential to quickly establish strong leadership for rapid decision-making, rapid deployment of resources, and agile action. With so many crises happening on short notice, the government could not wait for emails and messages to be conveyed between agencies, particularly when multiple agencies such as the SNS and various HHS operating divisions, FEMA and other Department of Homeland Security (DHS) offices, and others are involved in different aspects of the response. To enable timely and effective decisions, a “playbook” for agile action can drive rapid coordination by the right people from different agencies in a cross-agency manner. Individuals representing their agencies need the right level of authorization to make decisions quickly and convey requirements to their teams back at their agencies.
- **Lack of information access.** In addition to the inability to respond with needed health care supplies (such as personal protective equipment (PPE), ventilators, and pharmaceuticals), the government lacked access to data required for advanced supply and demand planning—critical when preparing for future pandemics. Responding to a national crisis of this magnitude is a complex task with many moving parts, including advanced demand planning, supply market intelligence, analyzing markets to assess the global availability of critical health care supplies, and creating sourcing plans for every key need that might arise. This task became essentially unachievable given the lack of dependable and real-time data on the current status of COVID cases, demand requirements for supplies across a health care network, current inventories of supplies, and upstream availability from suppliers and distributors capable of shipping to different facilities across the countries.
- **Lack of supply chain management expertise.** Beyond the lack of fundamental supply and demand data in the supply chain, the federal health care response system also lacked the personnel and capacity to assess the significance of different choices in addressing response problems. In particular, agencies needed knowledge of demand forecasting, acquisition and contracting, strategic sourcing, and modern warehouse management practices. Such expertise is essential in the middle of a pandemic. Health care systems were completely reliant on external global sourcing networks for supply of PPE and medical equipment. Yet government agencies had a dearth of skills on how to manage such complex global networks to secure required supplies during the COVID-19 pandemic.

## Requirements for a Government Response

In light of these factors, a key question arises: what can governments learn from this experience and address similar scenarios in the future given emerging global threats? To address this question, the IBM Center for The Business of Government and the Shared Services Leadership Coalition recently convened a roundtable of experts from government, industry, and academia to address these issues. (Details about this forum appear in Appendix 1). Objectives for the roundtable included:

- Framing the government’s supply chain challenges more specifically in the context of major performance problems in the national response to COVID
- Understanding the current state of capabilities in the national response system, and what missing or under-performing capabilities caused performance problems to occur
- Developing a model based on how world-class commercial entities approach similar challenges, and attributes associated with these capabilities
- Conducting a gap analysis between government and industry models
- Considering the crucial role of shared networks in addressing such a complex national challenge

The development of solutions to improve the government’s response and agility in the face of future pandemic and similar health care emergencies is no small task. Addressing such a problem of national scope requires a “whole of government” approach, but must also tie in critical industry players who play essential roles in health care. Achieving such an approach is complicated by tensions already existing between agencies, and by requirements for government contracting that present barriers for effective and timely responses from the private sector. Yet the COVID experience demonstrated the criticality of an agile government response, one that can connect industry knowledge, market intelligence, and distribution/sourcing capabilities in addressing a rapidly moving crisis. Timeliness, access to real-time information and indicators, and supply chain talent are all essential in such environments—yet there does not exist a coherent strategy today to bring these about.

In thinking through how to develop these capabilities, roundtable participants engaged in a number of discussions that focused on the role of shared governance frameworks. Shared service strategies provide a helpful model for development of shared governance frameworks, and a useful approach for organizing diverse actors to achieve a common set of goals. Employing a shared services strategy involves identifying critical networks of actors. This strategy also involves establishing data standards, role/responsibility identification, collective sources of funding, and requirements to measure success.

What would a shared governance framework look like for an improved government response, when so many actors are required? This issue is addressed in Table 1, which summarizes the outcomes from the roundtable. The categories essential for success are classified into three groups key to supply chain governance:

- Process Issues
- Technology Issues
- Policy Implementation Issues

Each of these issues is described first in terms of the *current state* observed during the COVID crisis, and a *future state* that would envision a shared governance framework for a robust supply chain system. The next section addresses each of the problems observed in the current state, and the critical requirements for success to be carried out in a desired future state.



**Table 1: Summary of Critical Insights from the Roundtable**

|   | <b>Current State</b>   | <b>Desired Future State</b>   |
|---|--|---|
| <p><b>Supply Chain Process Issues:</b><br/>Global Independence, Persistent and Agile/Market Intelligence</p>  | <ul style="list-style-type: none"> <li>• Reliant on external supply base primarily located in Asia</li> <li>• Absence of early warning signals and lack of mechanisms for what to do with the signals</li> <li>• Absence of coordination determining government actions when early warning indicators are present</li> </ul>   | <ul style="list-style-type: none"> <li>• Prioritization of critical supply list and government policies targeted supporting a domestic “stop gap” manufacturing capability</li> <li>• Establish an office responsible for supply chain resiliency</li> <li>• Establish a medical intelligence office to provide early warning of healthcare threats</li> <li>• Creation of a supply market intelligence capability to monitor supply markets</li> </ul>   |
| <p><b>Supply Chain Technology Issues:</b><br/>Transparency and Traceability, Flexibility/Agility, Equitable Distribution</p>  | <ul style="list-style-type: none"> <li>• Lack of material visibility within the SNS and inability to detect shortages in hospitals and distribution networks</li> <li>• Significant expiration of many materials required for COVID, no recovery plan</li> <li>• Inability to replenish stocks as majority of products were manufactured in Asia, not the US</li> <li>• Ad hoc allocation of materials from the SNS to states</li> </ul> | <ul style="list-style-type: none"> <li>• Control tower needed to create a national healthcare monitoring system</li> <li>• Create “supply chain immunity” to create real-time monitoring of inventory, including barcodes, supply mapping, event monitoring, and global network of trusted suppliers</li> <li>• Recruit ad hoc industry experts into a supply chain task force and allocate based on critical need</li> </ul>   |
| <p><b>Supply Chain Policy Implementation Issues:</b> Leverages existing capabilities and delivers effective cross-government shared services, respects constitutional roles and responsibilities, enables innovation throughout the ecosystem, political viability and sustainability</p> | <ul style="list-style-type: none"> <li>• Poor data quality and lack of data standards</li> <li>• Federal agencies competing with one another over decision rights, state agencies operating independently</li> <li>• No formal governance structure in place to manage the crisis, informal interconnected network emerged</li> </ul>  | <ul style="list-style-type: none"> <li>• Inventory visibility systems with common data standards across multiple industry tiers as a contractual requirement</li> <li>• Cross-agency informal network to develop linkages between defense logistics, FEMA, SNS, and other critical agencies</li> <li>• Defined governance and play-book for creation of a taskforce with a pre-defined governance apparatus from the outset</li> <li>• Consider a similar structure to the “War Production Board” used in WWII</li> </ul> |



# A Shared Supply Chain Governance Framework

To fully embrace all requirements for success, a complex network of actors must be governed by a common set of guidelines, which can draw on the context of a shared services environment. These current and future state issues are described in the context of supply chain process issues, supply chain technology issues, and requirements for implementation of new government policies.

## Supply Chain Process Issues

The two primary elements characterizing supply chain process issues discussed in the roundtable included the requirements first for Global Independence, and second for Persistent, Agile Market Intelligence. Both characteristics were deemed critical for constructing a more resilient national supply chain system.



### Global Independence

A globally independent supply chain does not rely on foreign manufacturers for production of goods. For sectors where this cannot occur, government policies can establish a system of acquisition and supply for areas critical to national security. This may include development of a domestic network of trusted suppliers willing and capable to be part of the response system fabric. This system may require additional ties to industrial strategy, such as the “[Make Buy American Real](#)” proposals by the Biden administration.



**Current State.** The COVID pandemic differed from prior regional disasters in several different ways, contributing to the inability to coordinate a federal supply chain response. The most fundamental and significant characteristic was a severe shortage of critical medical materials, specifically PPEs (e.g., N95 masks, nitrile gloves). This shortage did not just impact to the U.S. at a federal level, but impacted every state in the union as the emergency continued month after month.<sup>2</sup>

Many needed items were not in stockpiles at the SNS. During COVID-19, both sourcing activities and supplies emerged as weak links in the disaster relief operations. State agencies could not reach out for assistance from other states that were equally overwhelmed. Challenges existed in getting support from federal response agencies.

2. For more on the COVID's impact for government, see *Managing the Next Crisis: 12 Principles for Dealing with Viral Uncertainty*, by Katherine Barrett, Richard Greene, and Don Kettl for the IBM Center for The Business of Government. <https://www.businessofgovernment.org/report/managing-next-crisis>.

The federal government's reliance on many overseas health care suppliers made agencies beholden to the export policies and priorities of other nations, leading to significant shortages. For example, 3M could not produce masks because all the sources of materials (fabric, elastics, nose bands) came from China. State chief procurement officers suggested that partnerships with private sector companies, such as the association between the state of Michigan and General Motors, facilitated access to Chinese suppliers through assets on the ground in Shanghai. Many distributors were unable to access supplies, and were inundated with promises from bogus suppliers in Asia that they could produce masks. They were also flooded with orders from hospitals, desperate and placing orders with multiple suppliers that made it difficult to understand what the actual demand levels really were. In the words of one SNS official interviewed for this research, "I had no idea that almost all of health care supplies like PPE were manufactured overseas, and purchased from abroad by medical distributors." This lack of awareness reveals how unprepared this national institution was for the COVID onslaught.

In addition to the problem of most health care supplies being manufactured overseas, there was a lack of visibility into current inventories across the country, and a lack of an allocation strategy that often led to hoarding. These problems were discussed at length by participants in the roundtable, and led to a number of ideas for a desired future state.



