



**POLICY ANALYSIS:  
PERSONAL PROTECTIVE EQUIPMENT SUPPLY &  
SUPPLY CHAIN DURING COVID-19**

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COMMUNITY NETWORK FOR EPIDEMIC PREPAREDNESS AND SUPPORT





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# INTRODUCTION

“The chronic, global shortage of personal protective equipment is one of the most urgent threats to our collective ability to save lives,”

- Tedros Adhanom Ghebreyesus, WHO, Director-General

The World Health Organization considered the SARS-CoV-2 (COVID-19) virus a pandemic on March 11, 2020. Since then, the virus has infected more than 30 million Americans and resulted in more than 500 thousand deaths.<sup>1</sup>

Although the cases of the virus were first reported in China as early as December 2019 and the United States (U.S.) confirmed its first case on January 21, 2020, hospitals, health systems, long-term care facilities (LTCF) and other healthcare providers in the U.S. were unprepared to deal with the incoming onslaught of COVID-19 positive cases and hospitalizations. The most glaring example of this unpreparedness was the eventual lack of personal protective equipment (PPE), which was the first and arguably most important line of defense for healthcare workers. PPE as it pertains to this analysis includes N95 and equivalent respirators, facemasks, face shields, goggles, and isolation gowns. The pieces of equipment have been determined to be extremely effective since the virus is spread through airborne droplets produced by breathing, coughing, sneezing, and other actions that can expel the virus. All of the aforementioned pieces of equipment reduce the wearers' ability to become infected by reducing the inhalation of droplets.

Unfortunately, very early on in the pandemic, hospitals were faced with the reality that they would have trouble treating patients due to shortages of beds, clinically effective medications, and ventilators. The lack of clinically effective medications and the easy transmissibility of the virus meant that that cases were skyrocketing by late March of 2020. A byproduct of the rising infection rate and increased hospitalization rates was that healthcare workers (HCWs) were utilizing massive amounts of PPE. However, hospitals and health systems were unable to replenish their supply of PPE as quick as they were consuming it. This led to a national shortage of PPE which impacted the ability of HCWs to safely treat infected patients. This analysis will look to:

- Examine the impact of scarcity of PPE on COVID-19 response;
- Examine potential reasons for PPE shortages across the U.S.
- Examine how the federal government can assist states with supply of PPE by establishing policies that increase PPE production;
- Examine what policies currently exists for states to implement to protect healthcare providers from market forces that created PPE shortages;
- Examine recommendations on which policies are shown to be most effective for increasing PPE production and/or reducing PPE shortages.

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<sup>1</sup> “Mortality Analyses,” Johns Hopkins Coronavirus Resource Center, accessed May 2, 2021, <https://coronavirus.jhu.edu/data/mortality>.



The analysis will ideally be used by legislators, regulators and other policymakers to inform their response to the current COVID-19 pandemic, future surges of COVID-19, and other potential viral health threats. The policy recommendations within this analysis pertain to PPE, but policymaker should consider how this can be applied to any emergent issue that stresses a supply chain.

## IMPACT OF PPE SCARCITY

The primary purpose of PPE is to prevent infections from COVID-19 positive patients to HCWs. If HCWs are protected against the virus they're able to protect other patients, family and community members they interact with outside the confines of a hospital and/or LTCF. As mentioned previously, very early on during the pandemic hospitals were already beginning to show an inability to keep pace with their "burn rate." Burn rate is the pace at which healthcare providers were utilizing and discarding PPE while treating patients. This means that HCWs were using and discarding PPE quickly mainly due to the volume of patients being seen and infection control measures which require disposal of PPE. Healthcare providers that were surveyed in March of 2020, indicated that supply for a number of critical PPE supplies were "running low" or "almost out" at their facilities.<sup>2</sup>

Without proper PPE, healthcare providers were at extreme risk of contracting and dying from COVID-19. In fact, nearly 3,000 healthcare providers died of COVID-19 from March to December 2020 and a third of those that passed stated access to PPE as potential concern.<sup>3</sup> This analysis focuses on the U.S. response to COVID-19 and PPE shortages, but data shows that other countries including China, Spain and Italy also saw higher than average infection rates of their HCWs.<sup>4</sup> It's abundantly clear that to effectively address a health crisis you need individuals to treat the impacted population, but the lack of PPE endangered our HCWs and therefore our endangered our ability to effectively respond to the pandemic.

It's worth noting that much of the data used to determine the infection and death rate among HCWs is anecdotal in nature, including the aforementioned statistics (i.e. 3,000 deaths). This is due in part because of the limited data sets available by the CDC. The limited data we do have from the CDC showed approximately 145,000 cases of COVID-19 among HCWs and 660 deaths.<sup>5</sup> A survey of a nursing union membership identified 1,289 deaths among healthcare professionals. The Centers for Medicare and Medicaid Services reported at least 767 deaths among nursing home staff. Long term healthcare facilities accounted for the majority of COVID-19 deaths in Pennsylvania.<sup>6</sup> In Philadelphia

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<sup>2</sup> "Protecting Healthcare Workers During the COVID-19 Pandemic: A Survey of Infection Preventionists," aipc.org (Association for Professionals in Infection Control and Epidemiology, March 27, 2020), [https://apic.org/wp-content/uploads/2020/03/Protecting-Healthcare-Workers-Survey\\_Report\\_3\\_26\\_20\\_Final.pdf](https://apic.org/wp-content/uploads/2020/03/Protecting-Healthcare-Workers-Survey_Report_3_26_20_Final.pdf).

<sup>3</sup> Danielle Renwick, "Exclusive: Over 900 Health Workers Have Died of COVID-19. And the Toll Is Rising.," Kaiser Health News, August 11, 2020, <https://khn.org/news/exclusive-over-900-health-workers-have-died-of-covid-19-and-the-toll-is-rising/>.

<sup>4</sup> Raphael Minder and Elian Peltier, "Virus Knocks Thousands of Health Workers Out of Action in Europe," The New York Times (The New York Times, March 24, 2020), <https://www.nytimes.com/2020/03/24/world/europe/coronavirus-europe-covid-19.html>.

<sup>5</sup> "Update: Characteristics of Health Care Personnel with COVID-19 - United States, February 12–July 16, 2020," Centers for Disease Control and Prevention (Centers for Disease Control and Prevention, September 24, 2020), <https://www.cdc.gov/mmwr/volumes/69/wr/mm6938a3.htm>.

<sup>6</sup> "LTCF Data," Department of Health (Commonwealth of Pennsylvania, May 2, 2021), <https://www.health.pa.gov/topics/disease/coronavirus/Pages/LTCF-Data.aspx>.



and the surrounding counties there were 2,700 deaths associated with long term care facilities, with almost 10,000 cases among residents and 1400 among staff.<sup>7</sup>

## THE FEDERAL GOVERNMENT'S ROLE IN RESPONDING TO THE PANDEMIC

Reviewing the limited CDC data and the anecdotal data, it's easy to conclude that our HCWs were at a greater risk, not only because of their regular exposure to the virus, but also because of limited PPE supply. We need to understand how, and why the United States was so unprepared for this virus and its knock-on effects; specifically, how did the PPE shortage become catastrophic. We also need to identify what levers exist within our Government's control to mitigate the danger HCWs and the general public face during a public health crisis.

