

Covid-19 Aftermath: Balanced or Not?

The Covid-19 pandemic has inflicted serious destruction both in loss of life and economically in the United States. But as with all crises, it is exposing systemic weaknesses both in society and its institutions. There can be little doubt that every American is now keenly aware of how truly fragile the system within he/she lives is.¹ That system is “out of balance” and it will emerge from the crisis with substantial changes. The nature of those changes will be a mix of reactive and proactive modifications. Some proactive changes will be intended to *reduce* the exposure to disease in the future. Others will be driven by an extreme motivation to “never let it happen again.” The irony is that the latter approach is ultimately guaranteed to imbalance the system further rather than balance it. It is rooted in the misguided belief that man can control nature.

To better understand the importance of balance, consider the metaphor of the Four Horsemen of the Apocalypse.² For clarity, just consider crises caused by three that are common among the variations on the theme: war, famine, and plague. Covid-19 falls into the plague category. Extreme measures to never let such a plague happen again might lead to more severe quarantining measures being imposed much sooner and for much longer. If taken to extremes, the ramifications would be to halt *all* productive parts of the economy for months—in particular, food production. The “rule of threes” for survival is that we can survive three months without food. The resulting imbalance would be famine that would kill many more than the disease. In an effort to avoid starvation, civil society could degenerate into Hobbes’ “war of all against all.” Overreaction leads to imbalance.

As crises go, the Covid-19 pandemic will likely be neither the largest nor longest-lasting crisis in recent memory.³ Both the Depression and World War II will dwarf it by comparison.⁴ It has already eclipsed 9/11 in loss of life, but the duration and economic impact of its “cure” remains to be seen.⁵ It may or may not behave similarly to the 1918 pandemic.⁶ The most important action now is to take advantage of our heightened focus to assess the overall health of the nation itself and to assess how well we reacted to the crisis. All of the talk about supply chains highlights an unhealthy, systemic imbalance. Three of the questions that need to be asked are:

- What should be done about our supply chains?

¹ Cook, Richard I. “Massachusetts Institute of Technology.” Massachusetts Institute of Technology. Accessed April 13, 2020. [https://web.mit.edu/2.75/resources/random/How Complex Systems Fail.pdf](https://web.mit.edu/2.75/resources/random/How%20Complex%20Systems%20Fail.pdf).

² Aleksa. “Studying the End of the World: The Four Horsemen of the Apocalypse.” Ancient Origins. Ancient Origins, November 6, 2019. <https://www.ancient-origins.net/unexplained-phenomena/apocalypse-0012794>.

³ “United States.” Worldometer. Accessed April 13, 2020. <https://www.worldometers.info/coronavirus/country/us/>.

⁴ Misachi, John. “WWII Casualties by Country.” WorldAtlas. WorldAtlas, August 15, 2019. <https://www.worldatlas.com/articles/wwii-casualties-by-country.html>.

⁵ Cutler, Nancy. “Deaths from 9/11 Diseases Will Soon Outnumber Those Lost on That Fateful Day.” Iohud.com. Rockland/Westchester Journal News, September 10, 2018. <https://www.lohud.com/story/opinion/perspective/2018/09/06/deaths-9-11-aftermath-soon-outpace-number-killed-sept-11/1137572002/>.

⁶ Garrett, Thomas A. “Economic Effects of the 1918 Influenza Pandemic Implications for a Modern-Day Pandemic.” Federal Reserve Bank of St. Louis. Federal Reserve of St. Louis. Accessed April 13, 2020. https://www.stlouisfed.org/~media/files/pdfs/community-development/research-reports/pandemic_flu_report.pdf?la=en.

- How valuable have the models been?
- How effective were the non-pharmaceutical interventions?

There are at least two more questions. The impact of the CARES Act on the nation remains to be seen. How effectively has it mitigated the human and economic effects of the crisis? Has the government merely created more imbalance by its actions? These questions are part of the larger topic of the government's role in the economy that deserves its own consideration and is beyond the scope of this paper.

