The Public's Role in COVID-19 Vaccination:

Planning Recommendations Informed by Design Thinking and the Social, Behavioral, and Communication Sciences

Working Group on Readying Populations for COVID-19 Vaccine

July 2020

JOHNS HOPKINS
BLOOMBERG SCHOOL
of PUBLIC HEALTH

Center for Health Security

TEXAS STATE
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Acknowledgments

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Executive Summary

This report considers human factors in relation to future vaccines against the novel coronavirus (SARS-CoV-2), drawing on insights from design thinking and the social, behavioral, and communication sciences. It provides recommendations—directed to both US policymakers and practitioners, as well as nontraditional partners new to public health's mission of vaccination—on how to advance public understanding of, access to, and acceptance of vaccines that protect against COVID-19.

Problem

The protracted COVID-19 pandemic has placed multiple stresses on the US public: the threat of illness and death, the isolating effects of physical distancing measures, and the uncertainties and hardships associated with disrupted economic activities. People's resilience is being sorely tested. The scientific community, with support of the federal government, is taking extraordinary steps to develop SARS-CoV-2 vaccines as swiftly as possible and, along the way, to inspire hope that relief is coming. Despite vaccination's promise of release, some Americans—including those most at risk of COVID-19 impacts—may miss out on, or opt out of, this life-preserving public health measure. Some may worry about whether SARS-CoV-2 vaccines are safe or if they work at all. Some may be mistrustful of vaccine manufacturers, the agencies that regulate the industry, and/or the public health authorities recommending the products. For others, the issue may be access: Will a COVID-19 vaccine be affordable, easy to get to without losing wages or taking public transportation and risking infection, and/or provided in a place that feels safe? Under these circumstances, what can be done to ensure that US populations, particularly those at high risk for serious illness, benefit from SARS-CoV-2 vaccines? With the current lag time in vaccine availability, US vaccination planners and implementers can exercise foresight and take proactive steps now to overcome potential hurdles to vaccine uptake.

Cross-Cutting Recommendation: Put People at the Center of a Revolutionary SARS-CoV-2 Vaccine Enterprise

US research requires reconfiguring to value the contributions of both bioscience and social and behavioral science to inform SARS-CoV-2 vaccine development. If embedded within the COVID-19 response, rapid social, behavioral, and communication science can deliver timely data and empirically based advice to support vaccine delivery strategies and uptake. In the SARS-CoV-2 vaccine enterprise, communities can be active research partners, rather than passive study subjects. Finally, human-centered design principles (aka "design thinking") can help improve the planning and implementation of the COVID-19 vaccination program.

- Joined by private foundations, Operation Warp Speed (OWS) should commit a portion of its budget and work through the National Institutes of Health (NIH), the National Science Foundation (NSF), and the Centers for Disease Control and Prevention (CDC) to support rapid response research into the human factors related to COVID-19 vaccination.

- NIH should adapt the Accelerating COVID-19 Therapeutic Interventions and Vaccines (ACTIV) model to include social/behavioral research on COVID-19 vaccination. Minority serving institutions are well-placed for partnering with communities in which hyper-localized understanding of vaccine access and acceptance issues is very much needed.

- State and local health officials, along with university researchers from the social, behavioral, and communication sciences, should partner with grassroots groups in projects to understand how their communities are thinking about, and wanting to learn more about, SARS-CoV-2 vaccines.

Recommendation #1: Understand and Inform Public Expectations about Vaccine Benefits, Risks, and Supply

Much is still unknown about what the diverse US public knows, believes, feels, cares about, hopes, and fears in relation to SARS-CoV-2 vaccines. Nonetheless, some trends are worrisome: Optimistic projections about vaccine development timelines and emphasis on unprecedented speed appear to be fostering unrealistic expectations about availability, as well as safety concerns about rushed product or compromised safety guards. Some communities are worried about being the future subject of experimentation. Underestimated COVID-19 disease risk, engendered by an uneven government response, could dampen future public demand for vaccines.

- In advance of a SARS-CoV-2 vaccine rollout, federal health agencies should develop a coordinated national promotion strategy, employing human-centered design to develop interventions that help a broad network of champions communicate effectively with the public about risks, benefits, allocation and targeting, and availability.

- The CDC, with the support of Congress, should fund state and local health departments, via the Public Health Emergency Preparedness grants, to form partnerships with grassroots-level organizations, practitioners, and other stakeholders to engage early and often with communities around COVID-19 vaccination.

Recommendation #2: Earn the Public's Confidence that Vaccine Allocation and Availability Are Evenhanded

Plans for SARS-CoV-2 vaccine accessibility, in terms of product affordability and material distribution, have yet to be developed or communicated. Absent any evidence to the contrary, social and economic inequalities, racially biased health systems, and a politicized pandemic environment could influence public perceptions about fairness in relation to vaccine allocation. Past experience suggests transparency and community engagement at the outset could boost public confidence that allocation decision making is neither capricious nor unjustly weighted in favor of some people over others.

- The US government should take steps to make the vaccine available at no cost for all Americans and publicly pledge that everyone who wants a COVID-19 vaccine will get a COVID-19 vaccine.

- With stakeholder and public feedback, and facilitation by a neutral third party, the CDC should reassess its pandemic vaccine allocation and targeting strategy (which last received external input in 2007 and 2008), using multiple forms of widespread public engagement that would function well in the current context of physical distancing and uneven access to communication technologies.

- OWS, CDC, the US Department of Health and Human Services (HHS), and state and local health officials should develop operational systems that involve nontraditional civilian partners and instill public confidence that vaccine distribution is evenhanded. CDC should develop consistent guidelines and rubrics for evaluating operational systems on principles of effectiveness and equity.

Recommendation #3: Make Vaccination Available in Safe, Familiar, and Convenient Places

Once SARS-CoV-2 vaccines are produced, they will need to be made available to the public. This will entail assessing local vaccination capacities and addressing any inadequacies. It will also require working with community members, and particularly members of minority and other marginalized communities, to establish vaccination sites that will be accessible and feel safe. Finally, throughout the vaccination process, public health authorities will need to provide up-to-date, comprehensive, and trustworthy information about vaccination opportunities.

- The CDC and relevant professional organizations that set standards for local public health practitioners should consolidate evidence on what has worked well at the level of state and local public health departments for making vaccines widely accessible and locally acceptable.

- Local and state public health agencies should explore collaborations with interagency and nongovernment partners to (1) use nontraditional sites (eg, places of worship, senior centers) as vaccination sites, and (2) explore opportunities to bundle COVID-19 vaccination with other safety net services.

- HHS and CDC should work together with state and local health authorities to develop clear communication strategies for describing where vaccines are available, who should be seeking them, and, if there is any cost to individuals, how much it will be.

Recommendation #4: Communicate in Meaningful, Relevant, and Personal Terms, Crowding Out Misinformation

A profusion of information and misinformation now circulates about the COVID-19 pandemic. Despite the first COVID-19 vaccine being, at a minimum, months away from materializing, the topic of vaccination has already commanded immense public attention and generated its own pool of misinformation. In an already volatile and uncertain pandemic environment, health communicators are faced with a complicated challenge of engaging, educating, and empowering audiences who have diverse beliefs and life circumstances.

- The US government should sponsor rapid efforts for public/stakeholder engagement, formative research, and message development in connection with SARS-CoV-2 vaccines. All of these efforts must be apolitical and should involve direct, longitudinal engagement with communities so adjustments can be made if attitudes or beliefs change over time.

- The CDC should apply its research capabilities in risk communication and community engagement in concert with a broader coalition with local connections including state and local health departments, universities, and community organizations.

- Trusted community spokespersons should be engaged in communication efforts to amplify vaccine-affirming, personally relevant messages. This will help neutralize misinformation about COVID-19 vaccines and vaccination operations.

Recommendation #5: Establish Independent Representative Bodies to Instill Public Ownership of the Vaccination Program

Baseline vaccine hesitancy and uneven access to care, coupled with current opposition to mask-wearing and physical distancing despite active COVID-19 disease, suggest that public health authorities need to rethink how best to manage the pandemic and to spur recovery. Governance structures for the US COVID-19 vaccination program that incorporate public oversight and community involvement have the potential to inspire greater public confidence in, and a sense of ownership of, the public health intervention. Such "ownership" can strengthen the intent to vaccinate and ensure that distribution systems reach throughout communities, thus helping to assure the fitting and fair use of a public good.

- The US government should sponsor a national panel of experts, convened by a politically neutral entity—for example, the National Academy of Sciences, Engineering, and Medicine—to review, synthesize, and report on best practices for engaging communities in vaccine allocation, deployment, and communication systems to achieve equity, solidarity, and good health outcomes.