**Future State.** Creating a globally independent U.S.-based supply chain would entail prioritizing critical supplies required for national security—and for each supply category, developing either a domestic capability, or a means for managing the supply of items from global sources. For example, individuals pointed to the fact that during COVID, domestic manufacturers sprung up to produce N95 masks, supported by Department of Defense (DoD) small business innovation research (SBIR) grants. However, following COVID, many of these same mask manufacturers are declaring bankruptcy, due to a much higher price point than that of the many Chinese manufacturers selling to health care distributors and hospitals.

To address this issue, government industrial actions could support a domestic “stop gap” manufacturing capability. Partnerships with distributors could enable visibility into inventory systems, and enable contracts that set aside inventory for government allocation under different conditions of duress. This will require a set of common data standards and a common architecture to create a dashboard and control tower (see Technology section in this report).

In addition, a multiagency materials inventory portfolio based on in-depth supply market analysis is needed. At a minimum, this should include specialists in the following categories: disposable medical supplies (such as PPE, gowns, gloves), pharmaceuticals, plastics and resins, medical equipment, biologics, health care personnel, and respiratory products. This will require teams of supply market analysts with special knowledge of these categories, who track critical supply markets for medical supplies, supply risks within those markets, and acquisition strategies to manage risks. Multitier supply chain mapping based on multiple forms of risk assessment can reveal critical points of risk that can “shut down” the U.S. health care sector.

Because re-shoring all health care products is not practical or cost effective, the government could also develop a “make or buy” set of analyses and recommendations for investment in critical U.S. manufacturing infrastructure. This should be deployed in conditions of elevated market risk that create extreme exposure to other countries producing the bulk of manufactured supplies. Areas for analysis might include pharmaceutical products, raw materials, and other critical materials of strategic importance. Objective analysis of this capability would provide an impartial assessment of the likelihood of success for re-shoring.

This capacity will help government address challenges of re-shoring manufacturing to the U.S. Discussions with manufacturing executives suggest that once an organization commits to outsourcing to third parties in low-cost countries, a minimum planning horizon of five years follows that requires supplier qualification, audits, start-up, quality certification, and ongoing ramp-up.

In many industries, sourcing executives have embedded supply chains in Asian regions, noting that “these jobs will never return to Western countries.” As an example, 80 percent of the world’s production of certain medical products are produced by four manufacturers in one province in China. To establish alternative sources that are competitive, qualified, and at-scale would cost far more than the 25 percent in tariffs that U.S. companies pay today for Chinese imports.

Roscoe et al. (2021) developed a framework of supply chain strategies for geopolitical risk mitigation (see Figure 1), which provides some guidelines for whether federal supply chains should adopt centralized/regionalized or localized supply chain designs. These guidelines assess how entrenched suppliers are in a particular geographic location, as well as the severity of the geopolitical disruption.

**Figure 1: Framework for Supply Chain Strategies for Geopolitical Risk Mitigation**



The Y-axis of Figure 1 shows how shifts in the external business environment have rendered it difficult to localize or shift the supply base, because of the entrenched nature of the supply base or the cost-prohibitive elements for doing so. Many Chinese industries were established with government investment, and the cost of capital for developing local U.S. sources is a significant barrier for investing in local supply capacity. The X-axis refers to the perceived likelihood of ongoing political risk and disruption, including the likelihood of ongoing tariffs, customs duties, quotas, and export restrictions, resulting from major and ongoing geopolitical events such as Brexit or the U.S.-China trade war. The guidelines for this framework are shown in the Appendix 2.



## Persistent and Agile Market Intelligence

A second critical requirement for supply chains is the development of a persistent and agile source of medical and market intelligence. Enabling an effective response to supply chain threats involves the ability to monitor events globally and establish early warning signals that may indicate a potential threat on the horizon.



**Current State.** In the case of the pandemic, early warning of the COVID virus spread appeared in medical intelligence signals in December and January. But this knowledge did not translate into effective and early "whole of government" actions to mitigate the tidal wave that flooded the nation. Improved responsiveness requires agile networks that can quickly bring critical agencies into discussion where missions intersect. Multiple interpretations of intelligence are a requirement for translation into effective government policy-making decisions. Today, much of the intelligence in this area spreads across multiple agencies, including the Intelligence Community, the Federal Bureau of Investigation, the State Department, and the Department of Defense. An important criterion for assessing the usefulness of intelligence is the extent to which early warning signals can be leveraged from all of these resources, to highlight potential threats that may impact national security.



**Future State.** A requirement for the future discussed by many roundtable participants consists of several components, including (1) medical intelligence and (2) supply market intelligence. As with any crisis, the early part of the crisis was fraught with uncertainty, and often lacked good access to public health data within the U.S. health care system. Social media accounts of varied accuracy often complicated the picture. An established source of truth can provide objective information on what is happening in the global health care ecosystem, to provide an early warning system and support agility in response.

### 1. Medical Intelligence Signals

A medical intelligence signal can provide early warning indicators of problems that lie ahead. In a recent book, former Food and Drug Administration leader Scott Gottlieb notes that the U.S. can no longer rely on the World Health Organization (WHO) and other nations like China for early detection of novel pathogens:



*Global conventions, many implemented after SARS-1, were supposed to keep us fully informed of these risks and they were disregarded. This should change the future course for how we deal with these threats. We'll need to rely much more on our own tools for gathering information about novel pathogens and menacing outbreaks. We can no longer depend largely on global cooperation and the competency and transparency of other nations. COVID wasn't caused deliberately, but it was enabled and nurtured by the intentional quashing of information.<sup>3</sup>*



Gottlieb also notes specifically the need for a national intelligence service that can better identify and alert the country on the presence of alarming new medical threats:

3. Gottlieb, S., *Uncontrolled Spread: Why COVID-19 Crushed Us and How We Can Defeat the Next Pandemic*, New York: Harper Collins, 2021, p. 46.





*In short, COVID proved that we cannot trust as our only backstop the international conventions, cooperation, and obligations that govern our global public health order. These institutions need to be strengthened. But they cannot be our only means for being informed about new risks. We need more active efforts to gather information when there are signs of troubling outbreaks. We will have to rely more on our tools of national security, including our intelligence services.<sup>4</sup>*



Several roundtable participants discussed the need for medical warning systems, noting:



*Being surprised by COVID has been a pattern, and shows the lack of health security warning failures. We don't have a warning system, nor do we have a system of training the recipients of that information to understand the indicators. We can't just pay attention to patients, without determining what the global impact will be. There does exist a system of conveying warning information—and we do understand what these patterns look like. We can alert people to the fact that there is a situation occurring that is connected to the air traffic grid, which is how pathogens travel to the U.S. We need to develop the equivalent of a "hurricane warning" system.*



A comprehensive capability that relies on both global health security risk signals and tacit human intelligence signals, through a network of trusted experts around the world, lies at the heart of a future threat response system (Figure 2). This would include the following:

- A funded capability of observing direct indications of reports of human disease, coupled with indirect indications and warnings, such as official acknowledgement and action, demand for medical services, local perception of threat, comprised infrastructure, and change in business practices<sup>5</sup>
- Validation of medical threats with tangible multi-indicator analyses, and early warning signals communicated to others within the national threat infrastructure
- A multidisciplinary approach with specialists who have specific knowledge over different pathogens and biological threats
- A system for conducting simulations and scenario analyses that provide a range of possible scenarios—for example, tied to contagion through airborne travel—and a system of alerting health care providers of such risks using reliable and objective reporting. Today, this is often done by monitoring the FDA website, and guessing at the hidden meaning of different indicators observed around the world.

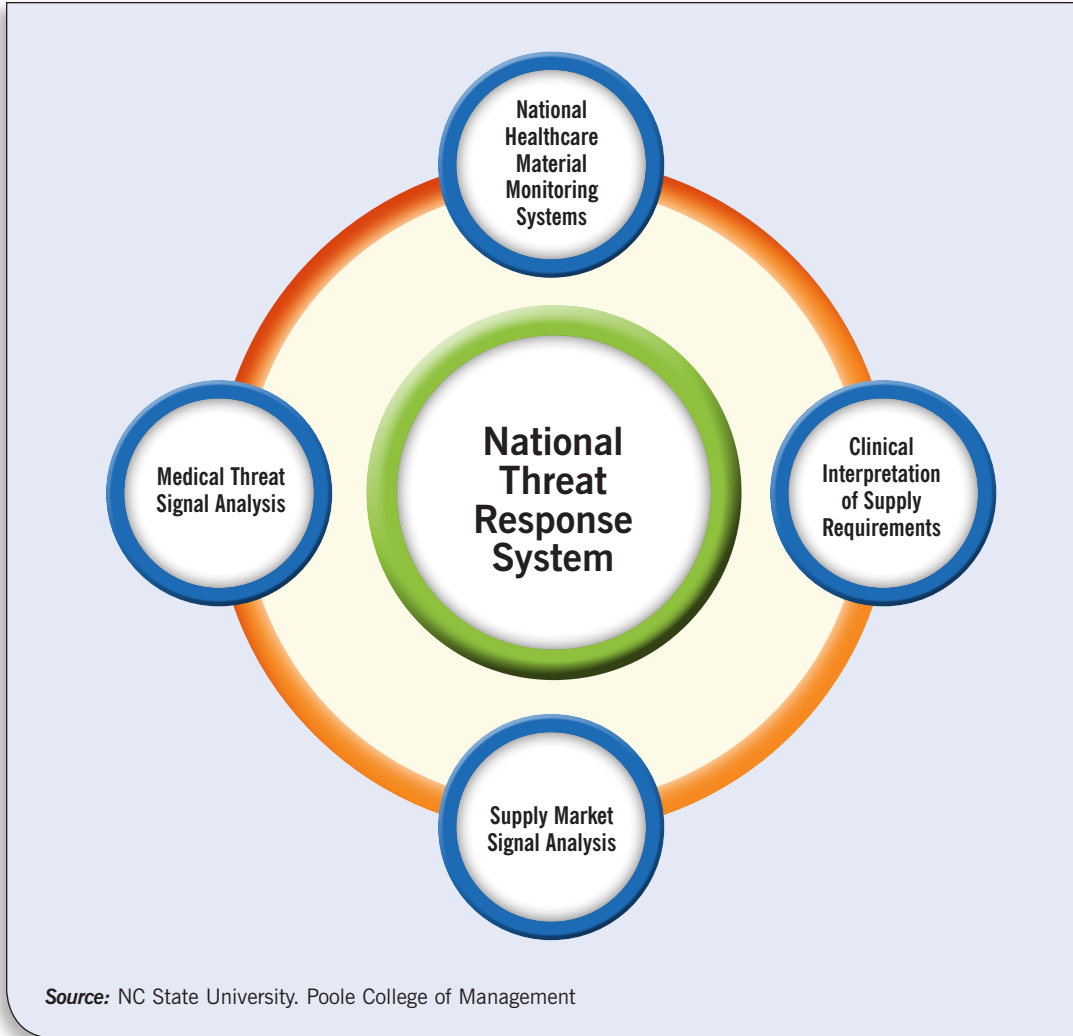
A parallel idea in the defense sector is [Northcom](#), which provides command and control of DoD homeland defense efforts. USNORTHCOM defends America's homeland—protecting the population national power, and freedom of action. NORTHCOM deters, detects, and defeats threats to the U.S., conducts security cooperation activities with allies and partners, and sup-

