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PROCESSING POLICY IN A PANDEMIC

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PROCESSING POLICY IN A PANDEMIC

by

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June 2021

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The United States has no recent experience dealing with a large-scale pandemic such as COVID-19 that has clearly affected our entire culture, institutions, and way of life. This type of problem is not predictable, and its associated impacts are not easily estimated. As such, we conducted a quantitative comparison in terms of case count between the Navy's response and the United States' national response to the COVID-19 pandemic. We evaluated the timing and implementation of Navy versus national and state policies, and explored the patterns and lessons learned to benefit the Navy and Department of Defense in the future. Our study meets a substantial need to look at both entities' response from an objective standpoint and to critique those aspects that served to further benefit or hinder outcomes.

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LIST OF ACRONYMS AND ABBREVIATIONS

CDC	Centers for Disease Control
CNO	Chief of Naval Operations
CONUS	Continental United States
CSG	Carrier Strike Group
DMDC	DOD Defense Management Data Center
DOD	Department of Defense
DON	Department of the Navy
DPA	Defense Production Act
FRAGORD	Fragmentation Order
GDP	Gross Domestic Product
HPCON	Health Protection Condition
MNP	My Navy Portal
MTF	Military Treatment Facility
NMCPHC	Navy and Marine Corps Public Health Center
OSD	Office of Secretary of Defense
PCR	Polymerase Chain Reaction
PCS	Permanent Change of Station
PFA	Physical Fitness Assessments
PUI	Persons Under Investigation
ROM	Restriction of Movement
RTW	Return to Work
SECNAV	Secretary of the Navy
SST	Sentinel Surveillance Testing
THN	Travel Health Notice
TR	USS *Theodore Roosevelt*
USFLTFORCMD	US Fleet Forces Command
USNORTHCOM	United States Northern Command
WHO	World Health Organization

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I. INTRODUCTION

> Epidemics provide a sampling device for social analysis. They reveal what really matters to a population and whom they truly value.
>
> —*History in a Crises*
> (Bahrol Olom & Noraee, 2020)

A. PROBLEM STATEMENT

Severe acute respiratory syndrome coronavirus 2 (SARSCoV-2), believed to have emerged in Wuhan, China, in late 2019, quickly spread around the globe (Tharakan et al., n.d.). The COVID-19 pandemic has thoroughly impacted every facet of American life, substantially altering (at least for now) the way we work, teach, gather, travel, and communicate. No race, ethnicity, or social class has proved immune to the devastating effects brought on by the virus at the center of this pandemic. Surely, the robust medical infrastructure and planning fundamentals common to the United States should serve as an effective defense against the threat imposed by the SARS-CoV-2 virus. While these factors have assisted and possibly provided a first line of defense, the United States has fared surprisingly poorly when compared to other countries in terms of case counts and deaths. As of October 2020, the "U.S. has experienced more deaths from coronavirus disease 2019 than any other country and has one of the highest cumulative per capita death rates" (Bilinski & Emanuel, 2020). Regardless, the policies adopted by a government or military play a vital role in determining future outcomes.

The United States' current preparedness for a pandemic is based on three core documents. *The National Strategy for Pandemic Influenza* (2005) places onus on the federal government to use all instruments of national power to address the threat and relies on each state to have pandemic preparedness plans (Council (US), 2005). *The National Strategy Implementation Plan* (2006) outlines individual entities responsibilities during in the event of a pandemic (Council (US), 2006). Finally, *The Pandemic Influenza Plan, U.S. Department of Health and Human Services* (2017) identifies seven key response elements for pandemic planning (Health & Services, 2009). As of 2017, every state, four major

metropolitan areas, and eight U.S. territories had developed their own pandemic influenza plans (Health & Services, 2009).

On the surface, it would appear that all necessary planning and policy elements are in place for the U.S. to successfully counter a pandemic. However, "state planning for pandemic response seems disproportionately weighted in favor of the use of vaccine and antiviral applications as the centerpiece of most pandemic response planning" (Alben, 2007). "While there is little doubt that vaccines would provide the most effective remedy for a global pandemic, such solutions are presently unavailable and will remain elusive until well after the start of a global pandemic" (Garrett, 2005, as cited in Alben, 2007). In addition, states do not possess identical plans that would facilitate cooperation, nor is there agreement among federal agencies in an approach towards averting, mitigating, and recovering from a pandemic (Foley, 2009). Planning for a pandemic is oftentimes grouped into the same policy arena as natural disasters or large-scale crises. This approach is somewhat flawed as in these cases, "the causes are clear, the central problem obvious, and the solutions and emergency responses, from a policy standpoint, clear" (Boin & Paul't Hart, n.d.; as cited in Capano et al., 2020). Unfortunately, the opposite can be said regarding knowledge about novel diseases in the midst of a pandemic.

Additionally, perfect policy is useless without the means to garner compliance. Realizing the impacts from effectively implemented policy relies directly on states', local jurisdictions', and most importantly, individual citizens' compliance. Roughly a year into the current global pandemic, those countries who are able to induce citizen compliance (whether voluntary, forced, or the result of cultural or social norms) in response to policy have been more effective at combatting the impact of the virus. South Korea, Singapore, Hong Kong, and Turkey have all experienced relatively better outcomes in terms of case counts, deaths, and not overstraining their medical infrastructures (Capano et al., 2020). These countries also excel, albeit through differing means at garnering compliance from citizens as it pertains to policy adherence. One study makes a case for a direct relationship between trust in government and citizen compliance with health policies such as quarantining, testing and social distancing (Bavel et al., 2020). How do these perspectives on citizen compliance apply in the U.S. considering our social and political landscape?

Even more intriguing, is policy implemented by the Armed Forces any more effective than policy applying to the general populace, as Armed Forces members are required to comply?

Since inception, the United States of America has utilized and clearly benefitted from a federalist form of government. This approach exploits the benefits of centralized leadership at the federal level complemented by more tailored leadership at the state and local level. While this structure empowers better informed decisions at a lower level and grants autonomy to leaders at the local level, federalism ironically discourages the implementation of policy on a national level. The presence of a federal system facilitates similar, "but not identical responses across jurisdictions." (Migone, 2020). Not unlike the U.S. national leadership construct, the Department of Defense (DOD) operates as a multi-tiered, hierarchal organization with even higher levels of delegation granted to subordinate leaders. However, in terms of policy, the DOD is an organization that normally responds as a single entity with direction funneled from the top. In effect, the U.S. national policy response to the COVID-19 pandemic was a delegated response handled by 50 unique entities and their reporting local jurisdictions while the DOD policy response resembled more of a singular "national" top-down approach.

As the Navy is essentially a portion of the DOD, we are specifically interested in analyzing the Navy due to the unique challenges encountered by a service that operates consistently in close quarters (ships, submarines, aircraft) and is consistently lacking access to extensive medical care while at sea. The "USS *Theodore Roosevelt* (CVN-71) is a Nimitz Class, nuclear-powered aircraft carrier measuring 1092 feet long" (Malone, 2020). This ship has a crew of 4800 Sailors who work, exercise, and sleep in exceptionally close quarters and breath air that is continually circulated through linear fan forced-flow mechanical ventilation (Malone, 2020). After a port visit to Vietnam in late March 20', a COVID-19 outbreak infecting approximately 1000 Sailors was discovered among the crew. The Theodore Roosevelt (CVN-71) subsequently pulled into Guam to isolate and treat infected personnel, essentially incapacitating a vessel that represents the largest floating piece of U.S. Sovereignty, capable of launching U.S. diplomacy from anywhere in the world.

This paper serves to compare the U.S. policy implementation as it related to addressing the COVID-19 pandemic and compare it to that of the U.S. Navy (policy dictated by the DOD) in order to identify those aspects which served to further benefit or hinder outcomes in either case. We will examine these results from a quantitative perspective and attempt to detect any relationships (whether positive or negative) between policy implementation and results. Our objective in this analysis is not about assigning blame or identifying faults. Instead, we seek to highlight actions and policy implementation that was beneficial in curbing the spread of a virus in order to apply lessons learned in the future.

B. RESEARCH QUESTION

Since the onset of the global COVID-19 pandemic, policy has been issued by the U.S. federal and state governments applicable to all U.S. residents while policy has been issued in parallel by the U.S. Navy applicable to all active-duty service members. This leads to our research question:

What aspects of policy implemented by the federal or state government compared with that of the U.S. Navy served to further benefit or hinder outcomes when evaluated quantitatively according to case count within similar populations?

II. BACKGROUND AND LITERATURE REVIEW

COVID-19 is changing our day-to-day lives, and nations are continuing to develop new policies and implement new ideas to reduce the impact of the infectious disease on their respective societies and local economies. Although a new challenge for most of present-day society, global pandemics have been documented back to 165 A.D. In the last century, nations have experienced a myriad of infectious diseases such as the 1918 Spanish Flu, HIV/AIDS, Swine Flu, SARS, a reemergence of Ebola, and now COVID-19. Nonetheless, policy has been implemented by governments and businesses to prevent the spread as well as operate during a global pandemic until a vaccine can be safely and effectively distributed.

As previously stated, infectious diseases are nothing new. They may vary in their virulence, as well as their impacts on a society, but as civilizations continue to progress, the world becomes smaller. Growing populations, improvements in economic relationships, advances in trade routes, and ever-increasing developments in technology present growing opportunity for the spread of infectious disease.

Over a year into the COVID-19 pandemic, U.S. society is still trying to work through the inherent restrictions brought on by such an invasive infectious disease. Day to day life has changed drastically for a large portion of the nation. With each holiday, or seasonal change, various parts of the country have witnessed a wide variance of policy response. The reasoning for such a wide variety of responses came from the delegation of authority to each state's governors, some of whom developed responses that were more restricting than others. Some states showed reluctance to reduce daily commerce, and restrict travel and social activities, while others were far stricter and more intrusive into the local economy and lives of their state citizens. States like California and New York issued stay-at-home orders, closed businesses for an initial 30-days, implemented curfews, mandated capacity restrictions, and closed non-essential businesses (Newsom, 2020). On the other hand, states like Florida were not as heavy handed towards restricting their citizens and local economy, using a focused approach, placing more precise measures on

regions with climbing case counts, and levying other restrictions on less affected regions of the state.

A. INITIAL COVID-19 TIMELINE

This section presents a simple timeline for key events in the COVID-19 pandemic.

December 31, 2019 – Multiple cases of pneumonia were reported, and a novel coronavirus was identified in Wuhan, Hubei Province (*World Health Organization (WHO) | Pneumonia of Unknown Cause – China*, n.d.)

January 10, 2020 – China officially announces the first known death from the coronavirus. (*Timeline of the Coronavirus Pandemic and U.S. Response*, 2020)

January 20, 2020 – The United States announces its first case of COVID-19. (*Timeline of the Coronavirus Pandemic and U.S. Response*, 2020)

January 30, 2020 – The WHO (World Health Organization) declare that the COVID-19 outbreak is a Public Health Emergency (*WHO / Coronavirus International Emergency*, n.d.)

February 2, 2020 – President Trump restricts entry into the United States from China (*Proclamation on Suspension of Entry as Immigrants and Nonimmigrants of Persons Who Pose a Risk of Transmitting 2019 Novel Coronavirus*, n.d.)

March 11, 2020 – WHO declares COVID-19 a global health pandemic (*WHO Director-General's Opening Remarks at the Media Briefing on COVID-19 - 11 March 2020*, n.d.)

March 13, 2020 – President Trump declares a national emergency (*Proclamation on Declaring a National Emergency Concerning the Novel Coronavirus Disease (COVID-19) Outbreak*, n.d.)

March 16, 2020 – The President announces Social Distancing Guidelines (*Trump Urges Limits Amid Pandemic, but Stops Short of National Mandates - The New York Times*, n.d.)

March 18, 2020 – President Trump signs an Executive Order allowing the Defense Production Act for medical and economic relief (*Executive Order on Prioritizing and Allocating Health and Medical Resources to Respond to the Spread of Covid-19*, n.d.)

B. NATIONAL POLICY

In March 2020, President Trump continued executive actions towards preventing the spread of COVID-19 and its impact on the United States. The actions included signing the Defense Production Act, deploying U.S. Naval assets, restricting foreign travel, and providing guidance on containing and slowing the spread of COVID-19.

Aside from restricting travel to foreign countries, and signing executive orders to enable levels of funding, the national policy response truly delegated the far more impactful and intrusive policy response to the State's discretion, meaning, the restrictions that would affect the day-to-day lives of the citizens of the United States would be implemented statewide and county-wide at the discretion of each State's governor. All of this was laid out in the White House's, *Guidelines for Opening Up America Again*.

The president's Guidelines provided states and regions with responsibilities and guidelines for managing the growing pandemic based on a series of phases. Phase I being states or regions that were most vulnerable, Phase II for states with no evidence of a rebound in cases, and Phase III being those areas that had been experiencing little impact and case growth.

The White House laid out responsibilities that included testing, contact tracing, managing healthcare system capacity, planning requirements for protection of workers in critical industries, mass transit, and senior care facilities. Additional planning requirements for protocols regarding social distancing and face coverings, as well as monitoring conditions for evaluating current outbreak severity. The document advised business immediately implement policies regarding protective equipment, temperature monitoring, sanitation, and business travel.

On March 13, 2020, the president declared a national emergency, identifying COVID-19 as a threat to national security. Just a few days later, on March 18, the President

exercised his powers to support the growing needs of the medical and health care workers by enacting the Defense Production Act (*Executive Order on Prioritizing and Allocating Health and Medical Resources to Respond to the Spread of Covid-19*, n.d.).