- Each state should establish a public oversight committee to review and report on systems that have an impact on public understanding, access to, and acceptance of COVID-19 vaccines. Moreover, this accountability mechanism can ensure that allocation is fair, that target groups receive vaccine, and that underserved populations disproportionately affected during the pandemic are justly attended.

Unless these critical steps are taken, a future COVID-19 vaccination campaign may fall short. A worst-case scenario would involve an inability to stop the ravages of the disease and its cascading social and economic effects; further erosion of public trust in government, public health, and vaccine science; and potential threat to other life-preserving and life-enhancing vaccination efforts. That said, a successful COVID-19 vaccination endeavor promises an alternative future: a return to a sense of normalcy, major innovations in vaccine research and operations, and the investment of US society as a whole in making vaccines a public good in which all can share and derive value.

Introduction

Since its first appearance in the United States in February 2020, the novel coronavirus (SARS-CoV-2) has infected more than 2.6 million Americans and killed more than 127,000 (as of July 1, 2020).[1] Moreover, concern about exposure to the virus in clinical settings has led many people to postpone diagnostic and therapeutic visits for other life-threatening health conditions and to forego life-enhancing immunizations.[2,3] Pandemic responses, including closing venues where person-to-person spread is likely (eg, schools, churches, businesses) and requiring the use of masks and physical distancing measures when human contact could not be avoided, have reduced the spread of SARS-CoV-2. At the same time, these protective actions have radically transformed social life and disrupted national and household economies.[4] As the health crisis continues to linger and pandemic fatigue starts to take hold, political leaders, health officials, and the general public are eager for solutions.[5]

One of the most promising interventions, if successfully developed and deployed, is vaccines that would provide individual and population-level immunity, and through these the conditions for routine social and economic activities to fully resume. To facilitate the development and dissemination of such vaccines, the US government has committed over $10 billion for Operation Warp Speed (OWS)—a public-private partnership involving several government agencies, including the Centers for Disease Control and Prevention (CDC), the Food and Drug Administration (FDA), and the Department of Defense (DoD).[6] The primary aim of OWS is to deliver 300 million doses of a safe, effective vaccine by January 2021.[6] While this timeline is likely overly optimistic—vaccine development, especially against a pathogen for which no vaccine currently exists, as is the case with coronaviruses, typically takes 10 to 15 years[7]—progress is being made. As of June 30, 2020, more than 125 vaccines are in preclinical evaluation, 14 are in Phase I and II safety trials, 1 has entered Phase III efficacy trials, and 1 vaccine was recently approved in China for military use.[8]

Despite promising technological output, OWS—and the existing structures of national, state, and local government on which it is built—nonetheless manifests a key social gap. The program rests on the compelling yet unfounded presupposition that "if we build it, they will come." Past experience in routine and crisis contexts demonstrates that, for a variety of reasons, not all segments of the public accept vaccines.[9,10] Vaccine hesitancy was declared a top 10 global health threat by the World Health Organization (WHO) in 2019.[11] In the United States, public reluctance to be vaccinated is expanding: Recent measles outbreaks reflect parental concerns about vaccines,[12] and each year, many adults refuse the seasonal influenza vaccine or get it late.[13] Among Americans polled between May 14 and May 18, 2020, by the Associated Press-NORC Center for Public Affairs Research, 49% reported they planned to accept a SARS-CoV-2 (COVID-19) vaccine, but 20% said they would not.[14] Another 31% were not sure. Black and Hispanic Americans were more likely than white Americans to say they did not plan to get the vaccine if it becomes available.

Baseline vaccine hesitancy and uneven access to vaccines, coupled with the country's currently charged political environment and fragmented pandemic response, call for effective planning and implementation of a COVID-19 vaccine program. If poorly designed and executed, a COVID-19 vaccination campaign in the United States could undermine the increasingly tenuous belief in vaccines and the public health authorities that recommend them—especially among people most at risk of COVID-19 impacts. At the same time, the broad impacts of a successful vaccine program are considerable: Immediate benefits include interrupted disease transmission; fewer cases, hospitalizations, deaths, and chronic sequelae; and fully reinstated social, educational, and

commercial exchanges. Longer-term effects include improved institutional capabilities to foster vaccine confidence among diverse communities, enhanced literacy around the value of vaccinations to society, publicly embraced innovations (eg, novel vaccine platforms and delivery), and heightened trust in government, science, and public health.

Under these circumstances, what can be done to ensure that US populations, particularly those at high risk for serious illness from COVID-19, benefit from SARS-CoV-2 vaccines? With the current lag time in vaccine availability, US vaccination planners and implementers can exercise foresight and take proactive steps now to overcome potential hurdles to vaccine uptake. The purpose of this report is to aid such endeavors by anticipating major challenges and opportunities in connection with human factors associated with COVID-19 vaccines. The report leverages findings from the social, behavioral, and communication sciences in connection with vaccine confidence, hesitancy, and access, as well as the expert judgments of a multidisciplinary working group about how that knowledge likely applies in the COVID-19 context. Because some issues are still unknown and solutions are yet to be developed, rapid response research and human-centered design efforts will be necessary to engage the public and to have a successful pandemic vaccination campaign.

What follows are empirically informed recommendations—directed to both US policymakers and practitioners, as well as nontraditional partners new to public health's mission of vaccination—on how to advance public understanding of, access to, and acceptance of vaccines that protect against COVID-19. The national aim of developing and deploying SARS-CoV-2 vaccines is occurring in parallel with the global goal of providing vaccine for the world.[15] This scenario adds an additional layer of social, political, ethical, and communication complexity that subsequent analyses must address.

Methods

In April 2020, principal investigators from the Johns Hopkins Center for Health Security and the Texas State University Department of Anthropology convened the 23-person *Working Group on Readying Populations for COVID-19 Vaccine*, with support from the National Science Foundation–funded CONVERGE Initiative.[16] The purpose of the working group was to develop and disseminate recommendations informed by design thinking and evidence from social, behavioral, and communication sciences that would support realistic planning in the United States for a COVID-19 vaccination campaign, from a human-factors perspective. Members of the working group include national figures in public health and social science with research, policy, and practice expertise in vaccinology, vaccine hesitancy/confidence, health disparities, infectious disease, bioethics, epidemiology, bioinformatics, public health law, pandemic mitigation, public health preparedness, mass vaccination campaigns, community engagement, and crisis and emergency risk communication.

Informing the report's development were a combination of literature reviews on vaccination, pandemic planning, and health crisis communication; an assessment of current news and social media trends regarding COVID-19 vaccines; and key informant interviews with each working group member focusing on their respective expertise. After analyzing the gathered evidence, a core team of 9 working group members drafted an interim report: namely, a research-setting agenda to guide the aggregation, generation, and translation of research about the social, behavioral, and communication challenges anticipated with COVID-19 vaccination (see Appendix).[17] The full working group met virtually on May 21, 2020, to deliberate the interim report and also emailed detailed written

comments. The core team integrated this feedback and then circulated a refined draft of the research-setting agenda to the full group for further comment, revision, and signoff by June 12, 2020.

The working group's final report, more strategic in nature as represented in this document, conveys a set of actionable recommendations for public health and government authorities on how to enhance public trust in and health with COVID-19 vaccination. The report was initially drafted by the core team who integrated the interim report inputs, further deliberations of the working group at a virtual meeting on June 15, 2020, and another round of evidence gathering. The core team submitted a preliminary draft of the strategic recommendations to the full working group for review and written comments. Incorporating this feedback, the core team then prepared and circulated a revised document to the full group for additional written input. By July 7, 2020, all working group members had reviewed and affirmed the document's final version.

Cross-Cutting Recommendation:
Put People at the Center of a Revolutionary SARS-CoV-2 Vaccine Enterprise

Current Scenario

Human factors—including understandings of disease, perceptions of risk, and social factors affecting access—are central to vaccine uptake. This has proven true in the past for both routine and emergency vaccinations. Despite this fact, funding for human factor research, and particularly agile and timely funding, is not commensurate with its significance for the success of a vaccination campaign—namely, one in the middle of a public health emergency.

