

Naive Probabilism and Covid-19

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Consider the guidance from the scientific establishment and government agencies in the early days and weeks of the 2020 U.S. Covid-19 outbreak.

- Masks don't work.
- Travel restrictions are xenophobic.
- No evidence of asymptomatic spread.
- No evidence for human-to-human transmission.
- No evidence that animals can get Covid-19.
- The risk to the general public is low.

We were told these repeatedly by the World Health Organization (WHO), Jerome Adams (U.S. Surgeon General), Anthony Fauci (Director of the U.S. National Institute of Allergy and Infectious Diseases), and a number of other experts in virology, epidemiology and public health. Similar statements downplaying the threat were made by a number of public intellectuals, including Cass Sunstein, John Ioannidis, Richard Epstein, Carl Bergstrom, and several others from academia.

Every one of the above assertions was later disavowed or disproven. In many cases the initially extreme underreaction was matched with an equal overreaction to the opposite extreme. In many jurisdictions, masks were mandated by law in all public places, under penalty of fine. Travel restrictions to, from and within many countries in North America and Europe became the norm. Large gatherings were deemed “superspreader events” because of their tendency for large-scale, human-to-human transmission by asymptomatic participants. Family members were prohibited from visiting hospitalized relatives who were sick and dying from Covid-19. The state of California limited Thanksgiving gatherings to at most 3 households and “strongly discouraged” singing, chanting or shouting. Religious gatherings were severely curtailed and even outlawed in some parts of the United States, a restriction that was later judged unconstitutional by the U.S. Supreme Court.

The earliest missteps contributed to higher death tolls, prolonged lockdowns, and diminished trust in science and government leadership. The later *post hoc* counter-reactions in the form of indefinite lockdowns, expanded government mandates, and extended use of emergency powers contributed further to economic and psychological distress while increasing distrust of the scientific establishment. Yet the organizations and individuals most responsible for misleading the public and damaging institutional credibility suffered little or no consequences compared to the losses their decisions inflicted on the rest of society. In fact, several of these individuals benefited from their consequential mistakes.

I discuss here how the mistakes listed above result from two related consequences of applying formulaic decision procedures to address highly uncertain and complex problems:

- (i) *Naive Probabilism*, the belief that decision-making under uncertainty boils down to probability calculations and statistical analysis; and
- (ii) *Freeroll Effect*, the phenomenon by which those responsible for risky policies suffer none of their negative consequences, while benefiting from their upside.

Though both are widespread throughout society, academia, business, medicine, finance, law and politics, I focus here on Naive Probabilism and the Freeroll Effect in U.S. Covid-19 response. In a series of three vignettes, I discuss how Naive Probabilism negatively impacted the U.S. response, and how those responsible for poor policy decisions benefited from the Freeroll Effect, in many cases enjoying increased public profile and greater influence even after negatively impacting the lives of hundreds of millions in the United States and around the world. The “axioms” corresponding to each section give an insight into the thought process underlying Naive Probabilism, and should be interpreted as “anti-axioms” for those wishing to avoid the mistakes highlighted below.

1 A mask is a thing

Axiom 1 (First Axiom of Naive Probabilism). *The more complex the problem, the more complicated the solution.*

A hallmark of naive decision making, and especially naive probabilism, is the belief that the more complex the problem, the more sophisticated the solution needs to be. Without question, the Covid-19 outbreak was highly complex due to the uncertainty of its origins, the novelty of the virus, and the interconnectivity of global economies and societies. Of its many complexities, however, the question of masks wasn't one of them. And because of the initial mistakes on masks—in not only failing to recommend but in actively discouraging mask use early on—the U.S. and global agencies (WHO, CDC), its leaders (Fauci), and much of the scientific establishment caused even greater confusion, delayed necessary precautions, and lost public trust to an extent which undermined their credibility on all Covid-19-related matters moving forward.

