

Coronavirus: The Cure Is Worse Than The Disease

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In response to COVID-19, governments the world over have embarked on the most extreme set of interventions in the last 50 years.

We now stand at a crossroads. We can decide whether to double down on these interventions, or take a different approach.

The purpose of this 50-page document is to provide any interested citizen with a thorough framework for thinking through these issues from a purely health-oriented perspective.

In other words, I am not attempting to measure lives against dollars. That is not to trivialize the dollars: a month or so in, America has spent more than it did on the decade-long Iraq/Afghanistan wars combined. Simultaneously, in a matter of weeks, we are on course to see as many new unemployment claims as we saw in the first *year* of the global financial crisis.

I do not mean to downplay this economic tragedy; it is no small thing that 10% of the American workforce has lost their jobs in *three weeks*. However, such comparisons are often dismissed by those focused on health as “inconvenient” but necessary side-effects of saving lives - or even pejorated through pithy witticisms like “Grandma died for the Dow.” So I’d like to focus on comparing apples to apples: lives to lives.

Based on extensive data on COVID-19 that is now emerging across the world, it is clear that shelter-in-place lockdowns do more public health harm than good. This is not to say that we should not take steps to combat COVID-19. However, these lockdowns are measures of the highest extreme that should be used if - and only if - they forestall a problem of the highest extreme, whereas COVID-19 can be effectively mitigated using much less extreme measures.

These lockdowns were driven by panic; the “consensus” view was that it was a foregone conclusion that millions of Americans would die, and that every hospital in the country would be overwhelmed by an order of magnitude. Data that has since emerged demonstrates that, even in the absence of any interventions whatsoever, this never would have happened.

While interventions may well have reduced transmission over the past few weeks, they may actually have *increased* transmission - as well as the severity of transmission - when they were implemented.

Now that we have more data, there is no excuse for doubling down on a course of action decided upon without the benefit of that data. While the right set of COVID-19 policy interventions will necessarily differ in each time and location, it is clear that as of mid-April 2020, the median American in most of the United States will suffer far more health harms from shelter-in-place lockdowns than from COVID-19.

It is important to avoid false dichotomies, and many paint our choices as a black-and-white binary: everyone locked in their homes, or crowded sports stadiums where the price of entry is sneezing on 10 strangers. Certainly, in many places, it seems prudent to continue many forms of social distancing.

Moreover, I believe that *everywhere*, we should actually be doing *more*, rather than less, to support the three populations that are vulnerable: the elderly, those with pre-existing health conditions, and last but certainly not least, the brave healthcare workers who are treating those who end up hospitalized with COVID-19.

Here, we can draw analogies to other public-health initiatives to reduce the transmission of diseases that are *far more severe* than COVID-19: a targeted focus on vulnerable populations will more effectively solve the problems that shelter-in-place lockdowns purport to solve, without any of the grievous harms that they cause as second-order unintended consequences.

In classic policy-debate style analysis, I have divided this document into three sections.

1. **Significance.** What is the nature of the potential harms from COVID-19?
2. **Disadvantages.** What are the disadvantages of the current policy of “shelter-in-place” lockdowns? How many people suffer more harm than benefit from these interventions, and in what ways?
3. **Plan.** What actions could we take to forestall the negative effects of COVID-19 without incurring the disadvantages discussed above? (This section is not comprehensive; I don’t have all the good ideas.)

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1: Significance: Understanding The Problem

1.1: Introduction

I believe that cherry-picking data weakens rather than strengthens arguments. It is clear that for many people, particularly the elderly and even for some young people, COVID-19 can be a very serious disease. My best friend and his girlfriend - both in their late 20s - have had fevers and fatigue for three weeks, with occasional transient bouts of shortness of breath. Although they have not officially tested positive for COVID-19, they have also tested negative for flu and everything else, and reasonable [priors](#) would suggest a high probability that they have coronavirus.

Obviously, I care for my friends' health, and I am thankful that neither has had to seek hospitalization as of this time. We should be supportive of the families who have lost loved ones to COVID-19, including young nurses and doctors who contracted coronavirus from patients. I will discuss, a little later, a reasonable data-backed hypothesis for why healthcare workers have disproportionately bad outcomes from COVID-19. I believe we should do everything possible to ensure that brave healthcare workers have sufficient PPE (personal protective equipment).

However, what we *should not* do is reason by anecdote. Many arguments made by both the media and elected officials take the fallacious form of “because we have an example of X, X is therefore true under all circumstances.”

For example: “Northern Italy and NYC saw massive outbreaks, so without early and extreme action, the same would have happened everywhere else.” In fact, we can identify a number of idiosyncratic factors that are unique to Northern Italy and NYC, that suggest that conditions elsewhere will be different.

Or: “we can find examples of healthy young Americans who have died, so therefore young people need to worry a lot about the virus and stay home 24/7.” Outliers exist in any data set, but we can't implement extraordinarily costly policies on the basis of outliers.

The data, taken as a whole, suggests that coronavirus is *much* less severe than we initially believed; it also suggests that a broad array of factors that can vary state by state, and even town by town, have a meaningful impact on COVID-19's impact on that community.

The fortunate result is that less intrusive interventions will likely be perfectly effective, and the correct intervention will vary depending on local circumstances.

We must be careful to avoid the idea that it is OK to do wrong things for the right reason. For example, many have suggested that it was OK to make and propagate alarmist forecasts, because it is better for people to be too scared of coronavirus than not scared enough.

On the basis of the precautionary principle, many also feel that it is OK to cherry-pick the scariest statistics and stories, and broadcast these widely.

Unfortunately, such approaches have negative [second-order impacts](#) that may, in many cases, be deadly. We will explore these.

1.2: Coronavirus 10 - 100x More Prevalent (10 - 100x Less Severe) Than Reported

1.2.1. Setting The Stage: Testing Capacity

Many officials refer to reported coronavirus case counts as a KPI for making decisions - i.e. “we can do X when reported case counts do Y.” Unfortunately, it has become exceptionally clear over the past couple weeks that reported case counts are an extremely unhelpful metric; as such, I believe that we should stop making decisions on the basis of recorded cases.

While case counts may have some use after many adjustments and contextualizations, on their own, they are likely to mislead us. At the time of this writing, there are half a million recorded COVID-19 cases in the U.S.

However, not all cases are recorded. Far from it. Testing capacity has been highly constrained; according to the [COVID Tracking Project](#), we have cumulatively (as of April 10th) performed about 2.5 million tests. Assuming each of these tests represents a unique individual, we have - at most - tested 0.75% of the U.S. population.

That means out of 2,000 people, we've only tested 15 for coronavirus. It is highly unlikely that with such a small sample size, we are catching anything close to all coronavirus cases.

1.2.2: True Prevalence Of COVID-19 Is Much Higher

The first I saw to suggest that coronavirus might already be far more widespread than believed was my friend Assaf Nathan. In a [blog post during the second week of March](#) (Hebrew, but Google Translate suffices), he observed that PCR testing (the nose swabs) would exclude people who have already had the virus and recovered from it. He noted that antibody tests would capture the latter category.

He also posited, based on what we know about many viruses, that the overwhelming majority of COVID-19 cases would be asymptomatic or very mildly symptomatic, and therefore would be extremely unlikely to be counted. (We'll return to this issue in a few sections.)

At the time, it was just a theory, and of course not everything Assaf said turned out to be true. But it seems like it was far closer to the truth than conventional wisdom at the time: we now have a wide variety of *different types* of data sources that suggest that tens of millions of people worldwide have already *had* COVID-19.

1.2.2.1: Antibody Tests

We'll start with the antibody tests that Assaf referenced: these are starting to come in from a variety of sources, and we will have much more data in the next several weeks.

We'll start with an interesting example from Germany. Testing a representative sample of 1,000 inhabitants from 400 households in the municipality of Gangelt - representing ~8% of the total population - [scientists found that](#):

Around 2% of individuals [in the study] exhibited a current SARS-CoV2 infection identified via PCR method. [...] In Gangelt this study records all infected individuals in the sample, including those with asymptomatic and mild cases. In Gangelt the segment of the population that has thus already formed an immunity to SARS-CoV2 is around 15%.

This means that 15% of the population in Gangelt can no longer be infected with SARS-CoV2, and the process for achieving herd immunity has already commenced. This 15% segment of the population reduces the speed (net reproduction figure R in epidemiological studies) of further spread of SARS-CoV2 accordingly.

So, while 2% showed up on PCR as having current infection, 15% showed up on antibodies with an infection anytime. Another [example](#) of a city in Italy:

So with a population of 6,169, Robbio had 27 confirmed cases, but blood tests of 2000 residents found 13-14% positive for antibodies, suggesting that confirmed cases were only about 3% of actual cases.

Similarly, one test of blood donors in a town in Italy found that 40 out of 60 (two-thirds!) tested positive for antibodies to COVID-19, though they had never displayed any symptoms. [The source](#) is in Italian, but via Google Translate:

When Avis volunteers summoned them for blood donation, they were confident that they would find a large number of Covid positives. Confirmation came from the results of tests and swabs: out of 60 citizens of Castiglione D'Adda, one of the municipalities in the former red area of Lodi, 40 tested positive without knowing it. All asymptomatic, escaped official statistics: they came into contact with the disease, they did not develop it, but they produced the antibodies, as if they had been vaccinated.

Here's yet another report from [Danish health authorities](#). The document is in Danish, but using Google Translate for the first paragraph of 4.1.2 on page 27, note that a sample of blood donors found that 3%+ had antibodies to COVID-19 as of early April, suggesting confirmed cases were merely 1.5% of *actual* cases:

Statens Serum Institut informs on the basis of antibody studies in 1,000 blood donors in the Capital Region, tapped in the period 1-3. April, 2.7% had been detected with antibodies, which with a sensitivity of 70%, corresponds to 3.5% of those studied have already been infected with COVID-19.

The State Serum Institute argues that if this figures are transferred to the entire population of the Capital Region, this corresponds to approx. 65,000 people may have been infected already on March 26. At this point, it was found 917 confirmed cases of infection in the region. This means that there can be up to 70 times more infected in the community than confirmed cases.

Finally, if you prefer examples closer to home, here's a report from Chicago. Exactly as Assaf expressed, although only 10 - 20% of patients getting tested there are *currently* infected with COVID-19, a much higher percentage - 30 - 50% - [have COVID-19 antibodies](#):

A phlebotomist working at Roseland Community Hospital said Thursday that 30% to 50% of patients tested for the coronavirus have antibodies while only around 10% to 20% of those tested have the active virus.

"A lot of people have high antibodies, which means they had the coronavirus but they don't have it anymore and their bodies built the antibodies," Owaynat told Chicago City Wire.

Antibody tests ongoing in many parts of the U.S. (such as one in California and one in Colorado) will hopefully provide more information in the coming days and weeks. Generally speaking, however, we can conclude that in many geographies across the world, far more people have had the virus - either asymptotically or mildly symptomatically - than were recorded as positive in case counts via PCR tests during the time they were infected.

1.2.2.2: Sewage (No, Not Talking About The Models)

Another method by which we can attempt to understand the prevalence of COVID-19 is by analyzing viral matter in human waste. Viral RNA is shed in human feces, and can offer a real-time look into [how many people have the virus](#):

"Studies have also shown that SARS-CoV-2 can appear in [feces] within three days of infection, which is much sooner than the time taken for people to develop symptoms severe enough for them to seek hospital care," Tamar Kohn, an environment virologist at the Swiss Federal Institute of Technology told Nature.

Using sewage to detect viruses is not a new method.

"Wastewater monitoring has been used for decades to assess the success of vaccination campaigns against poliovirus," Charles Gerba, an environmental microbiologist at the University of Arizona, told Nature. Gerba also found traces of coronavirus in raw sewage in Tucson, Arizona, according to Nature.

Obviously, this isn't a perfect indicator; a number of assumptions have to be made to convert the prevalence of SARS-CoV-2 in sewage into an approximation of prevalence in the general population. One [paper](#) by researchers at MIT and elsewhere, analyzing samples taken in Massachusetts, goes into these. It notes the inherent uncertainty, but nonetheless concludes that actual case counts in Massachusetts might be 4 - 200x higher than reported case counts:

*we note that any rigorous conclusions depend on a number of factors that are unknown, and thus additional experiments will be required to calibrate these numbers. Nonetheless, we can estimate an abundance based on the lowest observed values across these samples of ~10 copies/mL. If we assume typical stool sizes of 200g, diluted into an average volume of 1.36*10⁹ L, and a population of 2.3*10⁶ individuals each producing one stool per day...*

Estimates of viral load in stool from positive patients are still a matter of uncertainty, but at least one recent publication suggests levels as high as 600,000 viral genomes per mL of fecal material (12). This number would suggest roughly 5% of all fecal samples in the treatment facility catchment were positive for SARS-CoV-2 in the March 18 – 25 period, a number much higher than the 0.026% confirmed for the state of Massachusetts (a similar prevalence is obtained using individual counties represented by the wastewater treatment facility's catchment or state-wide estimates) on March 25.

Another paper reported a maximum observed value close to 30,000,000 viral particles per mL in a single fecal sample (13). If we use this number instead, we would estimate a prevalence of 0.1%, closer to, but still much higher than the number of confirmed clinical cases. Additional data on viral shedding in stool over the course of disease is required to fully interpret these findings.

Given the importance of assessing the fraction of SARS-CoV-2 infections that present with symptoms, we note that our results are consistent with the idea that a significant fraction of cases that are not detected with current testing algorithms, and that this fraction may include a large number of patients without symptoms.

1.2.2.3: Genomic Analysis: North American Community Spread Started Early

Another analytical method that is useful is genomic analysis. Viruses mutate - not always in ways that make them more or less infectious, but in ways that do allow us to “fingerprint” them and study their spread. In an analysis paired with some nice visuals, some researchers who have been [following this observe](#):

During the 2nd month of the outbreak, from mid-January to mid-February 2020, we start to see individual cases crop up in North America, Europe and Oceania. These early cases still group with samples from Asia, and generally lack the hallmarks of local transmission.

This is consistent with initial sparks being thrown from the main outbreak in Asia to other parts of the world. Although most of these sparks did not result in localized outbreaks, at least three of these introductions took off. These led to the large European and North American outbreaks, as well as more restricted spread in Oceania.

[...] the origins of the European outbreak were already circulating undetected by late January or early February. [...] although we only had 1 sequenced case from this cluster at the time, the virus was circulating undetected within North America by late January or early February.

Keep in mind that mitigation efforts did not start in full force in many parts of the country until mid-March, gaining in intensity into late March. Therefore, this paper suggests that SARS-CoV-2 might have had as many as 8 weeks to spread fully unchecked, in contrast with the CDC acknowledging the first potential case of community spread [in late February](#), and many communities not acknowledging it until well into March.

If as few as 100 “seeds” arrived in the U.S. and started transmitting on February 1 (for modeling simplicity), and the doubling time of the virus was 3.5 days (i.e. total cases increase 4x per week), then as of April 1, 8.5 weeks later, we would expect *13.1 million cases* - or 4% of the American population. If total cases have merely doubled over the ensuing 10 days (thanks to social distancing), you get to 26 million cases, or 8% of the U.S. population, potentially being infected today.

1.2.2.4: Mathematical Analysis: “Influenza-Like Illness” and Death Counts

Obviously, I’m not a mathematician, and my model is overly simplistic. So let’s turn to some mathematicians who have analyzed historical data (a much easier proposition than forecasting). Two separate papers, using two separate methodologies, have tried to estimate the prevalence of COVID-19.

The first uses reporting data on “ILI” - “influenza-like illness.” As a country, we have collected data on the prevalence of such illness, over the course of many years, so we know its patterns – and can easily observe when something stands out dramatically from the background. COVID-19 is an illness that shares many symptoms with flu, so in the absence of widespread testing for COVID-19, we could use data on ILI reports from doctors to estimate the prevalence of COVID-19.

One pair of researchers analyzed the data with that [premise](#):

The current literature suggests that the predominant symptoms associated with COVID are fever, cough and sore-throat; that is, patients often present with an influenza-like illness (ILI) yet test negative for influenza [4, 5]. With many COVID patients having a similar presentation as patients with influenza, existing surveillance networks in place for tracking influenza could be used to help track COVID.

Here, we quantify background levels of non-influenza ILI over the past 10 years and identify a recent surge of non-influenza ILI starting the first week of March, 2020. This surge of excess ILI correlates with known patterns of SARS-CoV-2 spread across states within the US, suggesting the surge is unlikely to be due to other endemic respiratory pathogens, yet is orders of magnitude larger than the number of confirmed COVID cases reported.

Together this suggests that the true prevalence of SARS-CoV-2 within the US is much larger than currently appreciated and that even the highest symptomatic case detection rates are likely lower than 3% corresponding to approximately 9 million new ILI cases due to SARS-CoV-2. Our analysis provides empirical corroboration of previous hypotheses of substantial undocumented cases [6] yet places the estimated 55 undocumented case rate an order of magnitude higher than prior reports [6]. Moreover, these updated prevalence estimates predict that epidemic doubling times greater than 3.5 days [7, 8] would be unable to account for the magnitude of the ILI surge.

We test our hypothesis of sub 3-day doubling times in the US by analyzing both state and national COVID surveillance data, finding a broad agreement of doubling time less than 3.5 days in both confirmed COVID case 60 counts and documented COVID deaths [...]

For the latest week ending March 14, COVID cases in the states with the highest estimated symptomatic case detection rate (Washington, Nevada, and Michigan) are only capturing approximately 1% of ILI surges in those states (Figure 2). Across the entire US we find the average symptomatic case detection rate to be 0.75% (95% credible interval 0.59%-1.0%).

[...] The total excess non-influenza ILI across the US was approximately 9.2 million excess individuals in the week starting March 15th, 2020 compared to the same week in 2019 (95% credible interval of 8.0-10.1 million).

[Another analysis from Germany](#) took a different approach, looking merely at the COVID-19 data itself. The researchers conclude that:

Insufficient and delayed testing may explain why some European countries, such as Italy and Spain, are experiencing much higher casualty numbers (relative to reported confirmed cases) than Germany, which has detected an estimated 15.6% of infections compared to only 3.5% in Italy or 1.7% in Spain. Detection rates are even lower in the United States (1.6%) and the United Kingdom (1.2%) – two countries that have received widespread criticism from public health experts for their delayed response to the pandemic.

In sharp contrast to this, South Korea appears to have discovered almost half of all its SARS-CoV-2 infections. The authors estimate that on 31 March 2020, Germany had 460,000 infections. Based on the same method, they calculate that the United States had more than ten million, Spain more than five million, Italy around three million and the United Kingdom around two million infections. On the same day the Johns Hopkins University reported that globally there were less than 900,000 confirmed cases, meaning that the vast majority of infections were undetected.

It is interesting that these different analyses arrive at similar conclusions: true US COVID-19 cases likely number in the *tens of millions* today.

1.2.2.5: If It Quacks...

Obviously, perfect information will only be available in hindsight. We may have all the answers above COVID-19 in two years. But that's not helpful given that we need to make decisions *now*.

There is, of course, uncertainty inherent in many of these methods of analysis. However, we've now seen that not one, or two, or three, but *four* different types of analysis all suggest that reported case counts so substantially undercount actual COVID-19 prevalence as to render the reported results of PCR tests rather unhelpful for shaping public policy.

Another necessary corollary here is that the horse is out of the barn, down the road, and well into the next county. COVID-19 is so widespread that we cannot reasonably expect to reach, with an acceptable timeframe, an environment where we can identify and contact-trace every single individual with COVID-19. If current active

COVID-19 cases are 5 million, and current lockdowns have managed to reduce R to 0.5, it would take *until the end of June* to get total cases to lower than 5,000.

Therefore, we need to shift our focus to other metrics and tactics; I will return to this idea in an ensuing section.

1.3: Implications: “Rumors Are Greatly Exaggerated”

1.3.1: Sample Bias Initially Overstates Epidemic Severity

Imagine, for a moment, that a certain respiratory illness sent half a million people to the hospital, where they all tested positive for the disease. Imagine that, say, 35,000 of these people unfortunately died. If you started studying this illness with the premise that the only people who had fallen ill from the disease were those who had tested positive at the hospital, you’d quickly grow alarmed: 7% of all people you tested ended up dying.

Well, the disease in question is not a hypothetical one: I’m citing [CDC data on flu-related hospitalizations and deaths](#) during the 2019-2020 season. I am not doing this to directly compare COVID-19 and the flu; rather, I’m simply pointing out that if you only test *people who get really sick with the flu*, then flu is going to look like a very severe illness. But, of course, we know that the flu is far more widespread than just those who show up at hospitals: the CDC estimates that 39 - 56 million individuals were infected with the flu this year, of whom only a *tiny fraction* (1%) have a serious enough case to go to the hospital.