4. Gottlieb, S., 2021, p. 54.

5. Polyak, M., Black, M., Collmann, J., and Wilson, J., "Emergency of SARS in the People's Republic of China, 2002-2003: A Case Study to Define Requirements for Detection and Assessment of International Biological Threats," working paper, 2021.

ports domestic civil authorities. In the case of an emerging pathogen without an early signals monitoring system, an approach like NORTHCOM would provide early indicators of potential health care threats in a manner similar to the indicators for ballistic missile threats, both of which can be highly serious.

**Figure 2: National Threat Response System**



**2. Supply Market Intelligence**

A second component is monitoring conditions across supply markets with the following properties that include both strategic and tactical components. This function would involve developing contracts with critical private sector providers, to ensure that the government can procure the right materials in quantities aligned with the perceived level of threat identified by the health security assessment. This might add new suppliers and potential domestic surge sources that could respond in light of new information.

This capability relies on the ability to create market intelligence focused on the availability of critical medical supplies required to respond to threats. The pandemic illustrated how the U.S. faced export restrictions from other countries who manufactured the majority of PPE and medical supplies. The U.S. will not likely develop a health care manufacturing infrastructure that covers all possible medical threat outcomes any time in the near future.

The **Warstopper** program could be a model for this kind of market intelligence. The program provides analytical support to maximize vendor capacity, access industrial equipment, stage raw material and subcomponents, manage vendor inventory systems, and establish industrial base maintenance contracts to maintain vital domestic industries. More details on Warstopper are provided in Appendix 3.

## Supply Chain Technology Issues

There are three primary attributes associated with improved technology required for a response similar to that of the pandemic. These include Transparency and Traceability, Flexibility/Agility, and Equitable Distribution.



### Transparency and Traceability

This characteristic refers to the ability to detect material levels in the supply chain through real-time visibility to inventories. Accurate visibility requires a strong focus on data hygiene with continuous quality improvement through analytics technologies, blockchain, artificial intelligence, and multi-cloud environments. Inventory turns can thus be managed, as material close to expiration can be released and sold to the health care system, and replenished on a timely basis.



**Current State.** A lack of technology for material visibility within the SNS, FEMA, and state procurement offices led to a lack of demand insights and the inability to detect shortages in hospitals and the national stockpile—one cannot manage what one cannot see. There were no barcode-tracking systems to monitor inventory location in the system or to find expiration dates of materials in storage. The SNS relies on a manual count of inventory and manual updates to its antiquated material system, with an antiquated inventory management system providing no visibility into materials' expiration dates—similar to recent findings reported in regard to the Department of Veterans Affairs' COVID-19 inventory readiness.<sup>6</sup>

For instance, an audit of the SNS stockpiles in January 2020 revealed that the stock of N95 masks, gowns, and gloves had been depleted during the H1N1 pandemic a decade earlier and never replenished, and that many of the masks were past their expiration dates.<sup>7</sup>

6. U.S. Government Accountability Office. VA acquisition management: supply chain management and COVID19 response. Report no. GAO-20-638T. Washington, D.C.; 2020.

7. Bender M, Ballhaus R. "How Trump sowed COVID supply chaos." *Wall Street Journal*. August 31, 2020. [https://www.wsj.com/articles/how-trump-sowed-COVID-supply-chaos-try-getting-it-yourselfes-11598893051#comments\\_sector](https://www.wsj.com/articles/how-trump-sowed-COVID-supply-chaos-try-getting-it-yourselfes-11598893051#comments_sector). Accessed October 12, 2020.

Moreover, significant shortages of PPE were not reported publicly by the CDC during this period. A June 2020 study by the [National Healthcare Safety Network \(NHSN\)](#), a part of the CDC and the nation's most widely-used health care associated infection tracking system, reported that 40 percent of hospitals could not obtain N95 masks.



**Future State.** Preparing for a pandemic requires the ability to monitor many different activities at once, from the dynamics of the Asian health care market to the shifting nature of supply and demand across multiple categories such as PPE, drugs, vaccines, ventilators, and testing kits. A significant investment needs to be made in creating a shared service capability staffed with experienced supply management professionals knowledgeable in developing category strategies for these materials. Many of these issues proved problematic because of a lack of visibility technology; a lack of a barcoding system for track and trace of material locations, expiration dates, and consumption; and a lack of market intelligence into the supply markets for these items.

To ensure agility and flexibility, a system for monitoring the current condition of inventories within the SNS and across major health care distributors and hospitals will be critical. During the COVID response few knew where products came from, where they were sent, and who received them. A “national health care monitoring system” with access to an inventory visibility system could be tied to a “control tower,” with real-time analytics that tracks the current status of material in critical stockpiles throughout the country. Further, national monitoring of critical materials through a modern QR or barcode inventory tracking system could be required. This would, in turn, spur investment across a trusted network of hospitals, distributors, and manufacturers—which is not expensive technology and relatively easy to deploy.

Government needs to move away from the idea of simply increasing the SNS, and think more in terms of a “Strategic National Sourcing” framework—a sophisticated approach for developing category strategies and deep supply market intelligence around how to mitigate risk. Supply market intelligence can be defined as a process for creating competitive advantage and reducing risk through increased knowledge of supply market dynamics and supply base composition.<sup>8</sup> The term “supply” in this definition applies directly to services as well—i.e., you can gain knowledge about the dynamics and composition of available service providers.

In addition, market research in a public sector context involves collecting and analyzing information about capabilities within the market to satisfy agency needs (see Federal Acquisition Regulation, Subpart 2). This can consist of surveillance and investigation techniques. Surveillance is a continuous awareness process, whereas investigation consists of targeted and comprehensive analysis for a direct need. Supply chains and markets have informational attributes in the aggregate or at discrete and finite levels, enabling an analyst to “zoom in” or “zoom out.” Moreover, a temporal dimension to market research can enable any future governance framework to consider these attributes, and seek useful and analogous frameworks from which to learn.

### Flexibility/Agility

This attribute refers to the ability to withstand different demand requirements that arise on short notice. A future state supply chain response ability involves withstanding different requirements that get pulled together. This requires advanced planning, effective category intelligence, and strategic sourcing plans for any need that might arise in an emergency.

8. Handfield, R. (2010). Supply Market Intelligence: Think Differently, Gain an Edge. *Supply Chain Management Review*, 14(6), pp. 42-44, 46-49.

Flexibility also calls for integrated teams with multiple agencies, expertise, and perspectives, enabled by global monitoring to catch problems early and share responses.



**Current State.** Almost all the executives interviewed for this report felt unprepared for a pandemic. Indeed, the entire country was unprepared. Despite the “near misses” that occurred during the SARS and Ebola pandemics, most organizations had not adjusted business continuity plans for a global pandemic event. At a federal level, the SNS was also not able to support a timely response, and few hospitals received supplies that were effectively used during this period. As one expert explained:

*We saw it coming too late. In January 2020, we were working on the CAH gown recall, and we started to see Wuhan extend its lunar new year in early February. We started to move to buy PPE, but it was too late. Fortunately, we implemented aggressive conservation measures on gowns, N95s, and masks, and started hydrogen peroxide decontamination of masks. We never ran out as a result. A caregiver always had what they needed, but not always everything they wanted.*

Many organizations had a business continuity plan around disaster recovery for a single site going down—but not for a pandemic. Many executives thought about having extra inventory on the shelf as a solution for having single suppliers go down, but having an entire region or country go down and operating at 30 percent of capability is not something that can be easily planned for.

Hospitals also lacked both visibility into their needs and a mechanism to compel the reporting of need metrics (e.g., inventory and use data). A system of real-time inventory availability, transportation movements, and consumption rates for critical materials are imperative for a flexible and agile approach, as are insights into the global supply of a shifting list of materials.