It's important to recognize the federal government does naturally assume a leadership role in responding to emergencies and disasters that overwhelm state and local resources. This is done through the Federal Emergency Management Agency (FEMA), but the history of the federal government's actions predates FEMA. While most federal intervention is prompted by natural disasters, there were also times when the federal government became involved in health-related issues like AIDS, but more recently issues like SARs, Avian Flu and Ebola.<sup>8</sup> All of this is to say, it's normal and appropriate for states and local governments to expect assistance or action at the federal level when responding to a public health crisis. The extent to which states were over reliant on federal relief will be investigated later in this analysis.

In order to better understand the unpreparedness of the federal government to deal with COVID-19, I've outlined the tools that were available to the Center for Disease Control and FEMA to address the pandemic below:

### Strategic National Stockpile (SNS):

- The Centers for Disease Control and Prevention's (CDC's) Strategic National Stockpile (SNS) is the nation's repository of antibiotics, chemical antidotes, antitoxins, vaccines, antiviral drugs, and other medical materiel designed to supplement and resupply state and local public health agencies in the event of an emergency. The materiel is intended to support national health security and is managed by the Office of Public Health Preparedness and Response's (OPHPR's) Division of Strategic National Stockpile (DSNS). The stated mission of the SNS is to prepare and support partners and provide the right resources at the right time to secure the nation's health.<sup>9</sup>
- The SNS in its current form was created under the Clinton Administration as it thought through what would be necessary for the U.S. to respond to an infectious disease outbreak.<sup>10</sup> The

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<sup>7</sup> Rose Cheyney, "Facing a Pandemic: the Impact of COVID-19 on Healthcare and the Region (SE Pennsylvania)," [www.cneponline.org](http://www.cneponline.org) (Community Network for Epidemic Preparedness and Support, August 28, 2020).

<sup>8</sup> Anthony S. Fauci, "What Three Decades Of Pandemic Threats Can Teach Us About The Future: Health Affairs Blog," *Health Affairs*, February 9, 2017, <https://www.healthaffairs.org/doi/10.1377/hblog20170209.058678/full/>.

<sup>9</sup> Anna Nicholson et al., "The Nation's Medical Countermeasure Stockpile: Opportunities to Improve the Efficiency, Effectiveness, and Sustainability of the CDC Strategic National Stockpile: Workshop Summary," *The National Academies of Science, Engineering, Medicine*, accessed 2020, <https://doi.org/10.17226/23532>.

<sup>10</sup> Olivia B. Waxman, "The Surprising Origins of the Strategic National Stockpile," *Time* (Time, March 11, 2020), <https://time.com/5800393/coronavirus-national-stockpile-history/>.



original name was National Pharmaceutical Stockpile (NPS). The NPS soon evolved to the SNS under the Bush Administration as it responded to Anthrax.<sup>11</sup> The most similar example of SNS use for a health-related emergency was during the H1N1 virus outbreak of 2009 which required the largest deployment of PPE and antiviral drugs in its history to that point.<sup>12</sup>

#### Defense Production Act (DPA):

- Per FEMA, the DPA is, “...the primary source of presidential authorities to expedite and expand the supply of materials and services from the U.S. industrial base needed to promote the national defense. DPA authorities are available to support: emergency preparedness activities conducted pursuant to title VI of the Stafford Act; protection or restoration of critical infrastructure; and efforts to prevent, reduce vulnerability to, minimize damage from, and recover from acts of terrorism within the United States.”<sup>13</sup> With respect to COVID, the DPA was primarily referenced as a tool to expand the capacity of businesses to produce PPE. This is done through the use of financial incentives and preferential contracts.<sup>14</sup>
- Prior to COVID-19, the DPA was used primarily during war time and for identifying and remedying gaps in industrial supply. While there may be no prior examples of the DPA being used for a public health emergency or pandemic, the use of DPA was eventually authorized and deemed legal since it was promoting national defense.

The extent to which the federal government failed to utilize or take advantage of these tools will be explored in detail later in this analysis. However, it is clear that at the very least the federal government failed to fully authorize the DPA to help address the shortage of PPE in the early stages of the pandemic. With respect to the SNS, officials within government and outside warned of dire consequences should the U.S. not replenish and take seriously the need to stockpile PPE in case of future emergencies.<sup>15</sup>

## PPE SHORTAGES EXPLAINED

Even though the federal government was lacking in its ability to respond to the PPE shortages, it is not solely responsible for the shortages themselves. It’s relevant to this analysis to understand what issues existed that lead to the shortages in hopes of identifying solutions to prevent future shortages. The research revealed that the following issues contributed significantly to the PPE shortages seen in the U.S:

### Global Supply Chain

Prior the pandemic, hospitals and health systems would procure PPE and other healthcare materials through vendor relationships and only procure what was needed based on statistical models for usage

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<sup>11</sup> Anna Nicholson et al., “The Nation's Medical Countermeasure Stockpile: Opportunities to Improve the Efficiency, Effectiveness, and Sustainability of the CDC Strategic National Stockpile: Workshop Summary,” *The National Academies of Science, Engineering, Medicine*, accessed 2020, <https://doi.org/10.17226/23532>.

<sup>12</sup> Ibid.

<sup>13</sup> “Defense Production Act,” FEMA.gov (Federal Emergency Management Agency, 2020), <https://www.fema.gov/disasters/defense-production-act>.

<sup>14</sup> Ibid.

<sup>15</sup> Anna Nicholson et al., “The Nation's Medical Countermeasure Stockpile: Opportunities to Improve the Efficiency, Effectiveness, and Sustainability of the CDC Strategic National Stockpile: Workshop Summary,” *The National Academies of Science, Engineering, Medicine*, accessed 2020, <https://doi.org/10.17226/23532>.





during normal operations. The alternate side of the equation is PPE producers who base their production of materials on demand. This is the basic model of supply and demand; however, this model is not sufficient during a pandemic since there was such an unexpected demand that outstripped the supply in a matter of weeks.

A major contributing factor for this inability to meet demand in the U.S. was due to a large part of the supply chain being based offshore in China. In fact, China was responsible for producing half of the world's import supply of N95 masks and respirators. (See: figure 1)<sup>16</sup> It's worth remembering that China itself was not only struggling with the pandemic and how to respond but was the original epicenter for the outbreak. China's response to the outbreak was to begin hoarding their already existent supply of masks and available PPE, but Chinese authorities also claimed diminished production of PPE.<sup>17</sup>

In short, it's abundantly clear that the U.S.—and the world—was over reliant on a global supply chain with a majority of the manufacturing based in China. A byproduct of this overreliance meant that there was no manufacturing framework in place to ramp up production of domestic supply and it was too late to diversify the procurement of PPE.

Share of global personal protective equipment imports by source, 2018



Figure 1 (Source: Peterson Institute for International Economics)

## Panic Buying, Hoarding, and Price Gouging/Inflation

PPE shortages were also caused by individual consumers and companies panic buying and hoarding of PPE. Panic buying is, "...when consumers buy unusually large amounts of products in anticipation of, during or after a disaster or perceived disaster, or in anticipation of a large price increase or shortage."<sup>18</sup> While it's not considered rational, the logic here is clear: individuals are fearful that without the product, in this case PPE, their safety and lives may be in danger. The byproduct of this behavior is that the individuals and institutions most in need of the product are forced to compete with the masses which ultimately leads to procurement limitations. When coupled with the aforementioned supply chain concerns, we end up in a situation where, once again, the surge in demand outpaces the supply in an extraordinary fashion.