Of course, we don’t actually test everyone for the flu: undoubtedly, I’ve had the flu at least once in my life, but I’ve never been tested for it. Nonetheless, since the flu has been around for a long time, we have a good idea of its actual prevalence and severity.

But when new diseases emerge, they tend to catch our attention by sending people with severe symptoms to the hospital. These people get tested first, and naturally, for *any* disease, if you test mostly people who are sick enough to go to a hospital, the disease is going to look really bad.

This has happened, in fact, with past pandemics. Even with new strains of flu! The case fatality rate (CFR) of the H1N1 “swine flu” in 2009 [was initially estimated at 0.4%](#), and a WHO presentation from July 2009 noted a CFR of “<1%” with [up to 10% of confirmed cases involving hospitalization](#).

Eventually, as we all know, H1N1 turned out to be not terribly severe. [One retrospective paper analyzing H1N1 in Greece](#), from 2012, notes:

The estimated CFR was 6.3 deaths/ 100,000 infected cases and 17.5 deaths/ 100,000 symptomatic cases... Only a small proportion were admitted to hospitals (15 per 1,000 symptomatic cases) or, subsequently, to an ICU (0.37 per 1,000 symptomatic cases)

[...]

Cao et al reported that 36% of infected individuals experienced fever >38.0°C [23]. Thus, the estimated incidence of symptomatic H1N1 infection (based on ILI-38 case definition) was divided by 36% to obtain the corresponding estimate for H1N1 infection.

So, we see a few things. First, at least the way they define “asymptomatic” (fever of <100 F), only one out of every three H1N1 infections in Greece (roughly) was even symptomatic. Second, out of all H1N1 infections in Greece, it appears that only 5 out of 1,000 (0.5%) required hospitalization - 20x lower than initial estimates of up to 1 in 10 - and only 0.0063% of people actually died - 63x less than 0.4%. This is just one country, but it’s indicative of what happened.

We cannot, of course, simply copy-and-paste numbers across to COVID-19: it is a different virus with different characteristics.

But it is worth noting the similarities here. We know how many people are actually hospitalized with COVID-19, because we're counting them. We know (roughly) how many people have died from COVID-19. We can have reasonably high confidence in the numerator. Might it be off some? Sure. But it's not going to be off by a factor of 10x.

Conversely, we *don't* know much about asymptomatic cases for several reasons. The first is that, as mentioned, testing capacity has been constrained.

For example, see this recent tweet (on the right) from an NYC ER doctor, noting that not even everyone who shows up *at the ER* can get tested.

Indeed, in much of the country, the sample of those being tested is *anything* but representative.

For example, even when drive-thru testing rolled out in Dallas County, you had to meet three criteria to get tested:

- Fever > 99.6
- Cough
- Shortness of breath

In mid-March - when community spread of COVID-19 was occurring in my community - I had a brief, transient low fever and malaise for a period of about 24 hours, as well as another well-documented symptom of COVID-19 (not cough, or shortness of breath) that I so rarely experience that it is notable when it occurs. The fever and malaise resolved overnight and the other symptom resolved by itself over a few days, without any medication, let alone hospitalization. Several days later, my mother felt slightly ill for a few days; her symptoms also resolved without any medication.

Given the above, the probability that my parents (in their 60s and 70s) and I were exposed to COVID-19 is clearly significantly higher than zero, and yet the probability that any of us could get tested for COVID-19 was zero, since we never had the required symptoms for testing.

Did we have COVID-19? I sure hope so. Who knows. The point is that reserving tests for those who are extremely ill - while completely understandable in terms of triaging medical care - is necessarily always going to undercount those who have mild or asymptomatic symptoms, and concomitantly massively increase measures of disease severity such as hospitalization rate and case fatality rate.

Even in places like South Korea that test broadly, those who are asymptomatic generally have no reason to seek testing. However, in places that have conducted truly random sample testing, we've seen that many people are indeed asymptomatic. [Half of positive PCR tests on the Diamond Princess were from asymptomatic passengers.](#) The same finding occurred in a [random sample in Iceland](#); meanwhile, in the town of Vo in Italy, asymptomatic people represented [the majority](#) (I believe 70%) of positive tests.

Here's the punchline, and why it all matters. Per [COVID Tracking Project data](#), roughly 50,000 people have been hospitalized with COVID-19 in the U.S. out of roughly 500,000 positive tests - or a 10% hospitalization rate based on reported cases. Meanwhile, a little under 20,000 people have died, suggesting a 4% CFR based on reported cases. (This is not really the right way to look at it, but we'll work with this for now.)

However, we now know that the denominator, i.e. reported cases, is so unreliable as to be unusable. To refresh ourselves:



- Antibody testing in Chicago suggests that *out of people getting tested*, 2-3x as many were ever exposed to COVID-19, as have it now (*just among the tiny fraction of people who are sampled.*)
- In cities in Germany and Italy that have been hard-hit by COVID-19, anywhere from a low-teens percentage (13 - 15%) to a much higher level of a random sample of the population displays protective antibodies against COVID-19.
- Sewage sampling in Massachusetts suggests that COVID-19 prevalence could be 4 - 200x that reported.
- Genomic analysis suggests that unchecked community spread was occurring in the U.S. for six weeks and potentially more.
- Two different mathematical analyses both suggest that by mid-March to the end of March, U.S. COVID-19 cases exceeded 10 million, with detection rates of COVID-19 at most 3%.

Based on all of these approaches, it seems like a reasonable lower bound is that cases are at least 10x underreported, likely more than 20x underreported (according to several researchers), and potentially as much as 100x underreported.

It seems reasonable, then, to assume that it's not 1 out of every 10 people with COVID-19 who will need hospitalization - but rather 1 out of every 100 - 500.

Similarly, rather than 1 - 4%, it seems likely that true CFR for COVID-19 will be well under half a percent, and potentially well under 0.1% for most of the population.

1.3.2: Broken Models...

The most important corollary here is that the underlying assumptions for the models that shut down the world - such as the alarmist Imperial College model that predicted 2.2 million deaths - were based on vastly inaccurate assumptions. For example, the [Imperial College model](#) assumed “an IFR of 0.9% with 4.4% of infections hospitalised.” The punchline, of course, was:

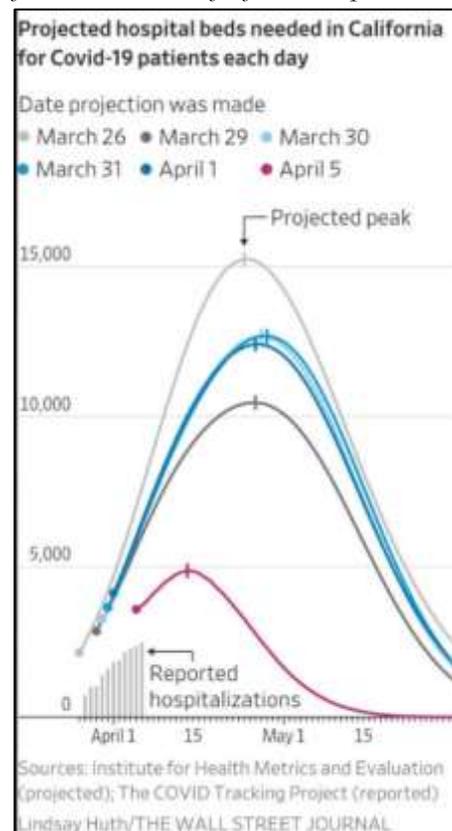
In total, in an unmitigated epidemic, we would predict approximately 510,000 deaths in GB and 2.2 million in the US, not accounting for the potential negative effects of health systems being overwhelmed on mortality.

And that's how we got to shelter-in-place lockdowns, and people being arrested for paddleboarding with nobody in sight.

The curious thing is that the models have, collectively, been dead wrong. Many have done a very good job of analyzing this in real-time, so I won't go into it in depth here. See [Justin Hart on Twitter](#), as well as [Alex Berenson](#).

To the right is an example: California ordered a lockdown [on March 19](#). A full week later, the IHME / Murray model projected 15,000 hospital beds needed; by April 5th, the model was down to a peak of 5,000 hospital beds. As you can see, the models couldn't even capture reasonable estimates of hospital utilization *a few days from now*.

What is important to understand is that proponents of these models are engaging in revisionist history; in many cases, it is being argued that the reasons that we came in so far under the models is that we did the lockdowns. This is true relative to, say, the Imperial College model, which assumed no mitigation measures.



But as Justin and Alex and others have done a good job of analyzing, many other models - such as the Murray / IHME model that appears to be the basis of much policy in the U.S. - *assumed full social distancing from the start*. In other words, the implementation of lockdowns alone cannot explain why the models predicted so many more hospitalizations than are actually occurring.

These models have continued to be inaccurate, as updated, *even once compliance with lockdowns was understood*. It is understandable, with an exponential process, why you might massively mis-predict hospitalizations out a few weeks - small changes in inputs can drive *massive* changes in outputs.

This means that something else must be driving the lack of accuracy. A key candidate? Underlying assumptions of disease severity.

Similar failures have occurred everywhere, not just in the U.S. In Switzerland, apocalyptic scenarios predicted a few weeks ago did not come to pass; as of a week ago, [not a single ICU was overrun](#).

Here's the punchline: these models are still being used to justify continued lockdowns, because they predict a massive surge of disease several months from now if we loosen the shelter-in-place orders *whatsoever*.

When we can't rely on these models to predict, with even directional accuracy, how many people will show up at hospitals *tomorrow*, how can we continue to believe what they say about what will happen two or three months from now? Officials should pivot to focusing on hard data that we can actually trust: hospitalization trends.

1.3.3: ... Empty Hospitals

Before we continue, it's worth pausing a moment here to understand why hospitals, and *particularly* ICU beds, are so important.

First, the most valid public health goal with regards to containing COVID-19 is preventing hospitals from being overwhelmed. With or without COVID-19, every day, people have heart attacks and strokes; they have appendicitis; they fall and break bones.

A good friend of mine and his wife are expecting in the near future. Both baby and mom deserve first-rate medical care; delivery of a newborn obviously happens when it happens and can't be deferred for another two months just because coronavirus happens to be in town. It would be unacceptable to all of us if my friend's wife and baby were put at risk because the hospital was unable to provide proper care.

Indeed, mortality from COVID-19 - and everything else - can vary widely depending on the availability of care. For example, one report on cardiac arrest provides some [very impactful statistics](#) on the importance of access to care that is both A) high-quality and B) prompt:

Every year in the U.S., approximately 395,000 cases of cardiac arrest occur outside of a hospital setting, in which less than 6 percent survive. Approximately 200,000 cardiac arrests occur each year in hospitals, and 24 percent of those patients survive. Estimates suggest that cardiac arrest is the third leading cause of death in the U.S. behind cancer and heart disease.

[...]

In addition, one study found that survival rates of cardiac arrests that occurred outside the hospital ranged from 7.7 percent to 39.9 percent across 10 North American sites. Risk-adjusted survival rates for cardiac arrests that occur in the hospital also vary 10.3 percent between bottom- and top-decile hospitals.

[...]

The likelihood of surviving decreases by 10 percent with every passing minute between collapse and return of spontaneous circulation, although new research offers hope in extending this time.

This is one of the reasons why the overwhelmed hospitals in Northern Italy were so scary to those in the healthcare system. If a hospital is overwhelmed with COVID-19 patients, it will not only be able to less effectively treat coronavirus, but also *every other medical problem*.

However, something that is really, really important to drill in here is that outside of NYC, most hospitals in the U.S. are actually... pretty empty. Far from being all hands on deck, many U.S. hospitals [are furloughing or laying off employees](#) due to a dramatic drop in patient volumes. (That link is tracking them, daily.)

There are a few reasons for this. The first is that, [per data](#), the U.S. and Germany have 30 - 35 ICU beds per 100,000 inhabitants, while Spain/France/Italy have 10-12, and China has about 3.6. Notwithstanding whatever valid criticisms we can level at our healthcare system, U.S. critical care is regarded as some of the best in the world. Therefore, it takes a far larger surge of COVID-19 patients to overwhelm hospitals in the U.S. or Germany than in Italy and Wuhan. The U.S. hospital system, with half its ICU beds full, still has more capacity available than the Italian hospital system, with *all of its beds empty*.

Of course, things can vary substantially from community to community. For example, per data from the [Washington Post](#), there are 42 ICU beds per 100,000 inhabitants of San Francisco, 28 in Sacramento, but only 14 in Santa Cruz. Moreover, as we've seen in New York, certain hospitals in hard-hit communities in the same metro area can be overwhelmed, while other hospitals elsewhere in the metro area might be fine.

This speaks to the silliness of assuming that the same policy interventions are appropriate everywhere. Well-equipped communities will have far lower risk than communities with less hospital care available; the intensiveness of interventions, holding all other factors equal, will need to be far less in the former than the latter.

The second reason for empty hospitals is that “elective” procedures at hospitals have been mostly canceled to free up capacity for COVID-19, and many people are avoiding hospitals. (We will return to both of these issues later; they are very important.)

However, the third - and in this part of the analysis, most immediately relevant - reason is simply that the anticipated surge of COVID-19 patients is, for the most part, simply not showing up. California, Oregon, and Washington are [sending ventilators to New York](#) because they don't need them.

And despite the well-known conditions in NYC as of April 7th, not so far away in upstate New York, hospitals had a very different problem: [“Instead of coronavirus patients, Syracuse hospitals swamped with empty beds.”](#)

The state directed the hospitals three weeks ago to cancel scheduled elective surgeries and take other steps to make room for an anticipated wave of coronavirus patients. While Onondaga County has seen a spike in the number of people testing positive for the virus, that has not translated into an appreciable increase in hospital admissions.

The three hospitals had 860 patients on March 2 in medical-surgical beds used for routine care and in intensive care and critical care beds. The average daily census for those beds today is 508, a decline of 352 patients.

About 20 percent of the decrease is due to a decline in seasonal influenza activity which had hospitals full in early March. But most of the decline is due to the cancellation of elective surgery, a major money maker for hospitals.

Similar stories are being told across the nation [by nurses and doctors](#):

An anxious ER nurse in Los Angeles took to Facebook recently to ask whether any of her colleagues nationwide were experiencing layoffs because hospital emergency rooms are virtually empty — one of the most surprising unintended consequences of the coronavirus crisis.

“This doesn't seem to be talked about at all... People are losing their shifts and paychecks and jobs,” the L.A. nurse wrote. “We only had 5 people in the whole ER when they sent me home. My agency sent out an email blast basically saying that there are a lot of people struggling to find shifts.

The response to her post was overwhelming.

More than 140 responses from across the country were posted on the Facebook private group page “All-ER nurses.” Most were concerned about diminished hours — or having no work at all — and the economic distress that would follow.

[...]

An ER nurse who works in Northern Virginia and asked not to be identified, told InsideSources that his emergency room has been like a ghost town for weeks. He called his shifts the easiest of his career.

“The only thing there is more of in the ERs right now is free food,” he said, referring to the food and other gifts community members are dropping off in support of hospital staff.

“Yes, we are dealing with some COVID-19 patients,” he said. “It’s just not nearly the war zone the media is making it out to be.

“As far as the amount of actual people in the ER, I don’t know if I’ve ever had a census this low three weeks in a row. Every shift is half empty.”

Of course, proponents of lockdowns will immediately argue - see, we averted disaster with lockdowns!

Perhaps this is true in some places. However, analysis suggests otherwise – one analysis suggests that there was [very little change in expected modeled deaths](#) depending on date of lockdown.

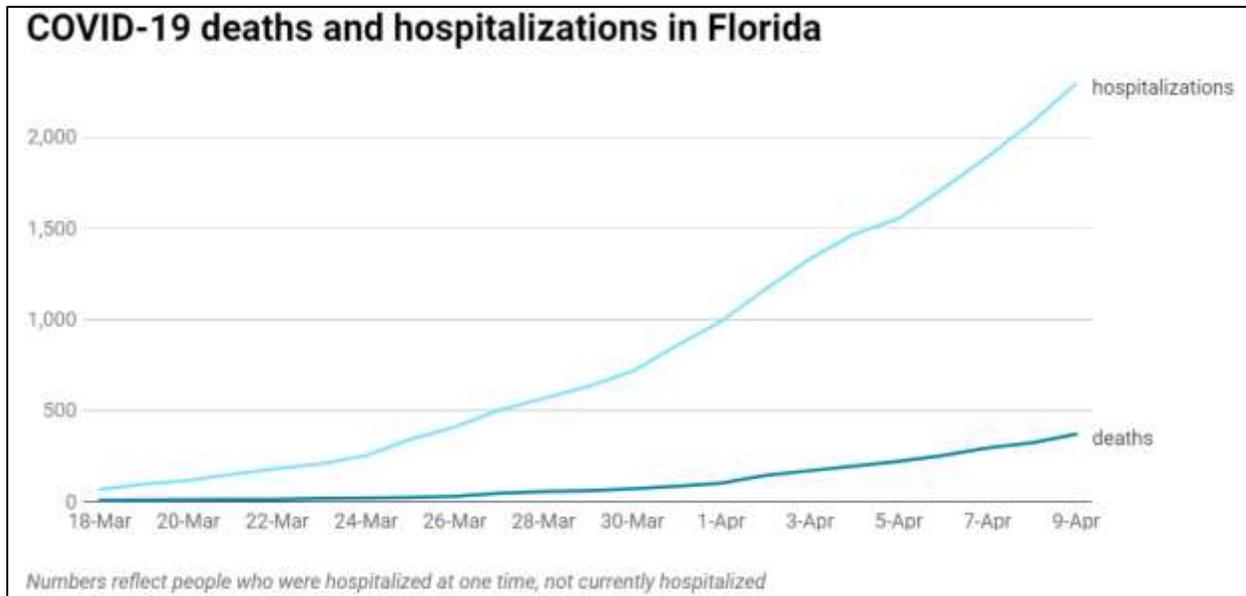
We can do our own analysis, too: science demands controls – we can’t reasonably know what effect intervention X has, if we aren’t able to compare it to what happened in the absence of interventions.

Using “natural controls,” we can demonstrate that the trickle, rather than surge, of COVID-19 patients is not *solely* the result of lockdowns. Lockdowns may be a contributing factor, but there are plenty of examples of places with late lockdowns - or *no* lockdowns - that haven’t seen hospital admissions go parabolic. This suggests that in many places, targeted interventions and self-policing by responsible citizens is enough to avert disaster.

Let’s drill in on the example of Florida. Florida would seem to be a high-risk state for several reasons. First, living up to its image as the retirement community of America, Florida has the second-oldest percentage of residents >65 years of age in the U.S.. [Over 1 in 5 Florida residents are in this elderly age group](#). Community spread started in Florida fairly early, with Dr. Fauci noting as of March 11th that Florida - as well as California, Washington, and New York - was a state where community spread [was definitely occurring](#). Meanwhile, we all know about all the cruise ships; Florida is the [only state to generate more than \\$1B in cruise-related spending](#), and accounts for 60% of all passenger embarkations for the entire U.S. cruise industry.

Subsequently, of course, we saw videos of spring-breakers [partying on Florida beaches](#), prompting widespread shaming on social media. Florida finally went into lockdown in early April, widely bemoaned as too little, too late - [“delayed lockdown decision](#) could haunt DeSantis,” proclaimed one headline.

How has this translated into reality? Keep in mind that hospitalizations today are a lag measure of infections contracted well in the past. Below is a [chart of total cumulative hospitalizations](#) (not current hospitalizations) in Florida. Again: not going parabolic; the chances of Florida hospitals being completely overwhelmed over the next week is zero.



That article in the Miami Herald, posted on April 3rd, notes 60% of ICU beds were “already full” and noted the risk of ICU beds being completely overwhelmed, per the Murray model:

About 60% of the state’s 6,000 ICU beds are already taken, according to Agency for Health Care Administration data on Friday evening. And it’s still about a month before experts say the state will hit its peak number of COVID-19 cases.

[...]

According to data from the Institute for Health Metrics and Evaluation at the University of Washington School of Medicine that predicted through August 4 between 40,000 and 178,000 deaths nationwide, Florida could have all of its ICU beds filled by April 16.

How is ICU capacity doing today, almost 10 days later? [Here’s data](#) from Florida noting that about 63% of adult ICU beds and 57% of pediatric ICU beds are full - or, pretty much the same as the utilization 10 days ago.