Conceived as a biotechnology and logistics challenge, COVID-19 vaccination is equally complex in terms of human factors. "If we build it, they will come" is a naïve presupposition about humans and vaccines. In 2010, for instance, many Americans rejected the H1N1 influenza pandemic vaccine because of perceived safety concerns—despite the fact that the vaccine involved only a strain change (ie, it was not a new technology) and the vaccine had been fully tested before release.[18] In contrast to the H1N1 pandemic flu vaccine, SARS-CoV-2 vaccines *will* be novel products, and when they are initially offered to the public, safety data may be limited to tens of thousands of vaccinated individuals, rather than larger numbers in which more rare adverse effects could be detected.[19] In addition, the H1N1 vaccine amplified health disparities as well as feelings of racial bias. In Los Angeles, for example, distrust in the government resulting from prior experimentation on Black men and women led Black faith-based leaders, radio personalities, and other community leaders to advise local Black community members to avoid vaccination. Even though the Los Angeles County Health Department actively sought to address these concerns, the local suspicions, coupled with a lack of convenient access to vaccines, ultimately resulted in many people remaining unvaccinated.[20]

Funding for vaccine-related research on human factors is not commensurate with its significance for vaccination success. OWS is providing over $10 billion to develop and distribute COVID-19 vaccines to the US population; project descriptions do not note any social and behavioral research investments.[6] A relatively nominal investment, however, could vastly increase the likelihood of success for this high-impact initiative. Apart from OWS, research funding streams for the social

and behavioral aspects of vaccination have historically been weak.[21,22] This type of research—practical research of a social and behavioral nature of a medical technology—falls in between the priorities of the NIH (which rarely funds social science research) and the National Science Foundation (which does not fund research that is only applied). Funding from other sources, including the CDC and private foundations, is also historically limited. A recent instance of misaligned priorities involves CIVICs, a network of multidisciplinary research centers focused on the development and clinical trials of universal influenza vaccines whose creation the National Institute of Allergy and Infectious Diseases heralded in September 2019; CIVICs includes no support for the social and behavioral science that could help assure that a clinically successful vaccine would also be socially acceptable.[23] Such research is critical. In 2019, for example, a national poll revealed that 51% of Americans believe that flu vaccine doesn't work, and 34% believe they could get the flu from the vaccine itself.[23,24]

Infrastructure to support methical basic research in a steady state environment is not outfitted for applied research during rapid response to a dynamic crisis like COVID-19. In recent years, and driven by events such as the Deep Water Horizon oil spill, recognition of the need for timely, quality disaster research has grown.[25-28] Extreme events often entail high-impact decisions that benefit from well-timed data and science-based advice.[29] At the same time, the quick pace, practical nature, and high "human" stakes of an emergency response are out of sync with the (typically) more methodical, abstract nature of academic research whose impacts are often iterative.[29] Initiatives are under way to develop a community of practitioners and a supportive infrastructure for disaster science in the United States, including professional networks, streamlined institutional review board processes, and joint responder-researcher training.[30,31] More work is needed, in particular, to expedite funding for time-critical studies and to ease administrative restrictions such as the Paperwork Reduction Act (PRA), which limits the breadth and speed of human subject data collection.[30] In the case of SARS-CoV-2 vaccines, an example of the need for more agile funding mechanisms to support social and behavioral research is an NIH Funding Opportunity Award, issued June 2020 and made possible by the CARES Act, for which the earliest project start date is September 2021—a full 9 months after OWS plans for COVID-19 vaccines to become available.[32]

Best Practices

The interventions below entail a reshaping of the US initiative to develop and deploy COVID-19 vaccine, based on the recognition that knowledge of human factors is essential to the success of a vaccination campaign, during a pandemic and in more routine times.

Reconfigure research investments to value the contributions of both bioscience and social and behavioral science to the development of SARS-CoV-2 vaccines. Some of the most highly regarded technical enterprises undertaken in the United States in connection with the biological and physical universe (eg, manned space flight, the Human Genome Project, or HGP) have carved out support for understanding human dimensions. The National Aeronautics and Space Administration, for example, invests in human factors across the agency, including to improve organizational performance and its investigations of aviation mishaps.[33] Likewise, the NIH and the US Department of Energy devoted 3% to 5% of their annual HGP budgets toward studying the ethical, legal, and social issues surrounding the availability of genetic material, including privacy concerns, psychological impacts, and social stigmatization.[34,35] A comparable portion of the current OWS budget would be $300 million to $500 million. The COVID-19 vaccine research enterprise should engage social, behavioral, and communication scientists in far greater numbers and at higher levels

of prominence. In particular, designers and experts in the science of innovation could play important roles in reconfiguring vaccination systems as a whole to promote widespread acceptance of COVID-19 and even other vaccines.

Embed rapid social, behavioral, and communication science within the COVID-19 response, helping to deliver timely data and empirically based advice. Awareness has grown dramatically within the global public health community about the importance of more fully understanding and addressing the social and behavioral dimensions of infectious disease outbreaks, given their influence on emergency response and recovery outcomes.[36] Recent high-level reports and post-epidemic analyses have encouraged national health authorities and multilateral health organizations to further develop and use their social science research capacities.[37-40] Social scientists, who are sensitive to the broader context, can employ methodologies with people at their center and command specialized knowledge of specific cultural and regional communities, thus serving as helpful advisors on the human factors of outbreaks and epidemics.[36] Tragic events during the 2014-2016 West Africa Ebola outbreak—including community rejection of public health measures as well as both journalist and health worker deaths in Guinea—lent much urgency to understanding how better to elicit the trust and cooperation of affected communities.[38,40-42]

Transform the vaccine research enterprise by having communities participate as active partners, not as passive study subjects. Medical and public health professionals have traditionally studied and interacted with communities during outbreaks in ways that have not always been effective. During the West African Ebola outbreak, for instance, professional-community interactions were often a "one-sided, top-down" affair in which the information delivered was meant to "correct" misperceptions and alter behaviors, rather than a 2-way dialogue in which people felt comfortable to share their concerns and fears and their own suggestions for finding a solution to the health crisis.[43] Eventual efforts to overturn a command-and-control form of communication and to practice genuine community engagement in West Africa produced myriad beneficial effects. These included enhanced cultural competency of health workers who wanted to share the benefits of evidence-based care and infection control;[37] collective behavior changes (eg, altered healing and burial practices) that, enabled by cultural sensitivity and resilience, interrupted disease transmission;[44] and vaccine research achieved through shared learning among communities, investigators, and clinical trial participants.[45]

Apply human-centered design principles (aka "design thinking") to the planning and implementation of the COVID-19 vaccination program. Community-based research involves community members in project design and implementation, values knowledge in its many forms, and returns practical benefits to the community.[46] Human-centered design, too, approaches a product or service (eg, a health system, a vaccination program, a communication intervention[47-49]) from the perspective of the user: What does the person on the receiving end think, expect, experience, and sense about the valued good intended for him or her?[50-52] In design thinking, users also become collaborators in developing the system, activity, or product that directly affects them. A recent review of human-centered design applications in healthcare settings suggests that this user-focused approach may result in more usable, acceptable, and effective interventions compared with traditional expert-driven methods.[50] Human-centered design, for example, has proven an effective tool for developing interventions to improve HPV vaccination rates, such as readying clinicians for their role as wellness advocates (versus experts) who use benefit language that speaks to parents' own values rather than relying on technical jargon.[48]

Action Items

More collaborations (eg, between social science and bioscience researchers, between universities and local and state public health departments) and more timely peer-reviewed publications can produce the knowledge about human factors that, if applied appropriately, could improve population uptake of COVID-19 vaccines. Public and private funding is critical for this to occur.

- **Joined by private foundations, OWS should commit a portion of its budget and work through NIH, NSF, and CDC to support rapid response research into the social, behavioral, and communication issues related to COVID-19 vaccination.** Priority topics include public views and values concerning SARS-CoV-2 vaccine allocation and targeting strategies, community hopes and concerns related to COVID-19 vaccination, underserved communities' COVID-19 experiences and thoughts on what vaccine may mean for them, and development and testing of communication messages and strategies informed by the above. Priority methodologies to include are panel studies, community-based research, human-centered design, public engagement processes, and longitudinal surveys and social media analyses to track how people's attitudes, knowledge, and behaviors evolve over time as the pandemic and vaccine availability change. Applying science regarding innovation, motivation, change, communication, and cognitive biases and decision making will also be important.

- **NIH should adapt the Accelerating COVID-19 Therapeutic Interventions and Vaccines (ACTIV) model to include social/behavioral research on COVID-19 vaccination.** Such an approach could facilitate collaboration among government organizations, private foundations, for-profit companies, and universities to support urgently needed research of a social/behavioral nature. Minority-serving institutions, in particular, are well-placed for research partnerships with communities where COVID-19 has had disproportionate impacts and where hyper-localized understanding of vaccine access and acceptance issues is very much needed. Collaborations could be accomplished by sponsoring social/behavioral research separately, or by embedding such research in already existing projects and proposals, such as requiring technical research projects on COVID-19 vaccines to include a social/behavioral component.