<sup>16</sup> Robert Handfield, "Where Are All the N95 Masks? A Supply Chain Dilemma: SCM: Supply Chain Resource Cooperative (SCRC): North Carolina State University," Supply Chain Resource Cooperative (NC State University, June 18, 2020), <https://scm.ncsu.edu/scm-articles/article/where-are-all-the-n95-masks-a-supply-chain-dilemma>.

<sup>17</sup> Chad P. Bown, "China Should Export More Medical Gear to Battle COVID-19," PIIE (Peterson Institute for International Economics, May 5, 2020), <https://www.piie.com/blogs/trade-and-investment-policy-watch/china-should-export-more-medical-gear-battle-covid-19>.

<sup>18</sup> Kum Fai Yuen et al., "The Psychological Causes of Panic Buying Following a Health Crisis," International journal of environmental research and public health (MDPI, May 18, 2020), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7277661/>.



Hoarding is another behavior that both individuals and companies can partake in during times of disaster, panic, and need. Hoarding is when an individual who is worried about shortages of a particular product, begins to stockpile large quantities for fear of being able to access and use them at a later date. While this is still disruptive to the market for products, it's not as large scale of an issue as hoarding for the intent of resale and price gouging. In response to the public recognition of PPE shortages early on in the pandemic, some individuals and companies began stockpiling or hoarding PPE with the intent to resell it at a higher price.<sup>19</sup> These behaviors once again stress the already diminished supply chain and harm entities and individuals most in need of the materials.

Price gouging is defined by Congress as, "...the sale of a good or service at an unconscionably excessive price by a person during an emergency period and in an emergency area."<sup>20</sup> Many Americans will recall the price of cleaning supplies and toilet paper surging in the early months of the pandemic and the PPE market was no different. While some individuals were hoarding and stockpiling PPE out of fear and for personal use, some people were planning on exploiting the market conditions and flipping the PPE for exorbitant profit. Later in this analysis I'll briefly touch on how the states and the federal government attempted to stop price gouging, but it was still pervasive early in the pandemic. One of the reasons price gouging was common was due to the need for healthcare systems to go outside of their normal vendor relationships to acquire PPE. States were doing the same and in many cases opening up portals and websites where individuals and businesses could market their supply for PPE or submit solicitations.<sup>21</sup> <sup>22</sup> It's worth noting that many of these sellers and producers were legitimate, especially when vetted by state governments which would prohibit price gouging; however, we do know that individual solicitations from "nontraditional" suppliers to hospitals were common during the pandemic.<sup>23</sup> Not only did these new suppliers increase risk of faulty or subpar equipment, but they also brought with them an increase in prices. An analysis by McKnight's indicated some equipment saw price increases greater than 1000% (see: figure 2).<sup>24</sup>

Item	Pre Covid-19 Cost	Current Covid-19 Cost	Price Markup	Percentage Markup	Notes
Vinyl Exam Gloves	\$ 0.02	\$ 0.06	\$ 0.04	300%	Ideally people use vinyl. If not vinyl then latex but issues with allergies so Nitril is most expensive resort
Latex Gloves	\$ 0.03	\$ 0.08	\$ 0.05	267%	
Nitril Gloves	\$ 0.05	\$ 0.10	\$ 0.05	200%	
3ply Masks	\$ 0.05	\$ 0.75	\$ 0.70	1500%	FDA certified in boxes, not bags.
KN95 Masks	N/A	\$ 4.00		N/A	Recently (April 2nd) FDA approved
N95 Masks	\$ 0.38	\$ 5.75	\$ 5.37	1513%	Niosh certified, CDC approved list
3M N95 Masks	\$ 0.11	\$ 6.75	\$ 6.64	6136%	Currently unavailable. Includes testing kit for sizing
Hand Sanitizer	\$ 0.26	\$ 0.56	\$ 0.30	215%	Per ounce for 8 ounce bottle. Required to be at 70% percent alcohol
Isolation Gowns	\$ 0.25	\$ 5.00	\$ 4.75	2000%	New gown per resident
Face shields	\$ 0.50	\$ 4.50	\$ 4.00	900%	Reusable
Soap	\$ 0.19	\$ 0.35	\$ 0.16	184%	Per ounce via dispenser

\*Pre-Covid-19 pricing is based on multiple facilities averaged over 12-month period.

Figure 2 (Source: McKnight's Long Term Care News)

<sup>19</sup> "United States' Attorney's Office," *United States Attorney's Office*, April 1, 2020, <https://www.justice.gov/usao-edmi/pr/fbi-and-united-states-attorney-investigate-and-prosecute-hoarding-needed-medical>.

<sup>20</sup> Prevent Emergency and Disaster Profiteering Act of 2020. Bill (2020).

<sup>21</sup> "COVID-19 PPE & Supplies B2B Directory," PA Department of Community & Economic Development (Commonwealth of Pennsylvania, September 1, 2020), <https://dced.pa.gov/pa-covid-19-medical-supply-portals/pennsylvania-covid-19-ppe-supplies-business-2-business-b2b-interchange-directory/>.

<sup>22</sup> "NJ PPE Access Program," New Jersey COVID-19 Information Hub (New Jersey, 2020), <https://ppe.covid19.nj.gov/#manufacturers>.

<sup>23</sup> Mike Schiller, "Blog: The Health Care Supply Chain before and in the Midst of COVID-19: AHA News," American Hospital Association | AHA News, September 9, 2020, <https://www.aha.org/news/blog/2020-09-09-blog-health-care-supply-chain-and-midst-covid-19>.

<sup>24</sup> James M Berklan, "Analysis: PPE Costs Increase over 1,000% during COVID-19 Crisis - News," McKnight's Long Term Care News, April 9, 2020, <https://www.mcknights.com/news/analysis-ppe-costs-increase-over-1000-during-covid-19-crisis/>.





It is worth noting that not all of this increase can be attributed to price gouging. The shortage of PPE, caused by all of the aforementioned reasons, and the supply and demand model created an atmosphere that perpetuated soaring prices. The concern here is that when we consider the ultra-competitiveness of the market, limited supplies, and inflated prices, health systems were put in an untenable situation that jeopardized care and their financial stability. The American Hospital Association puts the non-healthcare related costs of COVID-19 from March to June of 2020 at approx. \$2.4 billion dollars.<sup>25</sup> In short, hospitals were now forced to spend significantly more on PPE than anticipated which was unsustainable. When we consider this with other financial hardships like lost revenue due to the stoppage of elective surgeries, some hospitals teetered on the brink of insolvency.<sup>26</sup>