C. DEFENSE PRODUCTION ACT

The Defense Production Act (DPA) allows the President to influence the United States industrial base in the interest of national defense (Brown & Else, n.d.). The act requires private companies and manufacturers to accept and place preferential treatment on contracts signed under the DPA. Additionally, it incentivizes and assists companies to expand their production capacity. In the event of a war, the act would allow the President to ensure that the private sector focused on the immediate needs of the nation. Going further, and in the case of COVID-19, this authority can extend to national emergencies. At the early stages of the COVID-19 outbreak, personal protective equipment for health care workers, and ventilators had reached a limited supply. By enacting the DPA, the President was able to influence domestic manufacturers to prioritize these resources for the sake of supporting the growing pandemic and subsequent health crisis (*Executive Order on Prioritizing and Allocating Health and Medical Resources to Respond to the Spread of Covid-19*, n.d.).

D. ECONOMIC AND FISCAL RESPONSE

Closing borders, schools, bars, restaurants, restricting travel and retail businesses all while locking down various parts of the country as an attempt to reduce the spread of COVID-19 brought nations to an economic stand still. With the United States shutting down, trade and industry stalling, and forecasted negative GDP growth, the U.S. would be leaning towards a drastic economic contraction leading to a recession (Baker et al., 2020). As forecasted demand abruptly declined, so did confidence in retail, manufacturing, and energy consumption.

On February 19, 2020, the S&P 500 had hit its all-time high; by the end of the month, it had dropped nearly 13%. February had shown the upcoming uncertainty, and in March, surging unemployment rates coupled with government mandated shutdowns led to the largest stock market decline since 1987. In fact, no other disease to date had as much

of an impact on market volatility as COVID-19 (Smith, 2020). From the highs in February to low's mid-March, the S&P 500 index dropped 33% (Baker et al., 2020). At such an unprecedented time, the government would act to conjure up an unmatched stimulus package to help bolster the U.S. economy.

In March 2020, in an effort to provide emergency relief, support the health care system, and assist the nation's fight against COVID-19, the senate passed a $2.3T economic stimulus bill. This would be the first of many, but largest fiscal package to date. The trillion-dollar bill included expansions to unemployment benefits, backstops for corporate loans, small business loan forgiveness, hospital relief, as well as additional funding for state and local governments (Mcconnell et al., n.d.).

E. STATE POLICY

With the authority delegated to the governors, states took various measures to prevent the spread of COVID-19. California and New York both sought support and resources from the armed services, requesting additional assistance and capacity by requesting the presence of the Navy's Hospital ships. Under the theme of "Social Distancing," states looked to do whatever they could to prevent large groupings of people in environments that would easily spread the virus. The developed policies mandated schools to shut down and move to distance learning. Businesses like retail and dining were forced to reduce capacity, close, move to pick-up/delivery only options, or require outdoor dining only. Beaches were restricted to prevent large social gatherings, and in some cases, were closed on holidays.

The approach taken by the United States led to disparities amongst states and regions. In the spring, much of California's beaches and public areas had been closed, but inversely, images arose on the internet of crowded beach parties and gatherings of "spring breakers" in Florida (CNN, n.d.).

Global infectious diseases are nothing new. Nations and their citizens have battled infectious diseases for hundreds of years. As the severity and virulence changes, so do the policy responses of nations. Despite advances in medicine and technology, a nation's

response typically has more to do with their governing infrastructure and citizen's level of compliance.

Additionally, the response of a specific state likely will differ greatly from the response of a specific service branch. In terms of social distancing and preventing the spread of COVID-19, the nation and its states policy response differed from that of the Navy.

National Defense requires the Navy to be capable and operationally ready, which almost contradicts the notion of sheltering-in-place and socially distancing. A deployed ship can become quickly impaired should an infectious disease run rampant amongst its crew. Not only would this impact the crew, but with restricted movement on the shore side, this would greatly impact the logistics and support network. Social distancing aboard a ship becomes a challenge, as would quarantining portions of the crew. In October 2020, the CNO had addressed that more than 190 ships, roughly 65% of the fleet, had experienced some type of infection related to COVID-19. Yet, again, the idea of combating a global pandemic as it pertains to the United States Military is not a new concept. For example, in WWI, the Armed Forces dealt with an influenza pandemic. Late in 2020, the Navy no longer provided specific data regarding the outbreak as the impacts of the pandemic became an operational security issue (Ziezulewicz, 2020).

F. 1918–INFLUENZA AND PNEUMONIA

During WWI, the Armed Forces battled the influenza pandemic. Tight quarters, ships crossing the Atlantic, and the nature of trench warfare allowed the disease to swiftly move across personnel, strongly debilitating the armed forces. With soldiers and sailors impacted by the virus, so were the medical support and resources allocated for supporting combat operations. It had been said that influenza and pneumonia killed more American soldiers and sailors than enemy weapons (Byerly, 2010). At the time, medical treatment had been exercised to the fullest extent as they attempted to prevent the impact of the infectious disease. Quarantine measures and prevention tactics were drastic. Camp Upton in New York locked down and restricted more than 30,000 troops from entering or leaving (Byerly, 2010).

The wave of influenza experienced by the military in 1918 was not slowed until November of 1919, shortly after the Armistice which suggested that the wave had not been reduced by medical treatment or prevention, but through the reduction and withdrawal of troops in theatre (Byerly, 2010).

G. 2020–USS *THEODORE ROOSEVELT*

The USS *Theodore Roosevelt* (CVN 71) aircraft carrier appeared in the press as the first major service asset that had experienced a substantial outbreak onboard an operational vessel. During the beginning stages of the outbreak, multiple cruise ships reported cases, and in some situations were prevented from pulling into port. The Roosevelt was actively deployed to the West Pacific and after finishing up a port call in Vietnam, experienced an increase in cases. As a result, the aircraft carrier pulled into Guam to slow the spread. It was reported that at this time, there had been 1,000 service members onboard that had been infected (Payne, 2020).

The spread onboard the aircraft carrier drew the eyes of the not just senior Navy officials, but the Center for Disease Control (CDC) as well. The COVID-19 statistics at the time had little data surrounding the younger and healthier demographic that made up the crew of a U.S. Naval Vessel. As for preventing any further spread, the crew incorporated several preventative measures which included, social distancing, avoidance of common areas, additional sanitizing of workspaces and berthing's, and wearing face coverings. These policies appeared to have helped, as the CDC reported that a survey conducted onboard had shown that the number of cases reduced due to the advised preventative measures. Additionally, this served as a promising step towards preventative measures and policy with regards to young adults living within congested spaces (Payne, 2020).

H. THE NAVY'S POLICY

Policy that is implemented by the U.S. Navy is oftentimes a reiteration or delegation of policies from overarching entities (Office of Secretary of Defense (OSD), Chief of Naval Operations (CNO)). Naval policy can also be enacted to mirror the efforts of similar service implementations (Sec of the Air Force, Dept. of Homeland Security). In effect, Naval policy is oftentimes the byproduct of overarching guidance tailored to Naval entities and

incorporating guidance from multiple sources. In addition, Naval policy must also cater to the unique challenges imposed by operating in the maritime environment, frequently confined to close quarters, and operating in isolation from a robust medical infrastructure.

Navy policy differs from state / national policy in that, all members of the Navy, regardless of their geographic location are held to strict adherence and compliance to directed policy. While certain geographic areas were able to alter their Health Protection Condition (HPCON) based on local conditions sailor infection rate seemed to mirror that of the local civilian population.

The Navy does not have the benefit of being able to close its doors, order food via Door Dash, and execute its missions while spacing everyone 10 feet apart. Maintaining an operationally ready fleet in the event of a national threat is at the forefront of the Navy's priorities, not to mention managing actively deployed and deploying units.

At the onset of the COVID-19 pandemic, the Navy began implementing new policies to maintain an active and operationally ready fleet. These policies represented a myriad of strategies including mandatory face coverings, restriction of movement (ROM), and strict compliance with local Health Protection Conditions (HPCON) requirements (*NAVADMIN 2020*, n.d.-b,-f).

I. LITERATURE REVIEW

Is it possible to predict a nation's probability for success in dealing with a pandemic? Maybe not entirely, but a group of well-respected researchers present a compelling case in Mobilizing Policy (In)Capacity to Fight COVID-19: Understanding Variations in State Responses (Capano et al., 2020) that it is possible to predict a country's response, in terms of policy to a pandemic and this, in effect, yields significant insight into outcomes. In general, most countries have access to the same "mix" of policy proposals. They just differ in actual "mix" and timing of implementation. Figure 1 attempts to broadly categorize countries based on attributional performance according to two key variables including 1) relevant experience in dealing with a medical crisis as well as 2) pre-existing level of preparation in terms of medical infrastructure and capabilities. (Capano et al., 2020).

		Relevant past experience	
		High	Low
Pre-Existing Levels of Preparation	High	Prudent or realistic level of confidence in existing system capabilities to handle new disease. Well-Informed but wary of disease → intervened relatively early with a slow but steady and strong response. e.g. Many Asian Countries	Prepared but with no or outdated past experience. Somewhat justified (over) confidence in existing system capabilities to handle new disease. Well informed about resources but not epidemiology → late, slow, and weaker response. e.g. Some North American and European Countries
	Low	Realistic lack of confidence in existing system capabilities to handle new disease. Well-Informed about problems with system and disease and knowledgeable of weaknesses → early, fast and strong responses. e.g. Many African countries	Shocked. Not well informed or prepared and taken by surprise → late, slow but ultimately strong panic response. e.g. Some European, North American and Latin American countries

Figure 1. A Capacity Model Explaining Different Country Responses.
Source: Capano et al. (2020).

According to Capano, countries that had prior recent experience and sufficient preparation (S. Korea, Singapore) were better prepared and more familiar with their capabilities as well as the potential of the disease (Capano et al., 2020). This led to generally stronger reactions with respect to utilization of the standard elements of policy tools. The countries with high performing medical systems (U.S., European Countries) but lacking in relevant experience tended toward slower policy responses relying mostly on a robust medical system (Capano et al., 2020). The countries in regions that had no faith in their medical system but possessed relevant experience, (Africa [Ebola], South East Asia [SARS]), reacted quickly in policy implementation to prevent an emerging threat garnering varying levels of success (Capano et al., 2020). The countries that lacked experience as well as medical preparedness (Italy) were initially complacent but were quickly shocked into action as by the scope of the pandemic (Capano et al., 2020). Highlighted as a policy winner, South Korea was extremely quick to initiate the broad use of testing because they understood the devastating capability of an unknown virus. Their recent experience with a virus dictated this policy action.

This model is helpful in explaining general policy direction, but ultimate outcomes are subject to a host of complex and ever-changing variables. Regardless if a government can make the right decisions in a reasonable amount of time, efficacy relies on their ability

to “galvanize it’s administration and society into action” (Capano et al., 2020). In addition, countries exhibiting attributes of federalism (United States, Canada) have more bureaucracy to overcome as policy in some cases must go through regional and federal levels of approval (Capano et al., 2020). In addition, the author smartly acknowledges the fact that individual countries all have unique attributes including demographics with no single population or geographic traits being identical.

III. METHOD

A. DATA COLLECTION

We sought out to analyze the impact of policy implementation in curbing the transmission of COVID-19 from two perspectives. We compared the United States' policy response compared to that of the DOD / Navy along a timeline to determine if either entities' actions contributed substantially to the quantity of COVID-19 case counts among similar populations. To do this, we used two datasets that represent each respective population.

The first dataset was provided by the Center for Disease Control (CDC) and represents all positive cases reported through the national reporting infrastructure of civilian hospitals, healthcare providers, and laboratories. "Under state disease reporting laws, hospitals, healthcare providers, and laboratories must report confirmed or probable COVID-19 cases and deaths to state or local health departments" (CDC & CDC, 2020). This case reporting data is then transferred from local, state, regional, or territorial public health entities to the CDC where it is compiled and organized according to location and several non-descript personal identifiers (age, race, ethnicity) (CDC & CDC, 2020).

The second dataset was provided by the Navy and Marine Corps Public Health Center (NMCPHC) and encompasses Active-Duty Navy personnel excluding Marines. It is limited to data that was collected domestically and therefore excludes any overseas or deployed units. It does include Navy reservists who have been activated during the span of the COVID-19 pandemic. Data was compiled by the NMCPHC from all reporting DOD medical units as well as those ships with a medical department possessing the ability to submit polymerase chain reaction (PCR) tests. The data covered the time span from March 1, 2020, to December 12, 2020. Weekly new cases were separated by gender and age groups: 0–18, 19–30, 31–50, and above 51.

We have further focused the extent of our civil versus Navy comparison on three states (California, Florida, Virginia), each geographically and politically unique and each representing significant concentrations of naval personnel.

B. ASSUMPTIONS

In analyzing and processing data in the form of confirmed COVID-19 cases, we are compelled to make several assumptions that help to explain any conclusions. The following is a review of these assumptions to better inform the reader and assist in accounting for multiple complex and dynamic variables associated with data collection.

At the onset of the pandemic, testing equipment and testing locations were scarce. As a result, testing individuals without symptoms was discouraged in order to preserve limited resources. A few months into the pandemic, we have the benefit of knowing that asymptomatic individuals are just as capable of possessing and spreading the virus. In studying the outbreak aboard USS *Theodore Roosevelt* (CVN-71) "researchers found that one in five sailors infected with the virus were asymptomatic" (CDC, Navy COVID-19 Study on TR Finds 1 in 5 Asymptomatic; Loss of Taste, Smell Most Common Symptom, 2020). Therefore, we are assuming confirmed cases at the onset are an underrepresentation of actual cases.