The mask mistake was consequential not because masks were the antidote to Covid-19—the extent to which masks help remains unknown—but because they were a low cost measure whose effect would be neutral at worst. Expressed in common sense (Northeast Philadelphia) logic: a mask is a thing. Plain and simple. A mask is a thing, a virus is a thing; when one thing gets in the way of another thing, it can prevent that other thing from getting by; therefore, wearing a mask, in worst case, can't hurt in reducing the spread of a virus. This argument is common sense to every plumber (union and non-union), cop, used car salesman, and Uber driver, but not to Drs. Fauci, Adams, and the many other MDs, PhDs and MPHs whose advice influenced early Covid-19 response in the United States.

These experts neglected common sense in favor of a more “scientific response”, one based on “rigorous peer review” and sufficient data. Two months after the initial U.S. outbreak, a peer-reviewed study [6] confirmed what common sense knew all along: masks are things. Based on this science, not common sense, masks went from strongly discouraged¹ to mandated by law. Precious time wasted, thousands of lives lost, the economy stalled out, indefinite uncertainty for hundreds of millions around the world, and a drastic reversal from active discouragement of mask-wearing to government decree. First, ill-informed and misleading guidance. Later, over-bearing and disproportionate mandates in response to the initial folly.

As naive, and costly, as the initial mask denial was, it was naive in a way that the “experts” agreed. Even at the time, the mask mistake, which seemed easily avoidable from a common sense perspective, was unavoidable from the government bureaucrat's. Prior to Covid-19, the status quo in the United States was to not wear masks and there was no data to support a departure from this norm. Preserving the status quo was the natural instinct of those who sought to manage the public perception of the risk, rather than manage the risk itself. The initial argument for masks relied on the non-scientific influences of common sense and gut instinct, both anathema to government bureaucrats and academic researchers who fear being held responsible for a decision more than they care about getting the decision right.

The same bureaucratic logic and perverse incentive structure that led to the initial folly of discouraging mask use led to the later over-correction of focusing almost entirely on masks. Once “the science” revealed that masks were things, recommending—in fact, mandating—masks became safe haven for the government bureaucrat. For a period of time masks weren't just a part of the solution, they became *the solution*, just months after they were initially written off as unnecessary and even harmful.

Almost a year later, in January 2021, Fauci applied NE Philly logic almost verbatim while advocating that people wear not just for one, but two masks. Fauci told the *New York Times*, “If you have a physical covering with one layer, you put another layer on, it just makes common sense that it likely would be more effective.” Common sense indeed: a mask is a thing, two masks are two things, and two is better than one. Yet it took almost a year to come to this realization. By that time, it was too late. When the virus was still somewhat contained, one (or two) masks can possibly help slow the spread in the initial stages; they can't kill the virus once it's already spread throughout the population.

Fauci's conversion to common sense came at significant cost—just not to Fauci. By early February 2021, the United States had the highest number of Covid-19 deaths of any country in the world by a factor of two, it had also experienced a year of economic, political and societal turmoil, due in no small part to the collateral damage of prolonged lockdowns, economic uncertainty and overbearing mandates put in place to counter the fallout of the initially laissez faire response. Fauci, meanwhile, remained the face of U.S. government response, his influence over U.S. policy having increased substantially in the Biden administration.

¹ Discouraged because wearing a mask may scare others into thinking you are sick, or it may lull you into a false sense of security, or virus particles can get stuck in the mask.

2 Data-Driven Drones

Axiom 2 (Second Axiom of Naive Probabilism). *Until proven otherwise, assume that the future will resemble the past.*

At first, there was no data that masks work, no data that travel restrictions work, no data of human-to-human transmission, and so on. Indeed, there was no data for anything. And in the absence of data, the naive decision protocol is to maintain the status quo, in strict adherence to Axiom 2.

There’s some validity to Axiom 2—the future often resembles the past, and in most cases there’s little or no harm in assuming that it will—but as with all things naive, blind adherence to this axiom can have ruinous consequences. We already saw the consequences of this assumption in the case of masks. But the logic was applied much more widely in advocating against other precautionary measures to prevent the early spread of Covid-19.