**Future State.** A future state flexible and agile response would focus on the outcome of a [supply chain that is immune](#) to shocks that may occur, including a wide variety of potential disruptions. A future state national stockpile would have the ability to withstand different requirements that need to be pulled together on short notice. This requires advanced planning, effective category intelligence, and strategic sourcing plans for key needs that might arise in an emergency. Pandemic planning teams can develop demand sensing capabilities, wargaming situations/simulations to inform category strategies, and capacity requirements that span both domestic and global sources.

Requirements should embed industry standards to create maximum flexibility and increase alternatives in responding to needs. Rather than stockpiling items, this would involve contractual requirements and effective supplier development to ensure availability of supplies—beginning with National Response Framework (NRF) items, and building on other requirements based on wargaming and simulations to assess needs under different scenarios.

Increasing the stockpile will create more waste. To address this, a “living” stockpile can cover site needs. For instance, DoD/VA facilities carrying excess capacity can act as stockpile that is tracked in real time. This requires enhanced data management to provide real-time view of material, and a “first-in-first-out” inventory management approach to utilize stock that minimizes waste—assuring fresh stock for the national stockpile and minimizing obsolescence. Private firms offer “buy and hold” inventory management options that could also act as living



stockpiles, in addition to or in place of a DoD/VA option. This approach would also utilize current sourcing research practices to ensure that goods are state of the art and aligned with the realities of the supply market situation through focused category management and market intelligence.

An SNS positioned with demand-sensing capabilities can drive people within the supply chain into action. Key actions in the national supply chain system can prepare for future response. Supply chain immunity, in the case of massive disruptions of life-saving products and services, means the ability to survive through acting on the "how," not just the "what," in responding to emergencies. This can enable government to prevent recent supply chain failures from recurring, should there be another pandemic or global event. The U.S. can model action on a [plan for ongoing and persistent immunity](#) for the SNS.

A number of emerging technologies will drive this capability. Contractual requirements can be supplemented by inventory visibility systems tied to a control tower, using blockchain (or similar distributed ledger technology) transaction channels. A blockchain creates a trusted network of suppliers, through a private and secure technology network that allows instantaneous ordering, payment, and notification of receipt. The COVID response lacked the ability to track where products came from, where they were sent, and who received them.

Hoarding that occurred can be prevented by inventory visibility systems that employ barcode and QR code tracking of material through the supply chain, via a trusted network of distributors and manufacturers. Consumption of supplies should also be tracked, so that supply allocation decisions can take place in real-time based on daily or even hourly status updates versus self-reporting.

This technology is not overly expensive<sup>9</sup> but requires a centralized mandate and infrastructure to pull information into a data lake that serves as the single source of truth. This data lake must be curated carefully to ensure data quality, reliability, and timeliness. Traceability and transparency can also reduce risks from profiteering, counterfeiting, and quality degradation in critical supply chains. Blockchain and visibility are critical features for the future SNS that should be used across all health care logistics functions.

Capabilities and flexibility in sourcing alternatives aligned with national industrial priorities can create immunity for the federal supply chain. Several components of an SNS cannot be fully sourced in the U.S.; outsourcing of manufacturing capabilities has occurred for more than twenty years. Even today, many DoD contracts for aircraft and naval components are not commercially available in the U.S., and are often obtained through local distributors sourcing to manufacturers overseas. Alternatively, government could promote maintaining domestic sources where appropriate to support national security, and creating a global network of trusted suppliers willing to become part of a blockchain/visibility network.

This may also involve partnering with organizations that monitor global events in supply markets and map these to key global suppliers. Such actions can facilitate an understanding of the full risk picture, and promote securing national needs with an eye on global impacts. Early warning keys early action to prevent shortages and capacity problems. Rather than removing global suppliers from the field—impossible for certain categories of material and detrimental to overall supply chain risk—a network of suppliers can flex and collaborate through a trusted co-determined future relationship with government.

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9. <http://scnavigator.avnet.com/article/may-2017/the-living-supply-chain/>.



During the COVID-19 epidemic organizations involved in manufacturing non-PPE materials quickly ramped up their production of PPE. However, they lacked access to distribution systems for their products, leading to disorganized approach to working with hospitals and locations in need. A coordinated effort might have channeled these new suppliers to meet contractual obligations over an extended period of time. Strategies focused on demand shaping with suppliers also have a major impact on the cost and availability of supplies, more so than typical “strategic sourcing” RFQs that will not function well in the case of managing the stockpile.

## Equitable Distribution

During a pandemic, the demand for materials can come from many kinds of organizations at different times, each with claims on common goods. Organizations seeking goods include large integrated delivery systems, individual hospitals (inside and outside these systems), government delivery systems in DoD and VA, prisons, nursing and senior residential facilities, and rural hospitals and clinics. Importantly, all have had different levels of access to sources, especially traditional distributors and group-purchasing organizations. “Alternative markets” targeted many provider organizations during COVID-19, consisting principally of pop-up “brokers” with personal contacts in Asia or Central America outside the usual PPE production system.

An equitable system will respond to need as opposed to demand, and be guided by ethical principles that facilitate triage and distribution and not behaviors that threaten common interests. National allocation strategies based on hot spots and simulation analysis can better predict how to stem the spread of biological threats and viruses, as can strategies for effective pathogen protection and public communication.



**Current State.** As noted, the SNS was never designed to support a national pandemic (for history and background of the SNS, see Appendix 4). Prior to the 2020 onset of COVID-19, the SNS contained about \$8 billion of medical assets. However, many of these assets were well beyond their expiration date and could not effectively address the COVID crisis.

Disparate means of communication and coordination among public agencies were apparent. Today the Division of the Strategic National Stockpile occupies a low level within the Office of the Assistant Secretary for Preparedness and Response (ASPR), a group of public-health experts in the Department of Health and Human Services (HHS). In this location, the SNS has little influence and national visibility and lacks appropriate resources. SNS managers struggle to access information from other agencies, and they have little national visibility to support requesting such information. Ideally, the SNS would leverage opinions of experts from many sectors, including epidemiology, health care, distribution, occupational safety, cybersecurity, drug administration, the intelligence community, the State Department, state agencies, and public health.

The pandemic put a sudden and significant strain on supplies stored in the SNS. Despite the SNS’s purpose to provide for emergency health security and respond in the event of a bioterrorist attack or other public health emergency, the Stockpile had not attained public prominence prior to COVID-19, and did not have a level of funding commensurate with its mission. As such, the SNS did not have the tools or supplies needed to address the pandemic across populations in need.

An equitable policy and system for distribution is critical during any emergency. During a pandemic, demand for materials can come from many different kinds of organizations. Large integrated delivery systems, individual hospitals (in and outside of these systems), government

delivery systems in the military and the VA, prisons, nursing and senior residential facilities, and rural hospitals and clinics—all seek medical supplies, with differing levels of access to different sources. The “alternative market” that emerged during COVID-19, consisting principally of suppliers with personal contacts in Asia who were not part of the every-day PPE production system, targeted many of these provider organizations. Current COVID-19 supply strategies have become a zero-sum game given asymmetric information, and new forms of governance are required to address these shortfalls.

When the pandemic arrived in the United States in February 2020, the stockpile had not been properly replenished for many years and needed supplies had dwindled to levels not sufficient to respond. The supply of PPE had not been replenished since the H1N1 pandemic in 2009, the usage dates for many of the products (such as masks) had expired, and many could not be used. The supply of critically needed medical supplies has remained insufficient to meet the present crisis, and as of March 2021 the Food and Drug Administration identified several medical devices as being in a persistent state of shortage, including various forms of PPE.

Asking distributors to warehouse goods and to also be responsible for full distribution is not feasible. Prior research has highlighted several structural issues with health care distribution that make it problematic for distributors to house finished goods inventory buffers or address point of care needs. One of the biggest challenges is the historically inequitable allocation of goods. During the COVID crisis, the SNS could not serve a large number of health care institutions, especially smaller hospitals in less populated states, based on interviews with the National Association of State Procurement Officers and the National Governors Association. Further, private distributors will generally first serve their primary customers based on who has the greatest buying power as well as prior relationships. There is a need for increased visibility and fair allocation mechanisms that are transparent to all. (The CDC’s National Healthcare Safety Network, or NHSN, has the data to demonstrate that major shortages of PPE and masks were not equitably distributed.)



**Future State.** An equitable system would respond to need and be guided by a set of ethical principles to facilitate triage and distribution. An equitable system requires input from provider organizations regarding demand, but also focuses on preparedness—which may well prevent hoarding. Visibility into where things are going can alleviate reliance on distributors and vendors to allocate material to the right places, and a demand sensing capability at the SNS level can drive allocation to states and counties most in need. Resource availability is key, but information availability may be just as important if not more so.

While no “magic bullets” emerge as a solution to the problem of equitable allocation in a crisis, one possible pathway involves the “Dollar-a-Year Men” strategy discussed in Appendix 5. Using industry experts from the private sector to lead a recovery effort would support improved government insight and agility. Expert advisors could pool their knowledge, drawing on their private-sector (and likely international) knowledge and connections to identify what goods are needed and where, the present supply of those goods, and any competing demands. This would allow for the integration of medical, production, and supply chain management expertise in an area of the government presently dominated by medical knowledge. The SNS would be much better equipped to assess the health of supply lines, in order to more broadly protect health across the nation. The recent national supply chain directive highlights that the SNS should contribute to medical supply chain resiliency (beyond a static inventory level), which would enable the prescribed responsibilities of this resource to change.<sup>10</sup>

10. See <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/02/24/executive-order-on-americas-supply-chains/>.

## Supply Chain Policy Implementation Issues

Effective implementation of government policy issues can enable all-of-the-above elements discussed in this paper. Sound governance can allow agencies to leverage collective expertise and address complex issues underlying the response to a global pandemic. Specifically, the system should capture the following objectives: 1) leverage existing capabilities and deliver effective shared services, 2) respect roles and responsibilities and enable innovation via networks at all levels of government, and 3) promote public support that leads to political and operational viability and sustainability.