- **Public health and social science scholars and their national-level associations should call for greater private and public support for social and behavioral research regarding COVID-19 vaccination.** Among the entities that can voice the need for a greater focus on the human factors associated with SARS-CoV-2 vaccine are the American Psychological Association; the American Anthropological Association; the American Sociological Association; the American Political Science Association; the American Public Health Association; the Social Science Research Council; the National Academy of Sciences, Engineering and Medicine; and the American Academy of Arts and Sciences.

- **NIH, CDC, and the National Library of Medicine (NLM) should develop a repository for social and behavioral COVID-19 research, drawing on the quick peer-review and publication of research results.** These steps have already been taken for technical research on COVID-19 and COVID-19 vaccination. Spreading this practice to include social/behavioral research will facilitate collaborations between social scientists (and even social scientists and researchers working on more technical aspects of COVID-19 development) and also limit duplicate efforts.

- **State and local health officials and university researchers from the social, behavioral, and communication sciences should partner in projects to understand how their communities are thinking about, and wanting to learn more about, SARS-CoV-2 vaccines.** These research-practitioner partnerships should be broadly inclusive of community-based groups as well as financially compensatory of nonprofit organizations that are embedded in underserved minority populations, where cultural norms, language requirements, and social connections may not be well understood by mainstream institutions.

Recommendation #1:
Understand *and* Inform Public Expectations about COVID-19 Vaccine Benefits, Risks, and Supply

Current Scenario

Much is yet to be learned about what a very diverse US public knows, believes, feels, cares about, hopes, and fears now in relation to future SARS-CoV-2 vaccines; why that is so; how it may change over time; and how vaccination planning should evolve as a result (see Recommendation #4). At the same time, some challenges regarding public expectations about vaccines for COVID-19 are already emerging.

There is a risk that projections about vaccine development are overly optimistic and may set up unrealistic public expectations and mistrust around vaccine safety and availability. Vaccines typically require years of development and testing before receiving licensure. Many of the more than 125 vaccine candidate products in various stages of clinical development are likely to fail. Nonetheless, political leaders have publicly promised to accelerate vaccine development, manufacturing, and distribution "at an unprecedented pace," with the aim of delivering 300 million doses of a safe, effective, novel vaccine by January 2021.[53] As a result, public expectations around vaccine availability and effectiveness may not align with the practical realities of vaccine development, licensure, manufacture, and distribution. By failing to deliver SARS-CoV-2 vaccines as promised, the US government could frustrate pandemic-weary communities, siphon away their trust, and suffer a major loss of institutional legitimacy. Moreover, unfulfilled promises around SARS-CoV-2 vaccine could adversely affect public sentiments toward other vaccines as well as the entities involved in the medical countermeasure enterprise as a whole.

Emphasis on the unprecedented speed with which vaccines are being developed has inadvertently prompted safety concerns. The speed of development of a SARS-CoV-2 vaccine that the Trump administration has promised has raised concerns about both the safety of the resultant product and Americans' willingness to get vaccinated. Leading scientists have attempted to allay these concerns, offering assurances that no corners will be cut in terms of assessing vaccine safety.[54] However, a recent poll conducted by CNN showed that as many as a third of Americans would refuse a SARS-CoV-2 vaccine, even if it were widely available and affordable.[55] Moving forward, vaccine refusal and vaccine hesitancy—both on the rise globally and in the United States before the pandemic—are likely to exacerbate safety concerns further. In 2010, for example, many Americans rejected the H1N1 vaccine out of a sense that the vaccine was "rushed" and thus unsafe.

This happened despite the fact that the vaccine was only a strain change for a flu vaccine, not a novel technology, and the vaccine had been fully tested before release.[18] In regard to COVID-19 vaccines, the government's high-tech, space-age name for the vaccine development program—Operation Warp Speed—has also inadvertently increased concerns about the safety of future vaccines.

The legal and policy mechanisms by which medical countermeasures (MCMs) become publicly available are likely to influence public acceptance of SARS-CoV-2 vaccines. It is almost certain that COVID-19 vaccines available in the United States will be sanctioned for use via an Emergency Use Authorization (EUA). EUA is a power granted to the FDA to make available unlicensed drugs, vaccines, or other therapeutics during a public health emergency, provided sufficient evidence exists that the MCMs in question "may be effective." However, because EUA-sanctioned products are not fully licensed for the intended purpose, a vaccine receiving an EUA could engender uncertainties around safety and effectiveness that a fully licensed vaccine may not. Previous research indicates that factors such as belief in a vaccine's safety, perceived lack of clear recommendations for use, and mistrust and fears about authorities' motivations for vaccination could shape uptake of a vaccine authorized for use by an EUA.[56] Studies also report a high degree of public anxiety and mistrust associated with government-disseminated risk communication messaging, underscoring the urgency of identifying trusted vaccine communicators.[57,58] Furthermore, the legal and highly technical language used in EUAs and FDA recommendations could impede public understanding of the risks and benefits associated with an EUA-sanctioned vaccine.

Promulgation of unsubstantiated or harmful countermeasures for COVID-19 chips away at the government's perceived scientific objectivity. Concerns about COVID-19 vaccines' safety are closely intertwined with eroding public trust in US government institutions, including biomedical and public health agencies tasked with overseeing vaccine development, licensure, and distribution. The intellectual independence of the FDA, for example, has recently come under scrutiny—specifically, its ability to objectively assess vaccine safety and efficacy data amid immense political pressure to quickly approve a SARS-CoV-2 vaccine.[59] In addition to valid safety concerns, disinformation regarding alternative, unproven, and dangerous treatments for COVID-19— such as off-label use of hydroxychloroquine, exposure to ultraviolet light, and ingestion of bleach— might further reduce public willingness to obtain a vaccine once it is available.

Underestimation of COVID-19's risk, fostered by an inconsistent government response, dampens public willingness to implement protective measures. Vaccination is one tool in a broader arsenal of public health strategies for combating COVID-19, including implementation of remote working arrangements, school closures, and other social distancing measures. However, inconsistencies in state reopening policies, coupled with quarantine fatigue and a desire to resume "normal" life, could diminish public risk perceptions of COVID-19 infection and, with it, the demand for vaccines. If Americans become inured to COVID-19 as an endemic disease (ie, with continuous ongoing transmission through the year and from year to year), or if they equate it with more familiar, seasonal public health threats like influenza, encouraging vaccination and increasing vaccine uptake could prove to be a major challenge.

Best Practices

Amid this increasingly complex communication landscape, there are several best practices that public health and healthcare practitioners, political leaders and policymakers, and communication experts can implement to prime the American general public for a SARS-CoV-2 vaccine rollout.

Temper expectations of a vaccine as a "quick fix." Communicators must prepare the public to continue implementing a mix of protective actions and harm reduction strategies, even if SARS-CoV-2 vaccines become available. A vaccine may not be immediately available to every member of the public if certain at-risk populations are prioritized for immunization, thereby necessitating continued mask-wearing, social distancing, and other protective measures. These measures will also remain necessary if vaccine effectiveness is limited—especially in older individuals—or if vaccine uptake remains low in certain populations. Moreover, the dominance of COVID-19 and aspirational vaccines in current US discourse about health may inadvertently divert attention away from protective measures that are already in hand, such as influenza vaccines and pneumococcal and herpes zoster vaccines for older adults.

Forecast a range of vaccine possibilities, from best-case to worst-case scenarios, regarding vaccine supply and effectiveness. From a position of openness and transparency, public health communicators should address inevitable roadblocks and bottlenecks at every stage of vaccine testing, licensure, distribution, and administration, and they should convey to the public how this could affect vaccine availability. Frank acknowledgment of positive and negative vaccine outcomes—for example, ranging from no available vaccine, to limiting vaccination to high-risk groups, to having a licensed product in ample supply—could help further calibrate public expectations around vaccine availability. In addition, it will be necessary to reframe the dialogue about the value of vaccines, given that future SARS-CoV-2 vaccines may be not be as effective as most hope. A vaccine that may not prevent infection may still prevent the most severe disease. Thus, vaccination could keep hospitals from being overwhelmed, prevent declines into frailty after severe bouts of disease, and avert medical bankruptcies that may arise with the longer-term impacts of COVID-19, but it might not provide the community immunity necessary to halt the spread of SARS-CoV-2.