Supply Chains and Systemic Imbalance

In assessing system failures, it is important to realize that there is a tendency to only address the most obvious issues, and mistake curing a symptom as fixing the root problem. Addressing a symptom at best addresses the short term. It leaves the system vulnerable to the next crisis. The next crisis *will* come, and it will expose a different set of weaknesses in the system. That weakness may have nothing to do with a pandemic or the healthcare system; however, in-depth analysis of the weaknesses exposed by the pandemic will no doubt expose related weaknesses—if we look for them.

There seems to be universal recognition that the US can no longer allow the “most essential” components of critical drugs to be offshored to China.⁷ Simply addressing this would be a mistake because it is only a symptom of the systemic problem that caused it. The larger problem is that the supply chains are imbalanced, exposing them to international interests. To weather the next crisis, these systems should be reassessed from top to bottom (or better from bottom to top). Consider ball and roller bearings. In 2010, none of these bearings were made in the United States. The 2011 DFARS 252.225-7016 Defense Department Acquisition Regulation changed this, but only for DoD.⁸ No civilian uses are currently covered, and without these bearings, the modern wheel is in jeopardy. No line of production can be completely exposed to the whims of another nation—whether it's agricultural, industrial, or military. This means that the nation's economic dependence upon international corporations must cease. The system needs to be balanced such that the interests of our core institutions align with those of the nation. Government mandates tend to imbalance the system. A balanced approach could be achieved through a taxation system that encourages onshoring and institutional leadership with a universal sense of patriotism.

As bad as having critical drugs manufactured in another nation is, there's an exposure that is potentially even more damaging. The marvelous technology of today is dependent upon computerization that is embedded in virtually every digital device in existence. All computers have initial software that runs to set up the rest of the system/device. The key point to be aware of is that whoever writes this software can embed any Trojan Horse or virus they want into the system—and it can be virtually undetectable. Secure Boot guards against infections from images the boot

⁷ Gibson, Rosemary. “U.S. Dependence on China for Medicine Is a Major Problem.” The Seattle Times. The Seattle Times Company, July 19, 2019. <https://www.seattletimes.com/opinion/u-s-dependence-on-china-for-medicine-is-a-major-problem/>.

⁸ “48 CFR § 252.225-7016 - Restriction on Acquisition of Ball and Roller Bearings.” Legal Information Institute. Legal Information Institute. Accessed April 13, 2020. <https://www.law.cornell.edu/cfr/text/48/252.225-7016>.

program loads, not infections within the bootstrap itself.⁹ I was the project leader at Intel when we created the original PC BIOS.¹⁰ I have also written other bootstraps in my career. In 2012, there were three companies in the world that did BIOS software. The engineers for all three were either in Taiwan or on mainland, communist China. This is not to say that *all* burned-in bootstraps are one of these three; however, virtually no bootstrap software today is created solely by Americans and burned into chips on shore. That means everything that is dependent upon computerization is exposed. No one can “buy American” and be sure that any system is devoid of foreign malware. The ability for a thumb drive to infect a computer is a related problem. The exposure is much larger than just Huawei.

The era of unrestrained globalism must end.

Having a nation-state matters because it is our neighborhood. It is where we live. As a computer scientist for forty-five years, I have witnessed both the good and bad consequences of technology. There are many benefits; however, one byproduct that *cannot* be allowed to continue is the destruction of social cohesion.¹¹ You really do have more in common with your immediate neighbor than someone halfway around the world. Americans have more in common with each other than they do with Europeans or citizens of any other nation-state. In the event of war, it is your physical neighbor upon whom you will rely to defend yourselves—not your Facebook buddies. Assuming that another war will not happen is as fallacious as assuming that another hurricane will not strike Florida or that another flu won’t come from China. It is speculative, but there is some evidence that Covid-19 might have been created in a laboratory.¹² It is naïve to believe that a foreign power would not consider it a potential weapon of war.¹³ It is not that the world has been free of war since 1945. The wars have just not been declared.