### Leverage Existing Capabilities and Deliver Effective Shared Services

Government and industry capabilities already working effectively should be leveraged as fully as possible before building new capacity. To what extent could new national programs leverage multiple federal, state, or local government entities as a shared service in responding to a variety of emergency response scenarios? This approach would build on expertise across agencies, to bring a coordinated and intelligent response that expands on strengths and knowledge of experts who can work together in a unified forum to solve a problem.



**Current State.** Roundtable participants discussed the issue of data quality and data standards at length. Effective shared services rely on shared data standards, still being built by shared services organizations across the government. Participants also noted, “We have to be realistic versus inspirational when thinking about a national threat model. It will take years to break down siloes between agencies to establish a common architecture. But what we require is a system for interoperability, one that is not too federalized and which “screams” for agility.” A public-private commercial model like those emerging for federal shared services would support this objective, focused on critical information, and establishing roles and responsibilities, and communicating throughout the enterprise.

Agility in government requires trusted networks to build interoperability. In the past, simply ordering disparate groups to team up together in an immediate emergency has not been sustained over time. Each agency seeks guard rails to determine who leads what activities, based on capabilities not based on charters. Rather than setting up a massive monolith organization, governments can capitalize on national networks.



**Future State.** Asking manufacturers to reserve capacity/quantities of material to supplement the SNS is not a reliable strategy—foreign manufacturers will voluntarily or forcibly serve their country’s needs first. Separate research conducted with S&P Market Intelligence shows how exports into the U.S. were restricted during this period. U.S. manufacturers most often rely upon foreign supply chains, and which will change overnight. For instance, companies like 3M could not get masks delivered from China during pandemic.

This is simply not a workable proposition. Reserving manufacturing capacity would require significant advance notice to scale up, and most manufacturers do not control the capacity of their tier-two suppliers in foreign countries even if contractually reserved, which has left many products unavailable to tap into during the pandemic. Any major global crisis will face similar conditions.

Instead, contractual requirements must be supplemented by inventory visibility systems tied to a control tower, as well as blockchain (or other distributed ledger) transaction channels, as described on p. 22 of this report.

### Respect Roles and Responsibilities and Promote Innovation

The federal role should focus on setting standards and enabling interoperability for information sharing and coordinating response efforts, rather than orchestrating “command and control” responses in the states. Alignment of federal, state, and local actions should be clearly defined through a “playbook” that designates the roles of each party in a response. The response system should also enable entrepreneurial innovation responses from individuals and networks at all levels of government and industry.



**Current State.** During the peak of the COVID crisis, federal agencies competed over decision rights and ownership of issues, lacking an equitable and fair means of deploying materials in the stockpile. Today, no such policy exists; there has never been a situation comparable to COVID whereby every state in the country required emergency medical supplies. Further, state procurement agencies operated independently, which led to hoarding and gaps throughout the country, often with bigger and more populous states taking priority over less populated or lower-funded states. Tracking inventory across state lines and creating a commons-based system that shows nationwide demand and supply requirements was needed for the equitable distribution and allocation of materials.

The Defense Production Act was invoked for PPE essentially after the fact, as the global supply of raw materials to produce these goods was already backlogged by April. Government edicts to control production did not function in a global supply chain ecosystem that did not have raw materials available domestically. This situation revealed a lack of adequacy, capability, and governance to create and manage a common response to a national pandemic situation, due largely to a number of inherent problems in the national pandemic response as discussed above and to the general lack of integration across the U.S. health care system.

As one roundtable participant reflected:



*Across the pandemic, it is not just about material movement, but it also involves working across a patchwork of government issues and federal benefit programs. There were clear gaps between agencies like the Defense Logistics Agency, FEMA, and the American Red Cross—and very little interoperability between their systems. We need to know what is in our own warehouses, but also build partnerships with suppliers through our acquisition channels.*



**Future State.** Roundtable panelists from government stated that developing a cross-agency network to manage a problem as politically sensitive and dire as a national pandemic requires “baby steps,” and cannot evolve overnight. As one government expert noted:



Grand strategies sound great, and setting up some broad frameworks such as the DPA can be helpful, but we need to address the problems in smaller bit-sized pieces. If ASPR (Assistant Secretary for Preparedness and Response) is the wrong place to host the SNS, we should adjust the federal approach to managing the problem. We should rely more on commercial partners to optimize our response, and partner with our other Allies around the globe. We also have to be cognizant of the political realities faced, which often entail multiple objectives that are sometimes at odds with one another. For instance, contracts and acquisition strategies can be formed within the agenda of a national industrial strategy. To the extent that we promote an industrial strategy and relate it to the support of domestic manufacturers in the context of more strategic agile supply chains, we can be consistent across multiple agendas.



One of the biggest challenges ahead for government involves ensuring improved data sharing between agencies. During COVID, members of the SNS emphasized that they could not obtain basic data from FEMA or FDA on the number and location of cases. The model proposed here requires agencies to communicate, which requires addressing both legal and trust issues—the latter of which can be built through proactive communication and not reactive action.

Other activities in the government can improve communications across agencies, but multiple parallel activities can get bogged down. When national emergencies occur, agencies can mobilize more effectively with good governance. In the future, government and industry can agree on priorities for production and robust stockpile management approaches, and on specific actions and agencies responsible. For instance, rare earths and microelectronics are both areas where the U.S. is exposed internationally. Future efforts could focus first on a few such areas, or even a few medical supply areas.



The Biden administration has emphasized onshoring activities, but the U.S. may only be able to produce a small portion of medical goods domestically. To address this, government could incentivize investments in domestic supply chains, and emphasize the jobs impact of onshoring in addition to the reduction of risk. More broadly, numerous industries have started to restructure their global supply chains and move to the west to reduce supplier risk, potentially supporting a new north-south axis with Latin America and Mexico. Government actions may intersect well with these trends.

Any future state needs to clearly define roles and responsibilities, based on the type of emergency facing the country. An excellent example of such collaboration was the “swarm mentality” that took place during the Boston marathon bombing, when dozens of different police forces worked together from within their own lanes. During COVID, it was often unclear who was in charge, and there was no master plan to determine which agencies would handle which issues. Clearly defining the “swim lanes” will represent an important component of the future state.

An important component of a future state model to promote innovation might involve using an “[Other Transaction Authority](#)” (OTA) as a contract vehicle to act rapidly in an emergency. OTAs are a special contractual vehicle used for specific federal agencies to expedite and simplify access to mission-critical technologies that bypass the complicated and burdensome requirements of the Federal Acquisition Regulations (FAR). OTA use will require defining and understanding what third-party providers will supply to the government and the public. Many OTA concepts were built for nontraditional, small firms. Unfortunately, many OTA contracts have gone to large firms who seek to avoid cost accounting and intellectual property restriction requirements. For more on OTAs, see the recent IBM Center report, *Other Transactions Authorities: After 60 Years, Hitting Their Stride or Hitting the Wall?*<sup>11</sup>

### Political and Operational Viability and Sustainability

Any proposed solution must be acceptable to a broad, bipartisan community of political decisionmakers at the national level, and operationally viable and sustainable at the state and local levels, to succeed in a deeply divided America.



**Current State.** Unlike prior emergencies such as 9/11, when multiple agencies participated in multiple exercises, the COVID crisis did not unfold in the context of existing supply chain governance mechanisms. Executives in the roundtable asked if government could enable interconnected preparedness and have protocols in place across agencies to manage such a crisis. One noted, “OMB performs in such cases, because it has a built-in structure to frame the policy, identifying where it is coming from, and a format for presentation. OMB may not be the right agency to run the show, as they are not operational in nature, but they do have a good system of governance.” The critical element needed involved an anticipatory framework, so that the agencies could commence management immediately and with resources in place.

Roundtable participants noted that no structure was in place to address the pandemic. The government developed an interconnected network almost overnight, which involved frequent communication (even twice-weekly) among agencies just to determine where money went and how it was spent. The team also reached out to the business community to create a larger structure of external interconnected networks, enabling a common mission.

11. <https://www.businessofgovernment.org/report/other-transactions-authorities>.





**Future State.** A desired future state would entail developing a “board” or “task force” approach with a predefined governance apparatus. This entity could have an initial meeting with representatives from affected agencies to define a common mission. This could rapidly enable an interconnected network with predefined sourcing agreements. Because it is impossible to determine with perfect foresight the exact nature of a future problem, any such structure will need to perform in as agile a manner as possible.<sup>12</sup>

Early medical intelligence warning signals could trigger the formation of such a task force, beginning with due diligence in terms of supply market intelligence, as well as identification of current state conditions for critical inventory, sourcing channels, and hospital preparedness levels. Some form of industrial policy protocol could be mobilized, and intelligence networks reaching into the private sector, especially for medical distribution, would need to be in place prior to the emergency. This would address multiple planning needs. For instance, during the initial COVID period, the task force had little understanding of the lack of N95 masks or the poor condition of existing ventilators in the SNS, until it became too late to act.

The War Production Board (WPB) serves as a good model for such a task force. The WPB was designed as a new administrative agency vested with full power and responsibility for the mobilization of industrial resources, to assure the most effective implementation of war procurement and production. When WWII came to the United States with the attack by the Japanese at Pearl Harbor, preparatory production efforts—directed towards anticipating future needs and addressing them with ample supplies—now had to pivot to a reactionary posture, filling needs as they arose that included developing additional industrial production to meet new demand. To meet this more difficult task, the government created a correspondingly more powerful agency than had existed previously: the War Production Board. Additional details on the War Production Board are found in Appendix 6.