## Burn Rate and Use of PPE

Since COVID-19 is a highly transmissible virus infections quickly rose, and hospitals were soon inundated with cases. However, since there was limited testing availability early on during the pandemic it wasn't easy for HCWs to immediately tell which of their patients were actually COVID-19 positive. This required HCWs to change and dispose of PPE between patients for fear of spreading COVID-19 from an infected patient to a healthy patient. Additionally, PPE can only sustain continued use for a limited amount of time before it becomes ineffective at blocking out the virus.<sup>27</sup> Consequently, HCWs would naturally need to dispose of PPE when between shifts which also leads to high burn rate. The Johns Hopkins Center for Health Security analyzed use of PPE and began making estimates of needed PPE over a 100-day surge which can be found in figure 3.<sup>28</sup>

Incremental need for a single 100-day COVID-19 wave, assuming strict social distancing (rounded to nearest million)	US Total	Per capita (US pop)
Gloves (combined sterile and exam gloves of all types and sizes)	3.393 billion	10.28
Isolation gowns	321 million	0.97
Medical-grade masks (combined surgical, procedure, and isolation masks of all types)	179 million	0.54
N95 or similar disposable respirators	57 million	0.17

Figure 3 (Source: Johns Hopkins, Center for Health Security)

Early on in the pandemic, the CDC began releasing regularly updated guidance on the use and conservation of PPE since it was known to be an effective measure in preventing infection of HCWs. The original guidance called for strict adherence and use of the N95 respirators for HCWs.<sup>29</sup> However, faced with these unprecedented shortages, CDC guidance offered strategies to optimize the use of PPE during surge (or crisis) capacity, when supplies were limited. These strategies include extending the use and reuse of masks, while also implementing environmental and administrative changes to reduce

<sup>25</sup> "Hospitals and Health Systems Face Unprecedented Financial Pressures Due to COVID-19," *Hospitals and Health Systems Face Unprecedented Financial Pressures Due to COVID-19*, accessed May 2, 2021, <https://www.aha.org/system/files/media/file/2020/05/aha-covid19-financial-impact-0520-FINAL.pdf>.

<sup>26</sup> "Fact Sheet: COVID-19 Pandemic Results in Bankruptcies or Closures for Some Hospitals: AHA," American Hospital Association, November 2020, <https://www.aha.org/fact-sheets/2020-11-09-fact-sheet-covid-19-pandemic-results-bankruptcies-or-closures-some-hospitals>.

<sup>27</sup> "Recommended Guidance for Extended Use and Limited Reuse of N95 Filtering Facepiece Respirators in Healthcare Settings," Centers for Disease Control and Prevention (Centers for Disease Control and Prevention, March 27, 2020), <https://www.cdc.gov/niosh/topics/hcwcontrols/recommendedguidanceextuse.html>.

<sup>28</sup> Eric Toner, "Interim Estimate of US PPE Needs for COVID-19" (Johns Hopkins, Bloomberg School of Public Health, April 18, 2020), <https://www.centerforhealthsecurity.org/resources/COVID-19/PPE/PPE-estimate.pdf>.

<sup>29</sup> Stephanie Soucheray, "Hospitals Scramble to Keep up with CDC N95, Mask Guidance," CIDRAP (University of Minnesota, March 20, 2020), <https://www.cidrap.umn.edu/news-perspective/2020/03/hospitals-scramble-keep-cdc-n95-mask-guidance>.



risks. As a last resort, the CDC recommended using homemade face coverings (masks, bandanas, scarves) if respirators or surgical masks were not available, preferably in combination with face shields. CDC also changed its guidance to recommend only using N95s when performing procedures that release aerosol particles.<sup>30</sup> This change in guidance was both confusing given the lack of clear communication from the CDC and worrisome to healthcare providers.<sup>31</sup> Clear guidance is important because it allows for uniform use and disposable of PPE which creates an atmosphere where PPE use is being optimized and reducing waste.

## GOVERNMENT FAILURES

I previously outlined that the federal government naturally plays a role in disaster response, but by all accounts, it seems they were derelict in their duty during the early stages of the pandemic. States and health systems turned to the federal government for assistance but received little guidance or support on how respond to the PPE shortages. Ultimately, the federal government was unprepared and underutilized its available resources to address these shortages. Specifically, the two aforementioned tools, the Strategic National Stockpile and Defense Production Act, were little to no assistance as supply for PPE dwindled.

### Strategic National Stockpile

Thanks to congressional oversight and reports from FEMA, we know that even as early as March 2020, states were requesting large quantities of PPE from the SNS and often received just a fraction of what they were requesting in response. For example, in FEMA region 3, which includes Washington D.C., Delaware, West Virginia, Virginia, Maryland and Pennsylvania, 5.2 million masks were requested and only 445,000 were received.<sup>32</sup> Also, 194 million pairs of gloves were requested but only 991,000 were received.<sup>33</sup> It wasn't just the mid-Atlantic region that faced these severe shortages, there were consistent shortages across the country with many states receiving little to no PPE.<sup>34</sup> The question becomes how did the federal government fall so short in their response when a mechanism existed for precisely this type of event? The answer is twofold, a lack of replenishment and lack of funding.

Throughout 2009 and 2010 there was another pandemic that would test the country's readiness to deal with a public health crisis and that was the H1N1 virus. This virus quickly spread across the United States infecting more than 60 million people and causing more than 12,000 deaths.<sup>35</sup> The SNS was effectively deployed during the H1N1 pandemic and delivered over 20 million pieces of PPE and

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<sup>30</sup> Eden David, "The Battle to Protect Health Care Workers on the Front Lines of the Coronavirus Pandemic," ABC News (ABC News Network, March 18, 2020), <https://abcnews.go.com/Health/battle-protect-healthcare-workers-front-lines-coronavirus-pandemic/story?id=69625036>.

<sup>31</sup> Ibid.

<sup>32</sup> "House Committee on Oversight and Reform," *House Committee on Oversight and Reform*, April 2, 2020, <https://oversight.house.gov/news/press-releases/new-fema-documents-show-critical-shortages-of-medical-supplies>.

<sup>33</sup> Ibid.

<sup>34</sup> Lena H. Sun and Amy Goldstein, "Desperate for Medical Equipment, States Encounter a Beleaguered National Stockpile," *The Washington Post* (WP Company, March 29, 2020), [https://www.washingtonpost.com/national/health-science/desperate-for-medical-equipment-states-encounter-a-beleaguered-national-stockpile/2020/03/28/1f4f9a0a-6f82-11ea-aa80-c2470c6b2034\\_story.html](https://www.washingtonpost.com/national/health-science/desperate-for-medical-equipment-states-encounter-a-beleaguered-national-stockpile/2020/03/28/1f4f9a0a-6f82-11ea-aa80-c2470c6b2034_story.html).

<sup>35</sup> "2009 H1N1 Pandemic (H1N1pdm09 Virus)," Centers for Disease Control and Prevention (Centers for Disease Control and Prevention, June 11, 2019), <https://www.cdc.gov/flu/pandemic-resources/2009-h1n1-pandemic.html>.



approximately 85 million N95 masks.<sup>36</sup> While this isn't nearly the scale that would have been needed to effectively combat the spread of COVID-19 and the accompanying PPE shortage, this should be viewed as a testament to the effectiveness of a government funded stockpile. In a time of crisis, the federal government was able to step in and effectively address the needs during a public health emergency. However, even after this moderately effective success, the SNS was never fully replenished.<sup>37</sup>

The main culprit for the lack of replenishment is underfunding from Congress. Congress has the authority to appropriate money for the SNS but underfunded it for years after the H1N1 outbreak.<sup>38</sup> The approximate cost of the SNS is \$8 billion dollars, but it's funding for years post-H1N1 hovered around \$600 million.<sup>39</sup> We must consider that many of these materials, including N95 respirators, have a shelf-life and are considered no longer effective after their expiration date. For example, the CDC acknowledged that SNS did ship respirators that exceeded their shelf life, however, the CDC recommended use due to the PPE shortage.<sup>40</sup> Therefore, the SNS has to be strategic in how it uses its limited funding since they need to rotate the stockpile over the years to ensure that expired materials are replaced.

