Reality Injection: Beyond Masks and Quarantine

The True Cost of COVID-19

By Eric D. Achtmann; Raquel Bono; Anita Goel; Margaret A. Hanson-Muse; Steven M. Jones

COVID-19 has had a profound economic and social impact on America, taking over a half million lives—more than all American deaths in World War I, World War II, and Vietnam, combined.[1] This article seeks to examine primary and secondary consequences of the pandemic in practical terms for the average citizen and taxpayer, whose personal exposure exceeds 2.5 years of net income based on predictions of a $16 to $35 trillion cost to the nation by 2025. Further, we offer insight into the pandemic's collateral effects on our citizens and workforce (including often overlooked key stakeholders such as women, children, and minorities), as well as more overt aspects of our national security.

History will measure the pandemic's tragic and overwhelming impact on the world—and our country—in terms of infections, hospitalizations, vaccinations, and deaths. Yet, as COVID-19 extends our quasi-lockdown into its 18th month, we are scarcely beginning to comprehend its profound economic impact. A December 2020 Congressional Budget Office (CBO) report estimates Americans' costs at nearly $16 trillion[i] or double its May 2020 projections.[2] To a layperson, $16 trillion is the wealth of 16 *million* millionaires or $110k for each U.S. taxpayer. Analysts expect this number to reach $35 trillion by 2025[3]—a sum that easily exceeds the initiatives Congress has fought over for years[ii]. Another study conducted by the *Journal of the American Medical Association* reached a similar conclusion. "About half of the price tag, $8.6 trillion (about $26,000 per person in the United States), is driven by the long-term health implications and costs for those

[i] Unadjusted for inflation

[ii] (e.g., all student debt, public health coverage and vaccinations, clean/sustainable infrastructure)

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who contract COVID-19, as well as the statistical estimates for the loss of life."[4] Robert Frost's words aptly depict society's effort to overcome the pandemic's effects, "…miles to go before [we] sleep."

The stock market crash of 1929, in hindsight a predictable occurrence, unleashed a 10-year Great Depression. Likewise, the COVID-19 contagion, an equally predictable event, portends a similar trend. Long term, it compels society to address its socio-economic impact, acknowledge its lack of preparedness, and formulate a realistic action plan for protection against this and future pandemics, as well as potential biowarfare attacks. A similar event is inevitable, whether through malfeasance, rapidly increasing population density, environmental stress, biowarfare attack, or simply bad luck. So is society's realization of two things: our economy and civilization will struggle to survive another pandemic in the near term, and that "an ounce of prevention is worth a pound of cure." While one can theoretically shut down the engines and glide a plane to safety in an emergency, there is no substitute for proper planning, operations, and maintenance. Society needs a more proactive and anticipatory approach to national and global security, biodefense, and pandemic prevention and mitigation.[5] Leaders need a strategy that leverages the resources of both the public and private sectors, as well as academic and individual initiative. Failure to do this is not an option—it is too costly and could lead to the collapse of entire economies and societies.

COVID-19 Impacts Us All—Directly and Indirectly

As of the time of this writing, the total U.S. COVID-19-related hospitalizations and deaths have reached ~880k and ~515k,[6] respectively, with infections nearing 29m cumulatively and ~41k daily. The situation is clearly serious. Of these, ~8k people are currently in the ICU and ~3k on ventilators.[7] Presuming there is a family (e.g., in quarantine or, worse, mourning) for every COVID-19 hospital admission, the impact affects ~2 million members.[8] The number of indirectly affected families, friends, and co-workers is far more significant. As in war, we count the dead yet often forget the other casualties. Metaphorically speaking, carrying each "wounded soldier" requires at least two people, clearly indicating that COVID-19's impact on our socio-economical foundation is profound. Consequently, and for a country that prides itself on "never leaving anyone behind," the notion that "the COVID-19 response is exaggerated since only older people are affected" is myopic and runs counter to our most profound national and human values. Regardless of who lands in the hospital, given that COVID-19-related hospitalizations cost ~$73k and the total direct COVID-19 hospital bill has eclipsed $40 billion and continues to rise, the healthy, the sick, and future generations will all bear the pandemic's costs.

At the epidemic's peak, hospital outpatient services declined nearly 60 percent, meaning that for every 100 Americans requiring medical care, 60 experienced a delay in their care. Imagine a family member needing more complex care (e.g., cancer) when earlier, preventative care would have been curative. Yet to be determined is the cost of treating chronic conditions that have worsened, progressed due to delays, or resulted in death. Nor is there a remedy or triage for COVID-19's devastating effects on our education system, the foundation of our democracy. Estimates suggest that, since the start of the pandemic, over 5.5 million learning years have been lost (i.e., ~1.5 months for each of 51 million school children).[9] The United States depends on education to be globally competitive. Given that our school system currently ranks 38th internationally,[10] one could argue that the United States cannot afford to fall further behind. It is ironic that bars and restaurants reopened before schools. While COVID-19's damage to the curriculum is clear, less obvious is the fact that some students are not

returning at all, despite parents' and teachers' best efforts.[11]

Before the COVID-19 outbreak, 40 percent of our population had less than $400 in savings.[12] This fact, coupled with widely televised food bank lines stretching for miles, makes the ongoing highly politicized debate surrounding masks seem gravely misguided, unrealistic, and binary. The rhetoric suggests that wearing a mask assails our individual "freedom," despite scientific proof that wearing proper masks curbs transmission and prevents infection.[13] Given the substantial damage COVID-19 is wreaking on the economy and the U.S. health care system, the relevant question would better be: "In the highly imperfect world of a pandemic, what measures, including wearing masks, will allow us to restart our economy quickly and ensure broad public access to critical healthcare?" In the military, one of our most respected institutions,[14] there is never a debate about the freedom not to wear a gas mask if a contamination risk exists, nor to argue about the freedom not to drink water if there is a dehydration risk. The point is: an injured person—or someone who causes an injury—becomes a liability to the unit and mission.