Certain subsets of the Active-Duty Navy population were over-tested compared to similar civilian populations as a result of pre-training and pre-deployment testing. In addition, the Navy initiated its own Sentinel Surveillance Testing (SST) strategy for COVID-19 on June 25, 2020 with the first phase results due July 9 (*NAVADMIN 2020*, n.d.-o). This strategy sought to increase DOD testing capacity and included testing asymptomatic populations (those with a higher likelihood of infection) to detect disease early and bound possible outbreaks. While reliance on testing before Navy deployments has fluctuated throughout the pandemic, it has remained a surefire way to help detect and prevent the subsequent spread of the virus in confined environments on Naval vessels. As per ADM Gilday, "there is no substitute for an effective test—ROM (Restriction of Movement) sequester—test strategy process to establish and maintain the bubble" (*NAVADMIN 2020*, n.d.-f). This increased level of testing is required to safely put naval ships, submarines, and squadrons to sea in an environment which assures close quarters and shared living spaces. As a result of increased testing in the form of SST, especially that on asymptomatic populations, we are assuming that Navy populations will have higher

positive case rate proportions compared to similar civilian populations following the onset of this strategy.

Among both civilian and Navy populations, there should be an increase in confirmed cases over time that are purely the result of increased access to testing and testing equipment as well as education. This trend was seen not just in the United States, but also around the world. In effect, as the virus was propagating, so was the ability to detect it.

In our analysis of confirmed cases, we are assuming a proportion of Navy positive case totals are the result of congregate spread aboard ships / submarines / aircraft vice community spread due to the confined nature of the work environment. This phenomenon was displayed amongst the civilian community at the onset of the pandemic as outbreaks perpetuated on cruise ships around the world. One such ship, the Diamond Princess with 3,711 passengers and crew yielded over 700 cases of COVID-19, almost all the result of congregate spread (Mallapaty, 2020). Therefore, we are assuming this phenomenon increased the Navy positive case rate proportions throughout the pandemic when compared to similar civilian populations.

In terms of policy comparison, we recognize there is some bleed over from National policy compared to that of the DOD / Navy. Naval personnel, like all members of the DOD are required to follow national, state, and local laws while also being subject to the regulations imposed by the Department of Defense (DOD) and Department of the Navy (DON). For example, a Sailor may wear a mask while exercising outside based on a local city mandate and not a Navy directive. In terms of policy, regulations imposed by the DOD / DON have been more comprehensive and rigorous to help preserve the mission capabilities of the organization. In essence, the policy bubble enforced by the DOD / Navy usually exists underneath an umbrella already in place at the state / national level.

C. FOCUS

The focal point and subject of our quantitative data is new positive COVID-19 case counts among two different populations. As of April 14, 2020, the CDC began to include probable cases in addition to confirmed cases for the national total case count (CDC &

CDC, 2020). A confirmed positive COVID-19 case is the result of one of two types of viral (molecular PCR or Antigen) tests indicating the presence of SARS-CoV-2 infection in a person (CDC, 2020). A probable case is defined by the CDC as meeting one of the following:

- Meeting clinical criteria AND epidemiologic evidence with no confirmatory laboratory testing performed for COVID-19
- Meeting presumptive laboratory evidence AND either clinical criteria OR epidemiologic evidence
- Meeting vital records criteria with no confirmatory laboratory testing performed for COVID-19 (CDC & CDC, 2020)

While there is increased ambiguity associated with the criteria for a probable case, it provided reporting entities with a means to report when testing resources were scarce. Confirmed and probable cases are embedded in both Civilian and Navy datasets.

The chronological span of our data which tracks positive COVID-19 cases begins March 1, 2020 and ends December 12, 2020. The extent of our policy analysis follows this same timeline. We recognize that while there was policy initiated prior to March, our ability to assess its associated impacts would be limited.

We recognize that policy implemented at the federal (including DOD) and state level in response to the COVID-19 pandemic took on a variety of forms. These forms included facilitating policies such as support for healthcare resources and financial relief, as well as more regulatory public policies aimed at curbing the spread of a virus. It is the latter which our comparative analysis will focus on in the hopes of deciphering the respective policies' efficacy.

D. FEDERAL / STATE POLICY ACTIONS IN RESPONSE TO COVID-19

State governors and state agency officials issued statewide policy through executive orders (shelter-in-place, stay-at-home, closure, mask mandates, shutdown orders, evening curfew, and public gathering guidance) in response to the COVID-19 pandemic. These orders can be state-wide or regional. For example,

> On July 28, Gov. Northam issued an executive order placing new restrictions on businesses in the Hampton Roads area, including the cities

> of Virginia Beach and Norfolk. Restaurants in the Hampton Roads area will be limited to 50% capacity for indoor dining and must stop serving alcohol after 10 p.m., and gatherings will be restricted to 50 people. The restrictions take effect on July 31. (Virginia Exec. Order No. 68, 2020)

The policy information can be found at each state's government website. The media typically plays a key role in disseminating the new policy to the public.

For the purposes of analysis, we categorized state policy actions as either major or minor according to potential-for-impact on the concerned population. The concerned population consists of all residents of that state, including United States Navy Active-Duty Personnel. A major policy action is applicable to the entire concerned population or possesses the capacity to impact the entire concerned population. A minor policy action is applicable to a subset of the concerned population or lacks the capacity to impact the entire concerned population.

a. California

MARCH

Major: Gov Newsom issued a statewide shelter-in-place order on March 19, and closed public schools (California Exec. Order N-33-20, 2020).

APRIL

Major: On April 1, Gov. Newsom announced "that public school would remain closed for the rest of the academic year" (Ballotpedia, 2021).

Major: By the end of April, the state officials realized a potential to easing some of the restrictions. The path forward consisted of four phases to reopen businesses and address social distancing measures. On April 30, these stages were revealed, and the process of reopening began (Ballotpedia, 2021).

MAY

Major: On May 19, Gov. Newsome announced that 53 of 58 counties met the criteria to advance to the 2nd stage of re-opening. (Ballotpedia, 2021).

JUNE

Major: As the "virtual" school year ended, the focus on the following school year began. On June 8, the California Department of Education released guidance for school to reopen under certain restrictions. The guidance "included temperature checks before entering schools or buses, face coverings for staff and students, and physical distancing requirements" (Ballotpedia, 2021).

Major: By early summer cases began to rise, and on June 18, Gov. Newsom signed "an executive order mandating residents to wear face masks while in public or high-risk settings" (Ballotpedia, 2021).

AUGUST

Major: On Aug. 28, Gov. Newsom released "a new color-coded reopening plan. Counties will be classified as one of four colors based on coronavirus spread in each county. They are, in decreasing order of severity, purple, red, orange, and yellow. Different business restrictions apply to each of the color levels" (Ballotpedia, 2021).

OCTOBER

Major: Further easing restrictions, on October 13, the state released "guidelines that permit individuals from up to three households to gather privately" (Ballotpedia, 2021).

NOVEMBER

Major: To combat a growing trend in cases, the California Department of Public Health expanded the state's mask requirements on November 17. The new guidance "requires individuals to wear masks whenever they are outside of their homes unless they are outdoors and can maintain six feet of social distancing" (Ballotpedia, 2021).

Major: On November 23, Gov. Newsom announced "nonessential work, movement, and gatherings are prohibited between 10 p.m. and 5 a.m. every night in purple-tier counties" (Ballotpedia, 2021).

DECEMBER

Major: California Health Department issues guidance for regional stay-at-home orders: "health officials are tracking the state by five regions: Northern California, Bay Area, Greater Sacramento, San Joaquin Valley and Southern California. Regional Stay at Home Order takes effect Saturday; affects regions with less than 15 percent ICU availability. Regional Stay at Home Orders will require Californians to stay at home as much as possible, close operations for certain sectors and require 100 percent masking and physical distancing in all others. Schools currently open can remain open and retailers can operate indoors at no more than 20 percent capacity to reduce exposure risk. New order is a modification of the state's initial Stay at Home Order signed in March and builds on the Blueprint for a Safer Economy" (California Regional Stay-at-home Order, 2020).

b. Florida

MARCH

Major: On March 1, Gov. DeSantis declares a state of emergency (Florida Exec. Order No. 20–51, 2020). Less than two weeks later, on March 13, the Florida Department of Education closed schools across the state for two weeks (Ballotpedia, 2021). The school were continuously re-evaluated through mid-April until they were finally closed for the entire academic year.

APRIL

Major: Gov. DeSantis issued the stay-at-home order on April 1 (Exec. Order No. 20–91, 2020). Later in the month, on April 29, he issued an executive order allowing "restaurants, retail stores, libraries, and museums to open to 25% of their building occupancy under certain guidelines" (Florida Exec. Order No. 20–112, 2020).

MAY

Major: The stay-at-home order expired Monday, May 4 (Florida Exec. Order No. 20–112, 2020).

JUNE

Major: Gov. DeSantis announced "beginning on June 5 bars may reopen at 50% capacity inside and full capacity outside, with service only for seated patrons. Movie theaters and bowling alleys can reopen at 50% capacity on that day." The new rules apply to all counties except Miami-Dade, Broward, and Palm Beach (Ballotpedia, 2021).

Major: Facing outside criticism, on June 17 Gov. DeSantis announced "he would not roll back reopening efforts after the state reached new daily highs in positive tests three times in the last week. Gov. DeSantis attributed the increase in positive test results to an increase in the number of tests taken" (Ballotpedia, 2021).

Major: On June 26, The Florida Department of Business and Professional Regulation "suspended the consumption of alcohol at bars across the state" (Ballotpedia, 2021).

AUGUST

Major: On August 31, the Florida Department of Education ordered schools "to reopen for in-person instruction five days per week no later than August 31" (Ballotpedia, 2021).

SEPTEMBER

Major: The Department of Business and Professional Regulation announced on September 14 that "bars may reopen at 50% capacity" (Ballotpedia, 2021).

Major: Gov. DeSantis announced on Sept. 25 that Phase 3 could begin, allowing bars and restaurants to operate at full capacity (Florida Exec. Order No. 20–244, 2020).

c. Virginia

MARCH

Major: Gov Northam declared a State of Emergency on 12 March (Virginia Exec. Order No. 51, 2020).

Major: On March 23, Gov. Northam issued an executive order "which closed, or otherwise limited the operations of, nonessential businesses in Virginia. That order also

barred gatherings of more than 10 people and closed K-12 schools for the remainder of the academic year" (Ballotpedia, 2021).

Major: Gov. Northam issued a "Stay at Home" order effective March 30 (Virginia Exec. Order No. 55, 2020).

APRIL

Minor: Gov. Northam released a plan on April 27 that would allow businesses to begin reopening. The reopening criteria included an increase in testing and hospital capacity, combined with a two-week decline in cases (Ballotpedia, 2021).

MAY

Major: On May 15, many parts of Virginia began the first phase of the reopening plan. Northern Virginia (Arlington, Fairfax, Vienna, Alexandria) did not meet the criteria to reopen. The initial phase allowed for retail stores, bars and restaurants (outdoor dining) to reopen at 50% capacity. Entertainment and public amusements venues remained closed. Places of worship were limited to 50% capacity (Ballotpedia, 2021).

Major: On May 27, Gov. Northam issued a statewide mask mandate (Virginia Exec. Order No. 63, 2020).

Major: On May 29, Northern Virginia began the initial phase of reopening. Additionally, the state issued that "face coverings are also required in public indoor settings statewide for people 10 years and older" (Ballotpedia, 2021).

JUNE

Major: Much of the state, except Northern Virginia, entered the second phase of the reopening plan on 5 June. This phase eased restrictions to the following: "restaurants and breweries are permitted to offer indoor seating at 50% capacity to parties of up to 50 people. All retail businesses are permitted to reopen at 50% capacity. Gyms can reopen at 30% capacity" (Ballotpedia, 2021).

Major: Northern Virginia and Richmond joined the rest of the state in the second phase the reopening plan on June 12 (Ballotpedia, 2021).

JULY

Major: Phase 3 of the reopening plan on July 1, allowing public gatherings of 250 people, gyms open to 75%. Capacity restrictions are lifted for many other businesses. In a change to the previous plan, bar areas of restaurants are to remain closed (Ballotpedia, 2021).

Minor: On July 15, Virginia became "the first state to adopt mandatory workplace safety regulations related to the coronavirus pandemic" (Ballotpedia, 2021).

Minor: On July 28, Gov. Northam issued an executive order "placing new restrictions on businesses in the Hampton Roads area, including the cities of Virginia Beach and Norfolk. Restaurants in the Hampton Roads area will be limited to 50% capacity for indoor dining and must stop serving alcohol after 10 p.m., and gatherings will be restricted to 50 people. The restrictions take effect on July 31" (Virginia Exec. Order No. 68, 2020).

NOVEMBER

Major: On Nov. 15, Gov. Northam issued an executive order "lowering the limit on indoor and outdoor public and private gatherings from 250 to 25 and requiring Virginians five and older to wear a face covering in public settings. Additionally, the order prohibits the serving of alcohol after 10:00 p.m." (Virginia Exec. Order No. 67, 2020).

DECEMBER

Major: On Dec. 10, Gov. Northam instituted a curfew from 12 a.m. to 5 a.m. Public gatherings were reduced from 25 to 10 people, except for places of worship (Virginia Exec. Order No. 67, 2020).

E. DOD / NAVY POLICY ACTIONS IN RESPONSE TO COVID-19

The majority of policy implemented by the U.S. Navy is distributed digitally through a website (mynavyhr.navy.mil) and can be accessed by all Naval personnel as well as the general public (*NAVADMIN 2020*, n.d.). In our analysis, all Navy policy was authored and issued by one of three entities: 1) Chief of Naval Operations (CNO), 2) Secretary of the Navy (SECNAV), or 3) U.S. Fleet Forces Command (USFLTFORCMD).

See Figures 3–8 for graphical depiction of results along with timeline. See Appendix B for full listing and description of Navy policy actions.