The purpose of this analysis is not to lay blame at one political party or presidential administration, but both the Trump Administration and Obama Administration have pointed the finger at one another for the SNS depletion. There's strong evidence to support that neither political party or Administration prioritized the SNS as a resource to deal with a public health crisis.<sup>41</sup>

## Defense Production Act

The DPA was the other publicly cited tool at the disposal of the President when it came time to respond to the PPE shortages. The goal was for the President to compel private industry to begin producing PPE since there was a national emergency. The Administration did ultimately use the DPA to facilitate production of ventilators which are needed to treat severe cases of COVID-19.<sup>42</sup> We also know that the Administration used the DPA to ensure that PPE wasn't being exported outside of U.S. borders.<sup>43</sup> These actions should be lauded and were certainly effective with the former (i.e. restricting exports) useful in maintaining the current supply. However, what if anything, was being done to ensure new or increased supply of PPE? This is where critics of the President say there was no coordination or

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<sup>36</sup> Anna Nicholson et al., "The Nation's Medical Countermeasure Stockpile: Opportunities to Improve the Efficiency, Effectiveness, and Sustainability of the CDC Strategic National Stockpile: Workshop Summary," *The National Academies of Science, Engineering, Medicine*, accessed 2020, <https://doi.org/10.17226/23532>.

<sup>37</sup> "The Strategic National Stockpile and COVID-19: Rethinking the Stockpile," 2020.

<sup>38</sup> Isaac Arnsdorf and Yeganeh Torbati, "How Tea Party Budget Battles Left the National Emergency Medical Stockpile Unprepared for Coronavirus," ProPublica, April 2, 2020, <https://www.propublica.org/article/us-emergency-medical-stockpile-funding-unprepared-coronavirus>.

<sup>39</sup> "The Strategic National Stockpile and COVID-19: Rethinking the Stockpile," 2020.

<sup>40</sup> "Release of Stockpiled N95 Filtering Facepiece Respirators Beyond the Manufacturer-Designated Shelf Life," Centers for Disease Control and Prevention (Centers for Disease Control and Prevention, July 20, 2020), <https://www.cdc.gov/coronavirus/2019-ncov/hcp/release-stockpiled-N95.html>.

<sup>41</sup> Jane C. Timm, "Fact Check: Trump Falsely Claims Obama Left Him 'Nothing' in the National Stockpile," NBCNews.com (NBCUniversal News Group, May 7, 2020), <https://www.nbcnews.com/politics/donald-trump/fact-check-trump-falsely-claims-obama-left-him-nothing-national-n1201406>.

<sup>42</sup> Tanya Snyder and Gavin Bade, "GM, Philips Sign DPA Contract for Ventilators," POLITICO (POLITICO, April 8, 2020), <https://www.politico.com/news/2020/04/08/general-motors-ventilators-coronavirus-174724>.

<sup>43</sup> Joy Sturm et al., "Trump Invokes Defense Production Act to Block Exports of Personal Protective Equipment," Trump invokes Defense Production Act to block exports of PPE - Hogan Lovells Engage (Hogan Lovells International LLP, April 9, 2020), <https://www.jdsupra.com/legalnews/trump-invokes-defense-production-act-to-15471/>.



full-scale implementation of the DPA.<sup>44</sup> It's not possible to fully analyze and make the case for utilization of the DPA since the federal government doesn't release specific reports of its use. It's also increasingly difficult to wade through the political finger pointing since the DPA—and general COVID-19 response—became a talking point on the campaign trail during the 2020 election cycle. However, we do know that President Trump made regular statements which called into question the use of the DPA and his belief that private businesses should step in to increase production without being compelled.<sup>45</sup> Also, the U.S. Chamber of Commerce was regularly lobbying and making public statements that encouraged a limited approach to DPA usage, which may have had an impact on the Administration's actions.<sup>46, 47</sup>

Therefore, I began looking at other sources to understand how the DPA was utilized; specifically, whether there any firsthand accounts of the DPA being invoked for production of PPE. This led me to government and administration publicized contracts negotiated under the DPA. On April 13, 2020, FEMA released a statement claiming they, "...issued a DPA enabled production order to 3M for 10 million N95 respirators. The first shipment of this order arrived yesterday, April 12, and included approximately 600,000 masks. We intend to use this new source of N95s to both fill state requests of FEMA for support and to reinforce normal supply chain fills."<sup>48</sup> Ultimately, that was a \$139 million dollar for approx. 39 million masks.<sup>49</sup> Again, while this use of DPA was a positive action, the total number of masks are only a fraction of what was projected to be needed by Dr. Robert Kadlec, Assistant Secretary for Preparedness, HHS, in March of 2020. Dr. Kadlec would project that the U.S. would need 3.5 billion masks "if it were to be a severe event."<sup>50</sup> This statement was actually made before COVID-19 was declared a pandemic. The 39 million masks must also be put into context of the previously mentioned burn rate and use projections which was in the 10s of millions over a 100-day period.

Additionally, reports from September 2020 by the Washington Post found that money that was to be utilized by DPA from the CARES Act—legislation to provide for economic relief and recovery from COVID-19—was actually redirected to the defense industry rather than stockpiling the needed supplies.<sup>51</sup> These reports are backed up by additional research conducted by the non-partisan Congressional Research Service (CRS) which outlined the occasions which DPA use and funding was

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<sup>44</sup> Aishvarya Kavi, "Virus Surge Brings Calls for Trump to Invoke Defense Production Act," *The New York Times* (The New York Times, July 22, 2020), <https://www.nytimes.com/2020/07/22/us/politics/coronavirus-defense-production-act.html>.

<sup>45</sup> *Ibid.*

<sup>46</sup> "Proposed Executive Order on 'Buy American' and Defense Production Act Designation for Health-Related Goods Production," U.S. Chamber of Commerce (U.S. Chamber of Commerce, 2020), [https://www.uschamber.com/sites/default/files/proposed\\_eo\\_on\\_buy\\_american\\_and\\_dpa\\_designation\\_for\\_health-related\\_goods\\_v2.pdf](https://www.uschamber.com/sites/default/files/proposed_eo_on_buy_american_and_dpa_designation_for_health-related_goods_v2.pdf).

<sup>47</sup> Neil L. Bradley, "Defense Production Act Response Letter," U.S. Chamber of Commerce (U.S. Chamber of Commerce, April 7, 2020), <https://www.uschamber.com/letters-congress/defense-production-act-response-letter>.

<sup>48</sup> "FEMA," *FEMA* (FEMA, April 13, 2020), <https://www.fema.gov/press-release/20210420/applying-defense-production-act>.