Hospital ICU Beds Census and Staffed Availability as Reported in ESS

To download to Excel - Click Download at the bottom right of the screen then click Cross Tab

Last Updated: 4/12/2020 3:47:31 PM

County	Adult ICU Census	Available Adult ICU	Available Adult ICU%	Total Adult ICU Capacity	Pediatric ICU Census	Available Pediatric ICU	Available Pediatric ICU%	Total Pediatric ICU Capacity
Grand Total	3,812	2,270	37.32%	6,082	342	262	43.38%	604

This is even before considering measures to add more capacity: some [Florida hospitals have noted](#) that they can “double or triple” their ICU capacity if needed:

“In preparation for the prospect of additional intensive care needs, we have already created additional ICU bed capacity at Flagler Hospital and have the ability to add more very quickly if needed,” said Gina Mangus, Flagler Hospital spokeswoman.

[...]

Both Smith and Crossman said their hospitals have the ability to increase the number of beds in their intensive care units should the need for more coronavirus-specific beds arise.

“We are currently working to double or triple our capacity,” Smith said.

So, if the lockdown was really “too little, too late” when it arrived ten days ago, why haven’t thousands of patients who contracted COVID-19 prior to that time shown up in Florida hospitals in the interim?

Finally, one more useful control experiment comes from overseas: Sweden. Sweden’s approach has notably differed from that of the rest of the world, as they have implemented some social distancing, but have been more targeted in doing so. A piece in National Review puts it [quite bluntly](#):

If the COVID-19 pandemic tails off in a few weeks, months before the alarmists claim it will, they will probably pivot immediately and pat themselves on the back for the brilliant social-distancing controls that they imposed on the world. They will claim that their heroic recommendations averted total calamity. Unfortunately, they will be wrong; and Sweden, which has done almost no mandated social distancing, will probably prove them wrong.

Lots of people are rushing to discredit Sweden’s approach, which relies more on calibrated precautions and isolating only the most vulnerable than on imposing a full lockdown. While gatherings of more than 50 people are prohibited and high schools and colleges are closed, Sweden has kept its borders open as well as its preschools, grade schools, bars, restaurants, parks, and shops.

[...]

*This is, in fact, the first time we have quarantined healthy people rather than quarantining the sick and vulnerable. As Fredrik Erixon, the director of the European Centre for International Political Economy in Brussels, [wrote](#) in *The Spectator* (U.K.) last week: “The theory of lockdown, after all, is pretty niche, deeply illiberal — and, until now, untested. It’s not Sweden that’s conducting a mass experiment. It’s everyone else.”*

[...]

“The strategy in Sweden is to focus on social distancing among the known risk groups, like the elderly. We try to use evidence-based measurements,” Emma Frans, a doctor in epidemiology at Sweden’s Karolinska Institute, told Euronews. “We try to adjust everyday life. The Swedish plan is to implement measurements that you can practice for a long time.”

The problem with lockdowns is that “you tire the system out,” Anders Tegnell, Sweden’s chief epidemiologist, told the Guardian. “You [can’t keep a lockdown going](#) for months — it’s impossible.” He told Britain’s Daily Mail: “[We can’t kill all our services](#). And unemployed people are a great threat to public health. It’s a factor you need to think about.”

If social isolation worked, wouldn’t Sweden, a Nordic country of 10.1 million people, be seeing the number of COVID-19 cases skyrocket into the tens of thousands, blowing past the numbers in Italy or New York City? As of today, there are [401 reported COVID-19 deaths in Sweden](#).

The really good news is that in Sweden’s ICU census, which is updated every 30 minutes nationwide, admissions to every ICU in the country are flat or declining, and they have been for a week. As of this writing (based on currently available data), most of Sweden’s ICU cases today are elderly, and 77 percent have underlying conditions such as heart disease, respiratory disease, kidney disease, and diabetes. Moreover, [there hasn’t been a single pediatric ICU case](#) or death in Sweden — so much for the benefits of shutting down schools everywhere else. There are only 25 COVID-19 ICU admissions among all Swedes under the age of 30.

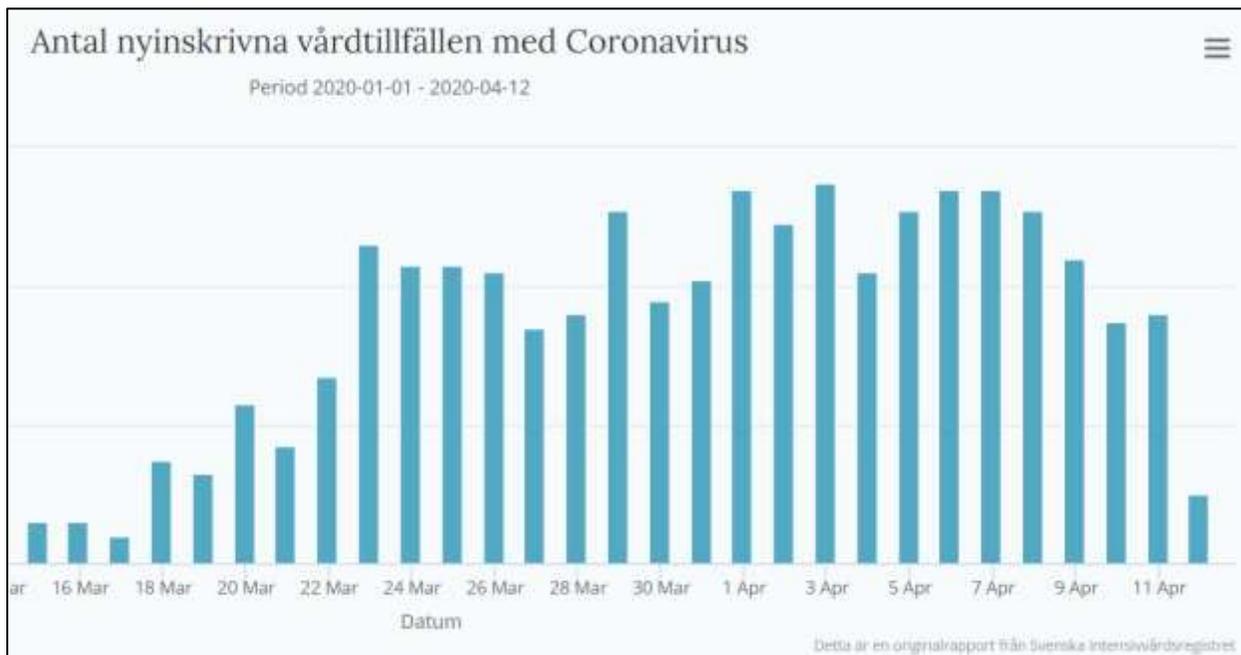
[...]

Sweden is developing herd immunity by refusing to panic. By not requiring social isolation, Sweden’s young people spread the virus, mostly asymptotically, as is supposed to happen in a normal flu season. They will generate protective antibodies that make it harder and harder for the virus to reach and infect the frail and elderly who have serious underlying conditions.

The Swedish story is of course not over, and we will get to see how this experiment plays out in the coming days and weeks. However, we can see - from hard data published by the Swedish government - that ICU admissions for COVID-19 [have not gone parabolic](#):



Similar to the total COVID-19 ICU census, the number of *newly entered* COVID-19 cases has also not skyrocketed, actually remaining pretty steady since late March:



There are many demographic factors that may be at play here, including population density and other cultural considerations. It is certainly possible that Sweden may need to tighten measures in the future.

However, importantly, such actions would not invalidate the evidence that even in the absence of a total lockdown, the healthcare system did not immediately become vastly overwhelmed.

In total, we can see that northern Italy and NYC are not the “norm” for what will happen without absolute and total lockdowns. In many places, more targeted, thoughtful, and less intrusive measures may well accomplish the same goal: avoiding an overwhelmed healthcare system.

1.4: Understanding Dose-Response and R0

1.4.1: And Alexander Wept

We are going to transition now into an entirely different yet equally important domain: understanding the nuances of coronavirus. So much of it is treated as some sort of law of physics or mathematical certainty: the coronavirus spreads at X rate (R0) if unchecked; if you get the coronavirus, you have Y chance of being hospitalized or dying.

It turns out that the truth is not so simple. We’ll get to R0 eventually, but let’s first start with the idea of dose-response - the concept that “the dose makes the poison.”

People are, in some cases, going to alarming lengths to avoid exposure to any coronavirus. A (relatively young) friend of mine posted a picture on Facebook of burnt mail: he’d accidentally set it on fire by putting it in the microwave. A friend of my mom’s is disinfecting delivered packages outside her front door, opening them there, and bringing only the contents inside the house.

While these make for funny stories, the underlying idea is also driving public policy: i.e., that all exposures to the coronavirus are equally dangerous.

We’ll get to hard science in a minute, but let’s start with an analogy. Imagine that you’re a small town in ancient times, and a few bandits show up. Your existing defenses are more than sufficient to deal with these bandits; no damages or casualties are suffered.

Now imagine that a small raiding party shows up. Your life might be disrupted for a little while: you might need to lock the gates, train ordinary citizens as militia, and send riders to the next town over asking for additional men. The bandits may claim a few lives and burn a few buildings, but ultimately, they will be defeated.

Finally, imagine that you wake up one morning to see that outside your walls, Alexander the Great has set up camp, with his entire army. In polite terms: you’re screwed. It really doesn’t matter what you do. Before you can even attempt to muster up more of a defense, your entire town is either razed or occupied.

This is an oversimplistic, but somewhat helpful, analogy in understanding viral dose-response. Indeed, it is the premise of attenuated live-virus vaccines, such as MMR and varicella. The [CDC notes](#) that the small dose of weakened but still-living virus can still overwhelm the immune systems of immunocompromised children, but it poses no risk to healthy children. Our immune systems easily vanquish the virus, but still build protective antibodies in the process that confer future immunity against larger doses.

1.4.2: Flu, Measles, HIV, SARS-1: Higher Dose Increases Disease Severity

Physician Siddhartha Mukherjee observes in the New Yorker that a wide variety of viruses, from [HIV to flu to measles to the SARS-1 coronavirus](#) from the early 2000s, display a dose-response relationship where a higher titer of virus leads to a higher severity of illness:

Could a lower initial exposure, as with children treated with tika, also lead to a lower set point? Faced with a smaller challenge, the immune system could have a greater chance of controlling the pathogen. In contrast, if you’re inundated with multiple high-dose exposures, the swiftly replicating invader could gain ground that the immune system might be hard-pressed to reconquer.

[...]

“Our data confirmed that there’s a dose-response relationship in viral transmissions for HHV-6,” Mayer told me. “The more virus you shed, the more likely you are to infect others.” He’d managed to turn around the rearview mirror of epidemiology.

[...]

That raises the second question—does a larger viral “dose” result in more severe disease? It’s impossible to erase from one’s memory the image of Li Wenliang, the thirty-three-year-old Chinese ophthalmologist who sounded the alarm on the first covid-19 cases, in his final illness; a photograph shows him crimson-faced, sweating, and struggling to breathe in a face mask, shortly before his death.

[..]

Could the striking severity of their disease—twenty- and thirty-year-olds with covid-19 generally experience a self-limited, flu-like illness—be correlated with the amount of virus to which they were initially exposed? At least two E.R. doctors in the United States, both on the front lines of the pandemic, have also fallen critically ill; one of them, in Washington State, is only in his forties.

To go by available data from Wuhan and Italy, [health-care workers](#) don’t necessarily have a higher fatality rate, but do they suffer, disproportionately, from the most severe forms of the disease? “We know the high mortality in older people,” Peter Hotez, an infectious-disease specialist and vaccine scientist at Baylor College of Medicine, told CNN. “But, for reasons that we don’t understand, front-line health-care workers are at great risk for serious illness despite their younger age.”

Some suggestive research has been done with other viruses. In animal models of influenza, it’s possible to precisely quantify exposure intensity, and mice who were given higher doses of certain influenza viruses developed a more severe form of the disease.

[...]

What sparse evidence we have about coronaviruses suggests that they may follow the pattern seen in influenza. In a 2004 study of the coronavirus that causes SARS, a cousin of the one that causes covid-19, a team from Hong Kong found that a higher initial load of virus—measured in the nasopharynx, the cavity in the deep part of your throat above your palate—was correlated with a more severe respiratory illness.

*Nearly all the SARS patients who came in initially with a low or undetectable level of virus in the nasopharynx were found at a two-month follow-up to be still alive. Those with the highest level had a twenty- to forty-per-cent mortality rate. This pattern held true regardless of a patient’s age, underlying conditions, and the like. Research into another acute viral illness, Crimean-Congo hemorrhagic fever, reached a similar conclusion: **the more virus you had at the start, the more likely you were to die.***

Perhaps the strongest association between the intensity of exposure and the intensity of subsequent disease is seen in measles research. “I want to emphasize that measles and covid-19 are different diseases caused by very different viruses with different behaviors,” Rik de Swart, a virologist at Erasmus University, in Rotterdam, cautioned when we spoke, “but in measles there are several clear indications that the severity of illness relates to the dose of exposure. And it makes immunological sense, because the interaction between the virus and the immune system is a race in time. It’s a race between the virus finding enough target cells to replicate and the antiviral response aiming to eliminate the virus. If you give the virus a head start with a large dose, you get higher viremia, more dissemination, higher infection, and worse disease.”

He described a study from 1994 in which researchers gave monkeys different doses of the measles virus and found that higher infection doses were associated with earlier peaks in viremia. In human beings, de Swart added, the best evidence comes from studies in sub-Saharan Africa.

“If you acquire measles through household contacts, where the density and dose of exposure is the highest—you might be sharing a bed with an infected child—then you typically have a higher risk of developing more severe illness,” he said. “If a child contracts the disease through playground or casual contact, the disease is usually less severe.”

Of course, it is too early to know for sure exactly how dose-response functions in COVID-19; Mukherjee points out that there is one known virus, respiratory syncytial virus, where for some reason dose-response actually appears to be *inverse* (i.e., higher doses might result in less severe disease.)

Nonetheless, we'll return to a common theme: we are making decisions based on necessarily imperfect information; we cannot afford to wait for perfect information, because it might well be years away, by which time COVID-19 will have infected everyone it's going to infect either way.

We know a few things. First, the [base rate](#) - most viruses seem to display a positive dose-response relationship, *including*, importantly, SARS-1. We know that the genome and behavior of SARS-CoV-2 is extremely similar to that of SARS-1; [one paper](#) notes:

SARS-CoV-2 shares a highly similar gene sequence and behavior pattern with SARS-CoV.

Second, we also have another source of suggestive data: the fact that a disproportionate number of young and healthy doctors and nurses are suffering from severe, and in some cases fatal, cases of COVID-19. What do we know about these healthcare workers who are falling sick? They are constantly exposed to very sick patients who are likely shedding high titers of virus.

So, based on all of the above information, it is logical to assume with a high degree of confidence that SARS-CoV-2 indeed has a dose-response curve like that of other viruses. If there was no dose-response, or if it was inverse, we would, respectively, expect doctors and nurses to not be disproportionately affected, or even to be disproportionately *spared*. This is clearly not what is happening.

This data leads to a number of important corollaries. The first is that it is clearly absolutely critical that brave front-line healthcare workers, including first-responders like paramedics, need to have sufficient PPE (personal protective equipment) - damn the cost. Just as we wouldn't send firemen into burning buildings without all their gear, so too we should not be sending healthcare workers into COVID-19 wards without protective equipment.

The second corollary, however, is that we should not use the illness severity of healthcare workers as a measure of risk for the general population. We are not talking about ironclad laws, of course, and someone who receives a low dose of virus could still become very ill, whereas plenty of people who receive a high dose of virus might be just fine.

Nonetheless, the risk of being coughed on a single time on a trail in a public park, or shaking hands with someone asymptomatic (who is likely shedding lower doses of the virus), is clearly not the same as the risk of working all day, every day, in an environment with constant exposure to very sick people.

Simple and near-costless interventions like masks, handwashing, and some distancing might not reduce the number of people who get sick - i.e., we will all be exposed eventually - but they may well reduce the *severity* of illness on average, by lowering the average exposure dose.

A third and final corollary is that lockdowns / shelter-in-place orders might paradoxically *increase* not only the volume but also the *severity* of transmission, over certain time periods and in certain circumstances. To the extent that lockdowns result in more close contact between family members, a higher severity of disease will result.

This is not to say that lockdowns could not well decrease transmission in many cases, but it does mean that we should be thoughtful about how we implement social-distancing, rather than implementing it in a haphazard and bizarre way that reduces social contact in some settings, but actually significantly intensifies it. We will return to this idea in the “disadvantages” section.

1.4.3: Not All Rs Are Created Equal

The same idea that applies to viral titers also applies to viral spread. We can see, with some basic logic, that R_0 and R will be very different in different environments.

Let's start here: one thing that has become clear is that NYC is an outlier, rather than the norm. As previously discussed, even states like Florida that would, conceptually, seem to be at high risk of severe COVID-19 outbreaks, have not gone parabolic the same way New York has.

Why could this be? Well, let's go back to the fundamental premise of social distancing. If you interact with fewer people (let's call this variable "X," as if you're hugging these people), then R will be lowered. So, in mathematical terms, we could create an equation in the form $R = f(x)$, where f is some function relating the spread of COVID-19 to the number of people, X, that we interact with on a daily basis.

I don't think there is anything controversial about the above statement; indeed, much has been made of "superspreaders" - the lady in Korea who gave COVID-19 [to 37 people at her church](#), or a man in Chicago who attended various gatherings and transmitted COVID-19 [to 16 people](#).

It is reasonably easy to demonstrate that the opposite could be true as well: imagine a prepper who goes into town to buy his annual semi-load of canned goods. He contracts COVID-19 from someone at Costco, then returns to his cabin in the wilderness, where he lives alone. The "X" - number of interactions - that this prepper subsequently has, upon becoming contagious, is zero. So it doesn't matter very much that he has COVID-19, from a transmission perspective, as he's not going to give it to anyone else.

This leads to a rather obvious conclusion: *in the absence of any interventions*, some communities will have far higher R0s than others. It does not need demonstrating that "X" is far higher in midtown Manhattan than in suburban Dallas Fort-Worth.

The population density of the NYC metro area is apparently 5,318 per square mile, compared to something on the order of 700 people per square mile for the D/FW metro area. 1-2% of D/FW residents use public transit; about two-thirds of NYC residents do. Weather may play a role as well; endemic coronaviruses that cause the common cold are seasonal, and weather conditions in D/FW might reduce the extent to which COVID-19 can efficiently spread.

So in a place like D/FW, you may well be worried about "superspreaders" at megachurches and sports stadiums. But *every single person who works in Midtown* could very well be a "superspreader." You take the subway to work, pressed up against dozens of people, coughing all over them in a small, enclosed space for however long your train ride lasts. (To our previous point about dose-response, all of these people will not just be coughed on once, but repeatedly - and common surfaces in the subway will undoubtedly be heavily coated with COVID-19 virus.)

You emerge onto a packed sidewalk, coughing on hundreds of additional people on your way to work. When you step out for lunch, coffee, or a smoke, you cough on hundreds of additional people. And then in the evening, you cough your way back to the subway, infect some more people, then arrive home.

All told, it's not inconceivable that a single person with COVID-19 commuting from Brooklyn to Midtown could, in the absence of any interventions, expose a thousand people *per day*. Not all of these exposures would cause infections, but it is self-obvious - and shockingly under-discussed - that somewhere like NYC is a tinderbox for COVID-19 transmission, whereas low-density, car-dominated suburbs in the rest of the country have naturally lower R0s.

In non-urbanized areas, people interact with fewer people *because there is more space*. With most people utilizing private vehicles, and much less cramped offices, restaurants, coffee shops, and retail stores, daily life has a far lower "X" in suburban D/FW than in NYC. The same, of course, goes for much of the south, southwest, and Midwest, where land is cheap and plentiful and communities therefore to build *outward* rather than *upward*. Much-derided suburban sprawl is perhaps the best natural defense we have against the spread of pandemics: most of us who live in low population density areas do so because we explicitly *want* some personal space, and don't like being forced to come within six feet of hundreds of people every day. With or without a pandemic, we don't find the crowds of cities to be pleasant.

The important consequence: the intensity of intervention necessary will not only depend on differing regional hospital capacity, but also the inherently differing R0 in a community. In *any* community, restricting large gatherings is likely to meaningfully reduce disease transmission - but it doesn't make any sense to propose that all Americans should live under the same rules. A socially-active extrovert in Tulsa might well interact with fewer people, *naturally*, than a loner

introvert in New York City who is nonetheless forced into close contact with hundreds or thousands of people per day.

Conclusion: interventions should be tailored to the needs of individual localities, rather than a “one-size-fits-all” blanket approach.

1.5: Assessing Actual Risk

1.5.1: Averages Conceal Risk Dispersion

Averages can be very sneaky and deceiving, as Jordan Ellenberg explains in his engaging book [How Not To Be Wrong \(review + notes\)](#). If you put Bill Gates in a room with 50 janitors, the average net worth per person is comfortably over a billion dollars - but the median person in that room obviously does not fly on a private plane, and may not even fly at all.