COVID-19 Will Haunt Us for a Long Time

Some may claim the stock market's historic highs have limited COVID's shock. To validate this notion, we need to understand who benefits from the stock market. For example, the "Big Five" tech companies (i.e., Apple, Alphabet, Microsoft, Amazon, and Facebook) have a combined value of ~$8.5 trillion. These companies account for over 40 percent of the NASDAQ 100. Their profitability rose in tandem with America's increased need for digital services during the pandemic. However, while founded in the United States, several of these companies have domiciled abroad for tax optimization and have significant operations outside of the United States to benefit from lower wages. Furthermore, foreign and institutional investors hold ~40 percent and over 80 percent of these companies' shares, respectively.[15] These investors do not contribute to the actual U.S. economy, yet they wield considerable influence. Lastly, concentrated wealth in the form of a sizable portion of the shares and profits lies in a dozen tech billionaires' hands. These individuals' wealth exceeds ~$1 trillion and is increasingly exacerbating economic inequality by widening the gap between the "haves" and "have nots."[16] Rather than limiting COVID-19's shock, the booming stock market is a better measure of how value is being *extracted* from the U.S. economy. This distortion of market dynamics by concentrating wealth instead of creating jobs hurts the *average* American badly.

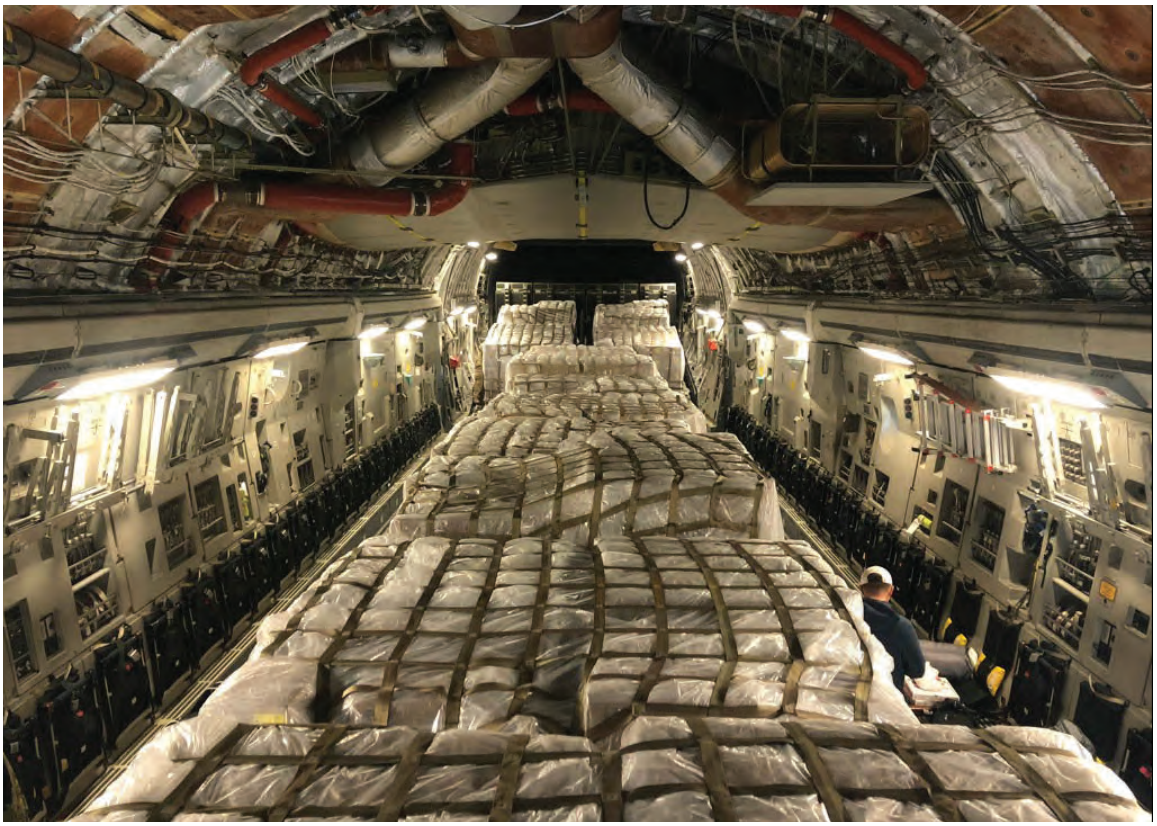
The vaccine manufacturers will produce a similar personal wealth boom for a lucky, select few. Ironically, U.S. taxpayers financed the development of these vaccines—directly or through tax incentives. American taxpayers will also pay for the legal indemnification promised to some firms if the accelerated regulatory approval processes fails to gather sufficient data regarding any potential long-term side effects of some vaccines.[17]