Flights from China to the U.S. were shut down in late January—much to the chagrin of the Naive Probabilist—but flights from Europe continued until mid-March, long after outbreaks had gotten out of control in Italy and elsewhere in Europe. American universities were among the earliest and biggest super-spreaders of Covid-19, with students and faculty regularly traveling to and visiting from all parts of the world. Despite their central status, both as vectors of disease spread and as leaders of the response, universities set the tone for delayed and naive action. Stanford waited (patiently) to close campus until a faculty member contracted the disease, and others followed suit, with most remaining open for more than a week after the Stanford shutdown, citing “no confirmed cases” on their own campuses. (Remember Axiom 2: the future resembles the past. There have been no past cases of Covid-19 on campus, and therefore one should assume there will be no future cases until proven otherwise.) University of Chicago was among the most lackadaisical, announcing on March 12 that it would wait until March 30 to begin remote activity, not wanting the virus to disrupt its final exam schedule. All the while, UChicago administrators maintained that there were no confirmed cases of anyone affiliated with the university, even though there were cases in its immediately surrounding neighborhood.

The delayed responses of the above and many other universities is a microcosm of the Naive Probabilist’s worldview: whatever can’t be explained in terms of something that happened in the past is speculative, non-scientific and unjustifiable. This argument was put forward by John Ioannidis in mid-March 2020, as the pandemic outbreak was already spiraling out of control. Ioannidis wrote that Covid-19 wasn’t a “once-in-a-century pandemic”, as many were saying, but rather a “a once-in-a-century data fiasco” [5]. Ioannidis’s main argument was that we knew very little about the disease, its fatality rate, and the overall risks it poses to public health; and that in face of this uncertainty, we should seek data-driven policy decisions. Until the data was available, we should assume Covid-19 acts as a typical strain of the flu (a different disease entirely). Under Ioannidis’s analysis, there were scenarios under which Covid-19 would be much more fatal than the annual flu and other scenarios under which it is much less fatal. The prudent approach, according to Ioannidis, was to delay response until we had a more definitive answer.

In academic circles, Ioannidis’s article was regarded not as a misguided and potentially disastrous recommendation by an influential scientist but as “good contrarian writing”, as epidemiologist Marc Lipsitch described it [7]. As a member of the academic establishment, Lipsitch was in the unfamiliar situation in which his advice had real consequences in real time. Rather than focus on the problem at hand, he instead focused on the academic exercise of “starting a discussion” about whether there was “sufficient data” to draw a conclusion about the dangers of Covid-19. For their participation in this thought exercise, Ioannidis and Lipsitch, like Fauci above, gained greater personal exposure and influence while delaying necessary action on the pandemic.

The problem with the “lack of evidence” argument was that there was, in fact, plenty of evidence well before the virus was spread throughout the United States [2]. China had locked down a city of 10 million; Italy had locked down its entire northern region, with the entire country soon to follow. There was overwhelming evidence, in fact worldwide consensus, that the virus was novel. The drastic measures taken in China, Italy and elsewhere were enough to conclude that (i) the virus was spreading fast and (ii) the medical communities in those countries had no idea how to treat it. That’s data. It’s not the kind of data that is curated by a lab or organized in a spreadsheet. But it’s plenty of information to act on.

3 Sunstein–Costanza Fallacy

Axiom 3 (Third Axiom of Naive Probabilism). *In the presence of uncertainty, derive wisdom from ignorance.*

Think of all the times you’ve been wrong in the past. If you could have just done the opposite, you’d have been right. This, in a nutshell, is the *Sunstein–Costanza Fallacy*, named after George Costanza, a fictional character from the 1990s sitcom *Seinfeld*, and Cass Sunstein, a real-life academic who repurposed Costanza’s sitcom fallacy as a catchall strategy for dealing with uncertainty in real world problems. The Sunstein–Costanza fallacy takes the Naive Probabilist’s credo—the future resembles the past (until proven otherwise)—one step further. It derives knowledge out of ignorance by analyzing past situations in which we’ve been ignorant, seeing how we reacted then, observing that those reactions were sub-optimal in hindsight, and concluding that we should do the opposite of what our instincts tell us in the present situation.

On February 29, 2020, there were 1,129 confirmed cases in Italy, up from 79 cases a week before. On that same day, Cass Sunstein chided Americans concerned over Covid-19 in a *Bloomberg* column:

“At this stage, no one can specify the magnitude of the threat from the coronavirus. But one thing is clear: A lot of people are more scared than they have any reason to be.”