Similarly, if you put an 85-year-old in a room with four toddlers, the average age might be 18 - but nobody in the room is heading off to college in the fall.

Thus, in data sets with extreme dispersions, analyzing the data in a segmented way yields far more useful results than looking at broad, population-wide averages.

Take [this table](#) from the South Korea CDC (as of April 6th, 2020):

Case distribution by gender and age group:		Confirmed Cases (%)	Deaths (%)	Fatality rate (%)
Total		10,237 (100)	183 (100)	1.79
Sex	Male	4,098 (40.03)	97 (53.01)	2.37
	Female	6,139 (59.97)	86 (46.99)	1.40
Age	80 and above	462 (4.51)	91 (49.73)	19.70
	70-79	681 (6.65)	51 (27.87)	7.49
	60-69	1,289 (12.59)	25 (13.66)	1.94
	50-59	1,904 (18.60)	13 (7.10)	0.68
	40-49	1,370 (13.38)	2 (1.09)	0.15
	30-39	1,083 (10.58)	1 (0.55)	0.09
	20-29	2,789 (27.24)	0 (0.00)	-
	10-19	535 (5.23)	0 (0.00)	-
	0-9	124 (1.21)	0 (0.00)	-

While the overall fatality rate of tested cases in South Korea appears to be 1.8%, this is a pretty useless figure on its own, as it dramatically *understates* the risk for many people while dramatically *overstating* the risk for others. Only a single age group of people – 60 – 69 – are even anywhere close to the “average” risk.

Segregating the data into age groups makes things considerably more clear. If you are over the age of 80, coronavirus is extremely deadly, with a fatality rate 10x the national average.

However, out of a confirmed 7,805 cases in those under the age of 60, there have been a total of 16 deaths, or 2 deaths per 1000 infected. Moreover, there was not a single death in almost 3,000 cases of those in their 20s, not a single death recorded in infants, children, or teenagers, and a grand total of 3 deaths among those aged 30 - 50. So the fatality rate for those between 40 and 50 is 10x *less* than the national average, and the fatality rate for those between 20 and 40 is 100x less than the national average.

We will return in more depth to assessing risk to the general population later; for now, it is enough to point out that the risk to most people is very small, while the risk to some people is very large.

1.5.2: Nobody Asked Grandma to Die for the Dow

We will pause here to address a common concern. Many people like to make reductionistic assessments of those, like me, who are making data-driven rather than emotionally-driven arguments. “Grandma died for the Dow” and other pithy witticisms are essentially pejoratives implying that we have only two options: selfishly sacrifice the elderly (and immunocompromised) to benefit the young and healthy on the one hand, or altruistically sacrifice everyone to protect the elderly and immunocompromised on the other hand.

That’s an overly reductionistic and false dichotomy: I have parents in their 60s and 70s, and grandparents in their 80s and 90s. Of course I care about these people; of course I don’t want my mom to die. I have friends with diabetes and cancer, too; I don’t want them to die, either.

Nonetheless, my conclusion after studying the data is that currently, we have embarked on a path that more or less destroys the economy for everyone, and severely infringes upon quality of life for everyone, and causes severe health impacts for some and at least modest health impacts for us all, to protect a small group of people who are particularly vulnerable to this virus. Pointing this out does not mean that we don’t care about that group of people.

It simply means, instead, that we should first do no harm, and stop hurting everyone who is suffering more from lockdowns than from COVID-19. We could, instead, more effectively use our resources to protect those who are vulnerable *even more than we currently are*, while not infringing upon the constitutional rights, mental and physical health, and economic well-being of everyone else.

1.5.3: Targeted Interventions: HIV as a Comparative

Let’s step back and discuss, for a moment, our public health initiatives to eradicate a different disease: HIV.

We all know that HIV is an extremely serious disease; few cases of HIV are “mild” or “asymptomatic” - a few people are genetically immune to HIV; for everyone else, it’s a big deal. HIV infects about 40,000 Americans per year, primarily otherwise young and healthy people. AIDS complications lead to about 15,000 HIV deaths per year.

Public health organizations, naturally, have a goal of driving HIV to zero. But let’s look at how they’re actually doing it. In its document “[Ending The HIV Epidemic: A Plan For America](#),” the CDC notes that HIV risk is very concentrated among specific populations, rather than dispersed throughout the population as a whole:

Most new HIV infections in the United States are highly concentrated in certain geographic hotspots. More than 50 percent of new HIV diagnoses in 2016 and 2017 occurred in 48 counties, Washington, DC, and San Juan, Puerto Rico. We also know that seven states have a disproportionate occurrence of HIV in rural areas. [...]

New infections are highly concentrated among men who have sex with men; minorities, especially African Americans, Hispanics/Latinos, and American Indians and Alaska Natives; and those who live in the southern United States.

The self-obvious corollary to this geographic and demographic concentration of risk is to aim the hose where the fire is. The planned interventions are highly targeted, both geographically and demographically.

Resources will be targeted to those areas that need them, and specific programs will be provided to high-risk groups, such as gay and bisexual men, minorities in certain areas, and those who share needles, who are overwhelmingly and disproportionately affected by HIV:

For the first five years (Phase I), the initiative will focus on a rapid infusion of new resources, expertise, and technology into those parts of the country now most impacted by HIV. [...]

Of the estimated 1 million Americans at substantial risk for HIV and who could benefit from PrEP, less than 1 in 4 are actually using this medication. In May 2019, HHS and Gilead Sciences announced that the pharmaceutical company has agreed

to donate PrEP medication for up to 200,000 individuals each year for up to 11 years. In December 2019, HHS launched Ready, Set, PrEP, a nationwide program that provides PrEP medications at no cost to thousands of individuals who qualify.

In addition, SSPs are an effective component of a comprehensive, integrated approach to HIV prevention among people who inject drugs. Nearly 30 years of research has shown that comprehensive SSPs are safe, effective, and cost-saving, do not increase illegal drug use or crime, and play an important role in reducing the transmission of viral hepatitis, HIV and other infections.

This, of course, all makes profound sense. The government has identified that a very small percentage of the population is highly vulnerable to HIV, and is promoting interventions that, for these vulnerable groups, will provide more benefit than harm, and more savings than costs.

The “PrEP” mentioned above is “pre-exposure prophylaxis” - antiretroviral drugs that substantially reduce one’s risk of contracting HIV, *even if they are exposed to it*. While these drugs do have side effects (a [tradeoff](#)), it obviously makes sense to encourage gay men who have unprotected sex with many partners to take these drugs, as HIV is a much more serious risk for them.

But the government could take another approach, as well. What if they forced - rather than encouraged - *every American*, not just those vulnerable, to participate in the fight against HIV?

What if they came into the home of happily married, HIV-negative heterosexual couples, and said - congratulations, Mr. and Mrs. Cleaver, *you* are ground zero for reducing HIV transmission. Here, take PrEP or else! Alternatively, the government could also shut down Tinder and Grindr as “non-essential apps” and implement “sexual distancing,” criminalizing all unprotected sex outside of monogamous relationships between confirmed HIV-negative partners.

Either of these approaches would be seen as ridiculous, for three reasons. First, they’re the equivalent of wasting fire trucks on waterparks rather than chemical plants - you’re diverting resources from something likely to blow up spectacularly, and instead spending those resources on something that is at vanishingly low risk of catching fire.

Second, such an approach would cause more harm than good. Long-term use of PrEP can cause severe side effects, such as [kidney damage](#). It would make no sense to subject over a hundred million American adults to these side effects, when their risk of getting HIV in the first place approximated zero. The health harms from PrEP side effects would vastly outweigh the health harms from HIV among this population.

Third and finally, we would view such measures as a gross invasion of civil liberties: whether we’re happily married or swiping like a demon, we don’t want the government intruding in our bedrooms. Note, by the way, that sex outside of monogamous relationships has *already* been criminalized in response to COVID-19 - in most of the country, it is illegal to go on a friendly first date, never mind spending the night.

Despite the seriousness of HIV as a disease, and the fact that - like COVID-19 - you can be asymptomatic and yet cause someone else’s death through your own actions - the government doesn’t see fit to mandate PrEP for at-risk populations, or even mandate *condoms*, which have *no* health side effects whatsoever.

We will return to this idea in a later section.

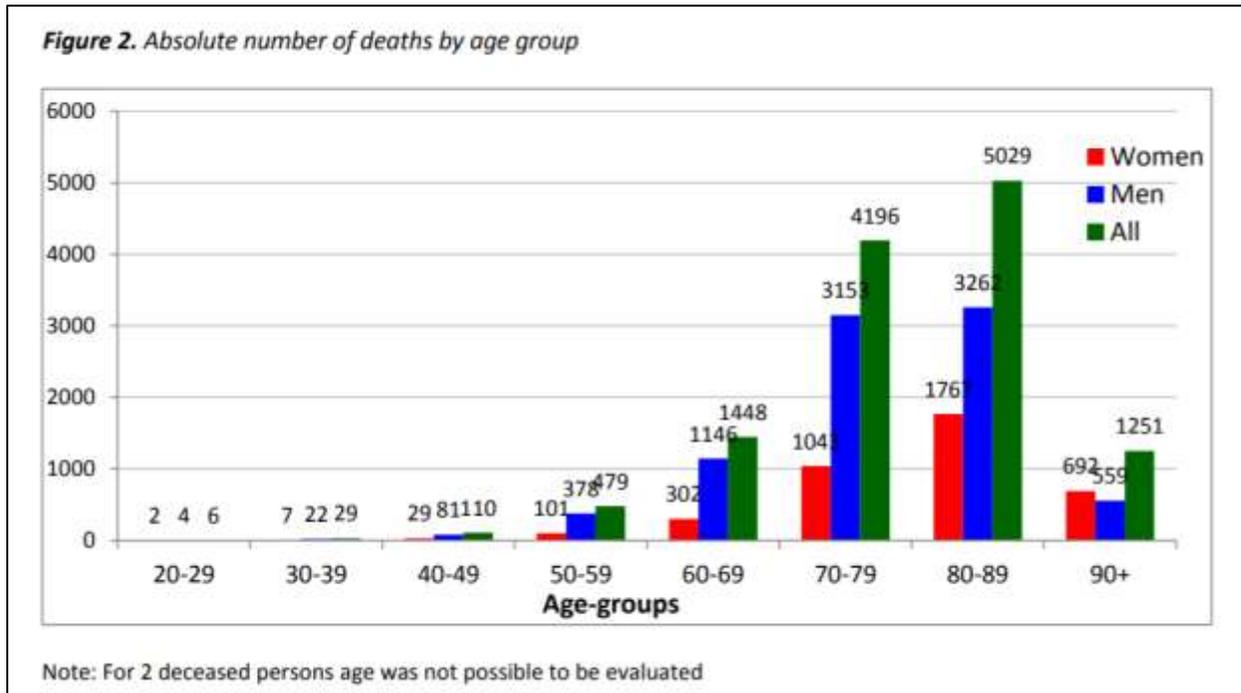
1.5.4: More Data on Risk

Coming back to coronavirus, when we further analyze the data - say, in places like Italy, one of the worst-hit in the world - we find similar conclusions to South Korea. Most of the population is at very low risk for coronavirus. A [report produced by the Italian government](#) on April 2, 2020 notes:

Mean age of patients dying for COVID-2019 infection was 78 (median 80, range 24-100, IQR 73 -85). Women were 3,943 (31.4%). Figure 1 shows that median age of patients dying for COVID-2019 infection was more than 15 years higher as compared with the national sample diagnosed with COVID-2019 infection (median age 62 years).

As of April 2nd, 145 out of the 12,250 (1.2%) positive COVID-19 patients under the age of 50 died. In particular, 35 of these were less than 40 years, 26 men and 9 women (age range between 24 and 39 years). For 14 patients under the age of 40 years no clinical information is available; the remaining 18 had serious pre-existing pathologies (cardiovascular, renal, psychiatric pathologies, diabetes, obesity) and 3 had no major pathologies.

Here is the chart, demonstrating that despite the over 10,000 total deaths, merely 35 of them (four tenths of a percent) occurred in those under 40:



This would again comport with the South Korea data, and when combined with the previous data suggesting that cases are massively under-reported, it seems likely that the death rate in healthy adults under the age of 50 is probably under 0.2%, with the death rate for those under 40 probably vanishingly small.

Moreover, in the population at large, most of those who perished in Italy had multiple significant comorbidities.

Tabella 3. Most common comorbidities observed in COVID-19 positive deceased patients by gender

Diseases	Women		Men	
	N	%	N	%
Ischemic heart disease	64	19.2	238	30.9
Atrial Fibrillation	84	25.2	165	21.5
Heart Failure	78	22.5	108	13.8
Stroke	37	11.1	90	11.7
Hypertension	251	75.4	543	70.6
Type 2-Diabetes	102	30.6	245	31.9
Dementia	66	19.8	107	13.9
COPD	44	13.2	158	20.5
Active cancer in the past 5 years	54	16.2	134	17.4
Chronic liver disease	10	3.0	35	4.6
Chronic renal failure	66	19.8	193	25.1
Number of comorbidities				
0 comorbidities	4	1.2	27	3.5
1 comorbidity	86	25.8	157	20.4
2 comorbidities	79	23.7	184	23.9
3 comorbidities and over	164	49.2	401	52.1

Admittedly, some of these comorbidities (such as hypertension) are very common - however, others, such as heart failure, stroke, COPD, and cancer, are not things that the average young and healthy person, or even many elderly people, suffers from. My parents and grandparents, ranging from 60s to 90s, have either zero or at most one of these comorbidities. To have two or three of these suggests that the people dying from COVID-19 tend to be in very poor health, to begin with.

When further segmenting deaths and severe cases of COVID-19 to exclude those who suffer from such serious conditions, it is clear that the population under 50 without such conditions is at very low risk from COVID-19 - likely lower than the one-in-572 lifetime risk of dying from a car accident (0.17%). Similar data is rapidly becoming available in America as we learn more and more - for example, [in Minnesota](#), while there are lots of younger people testing positive for the disease, the median age of hospitalization is 63, and the median age of death is **86**, again a very similar pattern to Italy, to South Korea, to everywhere else:

Despite recent public focus on older Minnesotans in group-living situations, the case counts showed that the most common age group for Minnesotans confirmed with the coronavirus is not the elderly, but those between 20 and 44 years old.

As of Sunday, that age group included 380 cases, which was higher than the 315 cases seen in people ages 45 to 64, the next-most prevalent group. Medicare-age residents accounted for only 212 of the cases, while those 19 or younger made up 28.

However, older residents appear to be more likely to need intensive hospital care if they are exposed.

The median age of a Minnesotan with a confirmed coronavirus case was 49 on Sunday, but the median age of someone who was hospitalized or treated in the intensive care unit of a hospital was 63. The median age of people who have died from the illness was 86.

It is popular to cite, as counterexamples, isolated incidents of those who are young and healthy who died from COVID-19. These are indeed tragedies, but anecdotes cannot be the basis of public policy when data points in a different direction.

We can find anecdotes for lots of things. Just in Texas: in 2018, [this 38-year-old woman perished of the flu](#); earlier in 2020, a 20-year-old woman had a heart attack and died, [after being infected with type-B influenza](#). Surely the attending doctor had never seen anything like that either; it is very rare for 20 year olds to have heart attacks.

Long ago, when he was exactly my age, Texas Governor Greg Abbott ended up paralyzed from the waist down because a tree fell on him while he was jogging. He has since required a wheelchair. These are tragedies, but outliers nonetheless, and do not mean that all of us should put our lives on hold every flu season, or that we should shake with fear every time we walk by a tree.

We have to look at the data as a whole. A [preprint](#) from Ioannidis et al notes that even in New York City - one of the worst-hit areas in the U.S., as well as the entire world - the risk of death from COVID-19 from those under the age of 65 is comparable (my analogy) to the risk of death a truck driver takes every single day during a single 8-hour shift of driving at 60 mph, with gas and bathroom breaks:

Individuals with age <65 account for 5%-9% of all COVID-19 deaths in the 8 European epicenters, and approach 30% in three US hotbed locations. People <65 years old had 34- to 73-fold lower risk than those ≥65 years old in the European countries and 13- to 15-fold lower risk in New York City, Louisiana and Michigan. The absolute risk of COVID-19 death ranged from 1.7 per million for people <65 years old in Germany to 79 per million in New York City.

The COVID-19 death risk in people <65 years old during the period of fatalities from the epidemic was equivalent to the death risk from driving between 9 miles per day (Germany) and 415 miles per day (New York City).

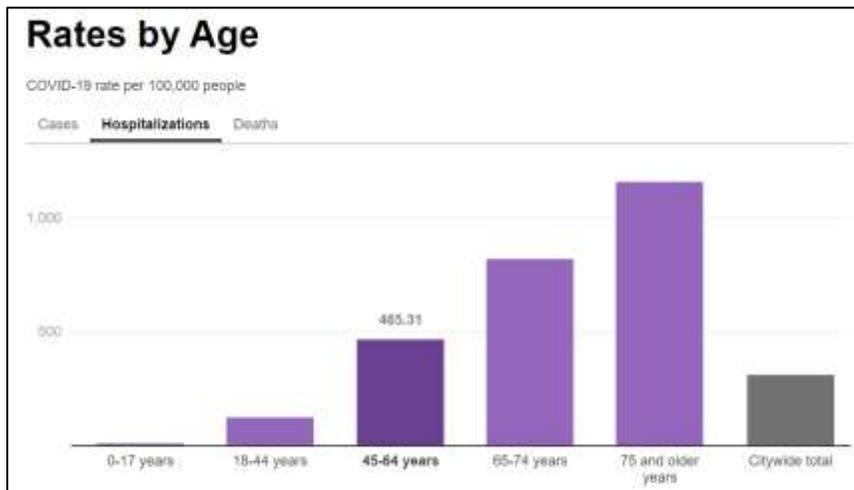
People <65 years old and not having any underlying predisposing conditions accounted for only 0.3%, 0.7%, and 1.8% of all COVID-19 deaths in Netherlands, Italy, and New York City.

CONCLUSIONS: People <65 years old have very small risks of COVID-19 death even in the hotbeds of the pandemic and deaths for people <65 years without underlying predisposing conditions are remarkably uncommon. Strategies focusing specifically on protecting high-risk elderly individuals should be considered in managing the pandemic.

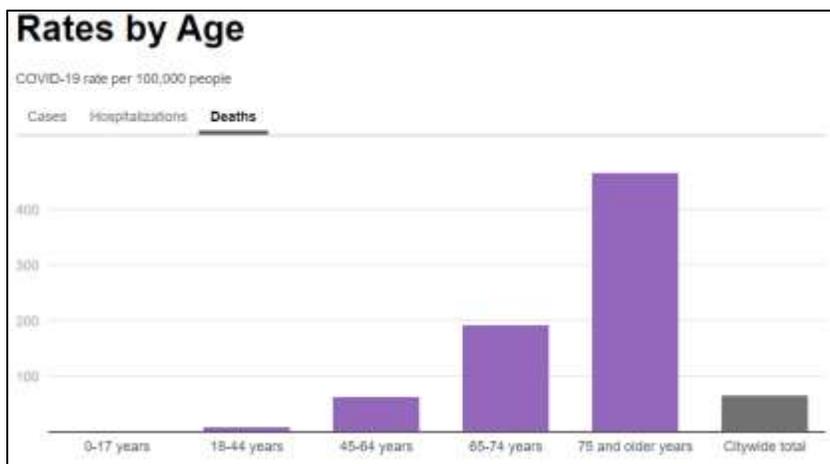
So, absent hospitals being overwhelmed, most young and middle-aged Americans without predisposing health conditions are at very low risk from COVID-19.

Perhaps the most relevant metric for public policy is hospitalizations. As discussed earlier, it is a reasonable and valid goal to ensure that hospitals are not overwhelmed for months on end, as this would cause significant increases in mortality from not just COVID-19, but from many other treatable health conditions.

Let’s look [at data from NYC](#), the worst-hit portion of America: as a percentage of population, *almost 15x as many hospitalizations* are from those who are 65 and older, rather than from those who are between the ages of 0 and 45:



Of course, this doesn’t tell the whole story for a few reasons. First, older individuals are disproportionately likely to have long (rather than short) hospital stays, and require ICU care as opposed to normal care. As demonstrated by the “deaths” data, 4 out of every 100,000 people in NYC under the age of 45 have died from COVID-19, whereas that rate is 464 - 116x higher - for those in the 75+ range.



Note that this comports with the data from elsewhere; in South Korea, for example, CFR was 100x higher for those 80+ vs. those 40 - 49.