Putting the medium- to long-term impact into context, the U.S. $68k median income pales against the pandemic's current $110k per taxpayer cost. For this generation, each taxpayer will have given up the equivalent of ~2.5 years of their post-tax income, representing over 10 percent of their career earnings. Seen another way, of the 143 million U.S. taxpayers[18], over 11 million (~8 percent) will have worked for nothing in 2020. A further knock-on effect of this is the ~40m imminent evictions (i.e., equivalent to the population of Texas).[19] Keeping in mind that it may be easier to evict than it is to rent, this exposure alone is ~$45 billion per month. These mind-numbing numbers show that the pandemic, our lack of preparedness, and harried response have

sickened our economy and cut away sizeable chunks. Although the economy will eventually heal, the mercilessly amputated sectors are unlikely to grow back.

From a national security perspective, COVID-19 created global risks and unveiled global threats. By the time the USS Theodore Roosevelt pulled into Guam for an unscheduled port call, COVID-19 had incapacitated nearly 27 percent of the crew.[20] There was a direct impact on troop strength and readiness. Delays or curtailments of recruiting to the military services and basic training also exacerbated the negative impact on troop strength.[21] Given readiness[22] requires the military to operate in forward-deployed areas worldwide, military members were put at risk by the unchecked pandemic, which further hampered ongoing contingency operations.

Like learning to live with a new disability, we will also need to adjust and compensate socio-economically. The sad math of calamity is that the injured and disabled, who often require long-term care and support, significantly outnumber those killed.[23] We are only now beginning to understand the long-term effects associated with even mild cases of COVID-19. At the same time, we are experiencing a marked increase in PTSD, suicides, divorces, and broken families, all of which burden our economy and lives. For example, compensation costs for Vietnam veterans and families are still $22 billion annually.[24] Despite grafting healthy economic flesh over our society's afflicted parts and economy,



As part of a U.S. Department of Health and Human Services-led, whole-of-government effort, AMC transported a shipment of 13 pallets containing 500,000 COVID-19 sampling swabs aboard a 164th Airlift Wing C-17 Globemaster III from Aviano Air Base, Italy, to the Memphis, TN, Air National Guard Base, March 17, 2020. (Photo by Airman Magazine)

significant permanent scars will remain.

Some of these scars manifest themselves in harm to the long-term relationships that underpin our national security. Invariably, calamity presents the need to make difficult decisions in the face of imperfect information. It also tests the character of our leadership—and, consequently, our national character. The U.S.' interception of medical supplies during the pandemic may be viewed as a "tough call" in light of an existential threat to the nation or, alternatively, as a callous and selfish affront to our closest strategic allies of decades and centuries, among them Germany and Canada.[25] Either way, as an old adage states, "good relationships and reputations take years to earn and moments to destroy." The reputation earned in blood on the beaches of Normandy will ultimately give way to that deserving of more recent national gestures.

Similarly, adversaries may be quick to capitalize on such situations in a number of ways. First, adversaries may highlight our mistakes or the raw calculus of decisions we take with the goal of undermining the perception of U.S.' competence and ability to lead.[26] Second, adversaries may take the opportunity to engage in those regions the United States has failed to address—for reason of lack of attention, resources, or design. Indeed, vaccine diplomacy has become a valuable foreign policy tool and provided inroads for competing interests as has been seen by China (Sinovac) and Russia (Sputnik) in emerging economies like Africa, Eastern Europe, India, Middle East, and South America, *inter alia*.[27] Naturally, the long-term effectiveness of a vaccine (or any other) diplomacy is linked to the efficacy of the vaccine or other solution being offered. That said, even perceived benefits can buy time for competitive interests to gain at least a temporary foothold. So was the case for Troy.

Vaccination is Only Part of the Solution

In less than a year, the development of novel vaccines for COVID-19 was an impressive technological achievement. Operation Warp Speed was an ambitious Public-Private Partnership (PPP) that provided government funding for research and manufacturing to five pharmaceutical candidates. The process leveraged the companies' scientific and clinical acumen to design and create effective vaccines. Simultaneously, multiple federal agencies harmonized and accelerated the lengthy regulatory process to mainstream these vaccines' approval for distribution. Some vaccines based on the novel technology continued on the accelerated commercialization and regulatory review path. The process was politicized, involved unprecedented amounts of money ($12 billion in the United States, alone), and suffered from inherent conflicts of interest.[28] Development and validation of these vaccines across the United States under the Emergency Use Authorizations (EUA) is a rigorous process, but still short of full approval. So is the logistical challenge of delivering two shots to 340 million Americans and potentially booster shots in the future to keep up with ongoing mutations and to maintain a threshold level of resistance to the virus.

Ironically, the speed of the development, approval, and distribution process may be one of the biggest obstacles to the widespread use of vaccines. First, because of vaccines' past effectiveness, the public has forgotten the horrors of mass infection. Second, there have been concerns about real or perceived harmful side effects of vaccines, such as autoimmune-related diseases like autism. The final obstacles are skepticism caused by the inadequate COVID-19 response and the perceived hasty vaccine development and approval with limited data on long-term efficacy and side effects. Despite the victory of the unprecedented swift vaccine development, there has not been continued deliberative

planning, education, and messaging to ensure that the vaccines get distributed and administered as needed. A possible solution would have been to use the PPP Operation Warp Speed to continue the distribution and administration of the vaccines—e.g., using military logistics and the federal EUA to partner with commercial pharmacies to ensure broad distribution and accessibility to testing, vaccines, and any potential therapies that might emerge.