Persist in transparency around vaccine safety systems and actively work to protect their integrity. Health authorities should focus existing vaccine safety infrastructure on the use of SARS-CoV-2 vaccines. In this vein, health authorities should ascertain background rates of anticipated adverse events prior to vaccine rollout, to enable comparison with post-rollout incidence of adverse events. This information could help public health officials to determine whether such post-rollout adverse events are occurring at higher, lower, or equivalent rates as compared to the same clinical syndromes prior to vaccine rollout. Communicating this information to the general public could also help mitigate anxieties around vaccination when post-vaccination adverse events—whether associated with the SARS-CoV-2 vaccine or not—inevitably occur. In the lead-up to a licensed vaccine entering the market, and on an ongoing basis, risk communicators should develop strategies for educating the public about protocols for assessing and monitoring vaccine safety at every stage of development and distribution, the processes for monitoring and responding to adverse effects, and the institutions responsible for implementing these protocols. The public themselves will need salient information about the nature of adverse events, including the fact that not all observed effects are attributable to the vaccine. Vaccine safety communication should be comprehensible to nonscientific audiences, eschew technical jargon, and follow principles in the CDC Clear Communication Index.[60]

Early on, seek the counsel and input of communities who have historic reluctance toward novel vaccines and understandable fears of being "experimented on." An effective SARS-CoV-2 vaccine communication and community engagement campaign (such as that noted in Recommendation #4) should actively address the concerns of populations that have been historically harmed by public health and clinical malpractice in the United States (see Recommendation #2).

Vaccine promotion efforts should engage these communities early and as frequently as possible, and as partners in the task, empathizing with legitimate concerns around vaccine safety and medical experimentation, while also identifying and sharing salient information that can help assuage unwarranted worry. Identifying champions of vaccination within these communities—particularly those at higher risk of experiencing COVID-19–associated morbidity and mortality—will also be essential to increasing vaccine uptake. Efforts to engage hesitant and underserved populations, who have been disproportionately affected by COVID-19, should reach back, too, to the stage of enrollment in trials for vaccine efficacy. Testing in specific racial and ethnic groups can ensure the right products, invest diverse communities in the vaccine enterprise, and, as a result, potentially instill greater trust.

Action Items

An effective communication and community engagement campaign that successfully promotes SARS-CoV-2 vaccination will necessarily include stakeholders at federal, state, and local levels of government, as well as partners in the private sector. Critically, such a campaign should also make concerted efforts to engage nontraditional, grassroots-level groups to which target audiences may belong; such groups play important roles in shaping public expectations around vaccine availability and effectiveness, as well as in encouraging vaccine uptake.

- **In advance of a SARS-CoV-2 vaccine rollout, federal health agencies should develop a coordinated national strategy to promote vaccination, employing human-centered design to develop interventions that help a broad network of champions communicate effectively with the public about risks, benefits, allocation and targeting, and availability.** The National Vaccine Program Office at the US Department of Health and Human Services (HHS) can coordinate the CDC, the FDA, and the NIH in developing a COVID-19 vaccine promotion campaign. Specifically, the Office of Minority Health at HHS, the Office of Minority Health and Health Equity at CDC, the Indian Health Service, and the Office of Minority Health and Health Equity at FDA should be involved. To assure the effectiveness of all SARS-CoV-2 vaccine communication (Recommendation #4), serial (ie, repeated) surveys of the public, including subgroups, as well as targeted qualitative research among essential, hesitant, and underserved groups will be necessary to know what people are thinking, how this evolves over time, and if communication messages need to be adapted. While the federal health agencies may lead this national effort, it will be critical to enlist nongovernment actors such as employers, human rights groups, minority interest groups, and other stakeholders in whom diverse segments of the US public may place more trust.

- **Federal, state, and local health agencies should enlist healthcare providers and community health promoters in vaccination promotion efforts by actively partnering with relevant professional associations.** Groups like the American Medical Association, the American Academy of Pediatrics, the National Hispanic Medical Association, the Association of American Indian Physicians, the American College of Physicians, the National Association of Community Health Centers, the National Medical Association, the National Black Nurses Association, the National Association of Hispanic Nurses, the American Nurses Association, and the National Association of Community Health Workers are comprised of clinicians and community health advocates who often function as the first point of contact for patients concerned about vaccine safety and availability. In addition, state-level associations of physicians, nurses, pharmacists, and other

health professionals are critical intermediaries for championing vaccines in their respective communities. Medical professional associations serve as powerful conduits for relaying information about risks and benefits to vaccine-hesitant patients and caregivers.

- **The CDC, with the support of Congress, should fund state and local health departments, via the Public Health Emergency Preparedness grants, to form partnerships with grassroots-level organizations and stakeholders (in addition to the practitioner networks above) to promote vaccination.** The Association of State and Territorial Health Officials (ASTHO), the National Association of County and City Health Officials (NACCHO), and the Association of Immunization Managers (AIM) play critical roles in planning on-the-ground vaccination programs, and they will need support in building out the robust partnerships with both community groups and practitioner networks. Reaching audiences that fall outside the purview of federal health agencies, public health institutions, and the medical community will be essential to achieving high SARS-CoV-2 vaccine uptake. Faith- and community-based organizations, schools, business and homeowners' associations, and unions—organizations with potentially untapped or underutilized infrastructures for public health message dissemination—could offer risk communicators inroads into hard-to-reach audiences. Similarly, community organizers could provide public health communicators with valuable context on community needs, attitudes, and norms that could modulate public perceptions of vaccination.[61] Investments should support development of resources to train existing community health workers, staff in community health centers, and others promoting vaccination to underserved, disproportionately affected groups.

Recommendation #2:
Earn the Public's Confidence that Vaccine Allocation and Availability Are Evenhanded

Current Scenario

Vaccine accessibility will be a key issue in a future COVID-19 vaccination campaign. The current climate of racial, political, and economic division in the United States has created a charged environment that necessitates, more than ever, both a fair vaccination campaign and widespread public recognition of its fairness. Issues of fairness incorporate both matters of allocation and distribution.

Plans for SARS-CoV-2 vaccine accessibility, in terms of product affordability and material distribution, have yet to be developed or communicated. Analysts tracking US government planning for SARS-CoV-2 vaccines have raised credible concerns about accessibility. In February 2020, HHS Secretary Alex Azar was unable to guarantee that a future vaccine would be affordable.[62] Dr. Rick Bright, a scientist recently removed as head of the US Biomedical Advanced Research and Development Authority, indicated in mid-May that the country did not have a plan for how to distribute potential vaccines effectively or equitably.[63] A more recent fact sheet provided on behalf of OWS does not address issues of vaccine cost or systems for equitable distribution, indicating only that, "as a condition of receiving support from OWS, companies will provide to the US government an allocation of countermeasures developed."[6] OWS operations also appear to depart

from prior approaches to vaccine distribution in a pandemic. During the 2009 H1N1 influenza, the US government contracted with pharmaceutical companies to produce formulations of the vaccine,[64] and the CDC contracted with logistics firms to develop distribution networks for state and local health departments.[65] State health departments worked with local health departments to distribute and administer the vaccine in routine clinical settings and alternative sites. With the current COVID-19 plan, the DoD appears to be taking on the CDC's role,[6] and distribution plans at state and local levels are still unclear. DoD involvement in these efforts further risks undermining public confidence in COVID-19 vaccines.

Vaccine doses will likely be limited at first, prompting the complex question of who should receive vaccines and in what order. Should current vaccine candidate(s) prove successful, the practical realities of vaccine manufacturing and distribution still mean that initial doses will be insufficient to vaccinate a majority of the US population immediately. HHS currently plans to apply a tiered approach to vaccine distribution, building on an allocation methodology devised as part of prior influenza pandemic planning[66] and adjusting it based on "experience during the first wave of the COVID-19 response, data on the virus and its impact on populations and the performance of each vaccine, and the needs of the essential workforce."[6]

Most recently, a subgroup of the CDC's Advisory Committee on Immunization Practices (ACIP) borrowed from an interim allocation methodology to develop a 5-tier prioritization scheme.[67] The first tier includes those individuals who are "critical health care and other workers," with tiers 2 and 3 including others who also work in health care and other essential jobs or who fall into the following categories: those who are age 65 and older those who are living in long-term care facilities, or those with medical conditions that would increase the risk of developing severe COVID-19. Tiers 4 and 5, however, are loosely defined as the "general population," an expected 206 million individuals. Concerns about the vague nature of the tier descriptions have already been raised by the full ACIP committee—for example, who precisely falls into the category of a high-risk medical worker? Additional questions remain regarding criteria surrounding race and ethnicity, low-income populations, and pregnant women. Such questions, and the general allocation strategy of balancing societal benefits and individual health, leaves plenty of room for perceived inequities in allocation decisions.