We must remember that a disproportionate portion of those hospitalized (and deceased) in the under-45 group will have specific pre-existing conditions such as diabetes. Third, the age group bands are so broad that they are likely not helpful; rates would undoubtedly be even more disparate if we had 10-year age bands all the way from 20 to 90.

1.5.5: Nursing Homes vs. College Campuses: Not All Interactions Equal

A key takeaway here is that preventing a *single* COVID-19 infection in a nursing home - where individuals are very elderly and very likely to have predisposing health conditions - will likely save as many lives, and have the same burden reduction on the healthcare system, as preventing *hundreds* or *thousands* of COVID-19 infections in the general population of those under the age of 50 with no pre-existing conditions.

It thus becomes obvious why targeted interventions will be more effective, at lower cost (both human and monetary), than broad interventions. The HIV comparison actually becomes quite relevant here - just as the CDC estimates that there are a million people at significant risk of HIV who tend to have highly identifiable demographic and geographic factors, the CDC [estimates that there are about 1.5 million people who live in 17,000 nursing homes](#). This is the single most highly vulnerable population to COVID-19; that is not to say there are not other populations, but this one is the easiest to address.

It is clearly much easier to isolate *one* nursing home with 100 elderly and infirm residents, than it is to reduce social contact among a city with 10,000 or 100,000 young and healthy residents. The former is much less costly, and much less invasive.

Yet both will have *similar impact* in terms of reducing hospitalizations and reducing deaths: as we saw in Washington, it's not unlikely that in the absence of intervention, a significant proportion of those living in a single nursing home could perish of COVID-19. As of today, the AP estimates that [more than 3,300 nursing home residents have died](#), representing **15%** of known U.S. deaths. This is despite the fact that nursing homes represent merely 0.5% of the total U.S. population. So those in nursing homes are *33x more likely to die than the population as a whole*, and, by extension, hundreds or maybe even thousands of times more likely to die than the population of young and healthy individuals. And when COVID-19 gets into a nursing home, it can kill many residents:

Outbreaks in just the past few weeks have included one at a nursing home in suburban Richmond, Virginia, that has killed 42 and infected more than 100, another at a nursing home in central Indiana that has killed 24 and infected 16, and one at a veteran's home in Holyoke, Mass., that has killed 37, infected 76 and prompted a federal investigation. This comes weeks after an outbreak at a [nursing home in the Seattle suburb of Kirkland](#) that has so far claimed 43 lives.

To be clear, I'm not advocating that we isolate nursing homes, and do *nothing* else *anywhere* else. I will, later, propose some interventions that could benefit healthcare workers, the immunocompromised, and the elderly. This simply demonstrates that it's not as if we have a choice between "lock down everybody" or "uncontained contagion." We should be more thoughtful in where and how we target our interventions, so that we're doing the most good - reducing risk for those who need it - while doing the least harm - not causing harms to those who are likely to see no benefit.

To this end, let's look back at the decision by many colleges to either encourage or *force* students to leave on-campus housing and return home - supposedly, to prevent the spread of COVID-19.

Imagine two scenarios. In the first, a college student remains on a now mostly empty college campus. In violation of "shelter in place" orders, the college student interacts with a few other friends on campus, who in turn interact with a few other friends, such that every college student on campus is eventually exposed to COVID-19. On a sufficiently large campus with a sufficiently large remaining student population, a handful of students may eventually require medical attention, likely not all at one time.

However, further transmission of COVID-19 beyond this population is very low, as the students remain on campus (with all public entertainment venues shut), and pick up food from on-campus or have it delivered, from campus employees who maintain social distancing. Such a scenario, while a violation of guidelines promulgated by

substantially all locales in the U.S., results in very little burden on the public health system caused by these students, and very few (if any) deaths - simply because these college students are not interacting with many, if any, elderly people.

Generally, the only elderly people on a college campus are professors or workers, most of whom have been sent home. Absent their parents and professors, college students as a group are not known for their frequent interaction with the elderly or infirm; the overwhelming majority of people in the social network of a college student tend to be very young and very healthy.

Let's take a separate scenario, in which a college student returns home from this relatively safe and sheltered environment. Imagine that the student lives with a sibling, two parents, and an elderly grandparent. If the student already had COVID-19, this elderly grandparent is now at risk.

Worse yet, imagine that one of the parents works at a grocery store or pharmacy (where they encounter many hundreds of people on a daily basis, either directly or through interacting with common surfaces.) Imagine that the other parent works at a long-term care facility for elderly with underlying health conditions. Even if neither parent is at high risk of COVID-19 illness *themselves*, this college student returning to their permanent residence from on-campus housing - perfectly legal and advised under current guidelines - could very well result in tens or hundreds of deaths, and substantial burden on hospitals, if they pass the infection along to their parents, who then pass it along to their colleagues and customers in high-risk, high-transmission areas.

Do you see the problem here? Not all social interactions are created equal, and the close familial interactions allowed under "social distancing" may well, in many cases, be far more dangerous than the ones forbidden, particularly given the dose-response characteristics of viruses including SARS that Dr. Mukherjee discussed in the New Yorker. A group of 20somethings interacting with each other, *if isolated from vulnerable populations such as the elderly and immunocompromised*, is likely to result in de minimis burden on the healthcare system.

However, the single link of interaction between husband and wife who work in high-risk, high-transmission places, is cause for far more alarm than a small dinner party on a college campus, or on a rural farm. Public health would be far better served by isolating this hypothetical couple *from each other*, than by isolating single twentysomethings from each other. Indeed - and it's heartbreaking - some doctors have started voluntarily isolating themselves from their families, to protect both families and patients.

If someone goes out into the world for an "essential" activity allowable under current guidelines, and returns with COVID-19 and subsequently infects their family members via the sort of close contact that facilitates intra-family transmission of *all* respiratory illnesses (such as common influenza and rhinovirus), if those family members are elderly, or simply those who interact with many elderly people, far more burden on the health system is created than if we took the opposite approach.

If anything, as discussed by Sweden's head epidemiologist, if the younger, healthy population gains immunity to coronavirus, that itself will go a long way in protecting the elderly - because remember, this is not a short-term fight, but rather a war that will not end until we reach herd immunity, or a vaccine is developed. A vaccine would likely will not arrive in time for a potential second wave in the fall, were one to occur. And it's not a reasonable solution to just keep locking the entire population down for months at a time over the next couple of years.

Dr. David Katz, [in an exceptionally insightful piece in the New York Times](#), made very similar observations:

If a germ can't secure its hold on your body, your body no longer serves as a vector to send it forward to the next potential host. This is true even if that next person is not yet immune. When enough of us represent such "dead ends" for viral transmission, spread through the population is blunted, and eventually terminated. This is called herd immunity.

What we know so far about the coronavirus makes it a unique case for the potential application of a "herd immunity" approach, a strategy viewed as a desirable side effect in the Netherlands, and briefly considered in the United Kingdom.

[...]

The clustering of complications and death from Covid-19 among the elderly and chronically ill, but not children (there have been only very rare deaths in children), suggests that we could achieve the crucial goals of social distancing — saving lives and not overwhelming our medical system — by preferentially protecting the medically frail and those over age 60, and in particular those over 70 and 80, from exposure.

Why does this matter?

I am deeply concerned that the social, economic and public health consequences of this near total meltdown of normal life — schools and businesses closed, gatherings banned — will be long lasting and calamitous, possibly graver than the direct toll of the virus itself. The stock market will bounce back in time, but many businesses never will. The unemployment, impoverishment and despair likely to result will be public health scourges of the first order.

[...]

So what is the alternative? Well, we could focus our resources on testing and protecting, in every way possible, all those people the data indicate are especially vulnerable to severe infection: the elderly, people with chronic diseases and the immunologically compromised. Those that test positive could be the first to receive the first approved antivirals. The majority, testing negative, could benefit from every resource we have to shield them from exposure.

It should be noted that Dr. Katz, himself, tested positive for COVID-19 - and has continued all the while to espouse viewpoints similar to the above.

More broadly, the implications of this also support another theory that's been floated around: that lockdowns might actually, at least in the short term, *exacerbate* the number of severe COVID-19 cases (while lowering the total number of cases) because people are being forced into more close contact, where they are likely to - literally - get more virus on each other.

Kids, for example, who might have come home from a closed school with a mild / barely noticeable case of COVID-19, might be coughing and sneezing and picking their noses all over their grandparents, who are helping out with childcare while the kids are out of school.

Nana might well be at orders of magnitude more risk from the unavoidable close interaction with her own sweet grandchildren, who are constantly up in her face getting germs all over her, rather than a stray cough from the stranger walking by her in the park. Bear in mind the earlier data about COVID-19 already being far more widespread than we knew it was: by the time lockdowns were implemented, it was already widely circulating in many communities.

This isn't a hypothetical concern: take our next-door neighbors. They are generally healthy, socially-active people who spend a lot of time going to concerts, etc. Two of them are under 30; the other two are under 60.

It is completely possible that one of them (out of four) contracted a mild case of COVID-19; they are now all trapped in the house with their grandpa in his early 90s, who has a number of health conditions. He, for one, might well have been safer if they had all been out and about, rather than permanently home.

[Emergency-room physician Jeremy Faust](#), a faculty member at Harvard, made similar observations:

For this reason, I think that a one-size-fits-all blanket approach to social distancing is not only a bad idea—in some areas it could be harmful. No one's really doing the analysis. Closing a school could cause deaths because parents are still going to work and the kids are gonna be watched by Grandma.

Faust has consistently been calling for a more thoughtful approach to social distancing. It's just that nobody's listening to him. Again, nobody (me included) is advocating for packed sports stadiums tomorrow. Caution is valid. But when we simply act without analysis, we risk doing more harm than good (as we will get to in section 2, disadvantages).

1.6: Mission Creep: Saving Lives Is Not A Valid Rationale For Shelter-In-Place

One thing that can make for very bad decisions is “mission creep” or “thesis creep.” You start down path X for reason Y, and it later turns out that reason Y ceases to exist, or is invalid - yet you are still on path X. Simply being on path X is not a good enough reason to continue down path X, if the justification for doing so has been abandoned.

Initially, we (as a nation) started down this path of shelter-in-place lockdowns on the basis that COVID-19 was an alarmingly serious disease that would kill millions of Americans and turn hospitals into war zones. This justification turned out to be grossly inaccurate; we now have *substantial* data confirming or suggesting a number of considerations:

- Absolute risk for COVID-19 was substantially overstated, as the overwhelming majority of mild/asymptomatic cases have not been counted. The prevalence of COVID-19 as of early April 2020 is 10 - 100x confirmed cases, with the corollary that disease severity is thus 10 - 100x less than previously believed for the general population, and completely negligible for the very young and very healthy.
- Models relied upon for shaping policy have consistently failed to provide directionally-useful outputs over a matter of *days*, let alone *weeks* or *months*.
- The horse is out of the barn, and we cannot reduce *true* (rather than recorded) case count to zero in any acceptable length of time, unless summer weather severely suppresses or ends transmission.
- Risk is indeed highly concentrated among three specific vulnerable populations: the elderly, those with existing health conditions, and healthcare workers. Targeted interventions to support and protect these sub-populations will have a similar or greater impact to broad interventions among the general population.
- Differing hospital capacity, dose-response, and R0 characteristics of the virus mean that not all exposures and places are created equal, so the same policies are not appropriate in every circumstance.

It is now clear that, even in the absence of *any* interventions, millions of Americans would never have died: such an estimate is simply not consistent with what we now know about COVID-19’s actual severity. Given the rapid doubling time of the virus, herd immunity would have been achieved in relatively short order, at the costs of deaths numbering perhaps somewhere in the hundreds of thousands.

In light of this information, it is clear that we can no longer continue down the shelter-in-place path for months on end. Criminalizing childrens’ playdates is *prima facie* one of the grossest widespread violations of constitutionally-guaranteed rights in modern American history, and as such, we do not need to demonstrate that shelter-in-place lockdowns cause harms for them to be unjustified in the face of new data. We will, however, demonstrate *substantial* harms, outweighing benefits for most Americans, in the next section.

Some, however, will attempt to argue that depriving Americans of liberties for substantial periods of time is justified in an effort to save lives numbering in the high tens of thousands or low hundreds of thousands.

Let us briefly demonstrate that this is inconsistent with existing public health policy: two of the leading causes of preventable death in the U.S. are [cigarette smoking](#) and [lack of exercise](#); fixing these issues could save up to a million lives per year. If it’s okay to suspend the Constitution to save lives, we could classify tobacco as a Schedule 1 drug like heroin, and we could mandate that every American must complete 500 MET-minutes of exercise per week (equivalent to two hours of brisk walking, or three 25-minute sessions of swimming laps.)

The immediate pushback would be: well, these aren’t *transmissible* causes of death; i.e., they only affect people who choose not to exercise, or who choose to smoke, rather than everyone. Fine: then let’s focus on transmissible causes of death. **The flu kills 20 - 50,000 annually, with up to 80 - 100,000 deaths in bad seasons, and secondhand smoke kills up to 40,000 Americans annually.**

Both of these causes of death are highly preventable without much if any cost or intrusion on liberty. Yet we do nothing – we just say “oh well.” Mandating the flu shot could increase vaccination rates from the current

~40% to ~80% while increasing worker productivity due to fewer sick days. Similarly, implementing public smoking bans nationwide requiring smokers to move a reasonable distance away from others before lighting up would reduce heart-attack, stroke, and cancer admissions to hospitals by a substantial percentage.

In both cases, we would be asking people for mere *minutes* of their time, to save many lives that are lost through their selfish actions (i.e, smoking around others, and not getting their flu shot). I've provided additional analysis in Appendix 1.

Yet neither policy is in force nationwide: we have apparently decided that the 50 - 100,000 lives lost each year to these two causes are not worth even the most *modest* and *trivial* of interventions.

It is thus woefully internally inconsistent to use “saving 100,000 lives” as a justification for ending American life as we know it *ad infinitum*: there are other preventable sources of death we could modify far less intrusively, to save hundreds of thousands of lives per year, every year - not just this year. COVID-19 deaths do not deserve special snowflake status.

We could save more lives over the next decade, by simultaneously lifting shelter in place orders, doing nothing about COVID-19, and instead mandating the flu shot and banning public smoking.

In the absence of the risk of overburdened hospitals, saving lives on the order of tens or hundreds of thousands is not a valid basis for shelter-in-place orders.

2: Disadvantages: The Extraordinary Public Health Costs of Shelter-In-Place

2.1: An Inconvenient Truth

In justifying shelter-in-place orders, officials have frequently used the weasel word “inconvenience” to describe the negative effects of these lockdowns. These effects are trivialized as a very minor, unimportant price to pay for a much greater gain.

For the overwhelming majority of Americans, however, the cost/benefit of shelter-in-place orders is entirely the opposite of this description. It's COVID-19 that's “inconvenient” - an annoyance, but something we can live with - and shelter-in-place orders that are the real danger, even if we completely disregard the ruinous economic consequences.

In this section, we will overview - with a substantial amount of data - how a great number of Americans are suffering irreparable harm as a result of these lockdowns.

2.2: Signing Death / Trauma Warrants for Abused Children

We are extremely fortunate that COVID-19 largely spares children. With a sample size of several million confirmed cases, tens of millions more real but unconfirmed cases, and over a hundred thousand deaths, we know that very few children have been hospitalized with COVID-19, let alone died from it.

For example, per [data from the New York City government](#), there have only been a tiny number of child hospitalizations - and zero child deaths - associated with the significant coronavirus outbreak there.

This is in contrast to the flu, which actually poses a [significant risk to young children](#).

As such, excluding neonates and very young infants, the health risk to children from the coronavirus, for all intents and purposes, approximates zero. Unfortunately, the health risk to children from shelter-in-place orders is much higher, and it is painfully clear that more children will die in 2020 as a result of lockdowns than as a result of COVID-19.

Hundreds of thousands of American children [suffer from physical or sexual abuse](#) annually, with close to 2,000 of those children dying annually of either neglect or physical abuse, and tens of thousands more suffering unspeakable trauma that leads to severe long-term [mental and physical health problems](#).

Officials advocating shelter-in-place constantly reiterate that coronavirus lockdowns are justified sacrifices of the strong to protect the vulnerable (i.e., the elderly and immunosuppressed.)

But I think we all, as a society, agree that children are the most vulnerable and deserving of protection of all. I believe the overwhelming majority of Americans, if provided with a classic “[trolley problem](#)” where a healthy school-age child was on one track and an infirm octagenarian on the other, would pull the lever to save the child.

In fact, the overwhelming majority of octagenarians would pull the lever *themselves*. And ~100% would pull the lever for their own grandkids or great-grandkids. Nobody in their right minds would choose to kill a healthy child to save an 85-year-old with serious illness; this goes against all logic.

Shelter-in-place orders are, curiously, the exact opposite of this choice.

By closing schools and churches and making playdates illegal, tens of thousands of children are now locked in a pressure cooker with an abusive parent. That abusive parent is, by the way also much more likely to now be home 24/7, leaving kids with no respite for any part of the day.

Don’t take it from me. Take it from child-abuse pediatrician Dr. Nina Agarwal, who penned a [chilling piece in the New York Times on this topic](#):

Already there are reports of a surge in suspected child abuse cases in Texas. We’ve seen this before during stressful times. During the 2008 recession, pediatricians reported a rise in infant injuries and deaths from abusive head trauma, a trend that lingered for years after the economy recovered.

When there is household dysfunction — domestic violence, parental substance abuse or a mental disorder — the risk of child abuse goes up, and there’s reason to believe all of these things will increase during this pandemic. New York is seeing an uptick in domestic violence. Suicide hotline calls are up around the country. For as long as we’re confined to our homes, many parents who are struggling with these issues will no longer have any reprieve from the hard work of keeping children fed, entertained and educated.

Children could be at risk for sexual violence in particular. An estimated one in four girls are sexually abused by age 18, and the abuse is typically perpetrated by a family member in the child’s home. Too often, children disclose the abuse to their mothers but the perpetrator remains in the home because he is the primary breadwinner. I worry that our current reality — the lack of opportunities to seek refuge outside the home combined with the difficulty of finding new living arrangements when money is tight — makes it even less likely that young victims will be able to escape their abusers.

Typically, the watchful eyes of teachers, guidance counselors and day care providers serve as lifelines for vulnerable children. Educators are the primary source of reports ([20 percent](#)) to child protective services nationwide. A teacher might see slap marks on a student’s face and make a report to authorities when the child, afraid of being taken away from his or her parents, provides inconsistent explanations for the injuries. A guidance counselor might meet with a teenager who is showing signs of depression and learn that the student’s stepfather is sexually abusing him.

As a child abuse pediatrician, I typically see more cases in the fall because abuse that occurs during the summer often goes undetected. I expect that when this period of social distancing comes to an end, I’ll see a similar surge.

These children must suffer without the ability to tell a friend or trusted adult, or ask a school counselor or church leader for help. Is this a tradeoff that could be justified in the very short term (days or weeks) if we were concerned that the alternative was millions of dead Americans?

Sure. We have to make tough choices sometimes.

Is this a tradeoff that we can continue to make for months on end, now that we know that coronavirus is not threatening our hospital capacity, and that future fatalities are far more likely to be 5 figures than 7 figures?

Absolutely and positively not. As referenced earlier, we are unwilling, as a society, to even take the tiny step of mandating the flu shot, or banning public smoking, to save tens of thousands of lives. Bear in mind that in many communities around the country, daily deaths from COVID-19 number only a handful. So why on earth is it acceptable to subject hundreds of thousands of children to an extended period of more intense, inescapable abuse, some of which will result in death, most of which will result in long-term trauma?

2.3: Signing Death / Trauma Warrants For Abused Women

We talked about the children; now let's talk about the women - who, incidentally, are also a [lower-risk group](#) from coronavirus:

It's no secret that males are in many respects the frailer sex. On average, men die younger and are at more risk of life-threatening ailments, especially heart disease and many forms of cancer.

The Sars-CoV-2 coronavirus seems to follow the same pattern. In all six of the countries that, up to 20 March, had sex-specific records of deaths from Covid-19, the proportion of men was higher than women. For four of those (China, France, Italy and South Korea), male mortality rates were more than 50% greater than female rates.

Women may be at less risk than men of severe coronavirus, but they are at orders of magnitude greater risk of physical and sexual violence perpetrated by their male partners. Across the world, domestic violence calls to police are up 20 to 30 percent or more, with [one report claiming](#) they have doubled to tripled in areas like China, Lebanon, and Malaysia.

What's called in to hotlines or police may just be the tip of the iceberg. One can intuitively see how lockdowns, which force both women and their abusers into far more close-and-personal contact, would make it far more difficult for battered women to seek help.