The numbers are not working with us. To achieve herd immunity (and the removal of COVID-19 restrictions), we must successfully vaccinate between 70 percent to 90 percent of the population in a country with a less than 50 percent average vaccination acceptance rate.[29] Achieving this target seems unlikely in less than two years. (… miles to go…). Unlike our childhood immunizations, COVID-19 vaccine recipients still have to wear a mask around unvaccinated people because none of the vaccines are 100 percent effective, the length of effective immunity is unknown, and COVID-19 is still actively spreading in certain areas.[30] With survivors of natural COVID-19 infection, immunity appears to last 8 to 12 weeks, but reports vary.[31] Vaccine data appear to correspond with natural immunity. However, more data and time are needed to determine whether that immunity extends beyond three months. The 2021 news year has been a bad one, and while the vaccines provide some light at the end of the tunnel, they are not a panacea for COVID-19. On the heels of COVID-19 vaccine distribution is the emergence of variant strains

Military members begin adding lamps to the Patient Care Units (PCU) for Phase II at the Jacob K. Javits Convention Center in New York City. (Photo by New York National Guard, April 2, 2020)

that have variable responses to the available EUA vaccines. We will need advanced precision testing innovations to track and monitor each vaccine's efficacy related to each strain.[32] Likely, the public will see this as yet another failure of our government in response, because the vaccines alone will not meet society's unrealistic hopes and expectations of a full recovery.

The Best Defense is a Good Offense

With COVID-21 and other mutants right around the corner, clearly COVID-19 is not going away anytime soon; it will neither be the first nor the last pandemic, and the cost is and will be devastating. Each of us has had a time in life when we were unprepared and paid a dear price for it. Perhaps it was the important exam we failed for not having studied sufficiently or the massive bill we paid for lack of insurance. In such cases we utter to ourselves "never again." Obviously, it is a bad strategy to first start building a firehouse when your own home is ablaze. Similarly, trying to buy liability insurance after the crash, is senseless. The same is true regarding pandemic readiness and defense. Some things cannot be left to chance or put off until later.

Rewind 18 months: What would we each have paid to avoid masks, quarantines, joblessness, evictions, closing our communities, and local restaurants—and the loss of loved ones? Or, seen another way, what would we have been willing to pay to have a year breathing freely with friends and family, dinners, movies, concerts, sporting events, prosperity, and the freedom we hold so dear?

The truth is, we cannot afford to handle COVID-19 or the pandemics that will follow on a reactive, *ad hoc* basis—unless we all want to be sick, lonely, and poor. According to the NIH, for $4.5b *per year*, we could put in place pandemic preparedness measures (e.g., strengthening national public health systems, funding R&D, global coordination and contingency efforts) which would make the nation and world a safer place33—a mere fraction of the estimated $20 - 40 billion *per day* cost of the current pandemic.iii NIH's proposed "ounce of prevention" is equal to roughly one *hour* of our *annual* pandemic cost. Put another way, for what America will pay for the pandemic, it could have purchased 500 years of prevention—enough to have protected the country since the Mayflower sailed until now, or from now until Captain Jean-Luc Piccard's and Captain Katherine Janeway's last USS Enterprise voyages. Reframing the issue, 20 million Americans (6 percent of the entire U.S. population) could be tested for $400 million per day (i.e., thereby allowing us to open the economy) versus the $12b *daily* cost of economic shutdown.34 Could have, would have, should have? This is a piece of insurance that we, as a nation, simply cannot afford to overlook.

So that this critical investment in insurance is effectively managed, it may be sensible to consider new policies aimed at responding differently in the future. This could include a cabinet position with a budget much like the Department Homeland Security (DHS) or an office as part of Health and Human Services (HHS). This apolitical new body should ensure coordination of the FDA, CDC, DOD, DHS, HHS, private sector, and Surgeon General aimed at the proactive, prompt, and efficient combatting of pandemic risk. Learning from South Korea, which managed SARS and COVID-19 more effectively than the U.S., this could be done in concert with a bipartisan commission for pandemic planning. Given the grave and indelible economic impact of a national shutdown, any solution should integrate the Department of Treasury and Federal Reserve to create the necessary financial contingencies—the "rainy day fund" for which our parents told us to save. Further, we will need extremely *accurate* precision mobile and decentralized testing and secure personal health verification systems that will allow the healthy to congregate, without the

[iii] Estimated $16 trillion over 1 to 2 years

need to divulge sensitive personal health care data. Such systems based, in part, on ground-breaking new science such as nano-biophysics will afford us a quantum leap and allow us to safely reopen our economy and keep our relationships humming, while simultaneously reducing our reliance on hastily developed vaccines with unclear side effects, even if some of the underlying technologies may not be completely new. Beyond vaccination, given our poor public health ranking (e.g., 27th place internationally) and that our relatively unhealthy lifestyles (e.g., poor diet, lack of exercise) are exacerbating COVID-19's impact, it begs the question what pre-emptive measures we should be taking to reduce our susceptibility and increase our resilience to this and future pandemics.[35] In short, unhealthy people become sick(er), more often.