Some individuals in potential priority SARS-CoV-2 target groups (eg, essential workers, people who are medically vulnerable) may forego vaccination. Healthcare workers are often considered high on vaccine priority schedules because of disease exposure risk and potential for transmission to high-risk persons. However, some healthcare workers are hesitant to be vaccinated; for example, 2018-19 flu vaccination coverage among healthcare personnel was 81.1%, similar to coverage during the prior 4 seasons.[68] Additionally, precedent exists for healthcare worker reluctance toward vaccination during a pandemic, as seen with the 2009 H1N1 influenza pandemic.[69] Few healthcare workers, too, volunteered for the 2003 smallpox vaccination campaign, in part due to the program's failure to engage constituents early on and to make its rationale transparent.[70] A legacy of experimentation on Black men and women[71-73] has led to distrust of the medical establishment, including a lack of trust in vaccination processes and an absence of interpersonal trust between patients and providers.[74] Public health authorities, too, elicit a lesser degree of trust among Black, Hispanic, and lower-income populations in connection with vaccine recommendations.[75] Despite best intentions, the prioritization of Black communities for vaccination may prompt concerns that they are "testing subjects" for a novel vaccine. Thus, the US is in a paradox, where populations of color could

be prioritized for vaccination based on their increased risk for disease, yet doing so may be perceived as experimenting on a vulnerable population.

Absent evidence to the contrary, preexisting inequalities could influence public perceptions about fairness or favoritism with vaccine allocation. COVID-19's impact on the US healthcare system has already necessitated the allocation of scarce medical resources, prompting discussion about the equitable distribution of limited supplies of future SARS-CoV-2 vaccines.[76,77] The backdrop for such discussions includes systemic and pervasive racial biases in the US healthcare system, including lack of insurance and a lesser quality of care for non-white and rural, low-income populations.[78-80] Social disparities, for example, have resulted in Black populations experiencing increased morbidity and mortality compared to their white peers, sometimes in ways that cannot be accounted for by access to health care and income.[81] Recent data on COVID-19 indicate that this disease is also having a disproportionate impact on communities of color.[82] Prior work on community values about the prioritized use of scarce medical resources in pandemic circumstances revealed that some in the public worry that emergency allocation decisions would replicate existing inequities, including along such lines as insured versus uninsured persons and urban versus rural communities.[83] Moreover, this research uncovered certain beliefs held by members of the public, such as that vaccines should be withheld from groups seen as socially "undeserving" (eg, incarcerated people, undocumented immigrants), that run contrary to medical and public health ethics.[83] Public health authorities will need to anticipate and mitigate public discourse regarding vaccine allocation along with prejudicial ideas about social worth, explaining that vaccinating individuals residing in the United States, regardless of social or legal status, is critical to the public's health as a whole.

Social protests about systemic racism define a political environment in which allocation of SARS-CoV-2 vaccines may become a flashpoint, if the process is judged unfair. Recurrent, large-scale, nationwide protests have heightened the visibility of and public concerns about law enforcement's disproportionate use of deadly force against people of color, further eroding trust in government institutions. Moreover, the reactions of some local leaders to pandemic conditions in the context of peaceful demonstrations as well as acts of civil disobedience have had additional splintering effects. The most salient example is the closing of COVID-19 testing sites in Los Angeles. Although local officials cited safety concerns for these closures, some protestors interpreted the action as a punitive measure.[84,85]

Politicization of the pandemic—both real and perceived—may prime expectations of a partisan-based vaccine allocation rather than an equitable one. Rapid social science studies have documented the partisan nature of the health crisis; reactions to the pandemic by the public, political elites, and some media sources exhibit an ideological inflection.[86,87] Some Americans, for instance, perceive the use of masks as a slight against President Trump by his detractors.[88] Likewise Trump has signaled his preference for having a vaccine available prior to the 2020 election (a projection not in keeping with expert assessments), prompting concerns about whether he could turn a potential vaccine into a campaign tool by releasing one that has not been adequately assessed for safety and effectiveness.[59] Disagreement has also arisen regarding federal aid for states to mitigate the impact of COVID-19 via the CARES Act passed in March 2020. Some Republican political leaders viewed the flexibility of states to determine how to use the provided aid as a cover for paying for non-COVID issues: Senator Rick Scott (R-FL) was quoted as saying, "Why do I want to go pay for all of [New York Governor Cuomo's] liberal issues?"[89] Such polarized views of COVID-19 raise concerns about whether vaccine allocation can and will be judged as fair by a majority of Americans.

Best Practices

People will judge a COVID-19 vaccination campaign's integrity not simply on biomedical merits, but on matters of fairness and equity—that is, have people received their just portion of health services, and has disease prevention, ultimately, been fairly distributed? Past experience suggests transparency and community engagement at the outset can boost public confidence that allocation decision making is neither capricious nor unjustly weighted in favor of other people.

Employ public engagement efforts to better understand group values and beliefs regarding the allocation and distribution of potential COVID-19 vaccines. Public engagement offers an opportunity for stakeholders to interact with one another, carefully consider important issues, and ultimately provide their feedback on what is important to them. Facilitating input from affected communities in allocation decisions in the pandemic context can generate innovative solutions, greater trust in authorities, feelings of ownership, and understanding for decisions, as well as creating an informed populace able to exercise responsibility for collective well-being.[90-96] Past public engagement efforts have helped provide insight into potential future medical countermeasure policies, highlighting the importance to stakeholders of equitable access to medical countermeasures and personal safety as well as clear, consistent, and timely communication.[97] Public engagement efforts during the summer of 2009 regarding mass H1N1 vaccination provided the CDC with insight regarding public values for protecting the maximum number of people from illness and hospitalization or death, and they gained a more nuanced distinction between elements of possible allocation options.[98] Public engagement efforts like these are perhaps most effective when conducted at the local level by trusted entities.

Implement vaccination allocation guidelines consistently across different geographic locations and healthcare providers. During the 2009 H1N1 pandemic, there were instances of healthcare providers adhering to different vaccination guidelines: Some sites provided vaccines only to those people on the priority schedule, while other nearby locations also vaccinated people on a walk-in basis, regardless of the priority schedule. This inconsistency caused confusion for some in the public and led to claims of favoritism or disproportionate levels of care.[99] Future vaccination guidelines should assure that the same level of care and allocation criteria are applied consistently across geographic locales and healthcare providers, and when dynamic supplies and local conditions (eg, high disease burden) prevent such consistencies, then federal, state, and local public health authorities should provide the public with timely, open, and frank insights into these predicaments. Having systems in place to monitor and to report publicly on the distribution of SARS-CoV-2 vaccines can help ensure that evenhandedness endures throughout the distribution process, even as vaccination guidelines change ([Recommendation #5](#)).

Develop allocation strategies that take into account racial, ethnic, and social factors and vaccine attitudes. Much is still unknown about future SARS-CoV-2 vaccines. These vaccines may use a platform technology that has not yet been licensed for other vaccines. If multiple vaccines are eventually deployed, distribution may start with one, while later, multiple vaccines will be used simultaneously. This development could cause concern in skeptical populations, including communities of color who fear being experimented on or provided with a countermeasure perceived as less safe or less protective. During the anthrax letter attacks, for example, the predominantly Black group of postal workers were prescribed an equally efficacious, yet different antibiotic from that given to predominantly white congressional staff, generating concerns about different levels of care.[100,101] Thus, allocation strategies should consider racial, ethnic, and social factors while addressing

the public's attitudes and behaviors toward vaccination. Research following the H1N1 pandemic provided empirical data about the elevated risk of racial and ethnic minorities regarding exposure, susceptibility, and access to health care.[102] In the pandemic, the disproportionate impact of COVID-19 on US Latinos, for example, is a function of exposure at jobs with inadequate sick leave policies, greater incidence of diabetes and other preexisting conditions, tight living conditions, lower rates of insurance coverage, mistrust of the healthcare sector, and, for some, concern over immigration status.[103] These factors could inhibit vaccination among Latinos if not anticipated and consciously remedied.

Develop objective allocation strategies and provide concrete proof that the process is apolitical. Effective allocation strategies cannot be developed if politics guide the approach. Any allocation strategy should be as devoid of politics as possible. Such a step can help assure a more equitable plan and potentially allow for more nimble adjustments in strategy. An accountability mechanism, such as a public oversight committee, could serve to mitigate real and perceived biases in vaccine allocation (Recommendation #5).