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12. Characteristics of an agile government are addressed in a recent IBM Center report, *The Road to Agile Government: Driving Change to Achieve Success*, by Ed DeSeve. <https://www.businessofgovernment.org/report/road-agile-government-driving-change-achieve-success>.

# Conclusions



The IBM Center-SSLC roundtable produced significant insights into the challenges of whole of government supply chain and shared service challenges, using the COVID-19 experience as an exemplar and drawing conclusions for larger process, technology, and policy strategies. The roundtable found that the U.S. possesses tremendous problem-solving capacity, which comes from networked individuals who step outside assigned roles and designations and join with others in bringing their collective talent to bear on urgent problems facing the country. Roundtable participants representing a wide spectrum of views assembled to share experiences, address lessons learned, and chart a path forward to prepare for the next pandemic or other whole of government management challenges.

Considering the discussion under the “Future State” sections in this report, key recommendations that emerged from this roundtable include:

- **Establish a new set of government industrial strategies** targeted at supporting a domestic “stop gap” manufacturing capability.
- **Enable visibility among government and distributors into inventory systems**, and with fixed “set aside” inventory for government allocation under different conditions of duress. This would require a set of common data standards and a common architecture to create a dashboard and a “control tower” capability.
- **Establish a multiagency materials inventory portfolio stockpile** based on in-depth supply market analysis. At a minimum, this should include specialists in the following categories: disposable medical supplies (PPE, gowns, gloves), pharmaceuticals, plastics and resins, medical equipment, biologics, health care personnel, and respiratory products. This could be a virtual stockpile that utilizes existing government storage facilities, such as those at the VA.
- **Develop a “make or buy” set of analyses** with recommendations for investment in critical manufacturing infrastructure within the U.S. This should be deployed in conditions of elevated market risk that create extreme exposure to other countries producing the bulk of manufactured supplies.
- **Develop and sustain a medical intelligence signal** to provide early warning indicators of health care pathogens and other imminent crises. This enables direct indications of reports of human disease, coupled with indirect indications and warnings, such as official acknowledgement, demand for medical services, and local perception of threat.
- **Monitor conditions across supply markets** that include both strategic and tactical components. The tactical element to this function would involve developing contracts with critical private sector providers, to ensure that the government can procure the right materials in quantities aligned with the perceived level of threat identified by health experts.
- **Create a shared service capability** staffed with experienced supply management professionals, knowledgeable in developing category strategies for these materials. This team would be tasked with development of category strategies, based on deep supply market intelligence around how to construct strategies to mitigate risk.
- **Create a “national health care monitoring system”** with access to an inventory visibility system tied to a “control tower,” with real-time analytics to track the current status of material in critical stockpiles throughout the country.
- **Establish a pandemic planning team** to develop demand sensing capabilities, wargaming situations/simulations that inform category strategies, and capacity requirements that span domestic and global sources. The capacity requirements should embed industry standards to create maximum flexibility and increase alternatives in the event of need.

- **Develop a blockchain created by a trusted network of suppliers** through a private and secure technology network, to allow for instantaneous ordering, payment, and notification of receipt.
- **Use industry experts to improve the integration** of medical, production, and supply chain management expertise in an area of the government presently dominated by medical knowledge, which would also improve preparedness of health care supply lines.
- **Develop contracts that require manufacturers** to reserve quantities of material to supplement the SNS, along with contractual requirements requiring inventory visibility systems tied to a control tower and blockchain (or other distributed ledger) transaction channels.
- **Consider using an “Other Transaction Authority”** as a contract vehicle to act rapidly in an emergency. OTAs are a special contractual vehicle used for specific federal agencies to expedite and simplify access to mission-critical technologies.
- **Develop a board or task force** with a predefined governance apparatus from the outset of a crisis. This entity should first meet with affected agencies to define a common mission and enable an interconnected and agile rapid response network, which would require some predefined sourcing agreements.

We hope that the analysis and findings from the expert roundtable that contributed to these recommendations will spark additional actions across government and industry to prepare for a strong, shared supply chain that can help drive effective responses to future crises.

# APPENDICES

## Appendix 1: Workshop Forum

Objectives for the roundtable focused on defining the current state of the government’s capability in three specific areas, as well as the ideal future state capability. Participants were asked to “stretch” their imagination on critical areas for the future state and what a world-class commercial set of capabilities would look like. The participants were from a number of different areas, including DoD, Congressional offices, DHS, and academia.

### Questions for Discussion:

1. What were the major performance problems in the national response to COVID?
2. What is the current state of capabilities in the national response system, and what missing or under-performing capabilities caused or enabled the performance problems to occur?
3. What would a world-class commercial set of capabilities look like, and what attributes would these capabilities possess?
4. How do the current state and a world-class future state compare relative to the following criteria: What would be the enabling elements required to establish and activate this capability? What is the timeframe for development? Who should lead the initiative?

Breakout groups dealt with the different types of issues for a current and future state, which includes the broad categories of Supply Chain Process Issues, Supply Chain Technology Issues, and Supply Chain Policy Implementation Issues, using the table shown below.

**Table 2: Shared Services Framework for Breakout Group Discussion**

| Breakout Groups:   | Current State | Future State | Critical Success Factors |
|--|---------------|--------------|--------------------------|
| <b>Supply Chain Process Issues:</b><br>Global Independence, Persistent and Agile/Market Intelligence   |               |              |                          |
| <b>Supply Chain Technology Issues:</b><br>Transparency and Traceability, Flexibility/Agility, Equitable Distribution   |               |              |                          |
| <b>Supply Chain Policy Implementation Issues:</b> Leverages existing capabilities and delivers effective cross-government shared services, Respects constitutional roles and responsibilities, Enables innovation throughout the ecosystem, Political viability and sustainability |               |              |                          |



## Appendix 2: Global Sourcing Framework

Roscoe et al. (2021) developed a framework of supply chain strategies for geopolitical risk mitigation (see Figure 3). This framework provides some guidelines to the federal supply chain on whether to adopt centralized/regionalized or localized supply chain designs according to how entrenched their suppliers are in a particular geographic location as well as how severe the geopolitical disruption is perceived to be.

**Figure 3: Framework for Supply Chain Strategies for Geopolitical Risk Mitigation**



The Y-axis of Figure 3 shows the shifts in the external business environment, which have rendered it difficult to localize or shift the supply base, because of the entrenched nature of the supply base, or the cost-prohibitive elements for doing so. We note here that many Chinese industries were established with government investment, and the cost of capital for developing local sources is a significant barrier for investing in local supply capacity. The X-axis refers to the perceived likelihood of ongoing political risk and disruption that is likely to continue, including the likelihood of ongoing tariffs, customs duties, quotas, and export restrictions, resulting from a major and ongoing geopolitical event such as Brexit or the U.S.-China trade war. In general, there are four strategies that emerge.

**Strategy 1: “Grin and Bear It”**—*High difficulty of reshoring, high likelihood of ongoing geopolitical risk.* The increasing cost of moving products from an overseas supplier has been escalating, not just because of labor costs but also because of transportation costs, tariffs, and duties. Supply discontinuity have also dramatically increased the discussions around localization. This perception has escalated following the COVID-19 crisis, as borders were suddenly shut down for critical materials like PPE and ventilators. However, there are some economic factors that simply cannot be overcome, where entrenched supply bases produce a “Grin-and-Bear-It” approach. This approach recognizes that in some industries, supply chain redesign is

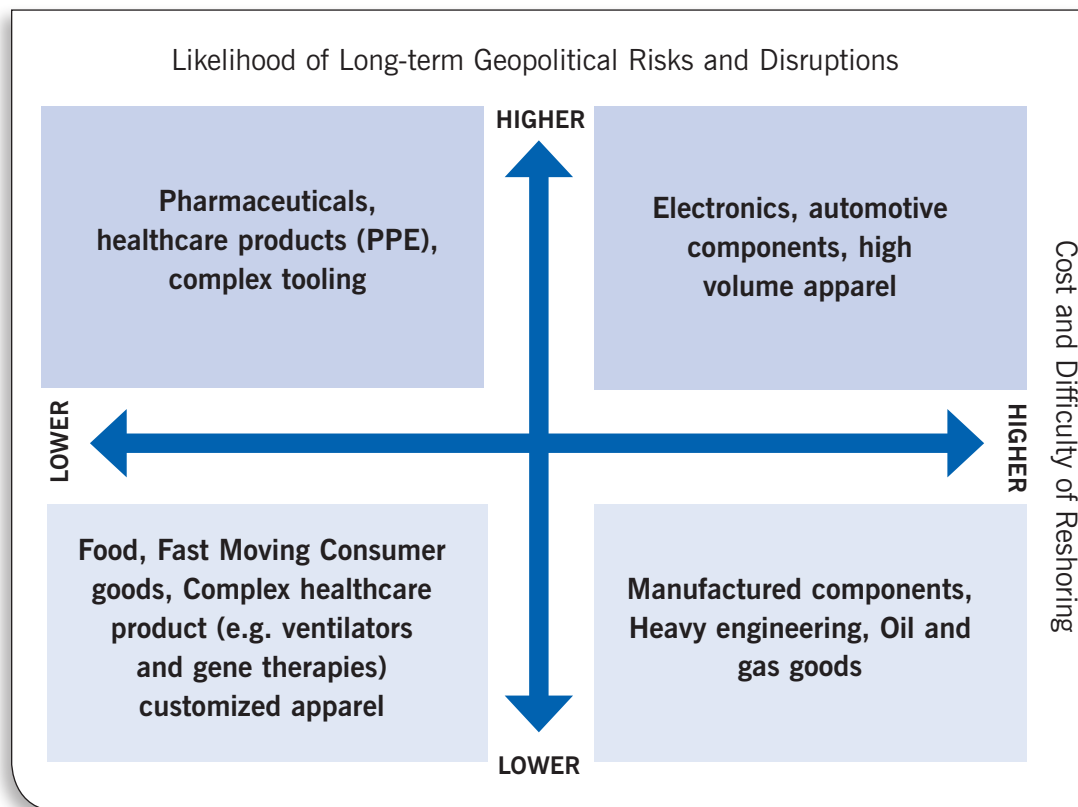
difficult, if not impossible, such as in the electronics industry where the epicenter of component manufacturing and final assembly is in Asia. Under the “Grin-and-Bear-It” approach, we suggest companies will prioritize short-term tactical efforts such as building redundancies and holding inventory at different points in the supply chain. Other tactical strategies may include moving production to nearby locations (such as Vietnam) or transshipping through nearby locations to allow for a change in the country of origin customs label and the avoidance of tariffs.