Fortune Favors the Prepared Mind

America has many levers to help us address the pandemic and prepare itself for the next. These levers include improved national health and wellness, testing and diagnostics, information, and therapeutics, as well as innovation. Given America's unique market structure, it stands to reason that these levers may be best applied in the form of PPP's which leverage entrepreneurship and capital markets under government guidance and incentives.

An Apple a Day…

Regarding health and wellness, it is impossible to discuss pandemic readiness without considering the overall health of the nation. As it pertains to COVID-19, the evidence suggests that a correlation exists between COVID-19 illness and deaths, and the social determinants of health.[36] Illnesses such as diabetes and obesity, which are prevalent in the United States, may be accentuated by the inactivity and stress associated with the lockdown. Conversely, such diseases are believed to make us more vulnerable, creating a deadly vicious cycle. It begs the question why, with full knowledge that there would be a "second wave" in Fall 2020, there were no initiatives to educate and advise the public on the need to maintain good health (e.g., proper nutrition, exercise) or, further, embracing the notion that our national security depends, in part, on our national state of health and natural resistance.

Testing—Mind the Gap

Quoting Peter Drucker, "if you can't measure it, you can't improve it." At the heart of *any* pandemic response is reliable, accurate testing which allows us to reliably separate the infected from the healthy and focus our limited resources, including vaccination, on those that need or can benefit from them. Specifically, the current vaccines are most useful for those who are both a) uninfected and b) at risk of having a severe response to COVID-19. As a nation we are best served by ensuring that the vulnerable people are provided access to precision testing, especially as the rate of emergence of new strains may exceed our ability to vaccinate the entire population.

Further, in the context of virus testing, the operative words are precise (i.e., finds small amounts), specific (i.e., detects only the virus you are looking for), and reliable (i.e., work the same every time). Poor tests can result in "false negatives" (i.e., a sick person falsely thinks they are healthy) and "false positives" (i.e., a healthy person wrongly thinks they are sick). The former can kill people, as each false negative is a potential "walking bioweapon" that risks infecting thousands of other people. The latter is effectively a false alarm, as false positives kill economies. The proverbial "boy who cried 'wolf'!"

Our current systems for diagnosing diseases like COVID-19 rely on a 400-year-old antiquated paradigm of centralized health care delivery, focusing primarily on testing sick patients at hospitals or clinics. In an age of cell phones and self-driving cars, we find ourselves fighting a global pandemic

with inadequate armament and intelligence.[37] This is much like fighting World War III with a musket,[38] where World War III is an unconventional, asymmetric world war against an invisible enemy—a war which could continue for another two to three years, depending in part on random mutations of the virus.

The pandemic has exposed critical gaps in our current testing infrastructure. In order to reopen the economy and rehabilitate industries, we will need to establish COVID-19-free safe zones for work and travel. Accomplishing this will require widespread community-based precision testing of hundreds of millions of people—more than 20 million tests per day. At present, we are testing less than 2 million (less than 10 percent of the target). Of these tests, many of them are of questionable value given the threshold of what is positive versus negative can vary by six orders of magnitude (100,000x!), creating a lot of confusion. In short, not all tests are created equal, and a bad test can be worse than no test. Hence, the critical path out of the COVID-19 economic doldrums is via the repeated widely accessible, rapid, high precision, decentralized, mobile testing of the population.[39]

The most accurate COVID-19 testing on the market today is based on a 35-year-old Nobel-prize winning molecular technology called PCR (*Polymerase Chain Reaction*). This technology is typically capable of detecting the presence of even a small number of viruses in a sample with high sensitivity and specificity. The manufacturers of PCR machines and reagents, as well as the centralized lab service companies, have made significant efforts to increase their throughput to provide hundreds of thousands more tests nationwide, but are confined mostly to hospitals, labs and clinical settings. This centralized testing system requires large bulky machines and extensive overhead infrastructure, complex sample transport logistics, highly trained personnel, high volumes of expensive reagents, and centralized lab facilities. This system does not lend itself to providing widespread and recurrent testing for hundreds of millions of people.[40]

The holy grail of testing has long been touted to be point-of-care (PoC) testing that bypasses the need for a centralized lab infrastructure and complex logistics. Currently, the most common market-available PoC testing detects the presence of antibodies (e.g., serum, immunoassay). Such tests could be used to map individuals as they build up antibodies to the coronavirus and to conduct further research to determine if people are gaining immunity after exposure and which antibodies, if any, may confer immunity to these patients.[41]

Some large conventional PCR machine and reagents manufacturers have made significant strides in miniaturizing and increasing the speed of their machines, reducing their size from 400 pounds to under 40 pounds and hence bringing them closer to PoC. This is a critical step in the right direction, but the ability to truly put these machines in the hands of the people and thereby release us from the grip of the pandemic will involve delivering compact (e.g., "tablet sized") user-friendly, rapid, accurate testing.[42] With the help of awards from agencies like DARPA, DOD, DOE, and NSF new technologies such as nano-biophysics have evolved which enable faster and smaller, IOT-connected, precision-engineered diagnostic devices, like the X Prize–winning Gene-RADAR™ technology.[43]

