Coronavirus will linger after the pandemic ends. But it won't be as bad.

We have a long, painful process ahead of us before it's just a part of normal life, though.

The virus will continue to circulate after the pandemic, but it will be less and less dangerous with each year.

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SARS-CoV-2, commonly known as the novel coronavirus, is officially a global pandemic. Multiple chains of transmission are underway in dozens of countries. Heroic efforts, such as instituting worldwide isolation measures like those in Wuhan, China, and in Italy might still slow the spread — but the impact of doing that everywhere could be even worse than the disease. So the virus will traverse the world, probably infecting between 40 and 70 percent of the global population during its first wave.

This might occur over a painful six to 12 months, or it might be spread over a more manageable several years. Either way, once the first wave is done, the virus is probably here to stay. This seems scary, as if we are resigning ourselves to tens of thousands — or hundreds of thousands — of deaths in the United States each year. But it is very unlikely that things will remain that bad.

Established diseases behave very differently from novel pandemic viruses. Most important, when a disease becomes established, the age distribution of infection changes. Right now, the high death rate from the coronavirus is driven almost exclusively by the oldest cases: One study from Wuhan found that 81 percent of deaths as of Feb. 11 were in people over 60, and only one death out of 1,023 was in a person younger than 20. Because this is a new virus, everyone is susceptible regardless of their age. This means a 70-year-old is just as likely to be infected as a 7-year-old — and far more likely to die. If you can work from home, you should. Now.

Compare this with an established disease like measles. Before a vaccine was licensed in 1963, nearly everyone got measles at some point in their life. In fact, because measles is so infectious, getting it was

an almost universal childhood rite of passage. And because infection with measles confers lifelong immunity, adults caught the disease only under extraordinary circumstances (such as when it was reintroduced to the Faroe Islands in 1846, after an absence of 65 years).

We don't know if infection with the novel coronavirus confers long-lasting immunity. If it does, then something similar will happen: Eventually, almost all adults will be immune, and new infections will be concentrated among children. Since the virus causes severe disease almost exclusively in older adults, this shift to a childhood infection would nearly, but not completely, eliminate hospitalizations and deaths from the virus.

But none of the coronaviruses currently common in human populations confer lifelong immunity, and there is a very good chance that SARS-CoV-2 won't, either. Still, subsequent infections with the virus will almost certainly be less severe than the first, as individuals accumulate partial immunity. This is similar to the incomplete protection you get when the flu vaccine is an imperfect match for circulating strains; you can still be infected, but the resulting illness is far less harsh. This partial immunity would have a similar, if less dramatic, effect on the age distribution of the disease, reducing illness and deaths in older adults.

A buildup of population immunity will also moderate the yearly impact of the novel coronavirus in less obvious ways. Epidemics are like fires: When fuel is plentiful, they rage uncontrollably, and when it is scarce, they smolder slowly. Epidemiologists call this intensity the "force of infection," and the fuel that drives it is the population's susceptibility to the pathogen. As repeated waves of the epidemic reduce susceptibility (whether through complete or partial immunity), they also reduce the force of infection, lowering the risk of illness even among those with no immunity. This simultaneous reduction in the number of people susceptible to illness and the force of infection is why the same strain of influenza that causes a devastating pandemic will later produce mild seasonal epidemics. Vaccination campaigns, even when inadequate to eliminate disease, will have a similar effect.

We can't stop the coronavirus now. But we can be ready for it.

So there will be a time after the pandemic when life returns to normal. We will get there even if we fail to develop a vaccine, discover new drugs or eliminate the virus through dramatic public health action, though any of these are welcome because they would hasten the end of the crisis.

But a long and painful process may be in store first. The first pandemic wave might infect more than half the world's population. It is not unreasonable to believe that 1 in 1,000 of those infected will die (since many infections will have mild or no symptoms, the death rate among identified cases will be far higher). Perhaps 10 times that number will be hospitalized. In the United States, this would translate to more than 1.7 million hospitalizations and 170,000 deaths over the course of the first wave. That is five to ten times as many deaths as we see from the flu in a year. If these deaths and hospitalizations occurred over six to 12 months, they would overwhelm the U.S. health-care system, which has only around 1 million beds across the country. The resources needed to care for coronavirus patients would leave little left over to properly care for people with other conditions such as cancer, heart disease or serious injury.

This first wave alone will not get us to the point where covid-19 becomes a disease of children. An infection rate of 50 percent would leave half of adults at risk in the next wave. But a reduction in susceptible individuals would weaken subsequent waves. For the sake of argument, let's suppose the second wave infects 30 percent of the remaining susceptible population, which translates into infecting

15 percent of all adults over 60. Using the same assumptions as before, in the United States this would mean 51,000 deaths, about the same as a very bad flu season. That figure would decrease with each subsequent wave, as both the number of people susceptible and the percentage of these infected go down. Eventually, we will reach a point where covid-19 deaths in the elderly are virtually unheard of — but this could take a decade or more.

Development of a vaccine would vastly accelerate this process. Even if we did not eliminate the disease, we could significantly cut its mortality rate in one to two years, rather than decades. Even without a vaccine, improved treatment and new drugs could substantially reduce deaths. There are countless efforts underway to develop vaccines and treatments, but these take time; pharmaceutical solutions may not be available fast enough to blunt the first wave of the pandemic.

One of the greatest challenges in the covid-19 response is the massive uncertainty about how deadly the infection truly is. While a death rate of 1 in 1,000 is plausible, some estimate it could be 10 times as high. If this is correct, the path to the post-pandemic period becomes much harder, and efforts to develop treatments and vaccines even more important.

No matter how the severe the disease, it is still in our power to mitigate the impact of the first pandemic wave and hopefully stop it from overwhelming our health-care systems. By staying home when we are sick, minimizing mass gatherings and reducing physical contact, we can dampen the epidemic, reducing the number of cases and the speed at which they occur. We can do so knowing that there is an end in sight — though it may be years in the future — and this once-dreadful disease will morph into a mild annoyance in the years to come.

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