For the purposes of analysis, we categorized Navy policy actions as either major or minor according to potential-for-impact on the concerned population. The concerned population consists of United States Navy Active-Duty Personnel. A major policy action is applicable to the entire concerned population or possesses the capacity to impact the entire concerned population. A minor policy action is applicable to a subset of the concerned population or lacks the capacity to impact the entire concerned population.

MARCH

Major: On March 12, 2020, the Navy issued the first in a series of policy moves titled, Navy mitigation measures in response to the CORONAVIRUS outbreak. This was a policy action that included a multitude of new mandates, the most important being the start of United States Northern Command's (USNORTHCOM) pandemic plan addressing stop movement for certain permanent change of Station (PCS) orders, restriction of some travel for training, and the initiation of COVID tracking and mandatory daily reports from all commands. The initiation of COVID tracking and daily reports was vital as it yielded accountability and empowered commands to implement their own controls based on respective environments.

Major: Two days later, the Navy issued a policy action in the form of a stop movement for all domestic travel. Leave outside of the local area required approval from the first flag officer in the chain of command.

Minor: Shortly thereafter, the Navy followed up with two policy actions to suspend physical fitness assessments (PFA) and cancel most training involving groups of personnel in close quarters.

Major: On March 23, the Navy introduced a policy initiative by introducing restriction of movement (ROM) guidance to help bound outbreaks after close contact and protect units prior to deploying. The "incubation period (the time from exposure to development of symptoms) of SARS-CoV-2 and other coronaviruses (e.g., MERS-CoV, SARS-CoV) ranges from 2–14 days" (CDC & CDC, 2020). As a result, the Navy defined

ROM duration as 14 days and prescribed procedures to comply with that guidance (NAVADMIN 2020, n.d.-f).

APRIL

Major: On April 5, the SECNAV mandated all personnel "on DOD property, installations and facilities will wear face coverings when unable to maintain 6 ft of social distance" (NAVADMIN 2020, n.d.-g), applicable inside and outside buildings.

Major: On April 21, the Navy issued more robust reporting requirements for current active positive cases / total currently hospitalized / total in ROM / total recovered / total deaths / current total persons under investigation (PUI) to mitigate risk and apply uniformity to the tracking process.

MAY

Major: On May 20, the Navy issued guidance for adapting HPCON status to local conditions based on public health surveillance data, CDC guidance, local military treatment facility (MTF) capacity. An assessment of these conditions and criteria provides a locally derived common operating picture of risk to force. (NAVADMIN 2020, n.d.-k)

Major: On May 26, the Navy implemented the original version of their COVID-19 standardized operational guidance. This all-encompassing policy provided a baseline for standardized operating procedures in the current COVID environment and provided a structure of best practices to enable COVID-free mission-ready crews. Examples of best practices include pre-deployment screening, 14 ROM-sequester prior to any deployment, actions to be taken in the event of COVID-19 infection, and return-to-Work (RTW) guidance post infection.

JUNE

Minor: Toward the middle of the month, the Navy refined its mitigation measures to COVID-19 and introduced a conditions-based approach at easing travel restrictions based on origin and destination conditions. The conditions were updated daily and reflected a tri-tiered color scheme of red (most restrictive), yellow (somewhat restrictive), and green (least restrictive) to reflect the current environment.

Major: Perhaps the most rigid policy enforcement during the entire pandemic, U.S. Fleet Forces issued overarching policy in the form of FRAGORD 20–024 on June 23 applicable to all continental United States (CONUS) naval personnel concerning conduct and behavior during HPCON Charlie that incorporated signing a legally binding document known as a Page 13. The behavioral standards were applicable on / off base and major themes included mandatory physical distancing, limits on group gathering, restriction on visiting only those establishments essential for business (Food, Medical, Pharmacy, Gas, Child Care), and restriction of certain off-duty activities (beach, concerts, indoor religious gatherings).

Major: On June 25, the Navy Formalized its own sentinel surveillance testing (SST) strategy for COVID-19 to request increased DOD testing capacity from the Federal Government and to support testing asymptomatic populations (those with a higher likelihood of infection) to detect disease early, bound an outbreak, reinforce public health measures, and ensure units deploy COVID-free. (NAVADMIN 2020, n.d.-o)

JULY

Major: On July 2, the Navy further reduced leave / liberty restrictions allowing operational commanders to approve leave outside the local area according to a conditions-based approach.

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IV. ANALYSIS

A. DATA SUMMARY

Table 1 shows total new cases that were reported over the 10-month time frame, average of new cases per month, geometric mean per month, population that we used as a baseline for our new case proportion, the total new cases as a proportion, average monthly proportion, and geometric mean monthly proportion.

Table 1. Data Summary Analysis (Monthly and Weekly).

Monthly							
March 2020 to December 2020 (10 months)							
CIV/NAVY	**CIV**	**CIV**	**NAVY**	**CIV**	**NAVY**	**CIV**	**NAVY**
State	**US**	**CA**	**CA**	**FL**	**FL**	**VA**	**VA**
Total New Cases	16,119,263	1,521,420	3,093	1,098,341	2,113	281,909	3,988
Avg Monthly Cases	1,611,926	152,142	309	109,834	211	28,191	399
Mean New Cases	1,176,525	98,214	225	67,290	117	19,738	201
Population	328,239,523	39,512,223	71,383	21,477,737	27,619	8,535,519	80,328
Total Proportion	4.91%	3.85%	4.33%	5.11%	7.65%	3.30%	4.96%
Avg. Monthly Proportion	0.4911%	0.3851%	0.4333%	0.5114%	0.7651%	0.3303%	0.4965%
Mean Proportion	0.3584%	0.2486%	0.3151%	0.3133%	0.4249%	0.2313%	0.2500%

Adapted from CDC (2020), NMCPHC (2020), U.S. Census (2019), DMDC (2019).

As a tool for comparison, we first looked at the average for each state and subsequent Active-Duty Navy population. This was done by taking the total number of cases over the 10-month period and dividing it by 10. Since the Active-Duty numbers by themselves were extremely small, we needed to base it off the number of members within the state to establish a proportion vice absolute. Additionally, the total case numbers for the United States were included to provide a means of comparing total state numbers.

The average (or arithmetic mean) was a good tool for us to develop a baseline for comparison to identify a median value for each entity. However, given the specificity of the proportion coupled with the immediate and drastic changes in cases associated with the populations, we concluded that due to these large changes, the average statistic was unable to provide us with a solid foundation for comparison. Due to the limited timetable our sample size was restricted to 10 months, so we sought another tool that could help mitigate the impact of sudden increases or decreases in periodic data. Because of this, we decided to use the geometric mean.

The average can be an accurate tool when the sampled data is tightly clustered and independent of one another, however, in instances of high variation between numbers, much like ours, the geometric mean provides a more accurate statistic for comparison. By using the geometric mean, the mean proportion was lower in all cases, but it provided additional insight for comparison that we would have easily overlooked had we not considered the volatility and variations during the 10-month time frame. (Hayes, 2020)

B. DATA ORGANIZATION

As mentioned previously, new cases for military were grouped aggregately by week-ending date, which required the grouping of the CDC daily new cases by week. Once the time-series data was grouped we placed them in a pivot table to produce graphical representations. We found that new case alone was not an appropriate avenue for comparison, so we scaled new cases into a proportion. The proportion baselines were state and national population, and number of Active-Duty Navy personnel in each state. Up to date information for these populations was difficult to obtain, so we utilized June 2019 population counts from the U.S. Census Bureau. Active-Duty Navy personnel population

counts were obtained from the DOD Defense Management Data Center's (DMDC) database for military personnel by state for June 2019. With each population established as the denominator, weekly new cases were divided to develop a proportion. The product produced gave us an accurate means to compare state, national, and Active-Duty Navy weekly new case counts.

C. COMPARING POLICY TO DATA

Once a policy is implemented, the first challenge is trying to determine when said policy will have an impact, if at all. A myriad of variables including the length of time it takes to be tested as well as to attain results makes this a difficult task. The second challenge is trying to determine the extent of the impact. As a result, the objective of our data analysis will attempt to assess the impacts, if any, in terms of scope and magnitude that policy implementation had on positive COVID-19 case counts. It is our desire throughout the analysis to let the data tell the story.

In analyzing how a specific policy directly or indirectly affected the magnitude of COVID-19 positive cases, we must address the variable of time. According to the CDC, the "incubation period (the time from exposure to development of symptoms) of SARS-CoV-2 and other coronaviruses (e.g., MERS-CoV, SARS-CoV) ranges from 2–14 days" (CDC & CDC, 2020). As a result, when we evaluate the impact of a regulatory policy aimed at changing behavior to curb the spread of the virus, we will consider the most conservative estimate of 14 days and add that interval to the implementation date before analyzing results. This will allow us to eliminate the variation associated with the incubation variable. For example, a Navy-wide mask mandate was put into effect April 5, 2020. Based on this, the soonest we would be analyzing data for possible impacts is 14 days post-implementation on April 19, 2020.

D. VISUAL DEPICTION OF RESULTS STATE-BY-STATE

The following series of figures provide a visual depiction of the data collected. **Figure 2** compares the selected three states to the national average, to serve as an overall reference. **Figures 3–8** target the comparison between the individual state's data with the Navy's data. The graphs depict trendline differences between the state and Navy data. The

timeline figures provide a condensed story comparing state and Navy data. Figure 9 shows the Navy-only comparison between the three states.

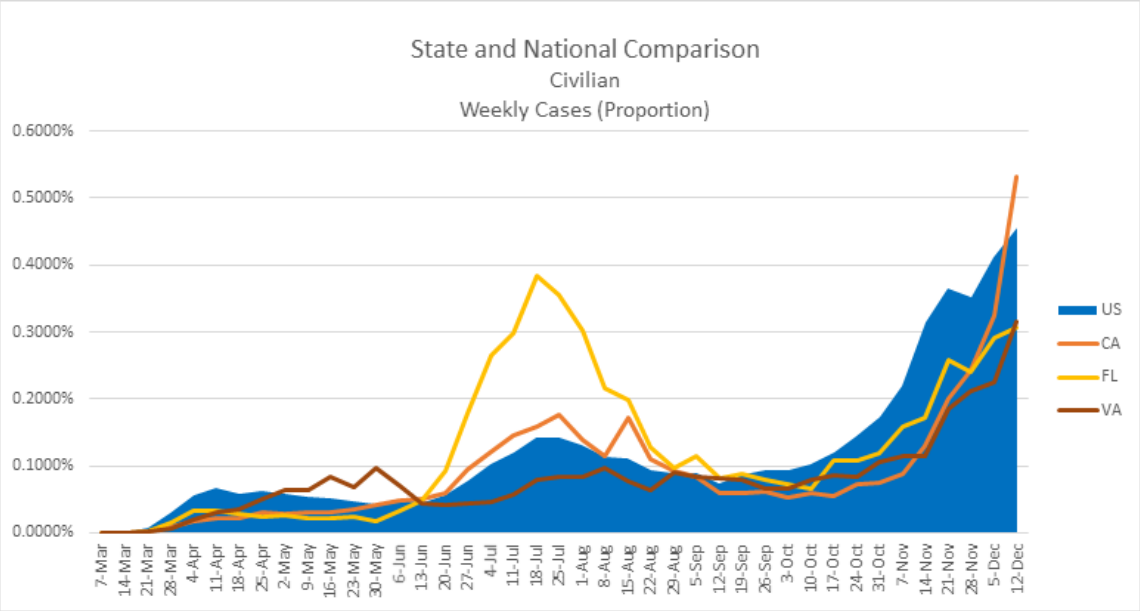

Figure 2. State versus National Comparison of Weekly Cases as a Proportion. Adapted from CDC (2020).