Such systems allow us to safely reopen our economy and maintain critical relationships, as we decrease our reliance on the newly developed yet still not universally approved[iv] vaccines.[44] It took a Manhattan Project to bring the latest atomic physics technology to scale to win World War II. Today, we need a similar effort to scale up our latest advances in nano-biophysics technology to fight and win World War III. History will show that this critical

[iv] On 23 August 2021, the FDA approved Pfizer-Biontech for 16-year-olds and above. It is still under EUA for other uses.

leap forward was the step that saved the economy and culture, and restored faith in the safety of our great nation.[45]

Knowledge is Power

The battle against COVID-19 is as much an information war as it is a bio-war. To respond quickly, effectively, and economically, we need access to clear, structured, scientifically robust, and objective (read: apolitical, free of conflict of interest) data and information at all levels. In the first instance we need to know and better understand the origins of COVID-19 in order to properly assess the nature, timing, and longevity of the threat, as well as what countermeasures are at our disposal at any time based on *best current knowledge*. Part of this involves establishing common understanding and definitions aimed at fostering constructive dialog and decisionmaking. It is shocking that we, as a nation, would make multi-trillion-dollar decisions without first having a common understanding of the criteria or metrics underlying those decisions. Further, from a national security perspective it is in our interest to set clear standards and root out gratuitous ambiguity and misinformation which can be an effective tool in the hands of a foreign power which would profit from us spending ourselves into oblivion because of sub-optimal decision-making. Put another way, considering the permanent economic and social damage that poor pandemic decisionmaking does to our nation, foreign adversaries could find it attractive to incite us to uninformed actions, which—like cyber-attacks—can cause more damage than waging a hot war. Let us not help them.

At a practical level, accurate data must be converted to useful information which allows healthy citizens to congregate and the nation to focus its resources on those who are especially vulnerable or in need of acute care. This may come in the form of proactive and reactive measures, where the former are greatly preferred for their higher efficacy and lower cost. In short, when we enable our citizens to establish their health status quicker and easier—and be able to share that status individually and collectively—we can target the only metric that counts, which is transmission rate. Since centralized responses to decentralized threats are generally ineffective, leveraging these Point of Care Technologies (PoCT) allows us to respond in the same decentralized manner which the virus manifests itself, thereby "fighting fire with fire." Examples exist where data has been used effectively to confront similar challenges, including ID2020 and related initiatives.[46] The solutions here will lie at the interface of fintech, health, and privacy, where America has demonstrated strengths or has made progressive regulatory moves which will allow us to know each other's health status without needing to divulge highly personal underlying health information. Given that large corporations have been using citizens' personal data for years, it is reasonable to expect that citizens would have control of their own data—especially when such control is critical to our economy and society.[47]