<sup>49</sup> Roxana Tiron, "Pentagon Picks 3M, Honeywell, Owens & Minor to Make N95 Masks," *Bloomberg.com* (Bloomberg, April 20, 2020), <https://www.bloomberg.com/news/articles/2020-04-20/pentagon-picks-3m-honeywell-owens-minor-to-make-n95-masks>.

<sup>50</sup> "Romney Questions Top Health Officials at Coronavirus Hearing," *Romney Questions Top Health Officials at Coronavirus Hearing*, March 3, 2020, <https://www.romney.senate.gov/romney-questions-top-health-officials-coronavirus-hearing>.

<sup>51</sup> Yeganeh Torbati and Aaron Gregg, "Pentagon Used Taxpayer Money Meant for Masks and Swabs to Make Jet Engine Parts and Body Armor," *The Washington Post* (WP Company, September 22, 2020), <https://www.washingtonpost.com/business/2020/09/22/covid-funds-pentagon/>.





facilitated by the Department of Defense.<sup>52</sup> The CRS would go on to call the Trump Administration's use of the DPA as "sporadic and relatively narrow."<sup>53</sup>

The criticisms and adulation of the Trump Administration's use of the DPA is similar to that of the SNS, in that the political grandstanding obscures our ability to truly understand how it was used. Without a complete analysis of PPE production from the companies compelled under the NDA it's not possible to know the full impact. We should also be concerned that the size and scale of the pandemic may have outpaced even the most efficient use of the SNS. Lastly, we should consider if the health systems and long-term care facilities—those most impacted by PPE shortages—were under prepared and did not have appropriate stockpiles pre-pandemic.

## State Preparedness

It's not just the federal government that responds to disasters and public health emergencies; states also play a key role in preparation and response. In fact, every state in the union has their own department of emergency management similar to FEMA. Furthermore, we can even scale this down to the local level. While we know the federal government will "step in" when an emergency outstrips the resources at the state and local level, we must recognize that there is a graduated response. Specifically, localities must utilize their resources responding at a local level (e.g. Philadelphia using its resources to assist hospitals within its borders.) When the local response has exhausted its resources, the state will fill the gaps since in theory it will have more resources than the local governments. It's at this point, when states can no longer respond at the scale necessary to prevent further damage or assist with recovery, we expect the federal government to step in. Clearly the size, scale, and speed of the pandemic outstripped the resources available to state and local governments very quickly. However, this analysis argues that states were originally over reliant on the federal government for relief and action, specifically on PPE shortages. The purpose of this section is not to absolve federal authorities of their responsibility for coordinating a large-scale response and working jointly with states, but rather identify why states were also underprepared.

Proof of the states' unpreparedness is evident when we analyze anecdotal accounts of the PPE market early in the pandemic. There are multiple accounts of states actually bidding against one another for the limited supply of PPE and even bidding against the federal government.<sup>54</sup> Again, this was a byproduct of the supply and demand market for PPE, but it clearly indicates that states also didn't have the necessary stockpiles of PPE for a large-scale event. The main reason for this is likely the same reason that the SNS was barely replenished post-H1N1 and that's because it's expensive to maintain these caches of materials. State resources are finite, so it's difficult for them to prioritize spending on stockpiling PPE or other medications in preparation for a health emergency. States are also hampered further because unlike the federal government, they are forced to balance their budgets which restricts deficit spending.

Even if we can excuse the legal reasons for not being able to fund the necessary stockpiles for responding to a pandemic of this scale, a historic analysis of public health spending illuminates this unpreparedness further. Public health, defined as "services to promote health and protect the public

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<sup>52</sup> Michael H. Cecire and Heidi M. Peters, "Defense Production Act (DPA): Recent Developments in Response to COVID-19," Congressional Research Service, July 28, 2020, <https://fas.org/sgp/crs/natsec/IN11470.pdf>.

<sup>53</sup> Ibid.

<sup>54</sup> Lauren Feiner, "States Are Bidding against Each Other and the Federal Government for Important Medical Supplies - and It's Driving up Prices," CNBC (CNBC, April 11, 2020), <https://www.cnbc.com/2020/04/09/why-states-and-the-federal-government-are-bidding-on-ppe.html>.





from illness” has seen disinvestment and spending cuts for years prior to the pandemic.<sup>55</sup> It’s difficult to determine the precise level of disinvestment or underfunding due to the variety of public health programming across the country including the federal government. However, there’s still a projected \$4.5 billion gap to provide basic public health infrastructure across the U.S.<sup>56</sup> The same report that identified the financial shortfall gap to provide the infrastructure found that, “...health departments subsequently experienced staffing cuts in excess of 50,000 staff positions nationally.”<sup>57</sup> This underfunding leads to the federal government needing to fill the gaps and puts more pressure on the already strained system. It would have been preferable to analyze available PPE stockpiles for individual states to see the true impact of underfunding, but this information wasn’t available at the time of publication. Continued research should look to confirm how much PPE states had available to them prior to COVID-19 and how much was bought in the immediate aftermath of rising case counts.

This is also subject to the political motivations and finger pointing between political parties rather than factual information. While we can point to the underfunding of public health—and absence of federal funding for that matter—it’s not clear how that may have impacted the response. Also, the competition between states and the federal governments is proof of inadequate supply generally, not just the lack of preparedness by states.

## State Response

Like the federal government, states had a weapon to respond to COVID-19: Emergency Health Declarations. These emergency health declarations vary from state to state and take on different names, but generally give broad powers to the executive branch and administration (governors and Health Departments) to take action to mitigate the impact of a public health emergency (i.e. COVID-19). However, these emergency declarations must be viewed through the lens as reactive rather than proactive. This is important because the context to these declarations is that they were happening after community spread of COVID-19, so infections and hospitalizations were rising. As mentioned previously, PPE shortages were already beginning within weeks of the WHO declaring COVID-19 as a pandemic. Clearly emergency declarations are not available to Governors outside of a public health emergency, but we should consider to what extent these policies, especially ones that compel or encourage PPE production, can take place through legislative or regulatory action before and after declarations of health emergencies.

For ease of understanding, I broke this section into two categories: 1. PPE Protection; 2. PPE Production/Increasing PPE

1. ***Protecting PPE stockpiles/supply chains.*** I consider any state action that didn’t proactively encourage PPE production through either contracts or manufacturing to fall into this category. Essentially, these actions were stopgap measures to safeguard the current supply of PPE.
  - **Mandatory PPE inventory**
    - i. States began requiring all entities and individuals to submit inventory of PPE and medical equipment to state and local health departments. This included hospitals,

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<sup>55</sup> Jonathon P. Leider et al., “How Much Do We Spend? Creating Historical Estimates of Public Health Expenditures in the United States at the Federal, State, and Local Levels,” Annual Reviews, January 28, 2018, <https://www.annualreviews.org/doi/10.1146/annurev-publhealth-040617-013455>.

<sup>56</sup> Nason Maani and Sandro Galea, “COVID-19 and Underinvestment in the Public Health Infrastructure of the United States: Milbank Quarterly,” Milbank Memorial Fund, June 16, 2020, <https://www.milbank.org/quarterly/articles/covid-19-and-underinvestment-in-the-public-health-infrastructure-of-the-united-states/>.