**Strategy 2: “Explore Your Options”**—*Low difficulty of reshoring, high likelihood of ongoing geopolitical risk.* The movement towards localization strategies is a function of the supply chain logics that prioritize the avoidance of uncertainty and risk, and an acknowledgment of the importance of lowering the total landed costs of goods, which occurs naturally as suppliers are located closer to customers. Localization is particularly relevant due to the size/cost ratio of goods with large, bulky, and low-margin items (such as food and beverages, vehicles, fabrications) being manufactured closer to the point of consumption because they are expensive to transport. There is also an opportunity to increase domestic sourcing to exploit local market knowledge and drive growth. Consider the case of mobile phone technology and how local producers in India and China have taken massive market share by moving towards regional supply chains that produce locally for local markets. Proximity drives lower costs by being closer to customers and closer to the point of sale. For the same reason, Amazon is opening distribution centers close to major centers of demand in the United States, with many U.S. retailers moving to a same-day or next-day logistics delivery model.

**Strategy 3: “Tactical Warfare”**—*High difficulty of reshoring, lower likelihood of ongoing geopolitical risk.* For some products, such as pharmaceuticals, medical supplies, health care products, and complex tooling, we may see reduced tariff barriers as access to these products is deemed critical following the COVID crisis. For instance, we are unlikely to see a sudden surge of local production of high volume, low-cost medical products in Western economies. For products within this quadrant, the expectation is that geopolitical risks will not be ongoing, with such risks not perceived as being not substantial enough to justify the cost of relocating production. Companies in this quadrant will adopt short-term tactical measures such as tariff avoidance, regional distribution centers with inventory, and national stockpiles of goods. However, if there is maintained political pressure for these types of goods to be produced locally, such as pharmaceuticals to treat the symptoms of COVID-19 or PPE, these industries will consider shifting production onshore. In addition, we may see manufacturing, heavy engineering, and oil and gas seek to develop local suppliers of engineered products, to ensure business continuity and develop secondary sources of supply, even though costs may increase.

**Strategy 4: “Buy Local”**—*Low difficulty of reshoring, low likelihood of ongoing geopolitical risk.* For those products subject to local cultural differentiation and local sources of supply, we will see localized supply chain designs dominate, with this category expected to grow further as consumer demand for local products increases. Industries in this sector include food, especially fresh fruit, vegetables, and meat, as well as complex health products such as customized pharmaceutical products (gene therapies) and ventilators. For example, we are beginning to observe new start-up companies in areas such as customized apparel, who are seeking to develop digital apparel production capabilities in response to consumers who are seeking customized clothing and want it delivered within 48 hours, and localized capabilities will become important for this sector. We now map the industries in our study to the four strategies shown (in Figure 3) to provide an indicative framework for supply chain designs (Figure 4).

**Figure 4: Indicative mapping of supply chain risk mitigation strategies by industry**



### Appendix 3: Warstopper

The Warstopper program was originally targeting defense manufacturing industries, but the ultimate goal is to provide government investments when readiness demand is higher than the commercial industry is willing to invest. The program began as an after-action item from Operation Desert Storm, when the manufacturer of the auto-injector used to deliver nerve-agent antidote was on the edge of not being able to meet the go-to-war requirements. This framework would be ideal for positioning an office to address shortfalls in domestic production of critical materials.

During COVID, the Defense Logistics Agency supported the nation’s response with direly needed supplies like ventilators and face masks through medical readiness contracts that were part of the [Warstopper program](#). The amount and type of items requested fluctuated daily as needs emerged and industry ramped up production through the Defense Production Act. While the 1950 law gives government agencies more control of manufacturing during emergencies, it also gives DoD authority to partner with industry and make investments to boost readiness on a continual basis. One advantage is that industry has to accept orders from Warstopper if they normally produce the parts and must move them to the front of their production queue for commercial work.

The Warstopper Program complements those protection measures by shielding over 14,000 medical items identified by the services as being critical from becoming scarce due to resources or industrial limitations. Long before COVID-19 spread across the globe, DLA’s contracting team established Warstopper contracts with suppliers and purchased vital material to

ensure essential go-to-war items could be rapidly produced. Warstopper is also authorized to purchase components needed for production of critical goods like ventilators, and pay manufacturers to keep it available for use so that when a surge occurs, the contract can be executed.

As a result, DLA's Warstopper-funded contracts facilitate “guaranteed access” and delivery of material much faster than if orders were submitting on an as-needed basis. All Warstopper contracts are sized to support DoD needs but have been used to support the public through humanitarian assistance.

## Appendix 4: History of the Strategic National Stockpile

The SNS originated in the last years of the Clinton administration through an act of Congress that formalized this stockpile under its current name. It required that:

*[HHS] maintain a stockpile or stockpiles of drugs, vaccines, and other biological products, medical devices, and other supplies in such numbers, types, and amounts as are determined [...] by the Secretary to be appropriate and practicable, taking into account other available sources, to provide for the emergency health security of the United States, including the emergency health security of children and other vulnerable populations, in the event of a bioterrorist attack or other public health emergency.”<sup>13</sup>*

The Stockpile's funding was established at \$640 million, and this value remained relatively stable over time even as the SNS has had to respond to a number of natural disasters and biological threats (Esbitt, 2003). The SNS is described by the CDC as a repository of potentially life-saving pharmaceuticals and medical supplies for use in a public health emergency in which local supplies have been or may be depleted (CDC, 2014). The supplies which make up the SNS are known as the “formulary” and include a wide range of medical products, including both pharmaceutical interventions (such as vaccines, antimicrobials, antidotes, and antitoxins) and non-pharmaceutical interventions (such as ventilators and PPE) (Siripurapu, 2020).

In ordinary times, SNS supplies are stored in two groups (Banner, 2016). A small portion—approximately 2 percent—of the supplies are maintained in “12-hour Push Packages” designed to be quickly distributed to locations across the United States, thus providing local authorities with a wide variety of emergency response equipment designed to obviate the need for specific requests. For example, these Push Packages were put to use in the Stockpile's first major response, assisting state and local authorities in the aftermath of the terror attacks of September 11, 2001, and the anthrax incidents of the following month (Khan, 2011). The remainder of the SNS inventory is stored as “Managed Inventory” and the CDC may provide local authorities with specific supplies from this group in accordance with particular needs. Notably, the CDC and the SNS are not the first movers of emergency response—rather, the Stockpile functions to assist state and local authorities with their emergency responses, an

13. See 42 U.S. Code §247d-6b - Strategic National Stockpile and security countermeasure procurements, at <https://www.law.cornell.edu/uscode/text/42/247d-6b>.

interconnected effort mandating cooperation and communication between federal, state, and local authorities to be successful (Redd et al., 2017).

SNS's failures have attracted the scrutiny of the public and many government agencies and committees. For example, a *New York Times* report details that, even during the early efforts to increase the Stockpile's supplies to respond to COVID-19, \$626 million was diverted to purchase anthrax vaccines from Emergent BioSolutions—money which, according to some involved in managing the SNS, should have been used to buy PPE and ventilators.<sup>14</sup> In April 2020, a shipment of ventilators was diminished by more than 2,000 as the result of a contracting dispute, which had prevented government contractors from properly maintaining the ventilators in storage.<sup>15</sup> Initiatives to expand the Stockpile's quantities of needed supplies also failed, including the Trump administration's push to expand N95 mask supplies to 300 million within 90 days starting in May 2020. By November 2020, only 142 million N95 masks had been delivered and were being held in inventory by the SNS.<sup>16</sup> At the same time, state governments had to compete amongst themselves for access to goods they could not otherwise get through the Stockpile.<sup>17</sup>

Government criticism has primarily attributed the SNS's failings to a lack of appropriations, but we believe the problems of the SNS is a function of a much larger set of problems.

A recent study by the author of patterns of PPE distribution during COVID suggests that the federal government did not have a systematic allocation strategy during the COVID crisis for distribution of PPE, and that the patterns of doing so appeared to be ad hoc. This raises an important issue: how are governments allocating critical medical supplies in situations such as COVID, when the demand far exceeds supply? For instance, an interview with a large mask manufacturer revealed that the monthly demand for N95 masks the manufacturer was facing was more than \$1 billion per month—while their typical volume of orders was never greater than \$2 million per month. This disparity in supply and demand requires an innovative set of allocation and distribution measures.

