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Editor's Journal

The Vaccine Exception

As photo ops go, it was reasonably authentic: Margaret Keenan, a 90-year-old retired jewelry store salesperson, dressed in a gray cardigan over a perky blue Christmas-themed tee shirt, gets the world's first COVID-19 vaccination, in a hospital in Coventry, England. Not a head of state or a corporate tycoon or an athletic star. She's one of the group of people deemed by the United Kingdom's Joint Committee on Vaccination and Immunisation to be most vulnerable to the disease: "residents in a care home for older adults and their carers [and] all those 80 years of age and over and frontline health and social care workers." In the United States, an advisory committee to the Centers for Disease Control and Prevention has issued similar guidelines, giving health care personnel and residents of long-term care facilities first priority for vaccination. While the ethical principles guiding the UK and US priority processes differ in details, both strive to put those most at risk of dying from the disease at the front of the line.

With some predictable exceptions. No one should be shocked that members of Congress were getting the vaccine before their most vulnerable constituents. More surprising, however, was that a number of medical centers were allowing executives and employees in low-risk positions to get the vaccine before or at the same time as frontline hospital workers. At Stanford University's medical center, 99% of its medical residents—many of whom work with COVID patients—were put in the second priority tier for vaccination, behind more senior doctors who weren't being exposed to COVID. Once this situation became public, hospital leaders were quick to blame a faulty decision algorithm for the error.

Stanford, and the other hospitals publicly shamed by the moral failures in their original vaccine rollout plans, promised to quickly change course. Monitoring and assuring the fairness of vaccine distribution plans across the broader society will obviously be more difficult than at a hospital, but the basic ethical principles are reasonably clear and uncontroversial. After a year of mounting chaos from the pandemic in the United States and many other countries, the advent of an effective vaccine creates a kind of moral clarity that can directly inform action upon which most people can agree.

That combination is a rare thing in the complex human world. Much more typical is moral clarity without efficacy. If I say "everyone deserves a good education" or "everyone deserves to be fairly compensated for their work," it is easy to agree with the moral imperative and incredibly difficult to operationalize, because people disagree about how to accomplish such high-minded goals. But if I say "everyone should get a vaccination," accomplishing that goal is a straightforward, if complicated, process that the nation has implemented successfully in the past and can do again.

The immediate and certain efficacy of vaccines is what makes this possible. In the few seconds it takes to administer a vaccine, recipients become immune for years or decades to a disease that might otherwise debilitate or kill them. And the more people who get vaccinated, the more protection is conferred across all society, even to the unvaccinated, as pathways

of disease transmission are cut off through growing herd immunity. Few technologies or procedures offer comparable power to deliver unalloyed and widespread good so quickly, simply, directly, irreversibly. Vaccines are so amazing that wars have been put on hold for a few days to allow children to be immunized for polio. They are so amazing that teachers, school district administrators, state and local governments, parents, doctors, the pharmaceutical industry—a fractious mélange of competing interests if ever there was one—converge around policies to assure vaccinations for all school age children in the United States. The spectacle of politicians who once encouraged skepticism about COVID's seriousness, such as Vice President Pence and Senators Lindsey Graham and Joni Ernst, now taking advantage of their privileged positions to get their vaccines, tells you how special this technology is: it even trumps politics.

But the particular amazingness of vaccines also means that we should not look to them for lessons or expectations about the relations between science, policy, and morality. They are an exception, not an exemplar. The kind of science involved in making vaccines is radically different from the kind used to determine policies around mask-wearing or social distancing, where uncertainties and trade-offs blur the boundary between imperfect knowledge and competing values and interests. Indeed, using "science" to describe both vaccine development and, say, the study of cloth mask efficacy, in preventing COVID transmission, stretches the meaning of the word beyond the breaking point. Vaccines build upon more than 200 years of practical experience and research made possible by extraordinarily clear feedbacks between scientific advance and a transparent and unequivocal measure of technological performance—people are protected against the disease being vaccinated against. We know the science is right because we see that the technology delivers its benefits completely and unequivocally.

Whereas the benefits of a mask are obscured by a range of variables such as: how and where it is worn, what it's made of, what the exact mechanisms of aerosol transmission are, how close the wearer is to other people, and so on. Masks may (or may not) have behavioral benefits, such as providing social cues about social distancing; conversely, they're likely to be more effective when other social distancing rules are also being observed. While the scientific tools used to study mask performance have advanced greatly, uncertainty about mask efficacy has not changed much over a century.