Action Items

There is still time, ahead of the availability of potential SARS-CoV-2 vaccines, for federal, state, and local entities to learn from both successful and unsuccessful allocation strategies of the past, and to determine how best to innovate the process and apply it in the COVID-19 pandemic.

- **The US government should take steps to make the vaccine available at no cost to all Americans and publicly pledge that everyone who wants a COVID-19 vaccine will get a COVID vaccine.** Removing cost as a barrier is among the most significant ways to assure that all individuals benefit from the life-preserving benefits of SARS-CoV-2 vaccines, and that the public can have the utmost confidence that public health needs and not economic means will determine access. OWS planners should investigate, and Congress should support, financing arrangements that permit no-cost vaccination for COVID-19. Once these economic structures are in place, a systematic communication campaign will be needed to inform the US public of SARS-CoV-2 vaccine affordability; even now, perceived cost is a barrier to planned vaccine uptake when, in actuality, it should not be the case.

- **With stakeholder and public feedback, and facilitation by a neutral third party, the CDC should reassess its pandemic vaccine allocation and targeting strategy, which last received external input in 2007 and 2008.** ACIP has developed a rough prioritization scheme, and it will revisit the issue in August 2020.[67] Having ACIP deliberations in public, such as a webinar, could help promote greater public understanding of allocation-related dilemmas and increase confidence in the government's decision-making process. At the same time, strong precedent exists for a public engagement initiative involving national-level stakeholders as well as local communities from diverse US regions in deliberation sessions.[104,105] The CDC should enlist both established and new partners to design and implement multiple forms of widespread public engagement that would function well in the current context of physical distancing and uneven access to communication technologies. Such partners should include organizations that are adept at facilitating discussion, deliberation, and resolution of policy conflicts; leading-edge companies that specialize in internet services and products; intermediary social advocacy and civil rights groups, at national and local levels, that can bring in voices typically under-represented in policy discussions; and important stakeholders such as ASTHO, NACCHO, AIM, and the National Association of Community Health Centers (NACHC).

- **Public health communicators at federal, state, and local levels should develop and deliver coordinated, consistent messages about vaccine allocation and targeting.** With concrete evidence to back them up, clear and transparent explanations about which populations comprise a priority group and why, as well as when and how diverse stakeholders were duly consulted in the development of the allocation strategy, can help allay public concerns about unjust apportionment of vaccine and boost confidence in the government's allocation decision making. Poised to deliver consistent core messages, public health communicators, too, should prepare, through advance research and training in best practices, to address the specific concerns of diverse social groups and to ready the public for change in an uncertain environment. Public health officials should engage nontraditional respected community voices to complement messages disseminated by government. Rapid response research will be necessary ([Recommendation #4](#)) to assure successful communication.

- **OWS, HHS, CDC, and state and local health officials should develop operational systems that involve nontraditional civilian partners and instill public confidence that vaccine distribution is evenhanded.** Involving civil rights groups and health advocacy organizations, including the NAACP, the National Urban League, the League of United Latin American Citizens, the Asian American Legal Defense and Education Fund, the National Disability Rights Network, the American Association of Retired Persons, the National Immigration Project, Unidos, Partnership with Native Americans, the Rural Community Assistance Partnership, the National Rural Health Association, Doctors Without Borders, and the Physicians Committee for Responsible Medicine, can bolster the equitable delivery of vaccines and instill public trust in the vaccination process. Once widespread vaccination begins, nontraditional locations to access vaccine will likely need to be used. In preparation for this, state and local officials will need to identify such venues and determine how best to address any legislative and policy barriers that may prevent these locations from being used ([Recommendation #3](#)). Monitoring of and public reporting on vaccine distribution are other critical components to ensure fair allocation ([Recommendation #5](#)). Not only should an organization such as the CDC develop consistent guidelines and rubrics for evaluating operational systems effectiveness and equity, but local and state stakeholders must be able to hold these agencies accountable.

Recommendation #3:
Make Vaccination Available in Safe, Familiar, and Convenient Places

Current Scenario

Once SARS-CoV-2 vaccines are produced, they will need to be made available to the public. Making vaccines widely available and accessible will entail local and state health departments' developing vaccination capacity, creating local adaptations to meet communities—and, particularly, vulnerable populations—where they are, and communicating timely information in clear and accessible ways.

The SARS-CoV-2 vaccine supply will increase incrementally, becoming available at first for specific target groups and later culminating in population-wide vaccination. As soon as the first batch of a COVID vaccine is available, vaccination programs will need to be rolled out

using a strategic array of vaccination sites that will maximize availability and access for populations prioritized in the first phase of vaccination. Once the vaccine becomes more readily available later on, further scaling up of vaccination capacity at these sites and others will need to be implemented for ongoing large-scale population-wide vaccination to occur. Access and availability have been problematic with vaccination programs in past pandemics (eg, H1N1),[18,20,99] and the COVID-19 pandemic response has already been hampered by shortages of other materials, including rapid testing and antibody testing.

The potential for intermittent limitations in SARS-CoV-2 vaccine availability will require local health authorities and communities to adapt. Production and manufacturing factors are a frequent culprit for ongoing shortages and limits in availability, especially for adult vaccines. Manufacturing of the H1N1 vaccine in the 2009 pandemic yielded an insufficient initial supply; ensuing shortages caused anger and frustration among health officials, especially in areas with the most acute shortages.[99,106] Individual states with acute shortages had to reconfigure their allocation plans on an ad hoc basis, making vaccine communications more difficult. Similar flu vaccine shortages in 2004-05 also required health officials to improvise how they allocated limited doses.[107] The high-dose influenza vaccine for adults over 65 has also been subject to "spot shortages," meaning supplies can run out quickly at individual sites that serve many eligible individuals and cannot store enough vaccine to keep up with demand.[108] Persistent shingles vaccine shortages in the United States due to manufacturing limits have similarly challenged consumers and led to informal rationing and prioritization criteria at the level of individual practices.[109] Strategies to update individuals on vaccine availability have included local pharmacy efforts (eg, calling a "wait list" as the vaccine becomes available) as well as an online vaccine locator tool managed by GlaxoSmithKline, where adults can search for the nearest available vaccine.[110]

Safe and accessible sites—both traditional and innovative ones—for all eligible recipients will be critical during the SARS-CoV-2 vaccine rollout. COVID-19 vaccination may require ramping up the use of sites that are already available and accessible to older adults but are used less frequently; widely placed community pharmacies, for example, are an underutilized site for routine vaccine promotion and administration,[111] but they were used successfully for expanding access to pandemic vaccine in 2009 and 2010.[112] Most adults in the United States live closer to a pharmacy than to a clinic, and pharmacy vaccination programs can be especially effective for harder-to-reach populations. Pharmacy immunization efforts work best when pharmacists are given adequate training in administering a new vaccine and when state-level policies allow pharmacists the ability to administer a vaccine directly without a standing order. Other nontraditional vaccination settings include grocery stores, senior citizen centers, health departments, mass vaccination clinics, and local corporations; these have been assessed as safe and acceptable sites for pneumococcal and influenza vaccines.[113-115] After doctors' offices, the next most common settings for influenza vaccination are pharmacies, stores (eg, supermarkets), and workplaces.[116] To allow adults to be vaccinated directly in their workplaces seems prudent, especially for essential workers likely to be in the first tier for vaccination. Schools, which are trusted institutions present in every community and available on weekends and at night, are an additional candidate location; they were used during mass polio vaccination campaigns.[117] In some cases, it also may be acceptable and feasible to deliver vaccination via home visits by community health nurses when vaccination is bundled with delivery of other preventive health services; this approach has received a strong recommendation in the past from the Community Preventive Services Task Force.[118] Ensuring that all COVID-19 vaccination sites maintain safe physical distancing practices may require additional planning.

Communities will need public health authorities to disseminate up-to-date, comprehensible, and trustworthy information about vaccination opportunities. Much of this communication work will be done by local and state health departments, which may be challenging in light of budget cuts and strained local public health infrastructure. One issue will involve providing timely and accurate information about vaccine availability—a potentially challenging scenario in terms of public reactions. Early shortages of COVID-19 diagnostic tests, for instance, caused public concern, and the news about testing shortages at the outset of the pandemic has created a persistent sense of scarcity and a wariness of public health and government mitigation efforts, even though tests are now more readily available.[119] A second predicament for public health officials could be having to deliver information in a way that would enable SARS-CoV-2 vaccine recipients, as well as those professionals administering vaccine, to navigate the highly complex logistics in a potential vaccination environment characterized by multiple vaccine doses, differently timed doses, multiple manufacturers, and/or adjuvant use in some vaccines and not others.