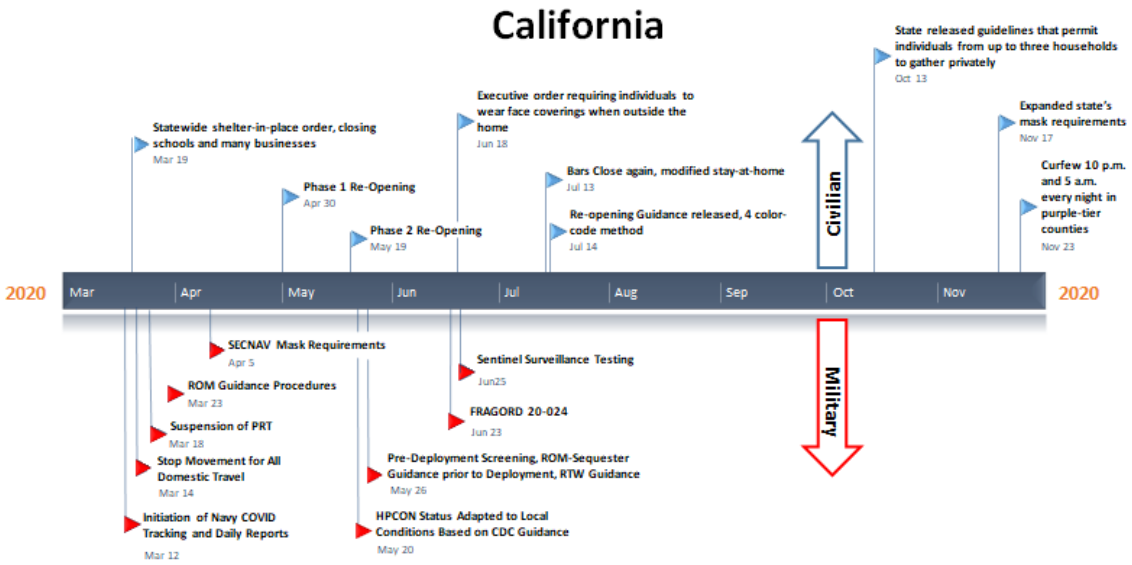

Figure 3. State of California versus Navy Timeline

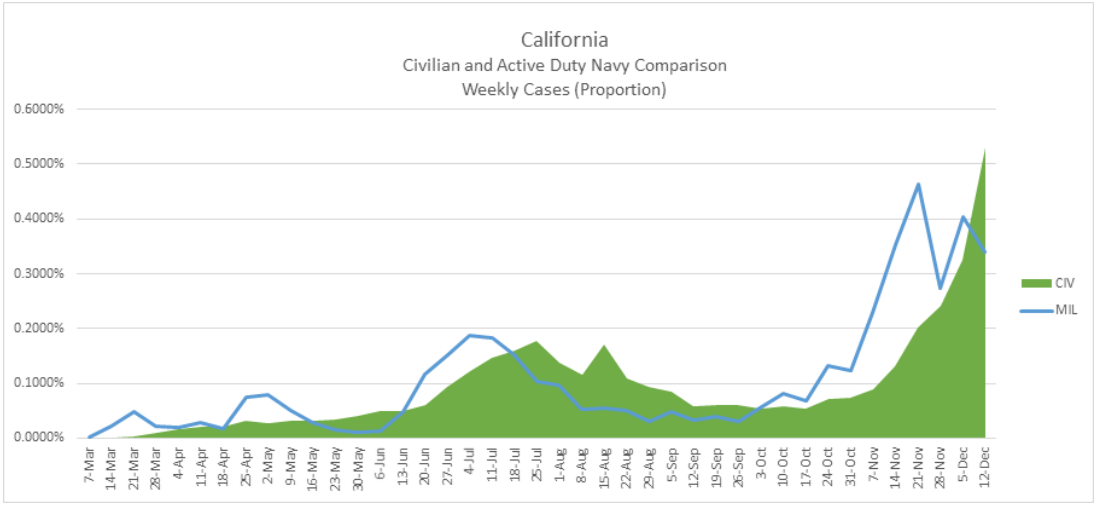

Figure 4. State of California Civilian and Active-Duty Navy Comparison.

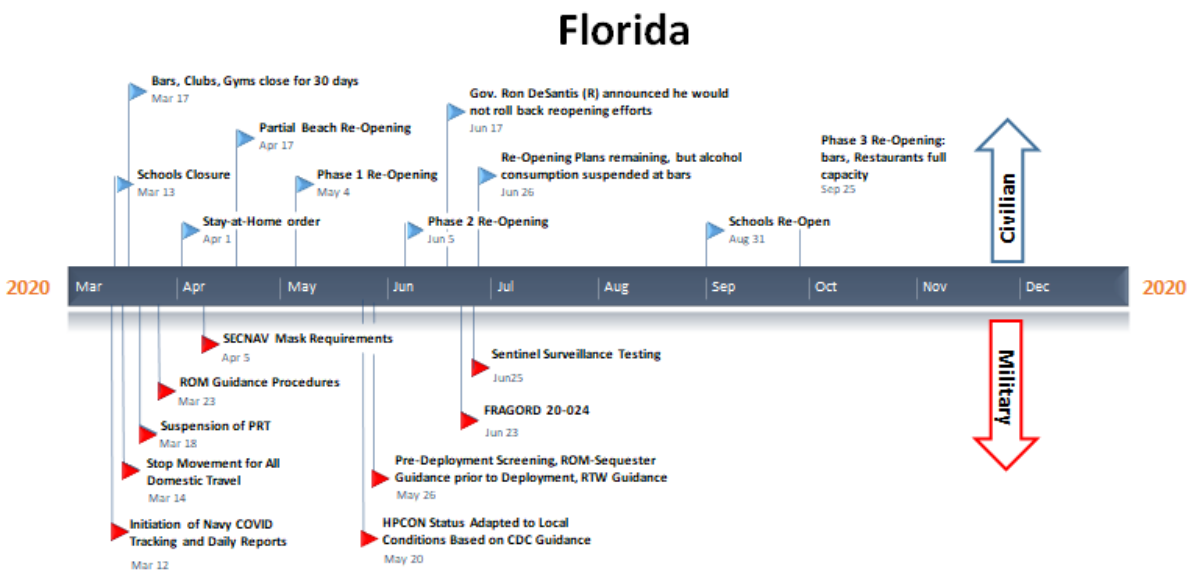

Figure 5. State of Florida versus Navy Timeline

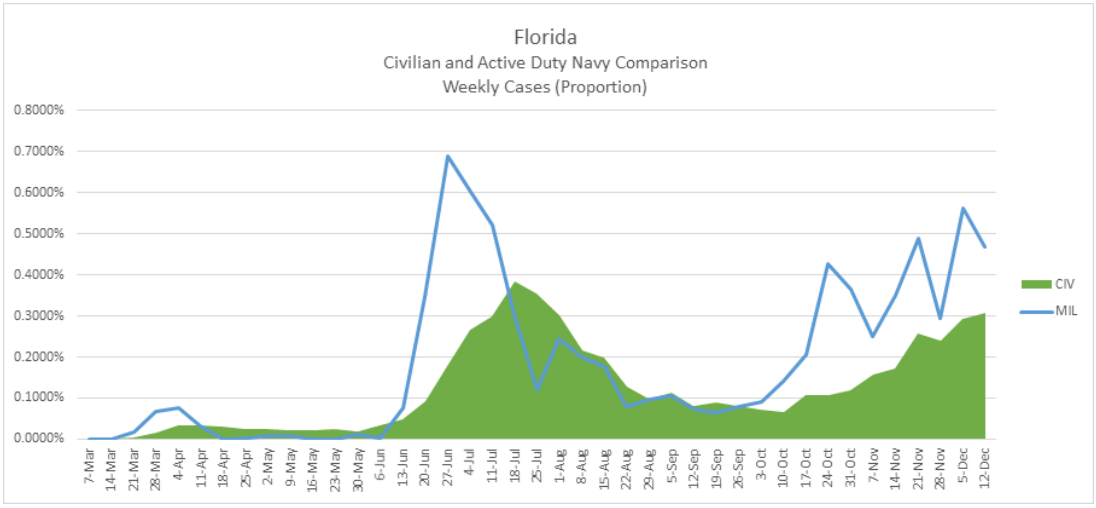

Figure 6. State of Florida Civilian and Active-Duty Navy Comparison. Adapted from CDC (2020), NMCPHC (2020).

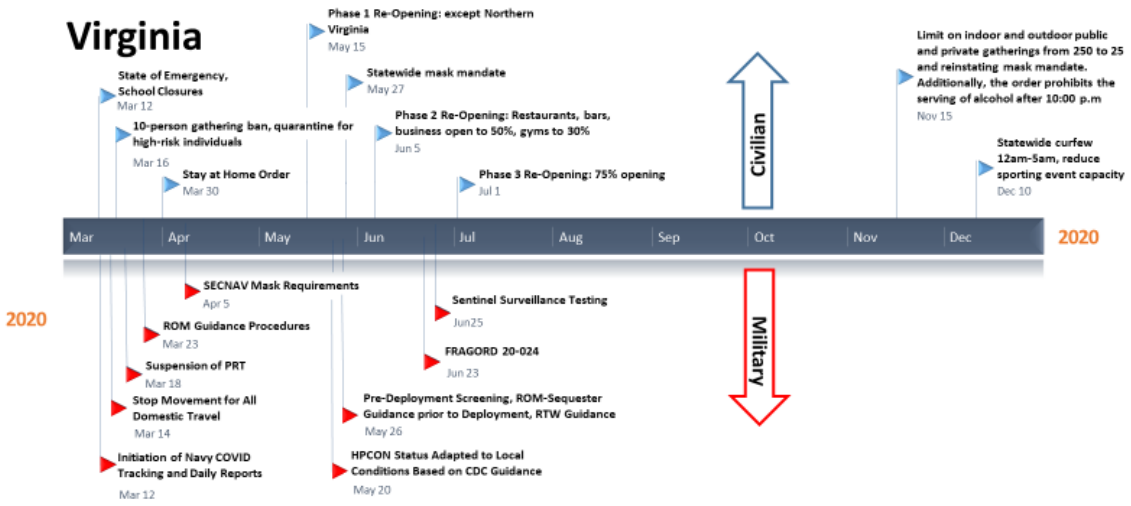

Figure 7. State of Virginia versus Navy Timeline

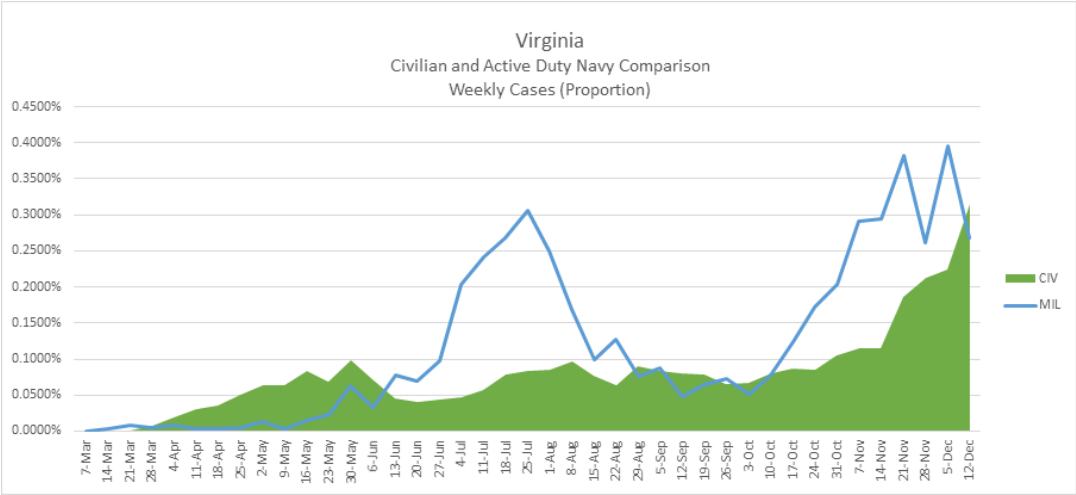

Figure 8. State of Virginia Civilian and Active-Duty Navy Comparison. Adapted from CDC (2020), NMCPHC (2020).

E. NAVY RESULTS BY STATE

Figure 9 comparatively shows new Active-Duty Navy cases of as a proportion of the respective population in each state.

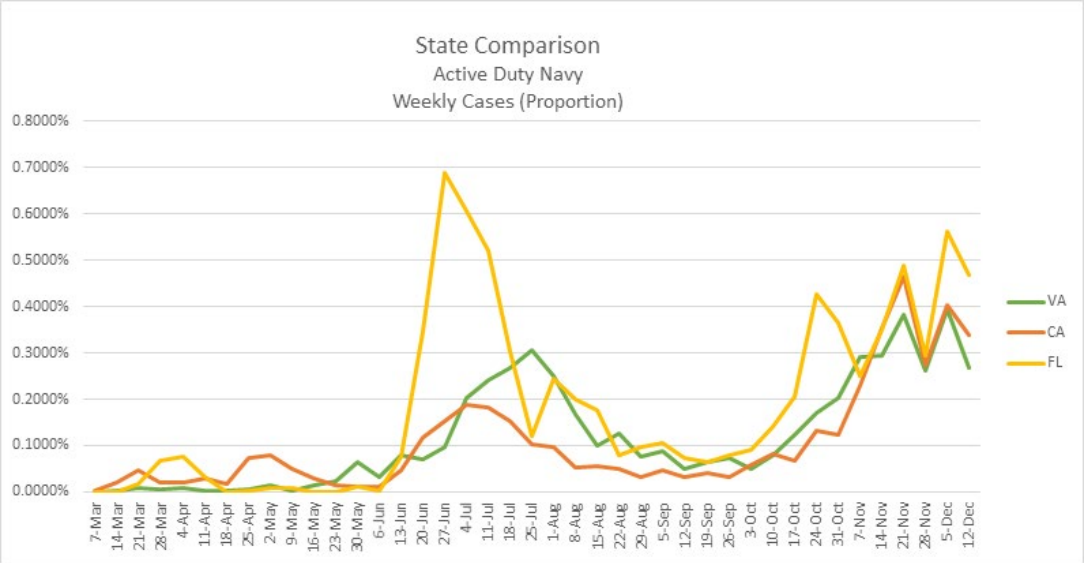

Figure 9. Active-Duty Navy New Cases in Virginia, California, and Florida. Adapted from NMCPHC (2020)

F. DATA ANALYSIS

1. Civilian Policy Analysis

a. California

In California, the initial measures implemented by Gov. Newsome (the state-wide shelter-in-place, closing of schools and many businesses) appeared to have a positive impact in containing positive COVID cases. This period of stability, with little rise of cases, remains in place until early summer. With this apparent security of the implemented measures, plans to re-open the state matriculate. In late April, the state implements a "Phase 1" policy to reopen businesses and address social distancing measures (Ballotpedia, 2021). The initial "stay at home" guidance is lifted on May 4. Continuing the wave of re-opening, the State implements "Phase 2" re-opening policy "allowing bars to reopen at 50% capacity

inside and full capacity outside, with service only for seated patrons. Movie theaters and bowling alleys reopen at 50% capacity as well" (Ballotpedia, 2021).

With much of the state beginning to re-open, the positive cases start to rise. On June 13, the proportional case rate measured 0.0496%, and by July 25, that rate increased to 0.1772%. The only significant changes in policy leading up to that time are the re-opening efforts. In the middle of that significant increase in cases, the state implements an order requiring individuals to wear face coverings when outside the home on June 18. They also close bars and modify the stay-at-home order to decrease the case rate. The cases remain relatively high until mid-August, when the rate beings a slow decline to 0.05836% on September 12.