The same could be said for evidence informing other policies aimed at managing the pandemic's course. Is six feet really the correct social distancing standard? Define correct. Is a 25% restaurant occupancy rate safe? Define safe. Such numbers are expressions of the judgment of public health experts, not a precise measurement of anything. Turning them into widely accepted beliefs requires public confidence in institutions and experts, and time for shared social norms to emerge. As Kathleen Hall Jamieson notes in her contribution to our Postpandemic collection, getting Americans to wash their hands regularly has taken decades of public health messaging aimed at reducing seasonal flu transmission. In a nation as politically divided as the United States—all the more so given a president who has seemed to take special relish in stoking those divisions—no wonder mask-wearing and business-closure policies remain controversial and divisive.

And yet, amid the ongoing politics, and despite the absence of any significant new treatments, COVID-19 mortality rates in hospitals seem to have declined, in some cases impressively. One reason for this welcome trend has to do with a type of knowledge creation that's often disregarded in discussions about how human know-how improves—not through formal research by scientists with big government grants, but by skilled practitioners trying to solve urgent problems in real time. In our feature article on nurses innovating on the hospital floor, Lisa De Bode explores how growing experience with managing COVID patients has led to lifesaving improvements in practices such as moving IV pumps from patients' rooms to hospital hallways, to allow nurses to monitor the vastly greater number of patients in intensive care units, while also reducing the nurses' exposure to the virus. Such innovations—not to mention the nurses who come up with them—attract little attention in discussions of how science and technology work in the real world because they don't fit with the social and intellectual hierarchies that surround research and innovation. Yet the deep

experience of nurses working directly with patients—including the strong bonds of empathy and trust that develop—may be an important driver of innovation and improved medical outcomes in the pandemic so far.

COVID can be a lens for examining hidden inner workings of science and innovation. Stanford's embarrassing algorithmic snafu in allocating its vaccines echoes familiar concerns that human biases, blind spots, and dumb mistakes are getting hardwired into artificial intelligence protocols, yet as Mark Hagerott suggests in his short entry in our Postpandemic collection, COVID seems to be accelerating the societal and economic transition away from the human and social and into the virtual and digital world. Can this transition be steered toward assuring the protection of what humans value most? Ben Shneiderman offers a philosophical and practical perspective on just that, rejecting claims that the human future will be dominated by intelligent, autonomous machines, and insisting that future smart devices can and must be designed to enhance people's humanity, rather than replace it. The crucial role played by empathy and trust in the ways that nurses have innovated during COVID—a role that machines will not replicate—reinforces Shneiderman's case for a human-centered AI approach to advancing and governing a looming techno-human future.

The belief that AI will displace humans across a broad range of social and economic functions builds in turn on the assumption that the most efficient economic path—for example, replacing human effort with machines—will in the long run always be the most socially beneficial. But William Spriggs—in another entry in our Postpandemic collection—sees the dogma of efficiency in the field of economics as a hidden rationalization for why it's okay for the US economic system to treat "unskilled" workers as something to be discarded—now, through the exogenous shock of the pandemic, and in normal times, through the creative destruction of technological innovation. Perhaps, Spriggs suggests, the basic tenets of economics should be reconsidered.

Certainly the COVID vaccine has made mincemeat of the tenets of laissez-faire innovation. Let scientists pursue their curiosity wherever it may lead! Let the market do its magic in freely developing the science-based innovations that society most needs! Except that COVID vaccine development has actually been pursued through bald-faced industrial policy: government working in partnership with industry to subsidize private-sector innovation and steer it in directions desired by society. Through Project Warp Speed, the federal government has invested in every phase of the vaccine innovation process, in the underlying science of course, but also in late-stage clinical trials, in increased manufacturing capacity, in support of the supply chain for vaccine development and delivery, in providing a guaranteed market for products. The vaccine mojo is so powerful that corporation-bashing liberals and free-market-adoring conservatives have all been willing to put ideological purity aside to support the pursuit of this redemptive technology.

Is that moral and political magic transferable to other domains? John Graham, Keith Belton, and Suri Xia conclude that unless the United States is happy to cede the future of electric automobiles (and, by extension, other emerging manufacturing sectors and the good jobs that come with them) to China and other countries, it had better get serious about applying industrial policies more broadly. The political window for adopting such policies may now be open. But successfully designing and implementing them will be much more complicated and uncertain than it has been for Project Warp Speed.

The development of multiple effective COVID vaccines is a magnificent achievement. Far from being a vindication of our current approach to science and innovation policy, however, it is both a conspicuous, happy exception, and a broad repudiation, one that brings with it the challenge to reflect deeply on how and why a nation that is now spending about $200 billion a year on biomedical research and development, and $3.8 trillion on health care, was so ill-prepared to cope with a disease that was widely understood to be inevitable—and what that means for how we ought to be pursuing knowledge and innovation for the public good in the future. This edition of *Issues* offers a variety of imaginative, pragmatic, and even courageous responses to that challenge. We will continue to cultivate this discussion and explore its implications for social progress—in all its complex, contradictory, uncomplacent, and inefficient glory.