The era of Americans loathing the US must end.

That is not to encourage a renewal of a mercantile system of international trade. Just as balance must be restored to the internal economic system within the US, the international economic system must be balanced. The balance to be struck is to strengthen the overall world economy by allowing each nation to strengthen its own. The overall effect of globalism has been, and always will be, to

⁹ Gelareh. “Difference between Tboot and UEFI Secure Boot.” difference between tboot and UEFI Secure Boot. Intel, April 26, 2013. <https://software.intel.com/en-us/forums/intel-trusted-execution-technology-intel-txt/topic/391211>.

¹⁰ Ahmed, Adam. “What Is BIOS ? How Many Company Make It ? What Is BIOS Companies Names ? - Bayt.com Specialties.” Bayt.com, May 25, 2016. <https://specialties.bayt.com/en/specialties/q/292982/what-is-bios-how-many-company-make-it-what-is-bios-companies-names/>.

¹¹ Haugh, Dennis. Political Vertigo: Stabilizing Politics in an Upside-down World. United States: Dennis Haugh, 2016.

¹² Saavedra, Ryan. “Fox News Reports U.S. Officials Have 'High Confidence' Coronavirus Leaked From Lab.” The Daily Wire. The Daily Wire, April 15, 2020. https://www.dailywire.com/news/breaking-fox-news-reports-u-s-officials-have-high-confidence-coronavirus-came-from-lab?utm_content=non_insiders&utm_campaign=dw_newsletter&utm_medium=email&utm_source=housefile&_hsenc=p2ANqtz-_AkVe1fy6scqQdLMgrlM9noJgeJOOOrqO6FMQ5gAOYXq2Vrp9h2sr0BG22fhRkGdmF3kfJ-67EnCGJsuBW6-E4MikOa9g&_hsmi=86383992.

¹³ “Gen. Spalding (Ret.): China Must Be Held Accountable for the Wuhan Coronavirus Ravaging the World.” American Military News, April 1, 2020. <https://americanmilitarynews.com/2020/04/gen-spalding-ret-china-must-be-held-accountable-for-the-wuhan-coronavirus-ravaging-the-world/>.

create an unstable patchwork of supply chains that seek minimization of production costs and encourage predatory corporate practices. The system is too tightly coupled for stability and is guaranteed to increase the impact of any crisis.¹⁴ There needs to be decoupling on a grand scale by changing the optimization criteria to be efficient, robust national economies that bolster the international economy as a byproduct.

Modeling

The belief that man could control nature was one of the byproducts of the Progressive Movement of the late 19th century. In 1898, Morgan Robertson wrote *Futility, or the Wreck of the Titan* as a warning about the arrogance of such an attitude. It was an eerily accurate prediction of the Titanic sinking in 1912.¹⁵ By extension, blind faith in projecting the future based upon any model or simulation is the fallacy of extrapolation.¹⁶ As a mathematician, I was a member of the I/O Performance Team at Digital Equipment for five years. My role was creating models and simulations. I know their limitations.

The Imperial College has published the source code for its model of the proliferation of the Covid-19 virus.¹⁷ It is a statistical model that depends upon the data it is given. The Institute for Health Metrics and Evaluation (IHME) appears to have done a better job of modeling, but I haven't seen the source code.¹⁸ They have taken all of the data they believe is relevant as it exists at a given moment in time and plugged it into what appears to be a reasonable model. They did take “non-pharmaceutical interventions” like “social distance” into account, and they also refined “mortality rate” according to age. On the other hand, the model suffers limitations that include not accounting for comorbidities like lung disease, and the diminishing care as the healthcare system itself gets inundated.