Throughout the fall, cases remain steadily low. The state issues guidelines to increase social gatherings for individuals of up to three household to gather privately. The cases begin to increase dramatically by mid-November, with case rates rising from 0.0884% on November 7 to 0.5309% on December 12. No significant policy correlates with the sudden rise in cases at the specific timeframe. To combat the rise, the State implements expanded face-covering guidance in mid-November and implements a curfew for the highly affected counties in late November.

b. Florida

In Florida, case rates remained low until the summer. During that time, Gov. DeSantis implemented school closures, business closures and stay-at-home orders. With these measures in place and an apparent contained case rate, the state began re-opening measures, with a "Phase 1" in early May and followed by "Phase 2" in early June. Positive case rates begin to rise dramatically by mid-June. The rate on June 6 was 0.0336% rising to 0.3828% on July 18. Gov. DeSantis attributed this rise to an increase in testing. Throughout June, he stated that he would not roll back the opening efforts. The only restrictive measure was to suspend the consumption of alcohol at bars within the state.

Case rates begin to decline in late July and return to lower, contained levels by the beginning of fall. No significant policy correlates with the steady decline in summer case-rates. Through the early part of the fall, the case levels remain low and stable. By mid-

October, the case rates begin to rise and continue into the winter. The rate on October 10 was 0.0654% and that rate slowly rises to 0.3063% on December 12. During this period, schools re-opened (late August) and "Phase 3" re-opening started on September 25. These policy decisions correlate with this rise in case rates.

c. Virginia

Virginia's data analysis reveals a slow and steady rise of cases through the spring, a slight dip in the early summer, followed by a steady plateau of case rates until late fall, early winter. This is illustrated with case rates rising to 0.0979% on May 30, with a dip to 0.0408% by June 20, a rise back to 0.0792% on July 18, a plateau until late October when a steady rise increases to 0.3146% by December 12.

In the early spring, the school closures and public gathering restrictions appear to have little effect on the gradual rise in cases. Despite this rise, most areas of the state, except Northern Virginia, begin "Phase 1" re-opening on May 15. Due to the continued rise in cases, a state-wide mask mandate is implemented, which correlates with the dip in cases in early June. "Phase 2" re-opening procedures being in that same early-June timeframe and appear to have little effect on the case decline. "Phase 3" procedures correlate with the small increase in case rates in mid-July. That rise plateaus at 0.0845% (August 1) and remains at that level until late October. No significant policy correlates to the dramatic rise in cases in late fall. Policy enacted on November 15, including limits on public gathers, re-instating the mask mandate, and limiting alcohol consumption, have little effect on the steady rise in case rates in early winter. This policy culminates with a state-wide curfew implemented on December 10.

2. Navy Policy Analysis

a. Inconclusive Effect

To consider the effects of each Navy policy in its entirety (See III.E., Appendix B for full listing), we examined 18 significant policies implemented by the Navy and narrowed it down to four that exhibited the breadth, longevity, and structure to reasonably assume their potential for impact on our subject. The ones we did not consider either only

applied to a subset of the population, were brief in nature (limited in scope), did not regulate behavior, or already existed within the civilian policy infrastructure.

Chronologically, the first policy that was evaluated was the Navy's ROM guidance issued on March 23. This policy outlined guidance as well as procedures that must be initiated in the event of close contact with someone infected with COVID-19 or following travel that exposed someone to the potential for contracting COVID-19. The effort to physically separate an individual from professional as well as social circles for 14 days has the capacity to break the chain of spread and isolate bubbles of infection. Unfortunately, the implementation of this policy relatively early in the pandemic, when disease propagation as well as testing supplies were low, limited our ability for analysis and comparison.

We then looked at the SECNAV mandatory requirement for face coverings promulgated on April 5. This policy was implemented before most states mandated wearing masks which made it a compelling subject for analysis. Positive case rates among our three subject states made comparison difficult and inconclusive in linking the effect of the policy to the data.

Next, we evaluated the Navy's version of Sentinel Surveillance Testing (SST). While surveillance testing incorporates testing asymptomatic populations (those with a higher risk of infection), the working environment, inherent to the Navy on closely confined vessels and aircraft created the ideal "at risk" population. Regrettably, the wide span of the project across dozens of states and locales, many not being in California, Florida, or Virginia negated the potential for impact in our dataset.

Out of these four policies that demanded further analysis, only one showed potential for impact and subsequent corroboration.

b. Substantial Effect

The most intrusive piece of policy implemented during the pandemic (civilian or military) was FRAGORD 20–024 issued by United States Fleet Forces Command. Implemented on June 23, 2020, we sought to examine the data beginning on July 11, 2020

(1st week-ending data grouping outside our 14-day incubation window) until August 29, 2020, a seven-week period and use consistency or lack thereof across the states to corroborate any findings.

In California, the Navy saw a plateau in cases the week prior and began to see a considerable drop in the proportion of positive cases seen on a weekly basis. The Navy experienced a drop (some significant) in the proportion of positive cases for six out of the next seven weeks. The proportion of positive cases among Naval Personnel in the state dropped from .182% on July 11 to .0308% on August 29. During this time, the civilian proportion in California started climbing from .146% on July 11 before peaking at .177% on July 25. It then slowly declined through August 29, just less substantially than the Navy. During this seven-week period in California, the Navy experienced an 18.15% average weekly decrease in the positive case rate while the civilian population experienced a .1% average weekly decrease.

In Florida, on July 11, the Navy began to see a dramatic drop in proportions after coming off a significant summertime peak. The Navy experienced a drop in the proportion of positive cases for five out of the next seven weeks. The proportion of positive cases among Naval Personnel in the state dropped from .5214% on July 11 to .0978% on August 29. During this time, the civilian proportion in California started climbing from .2975% on July 11 before peaking at .3556% on July 25. It then slowly declined through August 29. During this seven-week period in Florida, the Navy experienced a 9.29% average weekly decrease in the positive case rate while the civilian population experienced a 9.66% average weekly decrease.

In Virginia, The Navy proportion of positive case rates climbed for two weeks from .242% on July 11 to .306% on July 25 before starting a rapid and drastic drop in proportion to .0759% on August 29. At the same time, the civilian population was at .0577% on July 11 and gradually climbed for the next four weeks, hitting .0973% on August 8, only to maintain roughly this same proportion for the next three weeks until hitting .0899% on August 29. During this seven-week period in Virginia, the Navy experienced a 7.54% average weekly decrease in the positive case rate while the civilian population experienced a 10.68% average weekly increase. While the Navy did experience a higher proportion of

cases during this time, it also experienced a much greater decrease in the average proportion of positive case rates compared to the civilian population. Much of the higher case rate in the Navy population can be attributed to two factors.

First, as of July 7, news outlets in Virginia begin to report "Virginia Beach and Norfolk are reporting alarming trends of high COVID-19 numbers and the percent of positives cases is rising across the Hampton roads region, with a major spike up to 12.9% positive cases in Norfolk" ("Virginia July 7 COVID-19 Update," 2020). "Hampton Roads' increased numbers come as the rest of the state continues to see declining numbers" ("Virginia July 7 COVID-19 Update," 2020). As Norfolk is the home of the largest Navy base in the world, it possesses the highest concentration of Navy personnel in the State. Therefore, it is no surprise to see the Navy population proportion of positive cases in Virginia grow more rapidly during a time when the civilian positive population proportion grows, but at a slower rate. The distribution of new positive cases being heavily weighted in a densely populated Navy region helps to explain the climb in proportion among the Navy population.

Secondly, the USS Harry S Truman (CVN-75) returned to Norfolk on June 16 after a seven-month deployment (*Carrier USS Harry S. Truman Returns to Norfolk After 7 Months Underway*, 2020). While ships and squadrons consistently come and go in this Naval Hub, adding roughly 5000 Naval personnel to the Hampton Roads area two weeks before a significant spike in the Navy proportion of positive case rates is substantial. This does not take into account the return of multiple supporting vessels apart of the Carrier Strike Group (CSG). Based on these two events, it is clear to see why the Navy experienced an increase in the proportion of positive cases after the introduction of a rigid, behavior-altering policy.

During the seven-week period from July 11 to August 29, the entire U.S. civilian population saw a slight decrease of 1.11% in the average weekly proportion of positive case rates while the Navy in California, Florida, and Virginia saw decreases of 18.15%, 9.29%, and 7.54% respectively.

If we compare the three Navy populations against the civilian populations in each state during the entirety of our analysis from July 11 - August 29, we see a clear and discernable trend in the data. The aggregate Navy population sees a 93.26% decrease in weekly proportion of positive COVID-19 cases while the aggregate civilian population sees a 2.46% increase. For a graphical display of our analysis of the impact of FRAGORD 20–024, see Figure 10. We used a heat chart to facilitate a visual interpretation of the data. The heat chart applies a color gradient to a range of cells where the color is determined by where the value of the number falls within the range. The colors are displayed on a spectrum from red to green. In our case, red denotes an increase in new COVID-19 cases while green denotes a decrease in new COVID-19 cases.

Weekly Change	US	CA		FL		VA	
Week Ending	CIV	CIV	MIL	CIV	MIL	CIV	MIL
7/11/2020	16.82%	19.22%	-2.99%	12.10%	-13.77%	22.68%	19.02%
7/18/2020	17.05%	9.41%	-16.15%	28.68%	-41.67%	37.34%	10.82%
7/25/2020	0.79%	11.14%	-32.11%	-7.09%	-60.71%	5.58%	14.42%
8/1/2020	-7.48%	-21.86%	-6.76%	-14.86%	103.03%	1.09%	-18.29%
8/8/2020	-13.44%	-16.58%	-46.38%	-28.92%	-17.91%	15.09%	-32.84%
8/15/2020	-2.22%	48.72%	8.11%	-7.45%	-10.91%	-20.46%	-40.74%
8/22/2020	-16.73%	-36.37%	-10.00%	-35.36%	-55.10%	-18.53%	27.50%
8/29/2020	-3.63%	-14.48%	-38.89%	-24.34%	22.73%	42.63%	-40.20%

Change in Weekly Proportion of COVID-19 Cases	
CIV	MIL
18.00%	0.75%
25.14%	-15.67%
3.21%	-26.14%
-11.87%	25.99%
-10.14%	-32.37%
6.94%	-14.51%
-30.09%	-12.53%
1.27%	-18.79%
2.46%	-93.26%

Weekly Proportion	US	CA		FL		VA	
Week Ending	CIV	CIV	MIL	CIV	MIL	CIV	MIL
7/11/2020	0.1209%	0.1458%	0.1821%	0.2975%	0.5214%	0.0577%	0.2415%
7/18/2020	0.1415%	0.1595%	0.1527%	0.3828%	0.3041%	0.0792%	0.2677%
7/25/2020	0.1427%	0.1773%	0.1037%	0.3556%	0.1195%	0.0836%	0.3062%
8/1/2020	0.1320%	0.1385%	0.0967%	0.3028%	0.2426%	0.0845%	0.2502%
8/8/2020	0.1142%	0.1156%	0.0518%	0.2152%	0.1991%	0.0973%	0.1681%
8/15/2020	0.1117%	0.1719%	0.0560%	0.1992%	0.1774%	0.0774%	0.0996%
8/22/2020	0.0930%	0.1093%	0.0504%	0.1288%	0.0797%	0.0630%	0.1270%
8/29/2020	0.0896%	0.0935%	0.0308%	0.0974%	0.0978%	0.0899%	0.0759%

The upper left chart displays change in the proportions of new COVID-19 cases that are shown in the bottom left chart. The chart on the right aggregately displays change in COVID-19 cases among the civilian population in each state versus the military population in each state throughout the seven-week period.

Figure 10. Weekly Heat Chart. Adapted from CDC (2020), NMCPHC (2020), U.S. Census (2019), DMDC (2019)

G. EXPANDED ANALYSIS (GRAPHS, CHARTS)

1. High-4 Weekly Analysis

We sought a method to compare how the Navy's new weekly cases compared to the home state, as well as how those states compared to the nation. To accomplish this, we looked at the four highest weekly proportions of new cases for each respective population (state civilian population versus state Navy population). This is simply the maximum or four highest weekly proportions of new cases during the 10-month period. We evaluated the respective four maximums, their proportion, and the difference in the weeks in which they occurred compared to the national average.

For example, **Table 2** displays the four weeks in which the state of California experienced the highest proportion of new weekly cases. These maximums occurred during the same time as the national average. This is displayed by the weeks separating column. The major difference occurs in the proportion themselves. For example, the week of 11/21/20, California's weekly proportion (.2008%) of new cases was 82% lower than that of the national average (.3653%).

Table 2. California High-4 (Civilian).

National		California		Diff %	Weeks Separating
11/21/20	0.3653%	11/21/2020	0.2008%	*-82%*	0
11/28/20	0.3511%	11/28/2020	0.2420%	*-45%*	0
12/5/20	0.4117%	12/5/2020	0.3247%	*-27%*	0
12/12/20	0.4565%	12/12/2020	0.5310%	*14%*	0
Average	0.3962%	Average	0.3246%	*-22%*	

Adapted from CDC (2020), NMCPHC (2020), U.S. Census (2019), DMDC (2019).

Table 3. Florida High-4 (Civilian).

National		Florida		Diff %	Weeks Separating
11/21/20	0.3653%	7/18/2020	0.3828%	*5%*	18
11/28/20	0.3511%	7/25/2020	0.3556%	*1%*	18
12/5/20	0.4117%	8/1/2020	0.3028%	*-36%*	18
12/12/20	0.4565%	12/12/2020	0.3063%	*-49%*	0
Average	0.3962%	Average	0.3369%	*-18%*	

Adapted from CDC (2020), NMCPHC (2020), U.S. Census (2019), DMDC (2019).