This is not a small problem; this [horrifying article](#) documents a chilling anecdote from China's lockdown about a woman severely beaten by her husband who could not access any relief because police were too busy and the courts were shut. Locked-in 24/7 with her husband, another woman in Spain, speaking with reporters over WhatsApp, explains her unending nightmare:

One of them, Ana — who asked that her full name be withheld — shares an apartment with her partner and says he has been regularly abusing her. He insists on total surveillance at all times. If she tries to lock herself in a room, he kicks the door until she opens it.

"I can't even have privacy in the bathroom — and now I have to endure this in a lockdown," she wrote in a message sent late at night, to hide the communication from her husband.

It also presents broader statistics (elsewhere reported [by the WSJ](#)) about the scope of the impact. What's worse is that experts seem to think things will get worse the longer the lockdowns continue:

Eventually, the lockdowns will end. But as the confinement drags on, the danger seems likely to intensify. Studies show that abusers are more likely to murder their partners and others in the wake of personal crises, including lost jobs or major financial setbacks.

Government statistics suggest that over one million American women per year [suffer from domestic violence](#), and about a thousand of those women are beaten to death. That is one million women who we are now locking up with their abusers potentially 24/7 to be more severely and frequently beaten and raped. We are forbidding them from going to work, from seeing their friends in person, or even running many basic errands. They cannot leave the house, and neither can their abusers. Imagine being trapped in a small studio apartment with no escape.

For women under the age of 60 living with an abuser, the health risk of domestic violence is clearly far greater than the risk of coronavirus. We should ask our public officials why these vulnerable women are seen as acceptable collateral damage.

2.4: Millions of Americans Deprived of Impactful Medical Care

We must not forget that COVID-19 is not the only disease in the world. There are [close to a million staffed hospital beds in the U.S.](#), and COVID-19 is not the only disease that uses these beds.

To keep hospitals empty for a surge of coronavirus patients that, in many parts of the country, seems likely never to appear, “elective” surgeries have widely been canceled. Some of these are, of course, tummy tucks and other procedures that are medically unnecessary. But don’t be lulled into thinking that the majority of “elective” procedures are Botox and Brazilian butt lifts - instead, they are real, profound medical issues that are impacting people’s quality of life.

A [very elucidating Atlantic piece](#) notes that the surgeries being delayed include operations for early-stage cancer, gallbladder removal, joint replacements, and cataracts. These are not operations that people undergo for kicks; when was the last time you heard a celebrity tweeting about “getting their gallbladder done?”

Many of these patients are suffering from severe psychological or physical pain while their procedures are being delayed; imagine having to wait indefinitely for a surgery to remove a cancer growing inside you. Imagine slowly going blind because of an aggressive cataract.

Someone in my own life is in need of a “non-essential” medical treatment to resolve a non-life-threatening but nonetheless quite painful and mobility-limiting condition that is meaningfully affecting their quality of life on a daily basis.

Moreover, emergency-room volumes have dropped, as the unchecked panic over COVID-19 promoted by the media and public health officials has caused people to lose all sense of perspective. I saw an anecdote from a doctor where a patient was relieved to learn that she’d tested negative for coronavirus - but positive for an advanced stage of a serious cancer.

Meanwhile, a doctor in Portland discusses people’s reticence to go to the emergency room [even if they’re having a heart attack](#):

Woolf has already seen patients, including those experiencing heart attacks, waiting longer than usual to go to the emergency room out of fear that they might contract COVID-19.

“If you are having a heart attack and you wait longer to come in, the result of that heart attack is going to be more severe,” Woolf said. “We can definitely take care of urgent and emergent patients and we want them to come in when it’s appropriate. Obviously, a heart attack would be a situation where it is, but their fear of exposure to COVID is keeping them at home longer.”

These are, of course, not per-se a direct cause of shelter-in-place orders, as you’re obviously still allowed to go to the hospital if you have a heart attack. However, by vastly overstating the risks of the virus to the general population, public health officials have succeeded in convincing many middle-aged men, *who are in the middle of a heart attack*, that the *potential* for COVID-19 contracted in an ER poses a greater threat to their health *than the heart attack that they are actually having, right now*.

Some have argued that scaring the general population out of their wits provided benefits by increasing compliance with social-distancing measures; this may well be true. On the other hand, it is clear that runaway panic has its own tragic health consequences: someone having a stroke who waits to call an ambulance because they’re scared of COVID-19 is likely to suffer from a far more debilitating long-term prognosis than they otherwise would.

Another piece out in the New York Times, written by Dr. Harlan Krumholz, [provides more statistics](#):

What is striking is that many of the emergencies have disappeared. Heart attack and stroke teams, always poised to rush in and save lives, are mostly idle. This is not just at my hospital. My fellow cardiologists have shared with me that their cardiology consultations have shrunk, except those related to Covid-19. In an [informal Twitter poll](#) by [@angioplastyorg](#), an [online community of cardiologists](#), almost half of the respondents reported that they are seeing a 40 percent to 60 percent reduction in admissions for heart attacks; about 20 percent reported more than a 60 percent reduction.

And this is not a phenomenon specific to the United States. Investigators [from Spain reported](#) a 40 percent reduction in emergency procedures for heart attacks during the last week of March compared with the period just before the pandemic hit.

And it may not just be heart attacks and strokes. [Colleagues on Twitter report](#) a decline in many other emergencies, including acute appendicitis and acute gall bladder disease.

The most concerning possible explanation is that people stay home and suffer rather than risk coming to the hospital and getting infected with coronavirus. This theory suggests that Covid-19 has instilled fear of face-to-face medical care. As a result, many people with urgent health problems may be opting to remain at home rather than call for help. And when they do finally seek medical attention, it is often only after their condition has worsened. Doctors from Hong Kong [reported](#) an increase in patients coming to the hospital late in the course of their heart attack, when treatment is less likely to be lifesaving.

[...]

Meanwhile, the immediate message to patients is clear: Don't delay needed treatment. If fear of the pandemic leads people to delay or avoid care, then the death rate will extend far beyond those directly infected by the virus. Time to treatment dictates the outcomes for people with heart attacks and strokes. These deaths may not be labeled Covid-19 deaths, but surely, they are collateral damage.

The public needs to know that hospitals are equipped not only to care for people with Covid-19 but also those who have other life-threatening health problems. Yes, we in health care are working to keep people out of the hospital if we can, but we can safely provide care for those people who are not sick from Covid-19. Masks and protective gear for health care workers and patients go a long way to ensure a safe environment. Also, people with chronic conditions need to know that avoidance of needed care could ultimately be as big a threat as the virus itself.

Recall the earlier piece that I cited on how for cardiac arrests, mere minutes can mean the difference between death and long-term disability, and disability and full recovery? Well, undoubtedly, every day, hundreds (maybe thousands) who suffer heart attacks, strokes, and other acute health problems are facing a higher risk of disability or death because we've scared them senseless about COVID-19 to the point that they can't intelligently assess relative risk.

Last but not least, [much scientific research](#) has been shut down. Across the country, labs researching pretty much anything that isn't COVID-19 are now closed. Diabetes, heart disease, AIDS, cancer - these are scourges whose collective death toll in America alone numbers in the *millions*, every single year. For as long as COVID-19 is our only public health priority, we are delaying valuable research into treatments and even cures for these diseases.

Deaths from some of these diseases will of course be far in the future - but hundreds of thousands of them will come very soon. Many cancer patients, and those who suffer from severe heart disease, have only months or years left. Lifesaving therapies for these patients will be delayed, because private and public research centers are all but shut down. Are these deaths less meaningful to us than deaths from COVID-19?

As hospital beds across America sit empty, awaiting a surge of coronavirus patients that refuses to arrive, we should reassess our strategy. If we continue to leave hospital beds empty for weeks on end, we are directly *causing* the exact situation we were so worried that COVID-19 would cause: i.e., depriving those who need highly impactful medical care of the ability to access it in a timely fashion.

Empty hospital wards are a disservice to society: we should fill our hospitals with either coronavirus patients or normal patients whose treatments have been postponed. The whole justification for "flattening the curve" was to

avoid overwhelmed healthcare systems - but healthcare systems are, by and large, *not overwhelmed*, and it is unconscionable to tell people with cataracts and early-stage cancer to “keep waiting” for months on end, just in case.

A necessary corollary is that in the absence of overwhelmed hospitals, we should thus not be taking further steps to *intentionally prolong the pandemic* - having the same “area under the curve,” just over more months, means more misery for everyone.

2.5: Lockdowns Sacrifice 0.5% - 1% Of Median American Lifespan To Avoid Risk That May Be <0.01%

A premise implicit in much of current public health guidance is that we have infinite time: it's *okay* if our lives are wrecked over the next two months, or year and a half if it's deemed necessary, because then coronavirus will be gone. It's just a temporary inconvenience, and we'll have infinite time to catch up on all the things we postponed: birthday parties, vacations, or even a simple evening playing cards with a friend. The delay, however long it may last, is just the tiniest of inconveniences.

There's only one problem: our lives are not infinite. We can make more money in the future, but we can never make more time.

The median age in the U.S. is in the high 30s; a 40 year old woman, per actuarial tables, has about 500 months left to live. Here is the data in tabular format: you can see that for individuals from ages 30 - 60, 1% of their remaining lifespan decreases from half a year to merely three months.

Age	30	40	50	60	70	80
Actuarial Remaining Life (Years)	52	42.5	33.3	24.6	16.6	9.7
1% of remaining lifespan (in months)	6.2	5.1	4.0	3.0	2.0	1.2

So three months is not merely an “inconvenience” - it is 0.5% of a 30-year-old's remaining lifespan, and 1% of a 60-year-old's remaining lifespan. These are non-trivial figures.

And yet many public health officials seem to think that it would be OK to lock us all down for 6 months, maybe even a year or two, if that's what it took to ensure that coronavirus deaths were minimized.

This is not a reasonable optimization: we cannot sacrifice several percentage points of our aggregate remaining life-years to forestall deaths of tenths of a percentage.

It is a mathematical reality that for the median American woman, six months represents more than 1% of her remaining expected lifespan. The experienced quality of life during the next six months under a shelter-in-place lockdown is obviously far lower than the quality of life without a lockdown: lockdowns deprive us of many of the things that make life meaningful.

So, the median American woman of 40 years old has a far, far lower than 1% chance of dying of coronavirus - with reasonable measures, it's likely measured in the hundredths or thousandths of a percent.

But she has a 100% chance of experiencing severely impaired quality of life for 0.5% - 1% of her remaining lifespan if she is forced into a shelter-in-place order that extends into summer.

Is that a worthwhile tradeoff? Well, that's a question for us to answer, not the government. Just as the government doesn't ban people from smoking cigarettes or eating hot dogs, neither should it ban people from leaving their houses.

Someone who wishes to make such a decision to stay home permanently to avoid the risk of COVID-19 - and, for that matter, every other virus, bacterium, car crash, and other cause of mortality - can of course do so of their own free choice.

Of course, not all months of one's life are equal, leading to the concept of a QALY (or [quality-adjusted life year](#)). The idea of a QALY is that a life-year with significant health problems is worth significantly less, to a given individual, than a life-year of perfect health.

For example: my parents (in their 60s and 70s) enjoy the outdoors as much as I do, but due to various joint problems, can no longer go on strenuous hikes on rough terrain. My grandmother, in her 90s, needs a walker and has to ride a motorized cart up the stairs.

So, a planned vacation this summer could very well be the last time my mom and dad can go for anything resembling a "hike" - it's not a guarantee that their health would allow it next year, let alone 5 years from now.

A "shelter-in-place" lockdown that prevents us from taking a family vacation thus might not just represent the sacrifice of *one* of the potential vacations my parents have: it might very well represent the sacrifice of their *last and only* hiking trip, which they would value greatly and cherish for the rest of their lives.

2.6: Lockdowns Exacerbate Education Inequality, Sacrificing At-Risk Students' Best Chance At Future Health and Prosperity

Education is a public health issue: extended school shutdowns are likely to result in the destruction of millions of aggregate life-years.

Why? Well, we know that education is critically important for not only economic outcomes, but [also for long-term health outcomes](#). [One study](#) notes:

Phelan and colleagues found that U.S. adults ages 45 to 64 with nine to 11 years of education had a 93 percent higher mortality rate than individuals with 17 or more years of schooling for highly preventable causes of death.

[...]

This body of research documenting trends in educational differences in mortality since 1960 has demonstrated that educational attainment has become a very strong differentiator of men's mortality and longevity over the past 50 years. And more recent evidence clearly points to widening educational differences in mortality for women as well.

[...]

At age 25, women with less than a high school degree were estimated to live an average of 50 additional years, while women with a graduate or professional degree were estimated to live 62 additional years—a difference of 12 years. The gap was even wider for men: Men with less than a high school degree were estimated to live an additional 44 years on average, but men with a graduate or professional degree were expected to live an additional 60 years—a difference of 16 years.

As a result of abrupt school closures and transition to online education, tens of millions of children are now receiving a substandard education. The children (or grandchildren) of public officials and other white-collar professionals like myself will generally be fine: these school districts likely have better budgets for technology tools, the kids themselves will have plenty of access to electronics and the internet, and - most importantly - they have well-educated parents who can help fill the gaps for what is being lost for online learning.

Not all students are so lucky, however - many immigrants, whether from Asia or Latin America, do not have sufficiently good English to assist their children with schoolwork. Even among parents who grew up in the U.S, many dropped out of school and might not be able to provide help with middle-school or high-school level material.

Our education system is not exactly stellar to start with: 14% of the American adult population [cannot read](#), and over half of the 3.8 million students who are currently eighth-graders cannot read at grade-level standards.

Again, for kids of well-to-do white-collar parents, a few months out of school may be no big deal - but for kids who were struggling to begin with even with the full resources of the education system, months of subpar instruction may make it even harder for them to achieve the long-term educational outcomes they deserve.

This is particularly and doubly true if the fallout from shelter-in-place orders causes their families to struggle economically - putting pressure on the kids to help support their families rather than focus on schoolwork. These children may fall so far behind that they're unable to complete high school, let alone make it to college or beyond.

This is not a hypothetical concern. A recent story in [Politico](#) highlights the very real challenges facing even older students right on the brink of success:

Some high school seniors are dropping their first-choice schools in favor of colleges that are cheaper and closer to home, early surveys have found. Others are thinking about going part-time, or taking a gap year so they can work and bail out families whose breadwinners are suddenly out of work. Those who work with low-income students worry freshmen from poor families who were sent home this semester may never return and high school seniors won't get the hands-on help they need with their financial aid applications.

[...]

"We're on the edge of the precipice," said Bridgette Davis, a researcher and doctoral candidate at the University of Chicago who is studying 31 low-income students navigating their first year of college. Many have told Davis they are now less confident that they will successfully finish their current college semester, let alone re-enroll in the fall.

Meanwhile, this [LA Times story](#) not only provides a painful overview of the economic struggles of a hard-working mother trying to keep her family together, but also provides a glimpse into how many younger children in America may be hit with a double-whammy of both financial and educational insecurity:

But when would the [unemployment] money come? She still doesn't know.

Meanwhile, with no savings, how would she feed the children? How would she pay the monthly rent of \$1,400 on her half of the small lime-green duplex off South Figueroa Street, due next week? The landlord charges \$10 for every late day and was not offering any relief.

And what about the \$300 monthly loan on her 13-year-old Honda Accord? Or her \$140 monthly car insurance bill? The gas bill? The electric bill?

Should she cancel the \$35 monthly Wi-Fi? But then her son Alan could not access his school's promised distance learning.

It's not just school closures, however. Lockdowns exacerbate inequality. Well-to-do families - such as mine - can afford to buy books on Amazon, to buy laptops and iPads, to keep the internet on no matter what happens to us economically. We don't need public resources to ensure our children can receive a proper education.

For many, though, that's not true. The widespread [shuttering of libraries](#) deprives already-vulnerable populations of valuable and critical resources like access to books, computers, and the internet:

Libraries also serve as a lifeline for low-income families. They loan out far more than just books, Brixey says—[baking materials](#), [power tools](#), and general supplies that the more well off may take for granted. Libraries provide social resources for disadvantaged children or seniors, not to mention internet access in rural communities or for those who can't afford it.

Again, this results in a double-whammy for “at-risk” students in our education system - not just because the latter group is more likely to be *economically* affected by job loss, but because these children are also deprived of valuable supplemental government resources that they disproportionately benefit from.

I don’t see anyone discussing these tradeoffs: there are tens of millions of at-risk students who, collectively, will lose millions (maybe tens of millions) of life-years due to educational losses and foregone future prosperity and health, as a direct result of school closures and shelter-in-place orders.

Conversely, considering that the median age of death from COVID-19 is well into the 80s in many places - with significant comorbidities - for the median we save from COVID-19, we are likely saving only a handful of life-years, and certainly a very low number of QALYs.

This brings us back to the trolley problem. Again, to be absolutely crystal clear, I am not suggesting that we simply let “Grandma die for the Dow.” I like my grandma a lot.

What I am observing, however, is that there is no analysis in which substantial aggregate harm done to children is justified in attempting to protect elderly and infirm individuals, especially when we can instead offer those individuals *targeted* protections that don’t simply treat millions of children as so much collateral damage.

2.7: Lockdowns Damage Short-Term Immune Function and Long-Term Physical and Mental Health, While Promoting Suicides

2.7.1: Brief Overview

Presumably, a global pandemic of a novel pathogen is a time when you would want to avoid impaired immune function. Unfortunately, as we’ll see, shelter-in-place lockdowns directly impair short-term immune function through several separate mechanisms:

- Substantially increased stress/anxiety related to the news and circumstances, which directly impairs immune function and also leads to coping mechanisms such as increased alcohol consumption, which demonstrably and significantly increase individuals’ susceptibility to ARDS (acute respiratory distress symptom, the mechanism)
- Substantially increased loneliness and isolation, which leads to the same as above, and, separately, promotes both short-term mental health crises (including suicides) while demonstrably and empirically causing an increase in long-term PTSD.
- Worsened diet / reduced ability to exercise, which both impair short-term immune function and lead to substantial morbidity and mortality burden in the long-term via cancer, heart disease, diabetes, and other severe illnesses.

2.7.2: Lockdowns Directly Increase Alcohol Consumption, Which Increases Susceptibility to ARDS Death Mechanism of COVID-19

We’ll actually start with an effect here rather than a cause, then circle back to the (multiple) underlying causes. It is clear that worldwide, people are self-medicating their way through “shelter in place” with alcohol. Tracked alcohol sales in the U.S. were up 55% [during the third week of March](#), mirroring trends worldwide - [sales of hard liquor](#) such as vodka and whiskey soared 31% and 47% in Russia during the last week of March, for example.

People drinking at home obviously don’t have a bartender or buddy to say “hey man, you’ve had enough.” Recovering alcoholics - and those trying to get sober - are deprived from the valuable in-person component of AA meetings. And hitting the bottle hard leads to weaker immune function, including - of most immediate importance - [increased susceptibility to](#) pneumonia and acute respiratory distress syndrome, the *exact* phenomenon which COVID-19 and SARS cause:

Clinicians have long observed an association between excessive alcohol consumption and adverse immune-related health effects such as susceptibility to pneumonia. In recent decades, this association has been expanded to a greater likelihood of acute respiratory stress syndromes (ARDS), sepsis, alcoholic liver disease (ALD), and certain cancers; a higher incidence of postoperative complications; and slower and less complete recovery from infection and physical trauma, including poor wound healing.

So, when we lock low-risk young and middle-aged Americans alone in their homes, it is inevitable that many of them will cope with alcohol. Entirely setting aside the well-known long-term disastrous effects of addiction, for such individuals, their short-term risks from COVID-19 actually subsequently *increase* if and when they are exposed to the virus.

2.7.3: Lockdown Isolations A Form Of Torture; Dose-Response Increases in PTSD/Suicide

Loneliness is well-known as an independent risk factor for all sorts of medical conditions; some researchers have noted that loneliness can be [as damaging to health as smoking 15 cigarettes per day](#).

Lockdowns are an especially pernicious form of loneliness. There is evidence - both sociological and biochemical - that they get worse the longer they go on. There is a reason that “solitary confinement” is seen as an option of last resort, even for *committed felons*. The Wikipedia summary of solitary confinement notes:

Solitary confinement is considered to be a form of psychological torture with measurable long-term physiological effects when the period of confinement is longer than a few weeks or is continued indefinitely. ... The United Nations have also banned the use of solitary confinement for longer than 15 days

In many parts of the United States, for those who live alone in small studio apartments, shelter-in-place orders are comparable, at least directionally, to solitary confinement. You’re not allowed to see your friends; you’re not allowed to leave your home for all but “non-essential” purposes, and - in the most extreme cases - you’re even restricted from going outside for a walk. Yes, you can watch Netflix and play video games, but that’s only entertaining for so long.