The two sentences are contradictory on their own—if the magnitude of threat is unknown, then how does Sunstein know the level of fear is unreasonable?—but that’s not the worst part of Sunstein’s commentary. Rather than acknowledge that the uncertainty about the magnitude of the threat warrants a precautionary response to the pandemic—only after being definitively proven wrong did Sunstein later reverse course and advocate for precaution in another *Bloomberg* article three weeks later²—Sunstein applied Axiom 3 to derive wisdom from his ignorance about the magnitude of the threat. Sunstein diagnoses anyone concerned about Covid-19 with a cognitive defect known as ‘probability neglect’, which he defines as the tendency to fixate on very low probability, but highly impactful outcomes (good or bad) instead of focusing on what is most likely. With Covid-19, Sunstein argues that focusing on the possibility (small according to Sunstein) of a global pandemic, instead of the more likely outcome that the disease is about as dangerous as the flu, is a prime example of probability neglect.

Applying Axioms 1-3, Sunstein argues first that (i) most previous times of mass panic (e.g., the H1N1 outbreak) fell far short of the extreme outcome that caused the panic and, therefore, (ii) future instances of panic are also likely to fall short of their projected worst-case scenario. In other words, since we’ve overreacted unnecessarily (according to Sunstein) in the past, we are most likely overreacting unnecessarily this time. Since our future panic resembles our past panic, we can apply Axiom 3 and derive wisdom from our ignorance about the specific situation at hand: Don’t panic over Covid-19, not because of anything we know about it, but because of our extreme ignorance. When we’ve been ignorant in the past, we’ve over-reacted, therefore we’re likely to be over-reacting again this time.

The above reasoning is an example of the *Sunstein–Costanza Fallacy*. In the episode of *Seinfeld* called “The Opposite”, George Costanza reasons that he can improve his decision making by doing the opposite of what his instincts tell him.

Costanza: “It became very clear to me sitting out there today, that every decision I’ve ever made, in my entire life, has been wrong. My life is the opposite of everything I want it to be. Every instinct I have, in every aspect of life, be it something to wear, something to eat ... It’s all been wrong.”

Seinfeld: “If every instinct you have is wrong, then the opposite would have to be right.”

(*Seinfeld*, Episode #86, “The Opposite”).

<https://www.seinfeldscripts.com/TheOpposite.htm>

Channeling Costanza, Sunstein’s argument wasn’t based on data or evidence, but rather an appeal to ignorance. A call to do the opposite of what we’ve done before. As Sunstein argues, we’ve been in this kind of situation before: before every big storm, the supermarket shelves empty; during the Zika virus, Ebola outbreak or swine flu, people cancel travel. In all of the previous cases, we can assess in hindsight that the virus either wasn’t as deadly or contagious as originally feared. Sunstein concludes that that we were irrational to be concerned in those situations, and since we are now in a similar state of uncertainty relative to Covid-19 as we once were relative to Zika, swine flu, or a snowstorm, we’re irrational to have such concerns over Covid-19. Indeed, because I survived one pull of the trigger in Russian roulette, I was irrational to think that I could have died on the first round, and thus also irrational to think that the next pull poses risk.

² “This Time the Numbers Show We Can’t Be Too Careful”.³

4 The Freeroll Effect and Covid-19

In gambling terms, a *freeroll* is a bet that can be won but not lost. In the worst case scenario, the bet breaks even. For the gambler, there is no risk, only upside. For the party on the other side, there's no upside, only risk. The gambler is said to be *freerolling*; the other side is *getting freerolled*.⁴

Outside of gambling, the *Freeroll Effect* arises when an influential party is allowed to reap the rewards of its influence without suffering the consequences. Businesses deemed “too big to fail” are bailed out rather than suffer the consequences of their neglect for excessive risks. In academia, “peer review” indemnifies scientists against publication of flawed findings on the grounds that the work has been vetted by expert peer reviewers in their field. In all cases, the ones responsible for the decisions are inoculated from the ill-effects of those decisions. And in the case of public policy making, such as pandemic response, those who influence the policy enjoy the benefits of their influence while facing none of the negative consequences when those policies backfire.