HOWEVER, it is important to understand that both models take neither non-pharmaceutical interventions nor characteristics of the disease into account as you might expect. It does not take in details of either the disease characteristics or the mitigation strategies. It uses their *projected effects*. This is necessary because there are tradeoffs among time, accuracy, and precision. As counter-intuitive as it may seem, the quest for precision can induce inaccuracy when complete knowledge of a mechanism is unknown—and we are a long way from completely understanding Covid-19, how it is transmitted, or what makes it deadly to some and trivial to others. As projections are replaced with more accurate empirical data, the existing models' output converges with events on the ground. It is not that the *models* are changing; it is that the *data* being fed into the models are changing. The reason for the wild initial projections is that the initial data did not reflect reality within the US.

¹⁴ *Ibid.*

¹⁵ “The Wreck of the Titan’ or ‘Futility,’” Morgan Robertson, Titanic-Titanic.com, http://www.titanic-titanic.com/wreck_of_the_titan_1.shtml.

¹⁶ Wieckowski, Ania G. “Why It’s So Hard to Plan for the Future.” Harvard Business Review, October 23, 2018. <https://hbr.org/2018/11/predicting-the-future>.

¹⁷ GitHub. Imperial College. Accessed April 13, 2020.

<https://codeload.github.com/ImperialCollegeLondon/covid19model/tar.gz/v1.0>.

¹⁸ “Institute for Health Metrics and Evaluation.” Institute for Health Metrics and Evaluation, March 25, 2020.

http://www.healthdata.org/sites/default/files/files/research_articles/2020/COVID-forecasting-03252020_4.pdf.

In general, all software models and simulations suffer the same limitations as the Covid-19 models. In particular, weather forecasting has the same convergence. This is why forecasts change and are less accurate the more into the future one looks.¹⁹ In general, software engineers rarely solve the exact problem they are given. They are trained to be masters of taking what are classified as “NP complete” problems that cannot be solved in a reasonable amount of time by approximating the problem so it can be solved with computational means.²⁰ For example, the simulation we used for the deep space missions at Lockheed Martin made numerous “simplifying assumptions” because it had to run at real-time speed. The result was that the simulation could only be trusted for initial development. The rubber had to meet the road, so software proceeded to the next level of testing on the real hardware. After multiple levels of testing, there was no way to perfectly simulate deep space on earth—so we launched and kept our fingers crossed that we had done an adequate job. We had our share of successes.

Statistical models are useful for understanding past and static data, but they have limitations. In 2007, the St. Louis Fed produced a report on the 1918 “Spanish Flu” pandemic.²¹ After almost a century, the range of estimates on the death toll varies between 50 and 100 million worldwide. The United States’ toll is estimated at 675 thousand. So, even historic numbers are of questionable value. Certainly, we keep better statistics than were kept in 1918—or do we? Can we? Consider how difficult it is to assign a cause of death. During an epidemic, there is not enough time to do an autopsy on every death. If someone has Covid-19 when he/she dies, was it necessarily the cause of death? The point has been made with respect to prostate cancer that a man may not die *from* it, but he may die *with* it. And what is the CDC’s guidance on this matter?²²

There is a common acronym in the computer business—*GIGO*.²³ It stands for “garbage in, garbage out.” When a model is first used, the goodness of the parametric data is unknown, but there has to be a starting point. As data is reduced and fed back into the model, the accuracy will improve. In other words, the time when the model is most needed may be the time when it can least be trusted. As the pandemic winds down, can the model be trusted to help determine when it is safe to relax mitigation techniques? That depends upon the real characteristics of the disease. Will there be a second wave? Will the virus mutate and become more deadly? No one knows, and modeling will not help with that answer because a second wave would restart the model in another unknown, initial state. That is because the virus may completely mutate.

¹⁹ PhD, Lee Falin. “Why Are Weather Forecasts Often Wrong?” *Scientific American*. Scientific American, January 9, 2013. <https://www.scientificamerican.com/article/why-are-weather-forecasts-often-wrong/>.