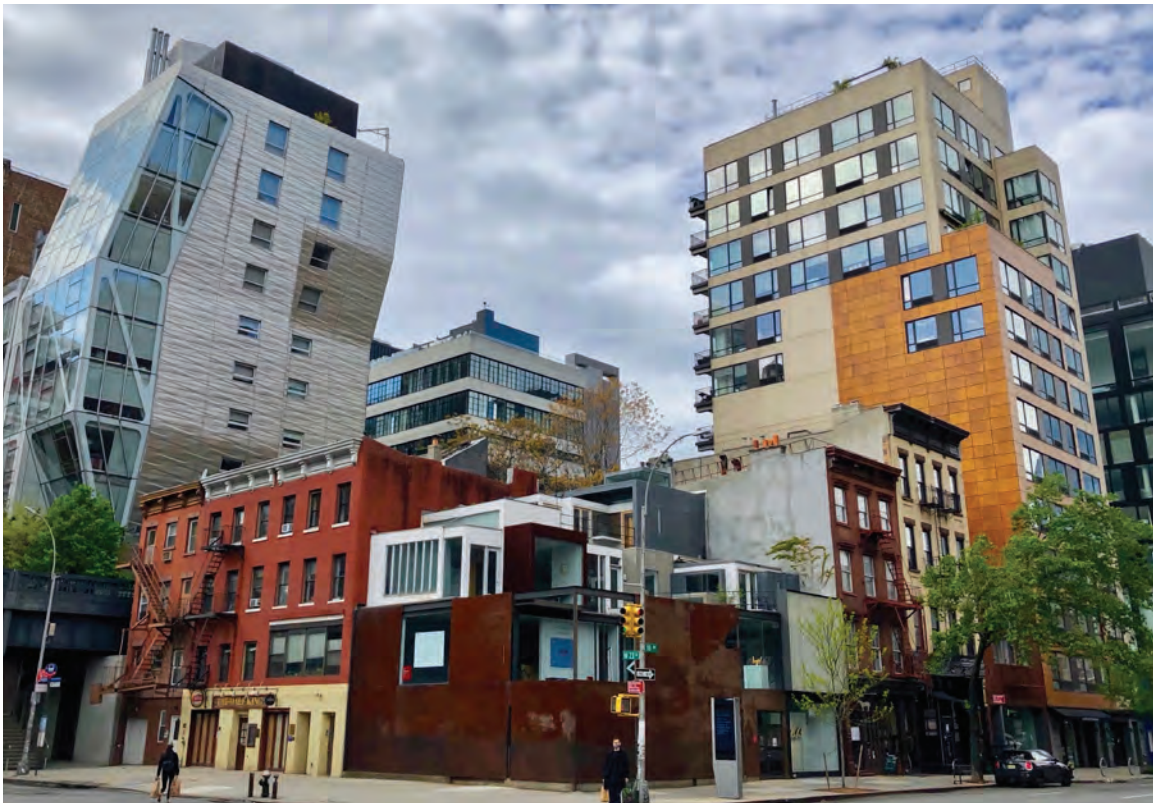
A Pound of Cure…

The COVID-19 world has been dominated by discussion of the merits of masks, social distancing, handwashing, testing of myriad types, sensitivities, specificities and failure rates, and, of course, vaccination. Specifically, what vaccines can and cannot do, what they will mean for a return to (a hopefully better, more resilient) normal, and when that might happen. The discussion of therapeutics has been less consistent and has run the gamut from the sublime to the ridiculous, with the consequence that this noise has drowned out an essential tool in the fight for this and future pandemic viruses. Moreover, this discussion has been distorted by mis- and disinformation, such as the efficacy of certain unproven cures for COVID-19.

The number of potential therapies for COVID-19 has been growing over the last year and the FDA has approved one drug, Remdesivir, for COVID-19 treatment in certain specific circumstances. Several new drugs, including monoclonal antibodies (i.e., made by cloning a unique white blood cell), have been granted under EUA. However, clinical patient management still relies on supportive care, including supportive oxygen and ventilation when required. The application of these supportive interventions has been significantly refined over the last year, and survival rates demonstrate the positive impact. The pandemic has shown that by striving to make the health care system ever more efficient, we have also made it vulnerable to shortages of critical supplies like Personal Protective Equipment (PPE), ventilators, and even life-saving oxygen. But even worse, we have exposed crucial weaknesses in the numbers of health professionals available to respond. Health care systems and hospitals found they were insufficiently staffed to manage the surge, among other reasons because many had been optimized (e.g., lean, six sigma) for pre-pandemic conditions and were consequently challenged to ramp operations to adapt to the rapid demand increase.[48]

This shortage of health care professionals has also impacted the development of therapeutics. There is no getting away from the fact that proper testing of new drugs and treatments is significant additional work. This extra work can be too much to ask for the frontline personnel consumed by treating COVID-19 victims.

Again, all of this was predictable. The need for



Socially distanced: New York City under quarantine. Empty streets on a mid-May afternoon in Chelsea. (Photo by Andreas Komodromos, May 11, 2020)

supplies, equipment, oxygen, health care professionals, new drugs, and the protocols and time to test them should have been part of our collective pandemic planning. We chose to take our chances in the belief that it wouldn't happen on our watch, but it did.

If we are to be better prepared in the future, we need to solve the challenges of maintaining capacity and operational readiness. We must also address the need to develop new antiviral drugs, make those that have already been developed accessible, or repurpose existing drugs. All of this is much better achieved between pandemics than during the peak of the fight. It is critical to understand that this work is not profitable for pharmaceutical companies for acute viral diseases. Despite a great deal of outstanding early-stage research, very few new drugs make it to market. As such, we desperately need a novel PPP model for the funding and development of antibiotics and antiviral drugs.[v]

Innovation, Small and Medium Business, and Resilience

In the age of COVID-19, many American businesses are treading water, on life support, or have gone bankrupt. Entrepreneurs, CEOs, and board directors acknowledge not living in an era of change; but bearing witness to a change of eras. Astute leaders have harnessed the chaos and are riding a wave of transformation. Others struggle to seek equilibrium. The pandemic's effect on both local and global enterprises will persist.

Our ability to survive COVID-19 and future such challenges depends on our ability to adapt and innovate in the face of the challenge. Therefore, the strength of our national innovation base is as critical to national security as ever. Darwin taught us "survival of the fittest," whereby *fittest* is not necessarily the *strongest*, but rather the most *adaptive*. While we count on large companies for innovation, according to a recent MIT study,[49] essential policy lessons emerge from small and medium-sized companies. Small businesses account for two-thirds of net job growth and 44 percent of U.S. economic activity.[50] Small businesses are nimbler and more responsive than their larger brethren. They can spot trends and respond more quickly with innovation. Many startups inhabit strategic sectors. Boston-based Moderna, a rapidly growing provider of one of the three main Western COVID-19 vaccines, is a perfect example. These start-ups are also critical to America's diverse social fabric, which is a key element of national strength. Traditionally, small companies and startups are engines and a vital source for minority employment[51] and innovation. In fact, a February 2016 study by the Information Technology & Innovation Foundation entitled "The Demographics of Innovation in the United States" concluded that, "immigrants comprise a large and vital component of U.S. [technical] innovation, with 35.5 percent of U.S. innovators born outside the United States.[52] In this way, diversity and innovation are inextricably linked[53] and create more reason for concern about COVID-19's impact on the American entrepreneurial spirit, and the vulnerability of small businesses which already face numerous barriers to success,[54] such as access to sufficient capital, and the challenges of scaling. We have seen the impact on the job market. The potential fallout could be devastating for the innovation that is necessary to ensure both health and security.