In the case of Covid-19, the above stories of Fauci, Ioannidis and Sunstein offer three high profile instances of the impact of Naive Probabilism and the Freeroll Effect. All three were influential in the early and ongoing public perception and response to the pandemic, and all three were wrong in their initial recommendations over impactful decisions. Despite their negative impact, Fauci, Ioannidis and Sunstein enjoyed increased influence as the pandemic wore on: Fauci's influence and public appearances increased after the transition to the Biden administration; Ioannidis gained increasing media attention throughout March and April 2020; and Sunstein was named to chair a Covid-19 technical advisory group at the World Health Organization. All were benefactors of the Freeroll Effect: they were indemnified (by society) against the large-scale risks of their mistakes, while they enjoyed the benefits of public influence.

In any complex system with competing incentives, there is usually someone in the position of a Fauci, an Ioannidis or a Sunstein, who standard to benefit at the expense of the rest. The specific individuals mentioned above are by no means unique in their benefiting from the Freeroll Effect. Except for their serving as vehicles of potentially widespread harm, they need not be particularly villainous or mean-spirited. The Freeroll Effect arises almost any time there is an asymmetric sharing of risk and of consequences between those who influence consequential decisions and those who are most impacted by those decisions.

5 The Naive Probabilist

The Naive Probabilist believes that all decisions under uncertainty boil down to probability calculations; that sound decision making is a just math problem, a simple matter of collecting data and “turning the crank” given to us by probability theory. As any “good Bayesian”, the Naive Probabilist updates based on new information, but often waits too long to act on that information, or fails to recognize information that doesn't come in the form of a well-manicured dataset.

The Naive Probabilist believes that the future is like the past, the house always wins, that all available information is “priced in”, debts always get paid, that the real world obeys the theory (on average), that deviations from theory indicate a problem with the real world, that good intentions are more important than good results, that ignorance begets knowledge, and above all, that all models are wrong, but some are useful. In practical terms, he (or she) waits until the car is buried in the ditch to put on his seatbelt. At the poker table, he waits until the cards are tabled to fold the worst hand. He waits until the disease is a six-continent pandemic, the global economy is in disarray, and the hospitals are full to determine, with certainty, that Covid-19 is a public health threat.

To be clear, Axioms 1-3 are axioms to the Naive Probabilist, but fallacies to everyone else. Complex problems call for simple, actionable solutions (i.e., a mask is a thing); the past doesn't repeat indefinitely (i.e., Covid-19 was never the flu); and ignorance is not a form of wisdom (i.e., contrary to nudge theory and behavioral economics, de-training our instincts isn't a sound approach to decision making). The Naive Probabilist's primary objective—to be accurate with high probability rather than to protect against high consequence, but low probability outcomes—goes against common sense principles of decision making in severe uncertainty, severe consequence situations. As I and others have written elsewhere, in the

⁴ Note that *freeroll* is not synonymous with *arbitrage*. Arbitrage is a financial concept describing opportunities for risk-free profits in financial markets. Most simply, arbitrage exists when it is possible to simultaneously buy and sell an asset at prices that generate profit. The arbitrageur's profits need not be at the expense of the buying or selling counterparties. The buyer and seller, as participants in a market, voluntarily offered to buy and sell at specific bids and asks, and therefore willingly entered into the transaction. The party being freerolled rarely enters voluntarily into such an arrangement.

presence of severe uncertainty, precautionary principles, common sense and basic survival instincts should predominate [1, 4, 8, 9]. In such situations, accuracy is the least of our concerns.

With that said, I stress that the hallmark of Naive Probabilism is naiveté, not ignorance, stupidity, crudeness or other such base qualities. In fact, the typical Naive Probabilist lacks not knowledge nor refinement, but the experience and good judgment that comes from making real decisions with real consequences in the real world; see Sections 1-3 for three examples. Far from ignorant, the most prominent naive probabilists are recognized (academic) experts in mathematical probability, or relatedly statistics, physics, psychology, economics, epistemology, medicine or so-called decision sciences. Beyond their sterling credentials, the best known (and most dangerous) naive probabilists are quite sophisticated, skilled in the art of influencing public policy decisions without suffering from the risks those policies impose on the rest of society.