<sup>57</sup> Ibid.



health systems, private industries like construction, to submit inventory reports to public health offices. The goal of this was to identify both gaps and surpluses in hopes of making strategic allocations as needed, while also identifying possible hoarding.

- Restricting sales and movement of PPE
  - i. States began instituting executive orders that would restrict the sale of PPE out of their state. The goal being not only to keep PPE production and sales in-state, but if someone were hoarding PPE or intending to sell to the highest bidder, their potential buyers would be limited.
- Limiting use of PPE
  - i. States and local health departments began requesting/requiring individuals that were not essential workers or responding the pandemic to cease use of PPE. The goal of these actions would be to preserve the PPE for those most in need.
- Procurement and Seizure of PPE
  - i. Some states issued executive orders that would allow for health officials to procure and commandeer PPE from hospitals and manufacturers. The goal of allowing for seizure of PPE from private businesses was to give the state governments a last resort should emergency allocations of PPE be needed, and inventory determined an entity had surplus PPE.

2. ***Supporting production of PPE supply and supply chain.*** I consider this any action that states took to help create a new influx of PPE into the marketplace. This could be done through purchasing and/or manufacturing.

- State Stockpiling
  - i. Although not common, some states began replenishing their individual stockpiles of PPE without relying on the federal government.<sup>58</sup>
- State-based manufacturing/production
  - i. Some states began using state resources to directly fund companies that transitioned their production to PPE.<sup>59, 60</sup>

These policies were not the only actions taken to address the PPE shortages. Others didn't fall neatly into these categories but none the less attempted to address the PPE shortages through government action. Attorney General's across the country began identifying and prosecuting price gougers.<sup>61</sup> Identifying price gouging and removing them from the market would be beneficial in helping reduce the costs needed to acquire PPE. This would be especially helpful for health systems and LTCFs that struggled to meet their needs but were desperate to acquire PPE at any costs.

Another common policy was for a state to grant liability protections for non-medical device manufactures that transitioned to producing PPE.<sup>62</sup> These were laws and executive actions that would protect manufacturers from being sued if their product was deemed harmful for any reason. Liability

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<sup>58</sup> Ryan J. Foley, "Iowa Rebuilds PPE Stockpile after Deals with Unusual Sources," AP NEWS (Associated Press, May 16, 2020), <https://apnews.com/article/b457635e50f286e9a74e54b1c1646e8c>.

<sup>59</sup> Karen Glenn Hood, "25 Maryland Companies Receive a Total of \$1.6M in Grants for PPE Production," MD Biz News, June 9, 2020, <https://open.maryland.gov/blog/25-maryland-companies-receive-total-16m-grants-ppe-production/>.

<sup>60</sup> "Business: Business Grants, Loans and Tax Credits," Ohio PPE Retooling and Reshoring Grant Program Guidelines, 2020, [https://development.ohio.gov/bs/bs\\_ppe-rrgpg.htm](https://development.ohio.gov/bs/bs_ppe-rrgpg.htm).

<sup>61</sup> "COVID-19 Survey of Federal and State Price Gouging Laws," King & Spalding, 2020, <https://www.kslaw.com/pages/covid-19-survey-of-federal-and-state-price-gouging-laws>.

<sup>62</sup> Matt Jardin, "Legislature Approves Liability Waiver for Local Manufacturers of PPE," University of Alaska Anchorage, April 10, 2020, <https://www.uaa.alaska.edu/news/archive/2020/04/manufacturingppelocally.cshtml>.



protections do not give the producers complete immunity. Liability protections were put in place to spur production of new PPE resources by removing the threat of legal action. Again, we only have anecdotal evidence that these actions spurred protection, but any easing of the burden for manufacturers and production should be welcomed in a time of need.<sup>63</sup>

One of the reasons we should encourage states to take on an increased role in emergency response, and rely less on the federal government, is the variation among states. The needs of one state are not the needs of another. In fact, each state was not impacted by the pandemic the same way or within the same timeframe. For example, the U.S. experienced waves of COVID-19 in the Northeastern states early in the pandemic and in colder months, but it slowly migrated to Southern states as the year progressed.<sup>64</sup> States in theory have the ability to be nimbler in their response to health emergencies. They're also better equipped to understand their individual needs and take a region-based approach rather than the blanket approach of the federal government.

Unfortunately, at the time of writing this, data on state stockpiles and PPE shortages aren't fully disclosed or readily available. These policies outlined in this section are supported by researchers and policymakers, but the intended impact isn't fully known at this time. Each state has a different political make up and constitutional authority may limit the actions of governors or legislatures. To that end, it seems that many of these policies were enacted under emergency declarations which can be limited and are not permanent. That is to say, how will we continue to permit manufacturing PPE if there's not a willingness to invest in manufacturing (i.e. increase spending) when an emergency doesn't exist? It remains to be seen if these policies can stay in place beyond the emergency declarations.

## LIMITATIONS

The analysis was challenged by the lack of publicly available data on pre-pandemic PPE supply compared to post-pandemic supply. While there was obviously a well-documented shortage of PPE, it's not clear if that shortage could have been addressed completely by increased funding to the SNS or full implementation of the NDA. As mentioned multiple times, we should consider to what extent there was an overreliance on these measures before the pandemic peaked in the early spring, summer and in the fall of 2020.

States are also in a more difficult position to address emergency health preparations due to their budgetary constraints. Unlike the federal government, states must balance their budgets on a yearly basis and cannot run continued deficits. This clearly impacts their ability to fund public health departments, respond to emergencies and enact potentially costly policies or increasing stockpiles. Generally, government spending continues to be a partisan issue, so there is no uniform approach to public health spending since each state's legislature and political makeup will vary.

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<sup>63</sup> Victoria Alvarez and Brett Tarver, "Considerations for Limiting Liability for Manufacturers and Importers of Masks and PPE During the COVID-19 Crisis," Troutman Pepper - Considerations for Limiting Liability for Manufacturers and Importers of Masks and PPE During the COVID-19 Crisis, April 9, 2020, <https://www.troutman.com/insights/considerations-for-limiting-liability-for-manufacturers-and-importers-of-masks-and-ppe-during-the-covid-19-crisis.html>.

<sup>64</sup> Lisa Lockerd Maragakis, "Coronavirus Second Wave? Why Cases Increase," Johns Hopkins Medicine, November 17, 2020, <https://www.hopkinsmedicine.org/health/conditions-and-diseases/coronavirus/first-and-second-waves-of-coronavirus>.



This analysis does not consider the role of individual hospitals and their internal policies on PPE stockpiling. In Pennsylvania for example, PPE stockpiles and supply varied significantly between hospitals only miles apart. This is partly due to the impact of COVID on the population they serve/treat, but also due to their ability to purchase PPE at inflated prices as the pandemic began to infect more citizens. This analysis also fails to fully understand how the PPE marketplace and reporting /purchasing mechanisms harmed the long-term care facilities which were disproportionately impacted by PPE shortages. This is in part due to the advanced age of their population and susceptibility to the virus, but also access to PPE procurement.<sup>65</sup>

Lastly, it's important to recognize that this pandemic is happening in real time. This has impacted my ability to collate data from primary sources (e.g. PA Dept. of Health, Philadelphia Dept. of Public Health). Given the haphazard and reactive approach in implementing policies, it's not clear to what extent any improvements of the PPE stockpile/supply chain are a byproduct of those policies or are a natural improvement due to time.