Florida's four maximum proportions were similar to California's, but the differences can be seen in the weeks which the state of Florida saw their highest proportions. In this case, Florida had their largest proportion of weekly cases four and a half months before the nation collectively saw its highest proportions.

Table 4. Virginia High-4 (Civilian).

National		Virginia		Diff %	Weeks Separating
11/21/20	0.3653%	11/21/2020	0.1855%	*-97%*	0
11/28/20	0.3511%	11/28/2020	0.2126%	*-65%*	0
12/5/20	0.4117%	12/5/2020	0.2239%	*-84%*	0
12/12/20	0.4565%	12/12/2020	0.3146%	*-45%*	0
Average	0.3962%	Average	0.2342%	*-69%*	

Adapted from CDC (2020), NMCPHC (2020), U.S. Census (2019), DMDC (2019).

Virginia performed similarly to the national average in terms of their occurrence of the four weeks of highest proportion of new cases of COVID-19. However, the average of their 4 highest weeks was substantially lower than the national average.

2. High-4 Method Comparison (State and Active-Duty Navy)

Next, we compared Active-Duty Navy in each state to the respective civilian population in each state using the same parameters described previously.

Table 5. California Civilian and Active-Duty Navy High-4.

California					
Civilian		Active-Duty Navy		Diff %	Weeks Separating
11/21/20	0.2008%	11/14/20	0.3530%	43%	1
11/28/20	0.2420%	11/21/20	0.4637%	48%	1
12/5/20	0.3247%	12/5/20	0.4035%	20%	0
12/12/20	0.5310%	12/12/20	0.3390%	-57%	0
Average	0.3246%	Average	0.3898%	17%	

Adapted from CDC (2020), NMCPHC (2020), U.S. Census (2019), DMDC (2019).

Active-Duty Navy service members in California hit their high-4 closely to the state of California. The proportion of new weekly cases in these weeks was substantially higher in the Navy than the state.

Table 6. Florida Civilian and Active-Duty Navy High-4.

Florida					
Civilian		Active-Duty Navy		Diff %	Weeks Separating
7/18/20	0.3828%	6/27/20	0.6879%	44%	3
7/25/20	0.3556%	7/4/20	0.6047%	41%	3
8/1/20	0.3028%	7/11/20	0.5214%	42%	3
12/12/20	0.3063%	12/5/20	0.5612%	45%	1
Average	0.3369%	Average	0.5938%	43%	

Adapted from CDC (2020), NMCPHC (2020), U.S. Census (2019), DMDC (2019).

Active-Duty Navy service members in Florida hit their high-4 earlier than the state of Florida, with a proportion and average proportion that was much greater than the states' civilian population. Additionally, using this method, the highest proportion of new cases as well as the average were significantly higher for the Navy than the state of Florida.

Table 7. Virginia Civilian and Active-Duty Navy High-4.

Virginia					
Civilian		Active-Duty Navy		Diff %	Weeks Separating
11/21/20	0.1855%	7/25/20	0.3062%	39%	17
11/28/20	0.2126%	11/14/20	0.2950%	28%	2
12/5/20	0.2239%	11/21/20	0.3822%	41%	2
12/12/20	0.3146%	12/5/20	0.3946%	20%	1
Average	0.2342%	Average	0.3445%	32%	

Adapted from CDC (2020), NMCPHC (2020), U.S. Census (2019), DMDC (2019).

Active-Duty Navy service members in Virginia reached their highest weekly proportions much earlier than the state, with one occurrence taking place nearly 5 months ahead of the state.

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V. RESULTS / CONCLUSION

We sought out to determine what aspects of policy implemented by the federal or state government compared with that of the U.S. Navy served to further benefit or hinder outcomes when evaluated quantitatively according to case count within similar populations. This proved a challenging task as the Navy's policy umbrella sits underneath the federal / state policy umbrella. From the Navy's perspective, the dilemma lies in determining whether the results found in the analysis were the effect of civilian or DOD or some mix of the two entities' policy actions. As a result, for our conclusion, we looked to compare the Navy to its similar civilian population by comparing results of each group during a time period that coincided with the states' most intrusive policy action. Our first step was to identify and then validate or invalidate the effectiveness of each state's most intrusive policy action.

We have comprehensively reviewed the policies issued by each state (California, Florida, Virginia) and analyzed the corresponding data through multiple lenses. We believe that each state's "stay-at-home" order served as the most intrusive and rigid policy implemented by that state's governance. All three states issued stay-at-home orders, but they did so at different times. We used the respective "stay-at-home" orders and associated time periods as a starting point for analyzing the effectiveness of this policy's impact on new weekly COVID-19 cases. The end point for our data analysis was the movement to a phase 1 reopening, or any executive action that addressed reopening from a stay-at-home or shelter in place executive order. Each of these executive actions to address each state's reopening were issued at different times.

California Governor, Gov. Gavin Newsome issued Executive Order N-33-20, California's stay-at-home order that went into effect beginning March 19, 2020. A little under two months later, on May 4, 2020, Gov. Newsome issued N-60-20, that identified a movement towards reopening for areas in the state that were at lower risk. During this time period, the geometric mean for weekly new cases in the state of California was 0.0167%.

Florida Governor, Gov. Ron DeSantis issued Executive Order 20–91, Florida's "Safer At Home" directive on April 1, 2020, that went effective starting on April 3, 2020. A month later, Gov. DeSantis issued Executive Order 20–112, which began "Phase 1," reopening businesses and entities that met individual criteria. Again, not fully reopening the state, but an executive action that indicated a slowing in cases, and one that state governance issued to ease restrictions on the state. This order was given one month after the "Safer At Home" directive, and was effective beginning May 4, 2020. During this time period, the geometric mean for weekly new cases for the state of Florida was 0.0280%. Given the data provided for comparison, we discovered, that despite having a later start, a shorter duration, and far less restricting policy, Florida's average number of new weekly cases was equal to that of California's average number of new weekly cases.

Virginia Governor, Gov. Ralph Northam issued Executive Order Number 55 (2020), a temporary stay at home order that was effective beginning March 30, 2020. On May 8, 2020, Gov. Northam issued guidance to ease restrictions on businesses which permitted the state to begin reopening efforts. This executive order went into effect on May 15, 2020. During this time period, the geometric mean for the weekly new cases for the state of Virginia was 0.0449%.

Table 8. Comparison of New Weekly Cases Mean Over Policy Window Compared to Entire Period.

	California	Florida	Virginia
Weekly Mean (MAR-DEC'20)	0.0504%	0.0590%	0.0569%
Close to Reopen Directive	0.0167%	0.0280%	0.0449%
Week duration of policy	8	4	7

Adapted from CDC (2020), NMCPHC (2020), U.S. Census (2019), DMDC (2019).

For our comparative analysis we looked at the geometric mean for new weekly cases in each state from March to December of 2020. California's geometric mean was 0.0504%, Florida's geometric mean was 0.0590%, and Virginia's was 0.0569%. This data showed that California had the lowest geometric mean during the 10-month time-period,

but when we analyzed the mean during the close to reopen executive order, Virginia had the highest geometric mean compared to both California and Florida. Additionally, despite the later and shorter duration of intrusive executive action, Florida's geometric mean during this particular time was still lower than Virginia's and only slightly higher than California's.

Based on our analysis in **Table 8**, we can confirm that the time period bounded by the implementation of stay-at-home orders yielded lower geometric means for weekly new cases when compared to the entire March through December duration. This would conclude that the policies implemented by each state were effective in reducing the number of weekly new cases in each respective state.

Knowing that the stay-at-home orders issued by each state were effective at reducing the quantity of new weekly cases, in **Table 9**, we compared the difference between the average number of new weekly cases during each state's restrictive policy window compared to the average for the entire 10-month period. This is simply the average of the restrictive period (Stay-at-home order) minus the average for the total duration. For instance, in California, we took the average of new weekly cases for the period of March 19 to May 4 and compared it against the average for the entire period. In California, the Navy's average proportion of new cases during the California stay-at-home order was 0.06% lower than the average for the entire data set for the Navy in California. Not only did the respective civilian populations in each state perform better in terms of new weekly cases during the period of restrictive policy, but the Navy, (subject to the same policy) also performed better.

Table 9. State Comparison of Averages for New Weekly Cases over Policy Duration.

Policy Duration	California		Florida		Virginia	
	CIV	NAVY	CIV	NAVY	CIV	NAVY
Stay-at-Home Order	-0.03%	-0.06%	-0.03%	-0.18%	-0.01%	-0.11%

Adapted from CDC (2020), NMCPHC (2020), U.S. Census (2019), DMDC (2019).

A. CONCLUSION

The U.S. Navy has a distinct and clearly defined mission that centers around the defense of our nation in a maritime capacity. This mission undoubtedly involves risk and cannot afford to be compromised according to competing priorities. To that point, all policy should straddle a fine line that protects personnel enough to keep them safe to accomplish the mission while at the same time, not stifling those abilities and proficiencies that enable mission execution. We must not be totally risk averse in our policy stance. The Navy and DOD do not have the luxury to implement policy that ignores this reality.

If this cataclysmic time period has reaffirmed one revelation, it is the idea that deterring the nation's enemies does not stop or take a pause during a global pandemic. The results that we have compiled serve as a metric and do not necessarily compel us to endorse a specific course of action by the Navy in the event of a future pandemic. While the Navy was able to meet its mission through the implementation of multiple layers of intrusive and arguably effective policy actions, these benefits had corresponding costs which our analysis cannot sufficiently quantify. What were the intangible effects of segregating personnel from their families before and after deployments or how did restricting the social interactions of all Naval personnel for a significant portion of the pandemic affect retention and mental health in the Navy? Based on our analysis of both civilian and DOD policy actions, we can conclude that rigid policies can succeed in reducing the spread of a disease, but at what cost?

APPENDIX A. COMPREHENSIVE LIST OF NATIONAL / STATE POLICY

A. CALIFORNIA

1. Major: Gov. Newsom issued a statewide shelter-in-place order on March 19, and closed public schools (California Exec. Order N-33-20, 2020).

2. Major: On April 1, Gov. Newsom announced "that public school would remain closed for the rest of the academic year." By the end of April, the state officials realized a potential to easing some of the restrictions. The path forward consisted of four phases to reopen businesses and address social distancing measures. On April 30, these stages were revealed, and the process of reopening began (Ballotpedia, 2021).

3. Major: On May 19, Gov. Newsome announced that 53 of 58 counties met the criteria to advance to the 2nd stage of re-opening. (Ballotpedia, 2021).

4. Major: As the "virtual" school year ended, the focus on the following school year began. On June 8, the California Department of Education released guidance for school to reopen under certain restrictions. The guidance "included temperature checks before entering schools or buses, face coverings for staff and students, and physical distancing requirements" (Ballotpedia, 2021).

5. Major: By early summer cases began to rise, and on June 18, Gov. Newsom signed "an executive order mandating residents to wear face masks while in public or high-risk settings" (Ballotpedia, 2021).

6. Major: On August 28, Gov. Newsom released "a new color-coded reopening plan. Counties are classified as one of four colors based on coronavirus spread in each county. They are, in decreasing order of severity, purple, red, orange, and yellow. Different business restrictions will apply to each of the color levels" (Ballotpedia, 2021).

7. Major: Further easing restrictions, on October 13, the state released "guidelines that permit individuals from up to three households to gather privately" (Ballotpedia, 2021).

8. Major: To combat a growing trend in cases, the California Department of Public Health expanded the state's mask requirements on November 17. The new guidance "requires individuals to wear masks whenever they are outside of their homes unless they are outdoors and can maintain six feet of social distancing" (Ballotpedia, 2021).

9. Major: On November 23, Gov. Newsom issued a curfew for non-essential work, movement, and gatherings between 10 p.m. and 5 a.m. in purple-tier counties (Ballotpedia, 2021).

10. Major: California Health Department issues guidance for regional stay-at-home orders: "health officials are tracking the state by five regions: Northern California, Bay Area, Greater Sacramento, San Joaquin Valley and Southern California. Regional Stay at Home Order takes effect Saturday; affects regions with less than 15 percent ICU availability. Regional Stay at Home Orders will require Californians to stay at home as much as possible, close operations for certain sectors and require 100 percent masking and physical distancing in all others. Schools currently open can remain open and retailers can operate indoors at no more than 20 percent capacity to reduce exposure risk. New order is a modification of the state's initial Stay at Home Order signed in March and builds on the Blueprint for a Safer Economy" (California Regional Stay-at-home Order, 2020).

B. FLORIDA

1. Major: On March 1, Gov. DeSantis declares a state of emergency (Florida Exec. Order No. 20–51, 2020). Less than two weeks later, on March 13, the Florida Department of Education closed schools across the state for two weeks (Ballotpedia, 2021).

2. Minor: On March 17, Gov. DeSantis continued the school closure through April 14. Bars, Clubs, and Gyms were closed for 30 days (Ballotpedia, 2021).

3. Minor: On March 30, The Florida Department of Education continued the school closure through May 1 (Ballotpedia, 2021).

4. Major: On April 18, Gov. DeSantis continued the school closure for the rest of the academic year (Ballotpedia, 2021).

5. Major: Gov. DeSantis issued an executive order on April 29 allowing "restaurants, retail stores, libraries, and museums to open to 25% of their building occupancy under certain guidelines" (Florida Exec. Order No. 20–112, 2020).

6. Minor: Palm Beach County joined Phase one reopening on May 11, trailing the rest of the state (Ballotpedia, 2021).

7. Minor: Gov. DeSantis announced on May 22 that "summer camps and youth activities could open immediately with no additional restrictions" (Ballotpedia, 2021).