²⁰ “NP-Completeness: Set 1 (Introduction).” *GeeksforGeeks*, September 7, 2018. <https://www.geeksforgeeks.org/np-completeness-set-1/>.

²¹ Garrett, Thomas A. “Economic Effects of the 1918 Influenza Pandemic Implications for a Modern-Day Pandemic.” Federal Reserve Bank of St. Louis. Federal Reserve of St. Louis . Accessed April 13, 2020. https://www.stlouisfed.org/~media/files/pdfs/community-development/research-reports/pandemic_flu_report.pdf?la=en.

²² “CDC - NCHS - National Center for Health Statistics.” Centers for Disease Control and Prevention. Centers for Disease Control and Prevention, April 13, 2020. <https://www.cdc.gov/nchs/data/nvss/vsrg/vsrg03-508.pdf>.

²³ “What Is Garbage In, Garbage Out (GIGO)? - Definition from Techopedia.” *Techopedia.com*. Accessed April 13, 2020. <https://www.techopedia.com/definition/3801/garbage-in-garbage-out-gigo>.

Is modeling of any value? Maybe. It's better than nothing to guide decisions; however, decisions need to balance the costs with the fact that the results are not perfect.

Non-pharmaceutical Interventions

Now consider the larger perspective of living life. The spiral into the world of using models to project risk emphasizes the desire for safety. The important dichotomy is that safety opposes liberty. The mitigation strategies are the safety predicates; however, whether they are voluntary or mandated determines liberty or tyranny. What are they?

- Washing your hands frequently and not touching your face
- “Social distancing”
 - staying six feet from anyone else
 - avoid gatherings of more than 10 people
- Wearing a mask

These were also the same general mitigation strategies used for the 1918 Spanish flu pandemic. The parameters were different, and the technology was not as developed. Likewise, guidance and enforcement were not as uniform. Washing hands and not touching your face is just good hygiene, but how effective have these techniques been with Covid-19? ²⁴ Modeling cannot tell us that answer. We have to understand the life cycle of the virus itself and how it is transmitted.²⁵ A study in China (which of course must be taken with skepticism) concluded that the virus²⁶

- mainly gravitated to the floor.
- was virtually nonexistent 13 feet above the floor.
- was shed a distance of 13 feet forward from an infected individual.
- was shed a distance of 8 feet behind an infected individual.

If true, these conclusions confirm how arbitrary the social distance guidance has been. Even worse, how feasible is it to maintain the required distance in general? Certainly it makes sense that the density of the virus dissipates with distance, but there is no guaranteed safe distance—especially if the virus lingers in the air.

In 1918, San Francisco put its faith in wearing masks. It didn't work because the masks were incapable of filtering the virus. Even if they are now, there is a risk of transmitting the virus upon removing the mask—either by air or by touching the mask itself. Today, we may have better filtration with the N95 mask and other even better masks. Even with better materials, not everyone is actually *using* better masks than those of 1918.

In reality, all of the non-pharmaceutical interventions are good advice, but they are largely arbitrary. They only reduce risk. They do not eliminate it.

²⁴ Sweeney, Chris. “Evaluating the Impact of Non-Pharmaceutical Interventions on COVID-19.” News. Accessed April 13, 2020. <https://www.hsph.harvard.edu/news/features/evaluating-the-impact-of-non-pharmaceutical-interventions-on-covid-19/>.

²⁵ Which surfaces are spreading Covid-19? Accessed April 13, 2020. <https://www.msn.com/en-gb/news/coronavirus/which-surfaces-are-spreading-covid-19/ar-BB11atmf>.

²⁶ “COVID-19 May Spread as Far as 13 Feet through the Air.” Did That... Just Really Happen?, April 13, 2020. <https://whoknewnews.com/covid-19-may-spread-as-far-as-13-feet-through-the-air/>.

Summary: Lessons Learned

A plethora of hard lessons will be learned by everyone from the Covid-19 pandemic. This paper has focused only on issues that are nationwide.