What can we learn about the biochemistry of sustained imposed isolation from long-term studies in both humans and animals? [One article in Psychology Today](#) notes that:

One of the most remarkable effects of chronic social isolation, as in the extreme case of solitary confinement, is the decrease in the size of the hippocampus, the brain region related to learning, [memory](#), and spatial awareness. The sustained [stress](#) of extreme isolation leads to a loss of hippocampal plasticity, a decrease in the formation of new neurons, and the eventual failure in hippocampal function. On the other hand, the amygdala increases its activity in response to isolation. This area mediates [fear](#) and [anxiety](#), symptoms enhanced in prisoners in solitary confinement.

Studies on mice have shown that one month of social isolation caused a decrease of around 20% of the total volume of neurons, though researchers saw that remaining neurons were branching out more than those mice that were not isolated. When the isolation went on longer — up to three months — researchers saw that the extra branching of the neurons was no longer happening, and that, in exchange, spines (structures that neurons develop to place the machinery that is required to communicate to each other) were greatly diminished.

What does this mean? The branching that took place in the first month of isolation may represent some sort of compensatory mechanism that the brain puts in place in order to overcome and prevent the detrimental effects of isolation. However, when isolation went on for “too long,” this mechanism seemed to come to an end, and trigger the loss of neuronal communication in the form of spine elimination.

What are the impacts of this long term? Although only a small segment of the population is truly at risk from the virus, and children are at *~zero* risk from the virus, *everyone* (including children) is being subjected to the risk of developing long-term PTSD. Notably, per [the Economist](#), the longer we spend in quarantine, the worse our mental health prognosis gets:

The scale of the lockdowns is unprecedented. But research into previous traumatic events and other types of isolation offers some clues about the likely mental-health fallout. According to a rapid review of the psychological effects of quarantines, published on March 14th in the Lancet, a British medical journal, some studies suggest that the impact of quarantines can be so severe as to result in a diagnosis of post-traumatic stress disorder (ptsd).

The condition, which may include symptoms such as hyper-vigilance, flashbacks and nightmares which can last for years, became a formal psychiatric diagnosis in 1980, when veterans were still experiencing stress from the Vietnam war, which ended in 1975.

One study from 2009 looked at hospital employees in Beijing who in 2003 were exposed to severe acute respiratory syndrome (sars), which, like covid-19, is caused by a coronavirus. The authors found that, three years later, having been quarantined was a predictor of post-traumatic-stress symptoms. Another study, from 2013, used self-reported data to compare post-traumatic-stress symptoms in parents and children who had been quarantined because they lived in areas affected either by sars or the h1n1 outbreak in 2009, with those who had not.

It found that the mean post-traumatic-stress scores were four times higher in children who had been isolated. Among the parents who had been quarantined, 28% reported symptoms serious enough to warrant a diagnosis of a trauma-related mental-health disorder. For those who had not been in isolation, the figure was 6%.

The longer a quarantine goes on, the greater the effect on people's mental health. Another study, which also looked at the impact of SARS, found that those who were quarantined for more than ten days were significantly more likely to display symptoms of PTSD than those confined for fewer than ten days.

Someone who spent time in Iraq suggested that COVID-19 shelter-in-place orders might well be worse:

Cynthia Dearin, a consultant in Australia who spent four years in Iraq between 2006 and 2010 in various military camps that restricted her movement, said that whenever she returned to Iraq after a “decompression break”, she felt an “instant Baghdad depression”.

Living in a war zone is very different from living through a pandemic, but she sees parallels in the loss of freedom and the sense of danger. “We also had the choice to leave the lockdown,” she reflects.

“What is different now is that nobody can escape.”

And we get to the cause of the spike in alcohol sales:

In Iraq, many of her contemporaries turned to alcohol to numb the boredom and the fear. Increased sales of alcohol suggest that many are doing the same today. In Britain they were up by two-thirds in the week to March 21st compared with 2019, according to Nielsen, a market-research firm.

What we see here is that social isolation - driven by shelter in place orders - causes profound and immediate negative impacts to both our physical and mental health, and both the severity and duration of these impacts increases with the length of time that isolation is imposed. So we can recover reasonably well from periods of short isolation, but biochemical changes in our brain make it harder to recover from extremely long periods of imposed isolation.

Most of us are familiar with many of the sad stories of PTSD from Iraq/Afghanistan veterans, including challenges adjusting to daily life and many, many eventual suicides. Of course, their experiences are in many ways more severe than those experienced by those of us at home today; conversely, however, highly trained self-selected soldiers is a very different sample than the American population at large. The long-term impacts from potentially giving millions of Americans a form of PTSD are horrifying to think about.

More immediately, however, [we know that about 50,000 Americans](#) die from suicide per year - a much smaller fraction of the 1.4 million suicide *attempts* each year. With regards to suicides, an extended shelter in place lockdown has two compounding negative impacts.

First, it obviously dramatically increases the stressors that may lead to suicide attempts in the first place. Just look at some recent headlines: “[Man commits suicide after being pushed over the edge with self-isolation.](#)” “[UK Teenager Commits Suicide Over Coronavirus Self-Isolation Fears.](#)” “[Man’s COVID-19 worries prompt murder-suicide.](#)”

In this last example, a man killed his wife - then shot himself - because he was worried they might have COVID-19. Tests for COVID-19 later came back negative, but underscore my earlier point about the government and media having scared people so senseless that they lose all perspective on relative risk.

Second, however, lockdowns dramatically lower the ability of concerned friends and family to check in with those who are struggling - as someone who struggled with depression and anxiety myself as a teenager, I know that it’s much easier to brush off attention over texts and IMs than it is in person.

So it is likely that in a period of extended lockdowns, more suicide attempts will be successful, because nobody’s around to notice - or talk someone off the ledge - or open the door and call 911.

Those describing lockdowns as merely an “inconvenience” or a chance to watch more Netflix generally tend to fall into the following categories:

- Financially stable, with jobs in white-collar industries that are insulated from social distancing because they can be performed online, from home
- As a consequence of being well-to-do, live in comfortable and safe houses with plenty of space and amenities, such as a yard, perhaps in-home workout equipment, and so on
- Have loving and stable families, so they don’t feel unsafe or isolated

I am fortunate enough to check all three of these boxes; my experience over the past month would have been far, far worse if I had lived alone in a studio apartment and didn’t have a job which I did from home in the first place, anyway. I am at no risk of not being able to pay my bills; I live with people who love and care for me; I live in one of the safest cities in the entire country, in a reasonably spacious home with a wonderful backyard. But many I know are not so lucky: they live on their own in cramped living spaces, and may not be able to even go out for a walk without having any fear for their personal safety.

Is it fair that those who live in a large, multigenerational family are still allowed to interact with all of their family members (in the same household or a different household), even if doing so puts grandma at risk - while those who are in their 20s and single are told that their mental health and social well-being are completely irrelevant casualties, and they aren’t allowed to even have a friend over for a few hours?

I’m allowed to go to the grocery store, and come back and interact with my father who is in his 70s, as well as my mother in her 60s, but my friends who live alone, far from family, are not allowed to see even a single friend their age. I’m far more of a danger to my own parents than I am to my 20something friends, yet shelter-in-place orders permit the first interaction, but not the second.

Are we okay, as a society, with perpetually isolating someone with severe depression, preventing their best friend from going over to check in on them? Isolating a grieving young adult who just lost their last remaining family member, maybe even to COVID-19? Isolating a middle-aged man who just went through a divorce and lost custody of his kids?

These are questions we should be asking - especially since suicide, unlike COVID-19, affects people in all age groups from preteen on up. Given prevailing data, it seems highly likely that more teenagers and 20somethings will commit suicide during COVID-19 lockdowns than will actually die from COVID-19.

2.7.4: Worsened Diet and Reduced Exercise Impair Short-Term Immune Function and Damage Long-Term Health

There are a few other important phenomena that bear discussing here. The effects of stress and loneliness are very similar and interchangeable, so I won't discuss stress specifically.

However, it has long been well-known that stress promotes bad eating behaviors. [One paper](#) notes:

For example, when rats were presented with a choice of highly palatable food such as lard or sugar, stress consistently increased intake of palatable food specifically [22-24](#). Humans similarly turn to hyperpalatable comfort foods such as fast food, snacks, and calorie-dense foods [25-27](#) even in the absence of hunger and lack of homeostatic need for calories [28](#); this effect may be exacerbated in overweight or obese individuals as compared to lean individuals [20, 29](#). Taken together, these findings suggest that stress may promote irregular eating patterns and strengthen networks towards hedonic overeating; these effects may be exacerbated in overweight and obese individuals.

Meanwhile, the wholesale closure of gyms, martial arts dojos, and yoga studios means that most people are getting far less exercise than they otherwise would, *particularly* when many jurisdictions are even starting to close parks and trails where people can walk, bike, or jog. (The parking lot near one of the best trails in my area has been locked, and this is not unusual more broadly: many state and city parks have been shut down, etc.)

I think we all know about the profound long-term benefits of diet and exercise on death and disease; 1.7 million Americans die from chronic diseases each year, most of which are highly reducible in severity by lifestyle introductions. These tradeoffs are pretty large; however, in the short term, a big problem is that diet and exercise both modulate immune function. For example, [one paper](#) notes the benefits of exercise in improving antibody production, *particularly in older individuals*:

For example, an early study categorized adults aged 62 years or older, into one of three groups: active (undertaking at least 20 min of vigorous exercise three or more times per week), moderately active (undertaking regular exercise but with lower intensity, frequency, and/or duration), or sedentary (non-exercisers). Two weeks after influenza vaccination, it was shown that serum anti-influenza IgG and IgM titers were higher in active versus sedentary adults, and so too were peripheral blood mononuclear cell responses to antigen-specific stimulation ([144](#)). In addition, a recent study has shown that men aged 65–85 years, who regularly undertook moderate or vigorous exercise training, exhibited higher antibody responses compared to inactive controls in response to an influenza vaccine ([151](#)).

Data linking habitual levels of physical activity to enhanced immune competency in humans are supported by evidence from animal studies, and show that the immunological benefits of exercise may be particularly beneficial in enhancing otherwise poor responses in older age ([152](#)).

There is data, as well, to suggest that even in the very short term, exercise (although perhaps not extreme, marathon-training level exercise) is important to boost immune functions. [One recent paper](#) stressed the importance of continuing to exercise during lockdown:

Co-author, Dr John Campbell added: "People should not fear that their immune system will be suppressed by exercise placing them at increased risk of Coronavirus. Provided exercise is carried out according to latest government guidance on social distancing, regular exercise will have a tremendously positive effect on our health and wellbeing, both today and for the future."

Undoubtedly, many people are making their best efforts to exercise, but for most everyone I know, exercise volume and intensity is down significantly during lockdown given the lack of choices. This situation will obviously worsen if localities continue to get even stricter on the use of outdoor public recreation areas such as parks and beaches. Particularly for very young Americans with no health conditions, the health risks from lack of exercise *alone* vastly outweigh the risk of COVID-19 – to say nothing of the risks of stress, loneliness, and alcoholism.

2.8: Lockdowns Deprive The Dying of Their Last Wishes

Even those who we most need to protect - the elderly - should be allowed to make their own decisions about how to conduct their affairs. What could be crueler than depriving people of their last wishes?

If you're 85 with a serious condition such as severe heart disease, you probably have a handful of years to live. Do you want to spend the next year to eighteen months - maybe half or more of your remaining lifespan - isolated from your family for your own protection? Would you prefer to miss your granddaughter's wedding? The birth of your first great-grandchild?

Or would you prefer to take your chances, signing a do-not-resuscitate order and refusing medical care to eliminate the externalities angle?

Again, the right decision will be different for every person depending on their preferences and circumstances, but I know for a fact that my own father - if he were to reach such a position - would want to live the remainder of his life on his own terms. These are experiences that cannot be replicated over Zoom. At that stage of his life, I know he would want to spend as much time as possible with his (as-of-yet unconceived) grandchildren - damn the consequences. And that's his decision to make, and his alone: not mine, not yours, and certainly not Dr. Fauci's.

This, again, is not a hypothetical concern. The title of an NYT article says it all: "[At 89, She Fears Dying Alone More Than The Coronavirus Itself](#)." It's well-known that many elderly people are already extremely lonely, and lockdowns deprive them of the choice to see their families for what might be the last time:

For New York City's 1.7 million older adults, this has become a second epidemic: the fear of dying alone. For many, it will do more harm than the virus itself.

Many have not seen their relatives or friends since early March, when the restrictions on travel began. Then the public libraries closed, restaurants, senior centers, YMCA and YWCA's, houses of worship.

[...]

"I'm very afraid of dying alone," she said, speaking through an interpreter. "If I had a normal illness I could ask my children to come to New York. But with the coronavirus, I cannot ask them."

She also cannot ease her fears by sharing them at the senior center. Instead, she said, she watches television all day, which only amplifies them.

Here's a story of an elderly gentleman from Italy, in [the Economist](#):

If lockdowns stretch on for months, old people will suffer particularly acutely. Even before they were confined to their homes, they were more likely to feel lonely. Elderly women in Europe are more than twice as likely as men to live on their own. They rely on seeing family and friends to keep up their morale, or simply for a routine.

Alfredo Rossi, an 80-year-old in Casalpusterlengo, one of the first areas of Italy to be put under lockdown in February, says that what upsets him most about the restrictions is being unable to see his grandchildren who live just 16km (ten miles) away in Piacenza across the River Po.

Take, at the extreme, someone - of any age, maybe young, maybe old - who at the beginning of March was given three months to live with a terminal, incurable illness. I have known several such people over the course of my life, as I'm sure you have. Generally, my impression has been that these people wanted to spend the last months of their life meaningfully: enjoying their favorite foods, their favorite places and activities, and saying goodbye to friends and family, to the greatest extent their health permits.

Although such people are at extremely high-risk from COVID-19, and are the people we would theoretically most want to isolate, analysis in a vacuum is irrelevant. Tragically, such people are not going to be with us by August either

way. Is it okay for us to paternalistically subject these people to shelter-in-place orders, and rob them of any joys they wish to experience during their final months?

Can we really call it victory if one less person dies of COVID-19 today, to instead die of terminal cancer a month from now, having spent that extra month of their life totally alone, extremely scared, and profoundly depressed?

2.9: Arbitrary Definitions of “Essential” May Increase Disease Transmission

Imagine a common garden hose. What happens when you put your thumb on the end? The same number of water molecules still exit the hose. Are they now crashing into each other more, or less?

Shelter-in-place orders universally draw arbitrary distinctions between “essential” and “non-essential” businesses. Some, like Collin County Judge Chris Hill, bravely declared “all businesses, all workers, and all jobs are essential” - but these holdouts usually, unfortunately, ended up being [overruled](#).

Local officials such as Dallas County Judge Clay Jenkins clearly don’t understand the concept of second-order impacts, i.e. unintended consequences. The closure of “non-essential” businesses in some cases reduced disease transmission; clearly there is not a substitute for, say, movie theaters or sports games, and reducing crowds in these environments seems extremely likely to reduce R0. However, when closing “non-essential” businesses while allowing “essential” businesses *providing similar goods* to stay open, you are necessarily funneling more demand into a smaller pool.

I clearly remember the day when it became clear that schools were closing, that bars and restaurants were closing. Grocery stores were mass pandemonium. Wait times of 30 minutes or more to check out were common; at some stores like Costco, lines just to get in the store stretched around the store and down the block. While bars and restaurants may be “non-essential,” it turns out that food demand - in a stunning plot twist - still exists. Virus or not, people need to eat. And, therefore, faced with the prospect of not being able to eat out, people *en masse* decided to stock up so they could eat in.

A cashier at Sprouts told me that the next day that during his previous shift, he’d had trouble getting to the back to clock in, because the store was “wall to wall” with customers. He checked people out for almost 6 hours straight with barely any breaks, and said their volume was at least double their typical peak days. While this quieted down to some degree after a few days, pretty much all grocery stores continued to be very busy for quite a while; I must have passed within 6 feet - unavoidably - of about 50 or 100 people when I went to the store that week, compared to merely a handful on a normal day. And companies like Kroger, Wal-Mart, Target, and others have reported 30 - 50% increases in sales.

What do you think poses more COVID-19 transmission risk: a packed grocery store operating at 200% of normal peak capacity, or a restaurant operating at 25% of normal capacity, where all parties are separated from each other by at least two tables? By shutting all restaurants rather than simply implementing capacity restrictions of, say, 30% of fire-code occupancy - most restaurants were running significantly below capacity, anyway - “non-essential business” closures created panic that drove millions of people into the same place, at the same time, exacerbating disease transmission.

I was very dismayed by this turn of events, and not because it hurts my pocketbook - I’m a shareholder of Sprouts, but I don’t own shares in any restaurants. So it’s great for me and my clients that more people are shopping at grocery stores rather than eating at restaurants. But it’s bad for COVID-19 transmission, and it’s taken several weeks for grocery stores to realize that they need to do a better job of enforcing “social distancing” inside the store: just because grocery stores are essential, doesn’t mean that there’s a magic sign on the door that makes COVID-19 shudder in fear and run away. COVID-19 can transmit just as well in a grocery store or pharmacy as it can in a movie theater or bar.

Grocery stores aren’t the end of it, however. Megastores like Wal-Mart, Target, and Costco count as “essential” because they sell groceries. But they also sell a whole lot of other things, too: furniture, apparel, toys, and so on.

Now, admittedly, buying new clothes is the last thing on a lot of people's minds, and Target noted that its sales in "discretionary" categories were down over 20% in March. But "over 20%" is not "100%," which means that plenty of people were still buying socks, lamps, and crafting supplies at Target. The same goes for Costco, which noted that apparel sales were weaker, down significantly - but not to anything close to zero.

Meanwhile, Hobby Lobby was [ordered to close](#), because it's not essential. Now, I've been to exactly one craft store in the past few years - a Michael's - and despite it being during prime shopping hours in a great neighborhood, the store was a ghost town. I don't think I came within six feet of anyone but the cashier, and this was a year before anyone had ever heard of "social distancing." A real hotbed of disease transmission, right there.

Undoubtedly, there are some people - those who've lost their jobs, or those who need to entertain bored kids - who are going out to purchase crafting supplies and sporting goods. Shipments on Amazon are now being delayed to prioritize essential items, and there have been concerns about whether or not social distancing is possible to maintain properly in Amazon warehouses.

So: if your kids have grown out of their jeans, as they tend to do, are you at more risk of increasing R0 in a packed Target, or at an empty Kohl's? If you want some workout gear, is it safer to join the crowds at Wal-Mart, or visit a barren Dick's Sporting Goods? If you need some furniture to improve your work-from-home setup, why is it okay to buy it at Costco, but not at IKEA? If you need more cookware and flatware because you're suddenly making lunch for yourself and your kids every day, why should you have to buy them from a crowded Sam's Club, instead of a deserted Bed, Bath, and Beyond?

Setting aside the "fairness" issue here of the government picking winners and losers - literally - it is not clear that the "essential" and "non-essential" dichotomy is a useful bright line. Perhaps capacity restrictions are more appropriate, *regardless* of the nature of the business: it would give closed businesses a chance to generate at least *some* revenue, and in many cases it might well take the thumb off the hose, leading to smaller crowds at the stores that remain open. Again, R0 is dependent not on how much you're out and about in general, but about how many people you cross paths with.

2.10: Conclusions: "Choices"

Much as it's the "cytokine storm" of our immune system that damages our lungs more so than the coronavirus itself, isolating everyone indefinitely in response to COVID-19 is like dousing a sledgehammer in gasoline, lighting it on fire, and using it to kill a garden-variety spider in your living room.

You win the battle, but lose the war; you do more damage to your home with the flaming sledgehammer than the spider ever could have. A book or a shoe would be a more targeted and appropriate tool to kill a spider, and so it is with coronavirus: in our effort to kill the spider, we should be careful not to reduce our house to ashes.

The story of shelter-in-place is a story of choices. Will we choose to continue damaging *everyone's* long-term health and sacrificing *everyone's* life years to - mostly - protect a small vulnerable population that we could better assist with targeted interventions instead?

And - will we choose to let people make their own choices? In other words, will we stop depriving people of their Constitutionally-guaranteed civil liberties? I'm not religious myself, but I did particularly appreciate [this TRO ruling from the Western District Court of Kentucky](#):

On Holy Thursday, an American mayor criminalized the communal celebration of Easter.

*That sentence is one that this Court never expected to see outside the pages of a dystopian novel, or perhaps the pages of *The Onion*.*

But two days ago, citing the need for social distancing during the current pandemic, Louisville's Mayor Greg Fischer ordered Christians not to attend Sunday services, even if they remained in their cars to worship – and even though it's Easter. The Mayor's decision is stunning.