Empathy and resilience are vital elements for human advancement. To ensure the survival of innovation and the entrepreneurial spirit, we can borrow from and improve the policies that revived America after the 1929 crash and the Great Depression. Those policies focused on reform and supervision to restore calm to the financial sector. The leadership modelled behavior that emphasized resilience, empathy, and support via employment, pension, health care benefits and

[v] E.g., PanSec.org (Pandemic Security Initiative 2021)

education programs to reassure workers. These policies and behaviors bolstered and soothed a broken society allowing families to rebuild their lives and business upon a new foundation. Thus, this horrible, multi-year pandemic nightmare may present the United States with opportunities for self-renewal. America's open culture, diversity and innovation have been important sources of greatness and security since the nation's inception.[55,56] Recalling Roosevelt's December 1940 radio broadcast[57], Rosie the Riveter and the Tuskegee Airmen became an integral part of America's "Arsenal of Democracy," without whom neither the Liberty Ships or B-17 Fortress bombers would have been built (or protected). Hence, as before it is in America's interest to protect and more effectively leverage these pillars of national security.

Ten ways businesses can start to surf the COVID-19 momentum wave are: (1) If your business is not diverse, it is missing out on innovation. Find and increase diversity, equity, and inclusion programs to stimulate more innovation. (2) COVID-19's impact on working women has been brutal. Is your business making a conscious effort to draw women back into the workforce? Our nation can ill afford to lose this talent. Addressing this issue might mean retooling work schedules to ensure flexibility. The payoff is creativity and innovation. (3) Create programs to attract GenZ, the fully digital native generation; they are another wellspring of innovation.[vi] Ask GenZ how to reach out to the senior citizen population. "Silver Tech" is a new area—COVID-19 uncovered this gap in the vaccination rollout process. (4) Evaluate greater business use of Artificial Intelligence (AI) tools from fintech to Grammarly to drone delivery, to Audible, to autonomous vehicles. (5) Would robotics streamline business processes? The fear of job loss to robots is real. However, robots will still need real people to repair and reprogram them. Ensure education and re-skilling are part of the deal. (6) Does your CEO regularly sit down to chat with startups in the industry and allied industries? Ideas from the outside will stimulate more innovation inside and nurture a growth and innovation mindset. (7) Get familiar with the 17 United Nations Sustainable Development Goals (SDGs). How many are business priorities? How many can create new opportunities for your business? (8) Related to the SDGs is the rise of B Corporation certification. The value of stakeholders becomes even more critical. (9) Is your CEO a CEEO (Chief Executive *Ethical* Officer)? Compliance is essential, and ethics begins at the top.[58] (10) Constantly evaluate the relevance of your business proposition and the efficiency of your business processes. Since the lockdown, the data intensity index has jumped, meaning that businesses receive information from all parts of the operation. Are these processes synchronizing and generating relevant data? How is the company using this information? Is it helping or hurting the customer? Many companies learn the hard way, on the way to obsolescence, that change is constant and not a matter of consent.

COVID-19 has been a terrible scourge and a great leveler. In 2021 and beyond, businesses will have the opportunity to reset by harnessing the pandemic's momentum to create something new, including becoming a positive multiplier of government[vii] action plans. We are at a Gladwellian "tipping point." We were at a similar point in 2008 when Sprint/Clearwire launched the first 4G LTE network, and the United States began its outstanding performance in 4G technology-related jobs. Biotech, 6G, quantum, and industries not yet invented will create similar job opportunities as business shifts into new sectors that will benefit our

[vi] However, according to the Demographics of Innovation in the United States Study "Contrary to popular narratives about young, technology-savvy entrepreneurs dropping out of college to found companies in Silicon Valley, the median age for innovators is 47."

[vii] i.e., Federal, State, Municipal Government

future. Conversations from the classroom to the boardroom should center on "what kind of innovation?" The national call to action is to make a serious attempt to harness diversity and innovation in our business processes for the benefit of as many stakeholders as possible. Let us capture the momentum of this new "Person on Mars" moment.

The Real Superpower

While America has held the role of overall economic world leader since WWII and has done many things "right," there is no manifest destiny or entitlement which guarantees our position of prominence, nor are we the best at all that we undertake. In fact, we have much to learn from far less powerful or resourced members of the world community. After all, necessity is the mother of invention. We should examine carefully the lessons learned from the COVID-19 experiences of our allies and our adversaries, including both their successes and failures alike. South Korea, Taiwan, the UK, and Israel have avoided the most destructive effects of the pandemic; Brazil, India, and Italy have not.

America's true and demonstrated superpower lies not in its absolute power or omni-excellence, but rather in our diversity, ability to adapt quickly, and ability to reinvent ourselves. Whether this ability stems from our colonial and entrepreneurial roots, our diverse makeup which provides the potential for a more balanced and holistic approach, or the potential which lies in our public, private, and academic institutions when united in service of the nation, this is the key to combatting a new era of [pandemic] threats that we can neither see, impress, nor negotiate with. COVID-19 has been devastating globally, and the United States has not escaped the devastation. Its diversity, ability to adapt quickly, and ability to reinvent itself will once again be tested. It is good news that our government has provided the critically necessary $1.9 trillion stimulus. Hopefully, we will have the wisdom to allocate these funds so that they fuel the reinvention we so desperately need to secure our nation's legacy and future. PRISM

Notes

The views expressed in this article are those of the authors and do not reflect the official policy or position of the U.S. Government or the National Defense University.

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