8. Major: Gov. DeSantis announced "beginning on June 5 bars may reopen at 50% capacity inside and full capacity outside, with service only for seated patrons. Movie theaters and bowling alleys can reopen at 50% capacity on that day." The new rules apply to all counties except Miami-Dade, Broward, and Palm Beach (Ballotpedia, 2021).

9. Major: On June 17, facing new daily-highs in positive cases, Gov. DeSantis announced he would not reconsider the current reopening effort and "attributed the increase in positive test results to an increase in the number of tests taken" (Ballotpedia, 2021).

10. Major: On June 26, The Florida Department of Business and Professional Regulation "suspended the consumption of alcohol at bars across the state" (Ballotpedia, 2021).

11. Minor: Miami-Dade, Broward and Palm Beach counties, who trailed the rest of the state, finally moved to Phase Two of reopening on August 20 (Ballotpedia, 2021).

12. Major: On August 31, the Florida Department of Education Public ordered schools "to reopen for in-person instruction five days per week no later than August 31" (Ballotpedia, 2021).

13. Major: The Department of Business and Professional Regulation announced on September 14 "that bars may reopen at 50% capacity" (Ballotpedia, 2021).

14. Major: Gov. DeSantis announced on September 25 that Phase 3 could begin, allowing bars and restaurants to operate at full capacity (Ballotpedia, 2021).

C. VIRGINIA

1. Major: Gov Northam declared a State of Emergency on March 12 (Virginia Exec. Order No. 51, 2020).

2. Major: On March 23, Gov. Northam issued an executive order "which closed, or otherwise limited the operations of, nonessential businesses in Virginia. That order also barred gatherings of more than 10 people and closed K-12 schools for the remainder of the academic year" (Ballotpedia, 2021).

3. Major: Gov. Northam issued a "Stay at Home" order effective March 30 (Virginia Exec. Order No. 55, 2020).

4. Minor: Gov. Northam released a plan on April 27 that would allow businesses to begin reopening. The reopening criteria included an increase in testing and hospital capacity, combined with a two-week decline in cases (Ballotpedia, 2021).

5. Major: On May 15, many parts of Virginia began the first phase of the reopening plan. Northern Virginia (Arlington, Fairfax, Vienna, Alexandria) did not meet the criteria to reopen. The initial phase allowed for retail stores, bars and restaurants (outdoor dining) to reopen at 50% capacity. Entertainment and public amusements venues remained closed. Places of worship were limited to 50% capacity (Ballotpedia, 2021).

6. Major: On May 27, Gov. Northam issued a statewide mask mandate (Virginia Exec. Order No. 63, 2020).

7. Major: On May 29, Northern Virginia began the initial phase of reopening. Additionally, the state issued that "face coverings are also required in public indoor settings statewide for people 10 years and older" (Ballotpedia, 2021).

8. Major: Much of the state, except Northern Virginia, entered the second phase of the reopening plan on June 5. This phase eased restrictions to the following: "restaurants and breweries are permitted to offer indoor seating at 50% capacity to parties of up to 50 people. All retail businesses are permitted to reopen at 50% capacity. Gyms can reopen at 30% capacity" (Ballotpedia, 2021).

9. Major: Northern Virginia and Richmond joined the rest of the state in the second phase the reopening plan on June 12 (Ballotpedia, 2021).

10. Major: Phase 3 of the reopening plan on July 1, allowing public gatherings of 250 people, gyms open to 75%. Capacity restrictions are lifted for many other businesses. In a change to the previous plan, bars areas of restaurants are to remain closed (Ballotpedia, 2021).

12. Minor: On July 15, Virginia became "the first state to adopt mandatory workplace safety regulations related to the coronavirus pandemic" (Ballotpedia, 2021).

13. Minor: On July 28, Gov. Northam issued an executive order "placing new restrictions on businesses in the Hampton Roads area, including the cities of Virginia Beach and Norfolk. Restaurants in the Hampton Roads area will be limited to 50% capacity for indoor dining and must stop serving alcohol after 10 p.m., and gatherings will be restricted to 50 people. The restrictions take effect on July 31" (Virginia Exec. Order No. 68, 2020).

14. Major: On November 15, Gov. Northam issued an executive order "lowering the limit on indoor and outdoor public and private gatherings from 250 to 25 and requiring Virginians five and older to wear a face covering in public settings. Additionally, the order prohibits the serving of alcohol after 10:00 p.m." (Virginia Exec. Order No. 67, 2020).

15. Major: On December 10, Gov. Northam announced a statewide curfew from 12 a.m. to 5 a.m. Public gatherings were reduced from 25 to 10 people, except for places of worship (Virginia Exec. Order No. 67, 2020).

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APPENDIX B. COMPREHENSIVE LIST OF DOD / NAVY POLICY

Specific policy action and its associated potential-for-Impact is based on a rudimentary two-category grouping of major or minor as defined below.

Major: Major (potential-for-impact) policy action: Policy action is applicable to the entire concerned population or possesses capacity to impact entire concerned population.

Minor: Minor (potential-for-impact) policy action: Policy action is applicable to a subset of the concerned population or lacking the capacity to impact entire concerned population.

February 2020

Minor: Reporting guidance supporting DOD response to novel coronavirus– NAVADMIN 033/20 (2/7/2020) (NAVADMIN 2020, n.d.-a)

Initiates initial reporting guidance based off Memo DOD USD (Personnel and Readiness, 7FEB20) and directs all Navy commands to begin reporting personnel who have traveled to China or personnel who could've have exposed to travelers from China.

March 2020

Major: Navy mitigation measures in response to coronavirus outbreak– NAVADMIN 064/20 (3/12/2020) (NAVADMIN 2020, n.d.-b)

Navy submission to SECDEF issued military HPCON guidance and initiation of United States Northern Command (USNORTHCOM) pandemic plan, stop movement for PCS in high-risk areas, restriction of certain travel for training, closer scrutiny of commanders in approving personal leave / liberty guidance, encouraging the use of virtual conferences, initiating basic health guidance in compliance with CDC, Initiation of COVID tracking and daily reports.

Minor: Navy mitigation measures in response to COVID outbreak, update 1 – NAVADMIN 065/20 (3/14/2020) (NAVADMIN 2020, n.d.-c)

Stop movement for all domestic travel. Leave outside of the local area requires approval from first flag officer in the chain of command.

Minor: Physical readiness policy update – NAVADMIN 071/20 (3/18/2020) (NAVADMIN 2020, n.d.-d)

"Immediate suspension of the Navy physical readiness program physical fitness assessment (PFA) for cycle 1, 2020 to minimize risk from COVID-19" (*NAVADMIN 2020*, n.d.-d).

Minor: Navy mitigation measures in response to COVID outbreak, update 2 - NAVADMIN 074/20 (3/19/2020) (NAVADMIN 2020, n.d.-e)

Modification and / or cancellation of certain training to mitigate the spread of COVID-19.

Major: Restriction of movement (ROM) guidance - NAVADMIN 083/20 (3/23/2020) (NAVADMIN 2020, n.d.-f)

This policy defines ROM and associated duration as 14 days based on the most conservative CDC incubation period. It delineates ROM procedures after close contact to mitigate or prevent further spread. It "requires that personnel returning from a Center for Disease Control and Prevention (CDC) Travel Health Notice (THN) Level 3 or Level 2 location perform a 14-day ROM" (*NAVADMIN 2020*, n.d.-f).

April 2020

Major: SECNAV memo requirement for face coverings. (5APR20) (NAVADMIN 2020, n.d.-g)

In order to echo guidance of CDC, the SECNAV mandated all personnel "on DOD property, installations and facilities will wear face coverings when unable to maintain 6 ft of social distance" (*NAVADMIN 2020*, n.d.-g), applicable inside and outside buildings.

Minor: Restriction of movement (ROM) guidance update - NAVADMIN 113/20 (4/17/2020) (NAVADMIN 2020, n.d.-h)

Provides update to ROM procedures and "acknowledges that operational unit commanders may have to execute a ROM period prior to introducing new members to the crew or prior to taking a unit overseas or underway" (*NAVADMIN 2020*, n.d.-h)

Major: Update to Navy COVID-19 reporting requirements - NAVADMIN 115/20 (4/21/2020) (NAVADMIN 2020, n.d.-i)

Initiates further guidance on reporting requirements for current active positive cases / total currently hospitalized / total in ROM / total recovered / total deaths / current total persons under investigation (PUI) to mitigate risk and apply uniformity to the tracking process. The guidelines include periodicity and well as content standards applicable to all units that yields more favorable tracking and accountability.

Minor: Navy Mitigation measures in response to COVID outbreak, update 4 - NAVADMIN 116/20 (4/21/2020) (NAVADMIN 2020, n.d.-j)

Extends ongoing stop movement travel restrictions to June 30, 2020 and provides emphasis from leadership to adhere to Force Health Protections Conditions Fleet-wide, reminder for COVID mitigations (social distancing, mask wearing, hand washing, group gatherings / meetings guidance).

May 2020

Major: Guidance on adjusting health protection conditions and base services - NAVADMIN 147/20 (5/20/2020) (NAVADMIN 2020, n.d.-k)

Provides guidance for adapting HPCON status to local conditions based on public health surveillance data, CDC guidance, local military treatment facility (MTF) capacity. Provides metrics for changing HPCON level based on OSD Memo 19MAY20. According to the CNO, "A framework to assess Navy installations or facilities using local community health conditions" includes:

> (1) "Downward trajectory of reported cases and COVID-like illness (CLI) cases reported over the preceding 14 days" (NAVADMIN 2020, n.d.-k).
>
> (2) "Downward trajectory of documented COVID-19 cases or of positive tests as a percent of total tests over the preceding 14 days" (NAVADMIN 2020, n.d.-k).

(3) “And MTF and / or local hospital have the capacity to treat all patients without degrading standards of care” (*NAVADMIN 2020*, n.d.-k).

An assessment of these conditions and criteria provides a locally derived common operating picture of risk to force.

Major: U.S. Navy COVID-19 standardized operational guidance (original) - NAVADMIN 155/20 (5/26/2020) (NAVADMIN 2020, n.d.-l)

Provides a baseline for standardized operating procedures in the current COVID environment that provides a structure of best practices to enable COVID-free mission-ready crews. This includes pre-deployment screening, 14-day ROM-sequester prior to any deployment, actions for Maintenance/ Basic / Integrated /Advanced / Sustainment phases, actions to be taken for COVID-19 infection, return to Work (RTW) Guidance, and post deployment ROM.

June 2020

Minor: Navy mitigation measures in response to COVID outbreak, update 5 - NAVADMIN 168/20 (6/12/2020) (NAVADMIN 2020, n.d.-m)

“Transition to a conditions-based approach to personnel movement and travel.” (*NAVADMIN 2020*, n.d.) According to the CNO, conditions for travel reside on two factors:

(1) “State and/or regional (to include host nation) criteria” (*NAVADMIN 2020*, n.d.-m)

(2) “Installation-level criteria based on conditions in and surrounding DOD installations” (*NAVADMIN 2020*, n.d.-m).

A living document travel tracker updated on my navy portal (MNP) delineates whether personnel can safely travel between locations based on above criteria.

Minor: U.S. Navy COVID-19 standardized operational guidance (Version 2.0) - NAVADMIN 173/20 (6/17/2020) (NAVADMIN 2020, n.d.-n)

Expands return-to-work criteria for personnel who have tested positive for COVID-19 based on increased understanding of the COVID-19 threat.

Major: NAVNORTH FRAGORD 20–024 in response to coronavirus disease 2019 (6/23/2020) (Fragord, n.d.)

Overarching guidance applicable to all Continental United States (CONUS) Navy personnel concerning conduct and behavior during HPCON Charlie and incorporates signing a legally binding document known as a Page 13. Applicable on / off base. Major themes include physical distancing, group gathering limits, stops only for essential business, restriction of certain activities and visiting specific types of establishments.

Minor: COVID-19 testing - NAVADMIN 178/20 (6/25/2020) (NAVADMIN 2020, n.d.-o)

This policy enacts the process to request DOD testing resources and implement testing procedures for the Navy in the form of the Navy's "Sentinel Surveillance Testing (SST) strategy for COVID-19" (*NAVADMIN 2020*, n.d.-o). With testing capacity available, testing asymptomatic populations (those with a higher likelihood of infection) to detect disease early, bound an outbreak, and reinforce public health measures.

July 2020

Major: Navy mitigation measures in response to COVID outbreak, update 6 - NAVADMIN 189/20 (7/2/2020) (NAVADMIN 2020, n.d.-p)

Reduced leave / liberty restrictions to reflect conditions-based approach. This includes allowing operational commanders to approve leave / liberty outside of the local area.

August 2020

Minor: U.S. Navy COVID-19 standardized operational guidance (Version 2.1) - NAVADMIN 217/20 (8/4/2020) (NAVADMIN 2020, n.d.-q)

This policy updated return to work (RTW) guidance after COVID-19 based off CDC and Navy and Marine Corps Public Health Center (NMCPHC) recommendations. A strategy based on testing to RTW is no longer recommended as people "may continue to test positive for up to three months (shedding)" (NAVADMIN 2020, n.d.-q) but are no

longer infectious (*NAVADMIN 2020*, n.d.-q). Based on the CNO, conditions for RTW include:

> (1) "At least 24 hours have passed since resolution of fever" (*NAVADMIN 2020*, n.d.-q).
>
> (2) "Progressive improvement in other COVID-19 symptoms as determined by a medical provider" (*NAVADMIN 2020*, n.d.-q).
>
> (3) "At least 14 days have elapsed since the symptoms first appeared or since the date of the first positive reverse transcriptase – polymerase chain reaction (RT – PCR) test if asymptomatic" (*NAVADMIN 2020*, n.d.-q).

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