Supply chains have been viewed as solely a private enterprise concern. It should now be apparent that they are also a national security concern as well as an economic one. But that concern should not be addressed by government takeover or mandates. These would just create more imbalances. It should be met by revisiting laws, taxes, and collective bargaining that encourage offshoring. They should be adjusted to balance the system in favor of the public interest—both financial and security.

No amount of logical argument substitutes for the concrete emotional impact of a large disaster, and the Covid-19 pandemic is such a lesson. The irony is that the underlying attitude of controlling nature leads to an almost religious belief in “models.” The problem with statistical models and computer simulations is that they are limited by the knowledge of those who build them—and *no one has a crystal ball to see the future*. Making major policy decisions based solely upon projections from a model ignores the balance that needs to be struck with the cost of action. The main use of modeling for the Covid-19 pandemic was to ensure that the healthcare system was not overrun. Italy suffered that fate. On the other hand, in the middle of April, as the US approaches the turning point of the first wave of the pandemic, the resources available are roughly five times the real demand created by infections.²⁷ Did the non-pharmaceutical interventions flatten the curve? Perhaps. Were the edicts more than required? Perhaps. Worse, they may backfire because they may have retarded “herd immunity” if there are subsequent waves of the virus.

No doubt that staying home has reduced the risk of infection, but it only takes one encounter to get infected. But the question needs to be raised about the cost. Unfortunately, most of the costs are unquantifiable. Worse, classifying every death *with Covid-19* skews the true loss of life. There is also no way to measure the health impact on people with undiagnosed issues who are having to postpone their “non-critical” appointments and screenings. Some of these people may die. Then there’s the cost to liberty.

Americans in 1918 accepted a temporary loss of liberty for safety, but the loss was not as uniform as today. Schools were shut down and businesses were closed, but the difference was the level of government that made the closure edicts. Like today, the national government did not dictate any closures. Unlike today, it was predominantly the city mayors who made the edicts, not the state governors. No state was completely shut down, nor were shutdowns simultaneous. The second wave progressed from east to west. Philadelphia was struck hard in September of 1918. St. Louis was struck the following month, and San Francisco was struck in November. It is interesting to note that historians label the end of the Progressive Movement around the time that the pandemic was waning. Is it coincidence, or did the public (perhaps unconsciously) decide it was on the wrong path? We can only speculate.

²⁷ “IHME: COVID-19 Projections.” Institute for Health Metrics and Evaluation. Accessed April 13, 2020. <https://covid19.healthdata.org/united-states-of-america>.

The increase in mobility and population density today has affected the speed of propagation and its pattern for Covid-19. As this pandemic wanes, we have the opportunity to perhaps make a more balanced assessment of the choice between liberty and safety. Did state governments have to decree the mitigation strategies, or would the public have voluntarily followed them, so that businesses would not have been forced to shut down? Perhaps proper guidance is more important than edict. Governor Jared Polis of Colorado perhaps put it best, “There is no enforcement authority here. There’s a far greater enforcement authority in these matters, and his name is the Grim Reaper. If we don’t abide by these simple, common-sense protocols, you will be jeopardizing lives...”²⁸ Of course, the governor went on to issue “stay at home” orders...

Voluntary actions may be inconsistent, but individuals can intelligently balance safety and liberty on a situational basis—if they have enough knowledge to do so. Edicts are consistent, but destroy the ability to balance tradeoffs. We seem to have a history of selecting imbalance. We have an opportunity to correct that.

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²⁸ “Gov. Polis Orders Non-Critical Businesses to Reduce in-Person Workforce by 50%; Calls 'Grim Reaper' a Far Better Enforcer.” KUSA, March 23, 2020. <https://www.9news.com/article/news/health/coronavirus/polis-non-critical-businesses-must-reduce-in-person-workforce/73-9368bd16-a755-4ee9-946c-640d2c9ac584>.