Thanks to the Freeroll Effect, naive probabilists continue to influence important decisions with far-reaching impact on the way society operates, government runs, and the economy progresses. The above commentary on Naive Probabilism and the Freeroll Effect in Covid-19 is a cautionary tale of the widespread influence of Naive Probabilism throughout society, science, academia, business, medicine, finance, law and politics. Naive Probabilism is responsible for prospect theory, the GRE, “libertarian paternalism”, Mitt Romney, ill-fated attempts to “solve” the replication crisis, and the early and ongoing response to the Covid-19 pandemic in the U.S. and throughout the West.

Naive Probabilism persists with the help of the Freeroll Effect, and also because in many, non-complex domains the tenets of Naive Probabilism have little or no major impact. But as we’ve seen in this case study of Covid-19, Naive Probabilism is most noticeable and most detrimental in complex systems, where its core axioms are the most wrong and have their most severe consequences. Drawing from this case study, we may better recognize the occurrence of Naive Probabilism and the Freeroll Effect in other domains, and hopefully mitigate or entirely avoid similar catastrophes in the future, whether economic, political, or health-related.

6 The Enlightened Probabilist

In contrast to the Naive Probabilist stands the Enlightened Probabilist, who unlike Sunstein and Co. understands that decision making is situational. Context is everything. The Enlightened Probabilist knows the theory inside-out, but isn’t blinded by it. He realizes that the theory applies only under specific circumstances. Decision making under uncertainty is practical, emotional and psychological.

The Enlightened Probabilist adheres to common sense. He (or she) wears a seatbelt, looks both ways before crossing (even when the light is green), locks his (or her) doors, keeps cash on hand (“dry powder”), stores extra ammo (dry powder), and avoids dark alleys. There are times when the Enlightened Probabilist neglects to do these things, and no bad comes of it. He forgets to wear a seatbelt—no accident; forgets to look before crossing—no car coming; forgets to lock the door—no robbery; runs out of cash—didn’t need it; runs out of bullets—no altercation; walks down a dark alley—nobody there. The Enlightened Probabilist knows ahead of time that these precautions safeguard against things that are all unlikely to happen, but also knows that probability isn’t just about what’s “likely”.

The Naive Probabilist denies that what’s “rational” for one person may be irrational for another, and that the right decision in one context may be the wrong decision in another. The Naive Probabilist rejects the Enlightened Probabilist’s Mantra:

The Enlightened Probabilist’s Mantra

When gambling, think probability.

When hedging, think plausibility.

When preparing, think possibility.

When this fails, stop thinking. Just survive.

To the extent that the Naive Probabilist follows the Mantra, he gets stuck on the first line: everything comes down to a gamble, an expected value, or a utility calculation. The Enlightened Probabilist knows that the Mantra applies from bottom up. First, survive (avoid ruin). Second, maintain (avoid loss). Third, thrive (win), time and resources permitting.

The Enlightened Probabilist would much rather be alive than look smart. To quote Warren Buffet, in the context of investing, “In order to succeed, you must first survive.” To invest successfully requires capital; and to have capital one mustn’t be broke. But the principle applies much more widely, at individual and societal levels. To do anything, one must first survive, and survival isn’t a matter of

probability, but of possibility. Seatbelts, locks, “dry powder”, dry powder, extra food and water all guard against the *possibility* of a crash, break-in, economic hardship, altercation, famine or drought, no matter how unlikely any of them may be.

Beyond survival, the Enlightened Probabilist hates being squeezed, stays liquid, buys insurance, hedges his bets. He doesn’t assume that *his* best explanation is *the* best explanation, or that his understanding incorporates all available information. He realizes that he is error prone, and therefore needs to protect against not only the most likely scenarios but also any additional *plausible* scenarios, especially those that would lead to substantial harm. At this stage, the Enlightened Probabilist isn’t trying to win the most, but to lose the least.

Only after shoring up survival and protecting against excessive loss does the Enlightened Probabilist even consider profiting, winning, or “being right” in any sense. At this point the Enlightened Probabilist has the luxury of considering the *probability* of the outcomes, but it’s a long road to get there.