And it is, "beyond all reason," unconstitutional.

[...]

There is no doubt that society has the strongest of interests in curbing the growth of a deadly disease, which is the interest Mayor Fischer and Metro Louisville (together, “Louisville”) has asserted when ordering churches and churchgoers to stay home on Easter. “When faced with a society-threatening epidemic, a state may implement emergency measures that curtail constitutional rights so long as the measures have at least some ‘real or substantial relation’ to the public health crisis and are not ‘beyond all question, a plain, palpable invasion of rights secured by the fundamental law.’” In this case, Louisville is violating the Free Exercise Clause “beyond all question.

[...]

Louisville will be (highly) unlikely to make the second of those two showings. To be sure, Louisville is pursuing a compelling interest of the highest order through its efforts to contain the current pandemic. But its actions violate the Free Exercise Clause “beyond all question” because they are not even close to being “narrowly tailored to advance that interest.”

As in Lukumi Babalu, the government’s “proffered objectives are not pursued with respect to analogous nonreligious conduct, and those interests could be achieved by narrower ordinances that burdened religion to a far lesser degree.” In other words, Louisville’s actions are “underinclusive” and “overbroad.” They’re underinclusive because they don’t prohibit a host of equally dangerous (or equally harmless) activities that Louisville has permitted on the basis that they are “essential.”

[...]

[including] walking into a liquor store where other customers are shopping. The Court does not mean to impugn the perfectly legal business of selling alcohol, nor the legal and widely enjoyed activity of drinking it. But if beer is “essential,” so is Easter.

[...]

Louisville’s actions are also overbroad because, at least in this early stage of the litigation, it appears likely that Louisville’s interest in preventing churchgoers from spreading COVID-19 would be achieved by allowing churchgoers to congregate in their cars as On Fire proposes. On Fire has committed to practicing social distancing in accordance with CDC guidelines. “Cars will park six feet apart and all congregants will remain in their cars with windows no more than half open for the entirety of the service.” Its pastor and a videographer will be the only people outside cars, and they will be at a distance from the cars.

While the court’s analysis does focus on religious liberties, the right to assembly is equally protected by the Constitution in the same clause that protects freedom of speech:

“Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble...”

As we have seen above, shelter-in-place orders are not an unalloyed good. They may meaningfully reduce the prevalence and severity of COVID-19, but their effect may be smaller than we think - or the *opposite* of what we think, in the short term. Moreover, they have profound costs, not only in the short term, but also in the long term.

Particularly in states like Michigan where the governor seems extremely eager to continue to deprive citizens of rights as long as is possible, hopefully more legal challenges will be filed - and more courts will, self-obviously, determine that shelter-in-place orders are underinclusive and overbroad, as they are arbitrary in what they permit and prohibit.

If liquor stores are “essential,” then so too is the ability to see a friend, which we know from decades of research has positive impacts on our mental and physical health - whereas alcohol has the opposite.

Most of us see far more harm than benefit from shelter-in-place orders, and - critically - we are not being given *any choice* in whether or not we wish to suffer those harms. By the end of April, tens of millions of Americans will have protective antibodies to COVID-19, and thus will see *~zero* benefit from extended shelter-in-place orders.

Most of us are far better off getting on with our lives - with, as necessary, some social distancing, but clearly not to the extreme degree being currently practiced. Of course, some people may choose to lock themselves in their homes, and that's okay.

These people - who are extremely vocal - use analogies such as “having a peeing section in the pool” to justify locking the rest of us up, implying that the actions of a few will contaminate everyone.

But this is not true, because you can choose not to go to the waterpark in the first place. You know the risks; you choose to go anyway. Nobody is “forced” to expose themselves to COVID-19. If you truly believe that COVID-19 is a risk worth doing *anything* to avoid, then you can take extreme measures to isolate yourself from the world, if you so desire.

If you work from home, you can pay for the delivery of groceries and other essential goods. If you currently work outside of home in an “essential” job, and view the risk as outweighing the financial rewards, you can quit - undoubtedly, given the 20 million Americans that will have filed for unemployment within a few weeks, there will be many people who would gladly take that job. If we're going to have tens of millions of Americans unemployed, they might as well be the ones who *want* to be unemployed.

Current policies, however, have deprived tens of millions of people of that choice - and deprived all of us of even the most basic daily choices. Given the relatively small maximum benefit of shelter-in-place lockdowns, *relative to* targeted interventions, on a go-forward basis, and the relatively far larger - even catastrophic - health *and* economic harms of those overbroad and underinclusive policies, we should adopt a different approach.

3: Plan: Protecting Those Who Need It

I'm a fan of focusing on solutions, not problems. Therefore, I'd like to suggest a handful of ideas, with the obvious caveat that I do not have a monopoly on good ideas. Surely, with the combined ingenuity and brilliance of America - that has enabled the invention of lightbulbs, airplanes, cars, assembly lines, computers, smartphones, and the internet - we can come up with some better COVID-19 interventions than “lock everyone in their houses indefinitely.” My ideas might be terrible, but I'm confident that together, we can come up with some first-rate solutions.

Of course, it is generally not appropriate to suggest one-size-fits-all guidelines for social distancing, given that hospital capacity, natural rate of transmission, and many other factors can vary on a local basis, and obviously vary in time as well - what is appropriate this week might be completely inappropriate three weeks from now.

So please bear in mind that some communities, at some times, might need *no* interventions whatsoever if there is de minimis ongoing transmission of COVID-19, and if antibody tests demonstrate that a substantial portion of the population already has immunity to COVID-19.

Conversely, some communities, at some times, might need *extreme* interventions, if the healthcare system is at imminent risk of being overwhelmed.

With these caveats, let's proceed.

3.1: Concierge Grocery Delivery For The Elderly And Immunocompromised (Pre-Existing Conditions)

It is clear from the data that those who are elderly and immunocompromised are at highest risk of COVID-19. Yet our current approach - shelter-in-place lockdowns - actually does very little to protect these people. Some people in these categories are lucky enough to have family, friends, or neighbors nearby who can do their grocery shopping for them, and prevent them from having to go out into the world.

Not everyone is so lucky, however. Meanwhile, for many elderly who aren't as technologically-enthusiastic as younger Americans, ordering groceries through an app such as Instacart is likely too difficult. Similarly, many people may wish to do so, but may – particularly given the current state of the economy – find delivery fees too high a burden.

Here's a solution: let's offer free once-weekly concierge delivery of groceries, including medications and other essential supplies, to *any* American household containing an immunocompromised or elderly individual. (Specific definitions of “immunocompromised” and “elderly” can be decided as-needed on a local basis.) What I'm envisioning is: anyone can call up a phone number, provide a grocery list, and it shows up at your door. You pay for the groceries, but not for the delivery.

Does this cost something? Yeah, of course it does. But we're currently paying significant unemployment benefits to tens of millions of Americans, in addition to sizable direct stimulus checks. We might as well get something back for it. We can provide meaningful, personally rewarding, socially-beneficial work to those who have unfortunately lost their jobs as a result of COVID-19 lockdowns. We'd be benefiting their pocketbook *and* their mental health (remember that the effects of job loss are as significant psychologically as economically).

Meanwhile, we would be providing a tremendous service to those who are at most risk from COVID-19. This would also give them a sense of agency. If they wish to bring their COVID-19 risk to zero, now they don't have to leave their houses at all – what they need is brought to them.

Conversely, they could now “trade” that risk for going outside for a walk, or seeing a friend. We would be substituting lower-quality interactions with strangers in a grocery store with higher-quality interactions that benefit the individual's physical and mental health.

3.2: Free Restaurant Food Delivery For Healthcare Workers

The idea of “[hazard pay](#)” has been floated for healthcare workers. Money is nice, but what many of these workers really need is time: these workers are mothers and fathers, sons and daughters. Many times, after a tiring shift caring for those with COVID-19, they have to care for those in their home – kids, parents, siblings, spouses – who need them.

In areas with high active transmission of COVID-19, such as New York City, healthcare workers are under high stress already, which we know increases their susceptibility to disease. What they obviously need first and foremost is a sufficient supply of PPE, but they would also benefit from being able to go home and kick their feet up and relax – or sleep – rather than having yet more responsibilities.

Let's deliver restaurant food to the homes of healthcare workers in heavily-affected areas, twice-weekly. Again, this costs something – but on net, it's not that much more than unemployment benefits already being paid to laid-off cooks and waiters at restaurants. We'd be supporting these employees, the owners of the businesses, and at the same time helping out those on the front line. Worrying about feeding themselves and their families should be the last thing on their minds.

3.3: Sentinel Surveillance for Nursing Homes

This was suggested a few days ago, and based on the data I presented above, it is clearly a high-priority intervention. As rapid testing becomes available, anyone going into a nursing home should be tested before being allowed to proceed, and those working in nursing homes should – to the greatest extent possible – still use masks, gloves, and other protective equipment when interacting with their residents.

3.4: Appointment-Driven Capacity Limits Rather Than Outright Closures

As I discussed earlier, closing “non-essential” businesses while leaving others open is both punitive to the non-essential businesses that sell the same products as the essential businesses, and also not helpful in reducing transmission: if you're going out to buy jeans, you're more likely to contract/transmit COVID-19 in a busy Costco than in an empty Kohl's. COVID-19 doesn't care what sign is on the door.

We should instead allow all businesses that can maintain social distancing to remain open, instead reducing social interaction (and thus transmission) on an as-needed basis in any given community by using capacity limits based on percentages of existing fire-code capacity.

Of course, reducing crowds inside the store may just increase them *outside* the store; plenty of pictures have circulated on social media of lines of dozens of people waiting to get into stores. A better solution might be appointments using fair and unbiased practices. Setting aside repurposing apps like GrubHub to book appointments at grocery stores, we could, for example, instructing people to go out – to the extent practical – on certain days of the week based on whether their street address ends in an even or odd number.

The same rules should be applied to public spaces such as beaches and parks that are currently closed.

Conclusion: Hope

In these least hopeful of times, I think it is helpful to end on a note of hope.

Not many kids are fascinated by virologists, by one of my heroes in middle-school was Jonas Salk. I wrote my SAT essay about him.

David Oshinsky's Pulitzer-winning "[Polio: An American Story](#)" ([review + notes](#)) tells a great story of a time when diseases like COVID-19 were part of the normal background of life. Poliovirus, specifically, killed or paralyzed half a million people per year during its peaks in the 1940s and 1950s, including – famously – FDR.

Jonas Salk changed the course of history when he announced the polio vaccine in 1955; he and other scientists continued to improve the vaccine ever since. [WHO estimates](#) note that thanks to this scientific ingenuity, millions of children remain alive, and tens of millions of people can walk.

Vaccines, antibiotics, and sanitation have, to a great degree, reduced transmissible disease deaths in the Western world to the tiniest fraction of what they once were. We forget that for much of human history, it was common to have multiple family members die of infectious disease before middle age. Dysentery used to be a real killer; today, it's just a meme. Tuberculosis? Gone. We've developed treatments that can substantially mitigate the effects of HIV.

Many of our brightest minds are focused on COVID-19 vaccines and antivirals. Every day, we learn more about it; we are farther along today than we were last week, and two months ago.

We have defeated far greater enemies before, with far less resources, technological, human, and otherwise, than we have today. We figured out how to split the atom without the help of modern computers; we figured out how to end polio without the instantaneous worldwide collaboration that is possible thanks to the internet.

COVID-19 is not a significant threat to most of us, but it is a threat to a great many people. I'm sure that each of us personally love and care for someone who is threatened by COVID-19.

But we vanquish such threats: that's what we do. We will eventually vanquish COVID-19.

In the meanwhile, we will find ways to reduce the risk as much as possible for those who are most at risk from it.

I hope, however, that we will not burn everyone else's house down in the process. Doing too much is just as much of a risk, if not more, than doing too little. I am hopeful that officials will look at the incontrovertible data and realize this sooner rather than later.

Appendix 1

1.6.1: The Flu Shot Isn't Mandatory - Would Save 20 - 30K lives per year

It has become extremely unfashionable to make comparisons between COVID-19 and the flu. It is, of course, impossible to compare the two apples to apples - whatever the death count from COVID-19 ends up being, it will be inextricable from the unprecedented actions we took in an attempt to slow its spread. Conversely, the flu has been around forever, so we have substantial existing immunity, on top of which we also have an effective vaccine and targeted antivirals that reduce the severity and prevalence of the disease.

Nonetheless, the presence of COVID-19 should not allow us to forget that influenza is indeed a serious public health concern. Bad flu seasons look very much like what scares us about COVID-19: hospitals at capacity, thousands of elderly people dying. Moreover, unlike COVID-19, hundreds of American kids die per year from the flu.

In bad flu seasons, the numbers look like this:

Nearly [80,000 Americans died](#) and 960,000 were hospitalized due to the flu during the 2017-2018 flu season, according to the Centers for Disease Control and Prevention.

And hospitals are overburdened, with [tents in parking lots \(sound familiar?\)](#):

BRIAN WILLIAMS, anchor:

When we talk about flu season this year, getting off to a galloping and virulent start this is what we mean--live picture of Lehigh Valley Hospital in Pennsylvania where they have got a tent setup out back to treat the overflow patients. In areas where the flu is bad, it's very bad and for health care professionals, it means more patients showing up at hospitals than they can treat in some cases and remember that's among those so sick with the flu they require hospitalization. The flu is now widespread in forty-one of our fifty states. It is all where we begin tonight with our Chief Medical Editor Doctor Nancy Snyderman. Nancy, good evening.

DOCTOR NANCY SNYDERMAN, reporting:

Good evening, Brian. This is the worst flu season we've seen in more than a decade. It has the CDC concerned and tonight, cities across the country and their hospitals are feeling the strain, and we haven't even reached the 50 yard line of flu season. Emergency departments have become ground zero in the fight against the flu. At New York St. Barnabas Hospital, the hallways are packed with patients. What's the status today?

DR. ERNEST PATTI (St. Barnabas Hospital): Well right now, compared to last year at this time, we've seen three times as many flu patients as we've seen all of last year.

DR. SNYDERMAN: More than 50 cases a day of flulike symptoms. Is it fair to say that you are overflow?

DR. PATTI: I'd say yes, we're at overflow right now. Yes, we-- we definitely are.

DR. SNYDERMAN: It is crazy here.

DR. PATTI: We're very busy. We're very busy.

[...]

DR. CHARLES POZNER: Patients usually come in feeling like they've been run over by a bus. They basically have body aches, joint aches. They-- they feel feverish. They oftentimes have sweats.

DR. SNYDERMAN: In Chicago hospitals are so overwhelmed with patients, seven have closed their emergency departments diverting ambulances to other facilities. At a hospital in Allentown, Pennsylvania, they are dealing with the onslaught of patients by triaging them in a tent in the parking lot. This influenza virus is tenacious. Droplets from a sneeze or cough can be anywhere, on a doorknob, a keyboard, even a pen for up to eight hours. So how can you avoid the flu? There are some simple precautions.

Wash your hands frequently, 15 to 30 seconds at a time, keep your hands away from your eyes and nose. You touch your face more than 2,000 times a day and that's the easiest place for the virus to latch on.

DR. PATTI: So far I don't think it's peaked yet, you know, it's still rising.

The good news is that the flu shot works - yes, it may only provide partial protection depending on which strains are dominant, but something is better than nothing, and it does significantly reduce disease transmission and severity. [One analysis](#) by a researcher notes that:

Scaled nationally, I find that a one percentage point increase in the U.S. vaccination rate would result in approximately 795 fewer deaths per year in expectation. The mortality benefits primarily accrue to individuals 75 and older, but are mostly attributable to the vaccination of people under 75, suggesting substantial externalities. I also find that vaccination significantly reduces illness-related work absences.

The estimates indicate that a one percentage point increase in the U.S. vaccination rate would result in approximately 14.5 million fewer work hours lost due to illness annually, in expectation. I find no impacts on either outcome during periods in which there is no influenza circulating and no impacts on outcomes that are implausibly related to influenza. In monetary terms, the estimates suggest that each vaccination confers at least \$63 in social benefits due to reduced mortality and \$87 in terms of reduced work absences

I'm not sure that the math works perfectly linearly, but the analysis suggests that if we could get flu vaccination rates to 80%+ from the current level, we would be saving perhaps 20,000 - 30,000 lives per year out of the up to 50,000 that are estimated to die in any given year, while actually *increasing* economic productivity by keeping more people at work instead of at home - the exact *opposite*, of course, of COVID-19 interventions that we are currently undertaking.

Clearly, this dramatic reduction in influenza burden would also free up lots of hospital capacity every winter there's a bad flu season: no more tents outside and packed hallways. This would have the positive second-order impact of making us more prepared for future pandemics.

Despite all of this, currently, only somewhere on the order of 40% of American adults and 60% of children [get their flu shot](#). If it's selfish to want to meet your friends or have a steady job because it could lead to overburdened hospitals and elderly deaths from coronavirus, then how can it be anything but profoundly selfish to be too lazy to get your flu shot?

If we like to virtue signal how compliant we are with social-distancing guidelines by shaming others for having the temerity to go for a walk in the park during COVID-19, then why don't we routinely eviscerate people on social media for not taking 30 minutes out of their year to get a painless, usually free flu shot?

The federal government has not seen fit to mandate the flu shot nationwide, despite the fact that doing so would save *several hundred thousand lives* this decade and *benefit the economy*, rather than harming it.

1.6.2: Public Smoking Isn't Banned - Would Save 30 - 40K lives per year

My favorite and best debate case in high school was banning public smoking (i.e., requiring that smokers be a minimum distance away from others, or in an out-of-the-way area, when they light a cigarette). The evidence for doing so is extremely robust: the CDC currently estimates that [up to 40,000 lives per year](#) are lost due to secondhand smoke.

As with my previous suggestion - making the flu shot mandatory - we are not asking for much. We are simply asking smokers to take a short walk, as little as 20 feet and likely no more than 50 - 100 feet, so that when they light up, they are only harming themselves, and not others.

To the extent that we have currently decided that we can lock asymptomatic people in their homes out of the fear that they *might possibly* transmit COVID-19 to someone, it's unconscionable that we allow people to intentionally expose others to harmful chemicals and particulates.

Here are some cards from my high school debate policy brief. The first demonstrates that secondhand smoke is the third leading *entirely preventable* cause of death:

April 2007, Samuel J. Winokur (J.D. Expected May 2007), "Seeing Through the Smoke: The Need for National Legislation Banning Smoking in Bars and Restaurants", George Washington Law Review, George Washington Law School, http://docs.law.gwu.edu/stdg/gvtr/issues/pdf/Note_Winokur.pdf

As part of its consideration of an anti-smoking ordinance, the Lexington- Fayette Urban County Government in Kentucky assembled a Smoke Free Task Force to conduct a year-long study of the impact of secondhand smoke on health. Citing over twenty-seven studies, the Task Forces report estimated that ETS brings on illnesses that kill over 53,000 people a year in the United States, and that even five minutes of exposure to E[nvironmental] T[obacco] S[moke] increases significantly a person's health risks. The American Cancer Society (ACS) reports that ETS is responsible for an estimated 35,000 to 40,000 deaths from heart disease in people who are not current smokers. The ACS further reports that [s]econdhand smoke is the third leading preventable cause of death in the U.S.[.] killing 38,000 to 65,000 nonsmokers every year.

The evidence is extremely robust, including "a/b tests" where smoking bans were turned on, turned off, and turned back on again. Here's some insight from a physician on what happened to heart-attack admissions at hospitals over this "natural experiment" of having, and not having smoking bans:

Ron Winslow, The Wall Street Journal, September 2009, "The Case for Bans on Smoking" [brackets original] <http://online.nsj.com/article/SB10001424052970203803904574426921442513660.html>

One physician who has seen first-hand the effects of second-hand smoke on heart attack rates is Richard P. Sargent, a family doctor in Helena. He and some colleagues noticed a sharp drop in heart-attack admissions at the city's main hospital about three months after a ban against smoking in bars, restaurants and casinos went into effect in June 2002. Then in December of that year, opponents succeeded in getting the ban revoked.

"We performed an ideal experiment," Dr. Sargent recalls. "We turned [the ban] on, and we watched the heart-attack rate go down. We turned it off and watched it go back up." The reduction was 40% in absolute terms—102 heart attacks per 100,000 person years after the ban, compared to 170 before the ban. Heart-attack rates rose sharply again after the ban was revoked, he says.

Public smoking bans have been effectively implemented on airplanes, inside most buildings and restaurants, on many college campuses, and in many locales. They are of course not 100% effective, but they are relatively costless, and most places that have implemented them have seen *enough* people comply to *enough* extent to save a substantial number of lives.