The interviews held with state officials in this study confirmed that the use of the SNS from the federal did not seem to follow a structured distribution strategy, and that most of the supply shortages experienced in the pandemic has fallen on the SNS, the CDC, FEMA, and HHS more broadly.

Once the pandemic arrived in the U.S. in February 2020, there was an attempt to source supplies on an expedited basis to address rapidly growing hospitalization rates and the commensurate shortages of badly-needed supplies, including ventilators. Additionally, a number of planning and interventionist strategies were adopted with the goal of making up the difference in critical materials by foraging supplies, such as 3-D printing of face shields by universities. But these measures were insufficient to prevent supply exhaustion in the early months of the pandemic. By late March 2020, most materials in the SNS had been depleted.

Meanwhile, what resources were available were the subject of competition between different federal agencies, as well as state and local governments, which resulted in inequitable distri-

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14. See Chris Hamby and Sheryl Gay Stolberg, "How One Firm Put an Extraordinary Burden on the U.S.'s Troubled Stockpile," *New York Times* (Mar. 6, 2021), <https://www.nytimes.com/2021/03/06/us/emergent-biosolutions-anthrax-coronavirus.html>.

15. See David E. Sanger, et al., "A Ventilator Stockpile, With One Hitch: Thousands Do Not Work," *New York Times* (Apr. 1, 2020), <https://www.nytimes.com/2020/04/01/us/politics/coronavirus-ventilators.html>.

16. See Stephanie Armour, et al., "U.S. Supplies of COVID-19 PPE Fall Short of Targets," *Wall Street Journal* (Dec. 9, 2020), <https://www.wsj.com/articles/u-s-supplies-of-covid-19-ppe-fall-short-of-targets-11607509800>.

17. See Monika Evstatieva, "A Revamped Strategic National Stockpile Still Can't Match The Pandemic's Latest Surge," *NPR* (Nov. 23, 2020), <https://www.npr.org/2020/11/23/937978556/a-revamped-strategic-national-stockpile-still-cant-match-the-pandemics-latest-su>.



butions of stockpiled materials as well as hoarding and gaps throughout the country benefiting better-funded areas at the expense of their worse-funded counterparts. Federal responses to this state of affairs came only after the SNS had already been drained of its key materials, with invocations of the Defense Production Act (DPA) to secure a supply of PPE in mid- to late-March, although the global supply of raw materials to produce these goods was already backlogged by April.

During the interviews, several state procurement officers operating in the Emergency Operations Centers of States that experienced high COVID-19 surge highlighted several times the lack of inappropriate PPE support from the federal governments.



*If you think that the federal government supported us properly, you are a believer. Initially we did get some supply, but I don't think anywhere near the amount that we were hoping to.*

*We did receive product from FEMA, but the vibe we had on it is that we were never too sure what was coming. And when it was coming.*

*Emergency management got some product from FEMA, but I would say it wasn't at reliable intervals and it often wasn't necessarily what we needed.*

*There was no big national stockpile to dole out and so there was anything coming on our way. I know other states experienced FEMA diverting their orders last minute.*

*FEMA cut off funding effective September 15<sup>th</sup> for all non-health care PPE [...] this decision put several states in a very difficult situation.*

*I heard many, many stories about product ordered and coming in, but they could not get it because FEMA stopped it at customs and took it.*

*As time went on, working with the vendors, they [the federal government] started putting limits on each state so that they could provide a little bit to each state, but that was further down the line.*



At the same time, there were states (not necessarily the most affected by COVID-19) that received a good and timely amount of federal PPE supply.



*They get federal distributions that the emergency management team is showing us [...] they get, from the federal government, so many of these gloves. They are shipping them and they are tracking per county, how many are coming in of N95 and gowns and gloves to our hospital agencies directly to hospital.*

*We did receive shipments from FEMA [...] we did get lots of help and receive some shipment of N95 and other types of PPE.*

*We worked through FEMA, which is our normal partner for an emergency, and they were able to get us the large amounts of PPE that had to go into federal sites for testing [...] They send us truckloads of PPE.*



This uncoordinated and ad hoc distribution approach affected states' ability to be able to react to the emergency and provide hospitals with what they needed. Our interviews reflected a diverse set of approaches, which operated relatively independently, that can be discriminated in two groups.

## Appendix 5: “Dollar a Year Men” Policy Used in WWII

In the rearmament period leading up to and during the WWII, one of the most notable—and criticized—aspects of the military build-up was the presence of the so-called “Dollar-a-Year Men” (Fleischmann, 1952). These men were not government administrators by training, and yet, especially during the period before the Japanese attack at Pearl Harbor, they played a major role in the planning and procuring of the war effort. The heart of their success, and their notoriety, was that they were industry men. The colloquial term “Dollar-a-Year Man” refers to outside experts who are brought in to the government in an advisory capacity but who are paid no, or only nominal, compensation for the service they provide, such as a one-dollar annual salary.

The Dollar-a-Year Men were, by and large, executives from some of the biggest companies in America, including men from corporations in Detroit, at that time a manufacturing powerhouse and home to production titans such as Ford and General Motors. The men were experts, not because of any academic background or theoretical knowledge about production and supply chains, but because they had practical knowledge gained from their careers, so they were brought on to advise and assist the government of Franklin Roosevelt in expanding the government's supply of, and the nation's capacity to produce, badly needed war material.

One of the recurrent criticisms of the use of Dollar-a-Year Men is that the practice of inviting industry executives into the government's decision-making process presents the potential for conflicts of interest and favoritism. While this is a valid concern, and would certainly be cause for worrying if the practice were employed governmentwide on a continual basis, the practice is very useful in emergency circumstances and its deployment is also contemplated by the Defense Production Act as presently enacted:



*[T]he President is . . . authorized, to the extent he deems it necessary and appropriate . . . to employ persons of outstanding experience and ability without compensation.<sup>18</sup>*



This practice, then, is already blessed by law—provided, of course, that the outside experts are not making all the decisions for the government and they serve only in an advisory capacity consistent with their role. This indicates an understanding in the law that circumstances in which the government would need to invoke the DPA—such as a pandemic in which supply chains are strained to the point of breaking—are also those which would justify the employment of outside experts in spite of any potential conflict that might arise.

For any Dollar-a-Year Man scheme for the SNS to be successful, it must incorporate executives and experts from every link in the supply chain, including representatives of the health care facilities which constitute the points at which supplies are predominantly used.

## Appendix 6: Reinstating the War Production Board

The powers entrusted in the War Production Board (WPB) were vast. Shortly after its creation, it would subsume into itself the functions of the other rearmament agencies, such as the Office of Production Management, consistent with the WPB's purpose as a centralized procurement management agency to handle the production of war material.

The WPB was authorized to:

- Exercise general direction over the war procurement and production program.
- Determine the policies, plans, procedures, and methods of the several federal departments, establishments, and agencies in respect to war procurement and production.

The WPB was also given further authority to direct all federal agencies' procurement and production operations. In sum, the WPB was authorized to take over the procurement activities of any and all government agencies, including the armed services and put them to use to meet the needs of the war effort.

It could be reasonably argued that the powers of the WPB make it a difficult model to emulate. After all, the centralization of procurement authority in one agency comes with the attendant possibility that such authority will be deployed coercively. Therefore, the argument goes, an agency such as the WPB is proper only in such dire times as the nation faced in the onset of the WWII, much as the British government marshalled its country's industrial resources to stave off a German invasion at the beginning of the war.

Indeed, it is precisely such considerations which justify the implementation of a WPB-modeled procurement board to oversee production and distribution in the event of a public health emergency which threatens the security of medical supply chains (Maier and Kumekawa, 2020). The powers of the Defense Production Act were clearly not enough, and in many ways exacerbated federal-state divisions by giving vast and misdirected authority to the federal govern-

18. See The Defense Production Act of 1950, as amended, 50 U.S.C. § 4560(b)(1) (2018) [https://www.fema.gov/sites/default/files/2020-03/Defense\\_Production\\_Act\\_2018.pdf](https://www.fema.gov/sites/default/files/2020-03/Defense_Production_Act_2018.pdf).

ment, but leaving constitutional and practical responsibility for their citizen's health and welfare to the states. Nor is the SNS enough. While the purposes for which the SNS operates are not themselves war, they are real emergencies in their own right, as the SNS is charged with ensuring proper supplies to respond to grave disease outbreaks and biological terrorist attacks.

Further, while there is no guarantee that any given public health emergency will rise to the same level of crisis as a global conflict, it is worth noting that the number of Americans who have died because of the COVID-19 pandemic—nearly 1 million as of March 2022—far exceeds the total number of Americans who died fighting in WWII—405,399 between 1941 and 1945. If nothing else, this difference reveals that the seriousness of the threat of public health emergencies cannot be discounted in comparison to that of war.

Just as the WPB did not outlast the end of the WWII, eventually giving way to the Civilian Production Administration as the nation transitioned out of a war economy and returned to civilian life, a WPB-modeled production board for the SNS would not need to be a permanent body. Indeed, such a body should be viewed as an emergency measure and nothing more. But the authority to create such a body must exist in the law before it is needed, or else the difficulty of responding to crises will compound. Any attempt to establish such a body in response to a future pandemic would need legislative authorization, and while Congress may act and has acted quickly to address the present crises, the experience of the COVID-19 pandemic demonstrates that even momentary delays in response can lead to crippling shortages in needed supplies.

Therefore, providing for the creation of a WPB-style board in law ahead of time is preferable. This way, in the event of a major public health emergency, especially the kind that poses an existential threat to medical supply chains and national security, such a board can spring into action at the command of the president and direct the procurement activity of the federal government towards the production, acquisition, and distribution of needed supplies.

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