## RECOMMENDATIONS

A core component of these recommendations is that there needs to be a renewed and reenergized approach to public health at all levels of government. Without a reinvestment in public health spending or a reallocation of current resources, we're doomed to repeat the mistakes examined in this paper.

### **Recommendation #1: Government should invest in local/domestic manufacturing of PPE supplies and other potentially necessary items to respond to public health emergencies.**

The one thing that is abundantly clear is that the PPE supply chain is over reliant on foreign manufacturing. Concerted efforts by government are needed to bring a large portion of the PPE manufacturing base back to the U.S. Both federal and state governments can act on this recommendation.

- Short term (immediately): Continued and increased use of NDA to compel production of PPE; continued liability protections at all levels for new PPE manufacturing.
- Long term (12-24 months +): Incentivize businesses to begin producing PPE and/or transition to producing PPE. This can be done through tax incentives and government-backed grants and loans. These types of incentives will also be important as the U.S. looks to embrace sustainable and reusable PPE.
- For this action to happen there would need to be guaranteed funding streams. If states are not willing to invest and purchase new supplies, businesses and producers will begin to look elsewhere to sell their products.

### **Recommendation #2: States should launch their own version of SNS without relying on federal government.**

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<sup>65</sup> Pamela Doty and Martin Blanco, "Long-Term Care and the Impact of COVID-19: A First Look at Comparative Cross-National Statistics," ASPE (OFFICE OF THE ASSISTANT SECRETARY FOR PLANNING AND EVALUATION, January 6, 2021), <https://aspe.hhs.gov/basic-report/long-term-care-and-impact-covid-19-first-look-comparative-cross-national-statistics>.



Given the overreliance on federal action to support states' demands for PPE, states should begin to stockpile PPE for their own use. This also will allow for future research to better understand logistical and funding issues related to PPE supply in individual jurisdictions. Health systems, with the assistance and incentives from state and federal governments, should also look to produce independent stockpiles. This analysis does cite a few examples of state stockpiling, but this action would have to take place on a large scale to mitigate the shortages that were experienced throughout 2020. A secondary benefit of independent stockpiles would be the ease of mutual aid agreements and cooperation agreements (see below).

### **Recommendation #3: States should look at cooperative ways to address purchasing of PPE to avoid over competition within the market while also regulating it.**

Due to the enormous increase in demand for PPE supplies, states were ultimately competing against one another. Increased cooperation between states for bulk purchasing could have alleviated that competition and given a competitive advantage against federal competition. States could also take a cooperative approach to addressing price gouging. In May 2020, New York, Pennsylvania, Connecticut, New Jersey, Delaware, Rhode Island and Massachusetts did announce a partnership to address supply chain concerns at a regional level.<sup>66</sup> This is a positive step and should be viewed as a model moving forward.

It's not explicitly stated in the cited press release, but states that chose to take a regional approach should entertain voluntary assistance programs to share PPE with those in most need. As we saw during the height of the pandemic, some states like New Jersey and New York were hit much harder than others in the region. With memorandum of understandings (MOUs) between states to share PPE and regional reporting of PPE stockpiles, it's possible that the PPE scarcity could have been addressed at a much quicker pace.

A regional approach would allow states to establish centralized visibility on orders placed. This central visibility for PPE would allow distributors and manufacturers to better identify duplicate orders and project true product demand to inform a manufacturing surge. Understanding true demand and assessing if supplies are available to meet that demand would also better inform the release of public health stockpiles or the need for alternative guidance for situations when the recommended PPE might not be available, help to facilitate redistribution, and support local decision-making regarding PPE distribution.

### **Recommendation #4: Investment in sustainable and reusable PPE.**

It's clear that PPE in its current form has a limited shelf life and is considered disposable whether due to expiration dates or overuse (i.e. infection control measures). The volume of PPE that was being discarded and used played a significant role in contributing to the disruption in the supply and demand model. Public health officials and governments should investigate what opportunities exist to invest in PPE that does not have a limited shelf life and does not require regular disposal. We did begin to see this unique approach take hold with the individuals beginning to use 3D printers to produce face

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<sup>66</sup> (New York State , May 3, 2020), <https://www.governor.ny.gov/news/amid-ongoing-covid-19-pandemic-governor-cuomo-governor-murphy-governor-lamont-governor-wolf>.





shields.<sup>67</sup> And, in hopes of reusing PPE, companies began popping up, like in Delaware County, PA, that could decontaminate N95 respirators.<sup>68</sup> These types of actions should be considered and invested in at a large scale.

## CONCLUSION

It's April of 2021 and COVID-19 is still a daily threat in the U.S. and beyond and will likely be impacting the global community for years to come as the virus mutates. PPE shortages, while no longer common, should still be considered a risk as we contemplate how to respond to the next COVID-19 surge or a new public health scare.

There is no doubt that PPE shortages played a significant role in our ability to adequately respond to the pandemic. Frontline workers faced an increased risk of infection and inability to treat infected individuals. This hampered the U.S. public health response by limiting the workforce. Additionally, we need to recognize the failures that took place across all levels of government in preparation and reacting to the PPE shortages. The government didn't take advantage of the tools at its disposal which could have mitigated the impact of the PPE shortage. Public health experts and policy makers are already calling for a post-mortem on the response, but the early data indicates that effective implementation and early interventions of already existing resources would have been helpful in the early stages of the pandemic. Furthermore, state and local governments should play an increased role in emergency preparedness and PPE supply chain improvements. The piecemeal state-centric approaches helped anecdotally, but only patched holes in a broken system. Lastly, the COVID-19 pandemic has taught us that we can no longer underfund or disinvest our public health capacity. The U.S. should reconsider the fragmented approach that left all levels of government scrambling. This reinvestment should also pertain to our domestic manufacturing capabilities. Public-private partnerships will play a critical role in how we respond to the current PPE supply chain concerns and the development of innovative technologies.

Often times, policymaking is detached from the real-life impact it will have. Our response to the Covid-19 emergency and PPE shortages is a prime example of this detached approach. While we look at these problems from the perspective of what went wrong and what policies can be used to make improvements, we must remember that these decisions ultimately cost people their lives. As we work to ensure we are better prepared to face public health emergencies, whether they be from future COVID-19 surges or another health crisis, we cannot forget the profound impact they will have on our frontline workers.

"We need to learn the lessons that are being shown from this virus,"  
-Dr. Michael J. Ryan, WHO Informal Advisory Group.

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<sup>67</sup> Aili McConnon, "The Coronavirus Pandemic Is a Call to Serve for 3-D-Printing Hobbyists," The Wall Street Journal (Dow Jones & Company, June 8, 2020), <https://www.wsj.com/articles/the-coronavirus-pandemic-is-a-call-to-serve-for-3-d-printing-hobbyists-11591658423>.

<sup>68</sup> "N95 Mask Decontamination Available for Healthcare Professionals," N95 Mask Decontamination Available for Healthcare Professionals - Delaware County, Pennsylvania (Delaware County Pennsylvania, 2020), <https://delcopa.gov/ich/resources/covid19/maskdecontamination.html>.



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