6.1 The many levels of risk and uncertainty

- (easy) *Theory*: what they taught in school.
- (hard) *Practice*: what you learned in the schoolyard.
- (harder) *Psychology*: how much you can handle.
- (hardest) *Ethics*: who you really are.

An understanding of the many levels of risk and uncertainty distinguishes Naive from Enlightened. For the Naive Probabilist, the theory is the only part. For the Enlightened Probabilist, the theory is just the easy part. Indeed, there are situations in which probability is the right concept and probability theory is the correct framework for decision making: when the probabilities are known or reasonably well estimated, and when the payoffs (especially downside) is bounded. For all the reasons discussed previously, the early days of Covid-19 was not such a situation, and the major individuals and organizations who influenced pandemic response were far from enlightened, and far from ethical.

A crucial step in bringing the theory to practice is to identify all the ways that the theory fails to apply. Hypotheses of uniformity, independence, infinite-population, and large-scale asymptotics all assume behaviors that don’t exist in the real world. Beyond the practical, there are the emotional and ethical aspects of decision making. Decisions under uncertainty impose a psychological burden: the right decision may go badly wrong, and the Enlightened maintains composure under this situation. They also impose an ethical imperative: one mustn’t impose risks upon others which they don’t subject themselves. Refer to Section 4 for discussion of how this ethical imperative was violated in the Covid-19 response, and is regularly violated in large-scale decisions under uncertainty in complex systems.

6.2 Naiveté repeats itself

The above case studies have the benefit of hindsight to illustrate the impact of Naive Probabilism on early Covid-19 response. As I write this a year after the initial outbreak of March 2020, many of the *post hoc* over-reactions (e.g., lockdowns, mandates, travel restrictions) remain in force in some parts of the United States. Meanwhile a number of new interventions, vaccines chief among them, are being implemented at large scale. Several Covid-19 vaccines have begun distribution on an Emergency Use Authorization (EUA) by the U.S. Food and Drug Administration (FDA). For some people, the vaccine will be a lifesaver. But for others, it presents another source of severe uncertainty and unwanted risk.

Much like early detractors of precautionary measures, the Naive response to concerns over vaccine risk has been to dismiss context dependence in decision making—what’s rational for one person may be irrational for another—in favor of a public outreach initiative that seeks 100% adoption. June Raine, CEO of the United Kingdom’s Medicines and Healthcare products Regulatory Agency (MHRA) assured the public that “the benefits outweigh any risk” of Covid-19 mRNA vaccines. Indeed, for some people, the benefits do outweigh any risk, as Raine suggests. For many others, however, the untold risks far outweigh any benefits. Naive Probabilism arises from the belief that risks are uniformly shared across everyone, and that there is a unique correct decision to every challenge. In doing so, Naive Probabilists replace one relatively known risk (Covid-19) with another much lesser known one (uncertainty of the vaccine risks).

As with the initial handling of masks and precautions, efforts to squash vaccine concerns have only shed more doubts about the credibility of leading scientists. In the minds of those concerned, the Covid-19 vaccines approved for EUA in the U.S. were developed at “warp speed”⁵ to treat a novel virus

⁵ Supported by the U.S. Department of Defense “Operation Warp Speed”.

using a technology (messenger RNA, mRNA) which has never before been approved for use in humans. Compounding this natural skepticism is the fact that many of the same people who denied the early risks of Covid-19 are now dismissing potential risks of widespread vaccination, and doing so in an admittedly deceitful way. When polls suggested that about half of Americans would refuse to get the vaccine due to concerns over its safety, Drs. Fauci and Adams made a number of media appearances to assure the public that the vaccines were safe. Fauci told the *New York Times*:

“When polls said only about half of all Americans would take a vaccine, I was saying herd immunity would take 70 to 75 percent,” Dr. Fauci said. “Then, when newer surveys said 60 percent or more would take it, I thought, ‘I can nudge this up a bit,’ so I went to 80, 85.”⁶

The above observations about masks, data, rationality, and risk assessment of vaccines highlight the failed thought process underlying all of these decisions. The problem with these decisions isn’t that they were “right” or “wrong” with the benefit of hindsight—whether current vaccine recommendations prove beneficial remains unknown—but that they originated from a naive understanding of probability and its proper place in decision making under severe uncertainty.

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