What vaccine recipients consider to be a "safe" place to be vaccinated may differ across various social groups. Older individuals and those with preexisting conditions that put them at higher risk of COVID-19 complications may be concerned about crowds and the ability to physically distance themselves from others, so plans for locations outside of high-volume ones will be necessary. Furthermore, a sense of safety extends beyond health matters. During the H1N1 2009 pandemic, mistrust and fear among marginalized communities posed a challenge: Latino farmworkers in the United States were at greater risk for H1N1-related morbidity and mortality; yet, reports of bullying and harassment of these workers within and outside of local healthcare settings led them to be fearful and to hesitate to seek out vaccination.[120] Also, during the 2009 H1N1 pandemic, public health officials made efforts to engage Black and other minority communities that historically have had low rates of vaccination to improve H1N1 vaccine uptake, but disparities still persisted: Black communities were found to have lower overall rates of H1N1 vaccination, partly due to the unsuitability of the sites at which the vaccine was offered.[99,121] Mass vaccination clinics and physicians' offices may be less convenient and feel less safe than other sites for Black and minority communities. In the case of future SARS-CoV-2 vaccines, DoD's central role in OWS operations[6] could also compromise trust, as this could be perceived as a militarized approach to vaccination that is outside of the norm and may provoke fear in certain groups.

Best Practices

Creating an effective vaccination campaign, one that allows for widespread availability and acceptance of vaccines, is a complex endeavor. Past experience suggests that such a campaign is possible with proactive, thoughtful coordination and communication.

Utilize nontraditional vaccination sites like schools, pharmacies, workplaces, grocery stores, health departments, mass vaccination clinics, faith centers, barber shops, senior centers, dental offices, home visits, and others. Utilizing these sites, as well as adding sites that are directly located at individuals' places of work and can be administered during the workday, can be a good strategy for improving vaccine uptake in hard-to-reach populations that may be less likely to have access to or seek out vaccination at a clinic. Clinical sites that already serve vulnerable or underserved populations (eg, WIC clinics, federally qualified health centers, STD clinics, substance use treatment centers) should also be explored as potential sites for co-locating vaccine services.

Ensure that federal authorities, state and local public health officials, and other entities design communication strategies that "under-promise and over-deliver" on vaccination.[99] Communication strategies should err on the side of caution and temper public expectations about how available a vaccine will be—given the high likelihood of scarcity and the reality that local supplies will fluctuate—to maintain public trust over time. Local vaccine supplies and delivery should map onto public expectations for allocation plans: Clear communication of how vaccines will be allocated and reliable implementation of previously communicated allocation plans will be essential.

Strengthen partnerships between local and state health departments and media news sources to communicate effectively to local communities about vaccine availability and access. These stakeholders can play a key role in disseminating information in real time to eligible vaccine recipients on where and how they can get a vaccine, as well as how much the vaccine will cost (in this case, cost barriers should be minimized by policy interventions).

Prepare in advance any necessary educational materials and training that may be needed for clinicians tasked with vaccination at nontraditional sites. Pharmacists, for example, have benefited in the past from training to help them roll out a new vaccine at their site of practice. Training may include information on how to look up immunization records in state immunization registries, how to safely administer a novel vaccine, how to safely store vaccine, and how to safely recommend the vaccine for targeted populations, keeping in mind any contraindications. Training sessions should be tailored to best suit the individuals tasked with vaccination at each nontraditional site; these may include community health workers and community health nurses as well.

Anticipate hesitancy among marginalized populations who may be fearful or wary of seeking vaccination at sites that have historically caused mistrust, and plan to either expand sites to better serve these populations or engage these populations earlier to earn and build trust. This may require thinking outside the box and using novel sites to better serve marginalized populations (eg, churches, schools, culturally specific community centers or senior centers, mobile clinics). These nontraditional settings will also require the public health workers tasked with vaccination to be culturally competent. Vaccination sites should not be heavily policed or send any signals that the site may be unsafe for Black or other minority communities. Additionally, other services should be provided at these sites that may be urgently needed, given other current COVID-related stressors experienced by marginalized populations; these may include food aid, employment aid, or other preventive health services.

Action Items

An effective vaccination campaign that makes vaccines available in safe, familiar, and convenient places necessitates coordinated efforts among federal, state, and local health authorities. At local levels, it also requires assessment of community needs and the development of strategic partnerships with other public and private organizations.

- **HHS and CDC should work together with state and local health authorities to develop clear communication strategies for describing where vaccines are available, who should be seeking them, and how much they will cost.** Cost barriers should be minimized via appropriate policy processes early on to promote uptake, and this information should be disseminated widely. Information about affordability and availability should be disseminated widely and in different languages. This action item builds on the action item in Recommendation #1 concerning the need to educate the public effectively about the vaccine's associated risks and benefits, in the context of COVID-19 disease, as well as that in Recommendation #2 regarding the need to develop and deliver coordinated, consistent messages about vaccine allocation and targeting. To assure the effectiveness of all SARS-CoV-2 vaccine communication (Recommendation #4), serial (ie, repeated) surveys of the public, including subgroups, as well as targeted qualitative research among essential, hesitant, and underserved groups will be necessary to know what people are thinking, how this evolves over time, and whether communication messages need to be adapted.

- **Local and state public health agencies should explore collaboration with interagency and nongovernment partners to bundle vaccination with other safety net services.** For example, the WIC nutrition program serves as a key mechanism for connecting low-income pregnant women with nutrition supports and clinical services, and immunization screenings and vaccine promotion are built into the WIC program. Bundling services (eg, food security, rent assistance, free clinic services) that are already being provided to particularly vulnerable populations in the context of COVID (eg, older adults, low-income adults, Black and minority communities) could be a way to build trust and streamline vaccine provision. Early, rapid-response, community-based research (Recommendation #4) can help broaden planners' understanding of how the intended beneficiaries of vaccines think about where these products fit into their lives overall, based on their own definitions of health and well-being.

- **The CDC and relevant professional organizations that set standards for local public health practitioners should consolidate evidence on what has worked well in state and local public health departments to make vaccines widely accessible and locally acceptable.** This may include strategies to promote the vaccine to eligible populations as well as strategies to provide timely and accurate information in real time on actual vaccine supply locally to avoid the pitfalls of the COVID testing issues, where early scarcity has led people to still believe the test is scarce even as it has become more available. It will also be critical to monitor in real time who has gotten the vaccine and what the key facilitators and barriers to vaccination have been within communities, so local public health departments can adapt their approaches accordingly.

- **Federal, state, and local health officers and their strategic partners should actively involve experts on preparedness and planning in vaccine rollout preparations as early as possible, given that novel or nontraditional sites for vaccination may become the frontlines of a successful vaccination program.** These experts can help coordinate efforts at heterogeneous sites and adapt strategies that suit each site accordingly. For example, the vaccination logistics and rollout at a grocery store site will require different planning and preparation than vaccine rollout in traditional physicians' offices.

Recommendation #4:
Communicate in Meaningful, Relevant, and Personal Terms, Crowding Out Misinformation

Current Scenario

Information about SARS-CoV-2 vaccination, both true and false, is now widespread on both traditional and social media. In this environment, misinformation is a significant factor that could severely affect future vaccination efforts. Further complicating this difficult communication milieu are the increasingly diverse and divided audiences that communications need to reach.

A profusion of true and false information now circulates around the COVID-19 pandemic. The WHO recently used the term "infodemic" to describe the wild propagation of true and false information during the COVID-19 pandemic.[122] In this crowded information landscape, key messages can fail to stick out and the veracity of information globally can be difficult to determine. US public discourse on the pandemic now incorporates a panoply of topics, each of which can be a vehicle for misinformation, which is defined as information that differs from expert consensus at the time it is shared.[123] Topics include science, public health, social disruptions, political divisions, and economic fallout, such as when unemployment rates peaked at 14.7%, millions were out of work, and pitched calls were made for business operations to resume.[124,125] There are many reasons for the flood of COVID-19 misinformation, including the widespread public adoption of social media platforms as a tool for information seeking, the uncertain nature around COVID-19 as a novel infectious disease, and the presence of disinformation campaigns aimed at deflecting blame and pushing false narratives around the global COVID-19 response.[126,127] The United Nations has acknowledged the world's battle with a pandemic of misinformation, and some of the largest social media platforms have struggled to address the issue.[128,129]

The first COVID-19 vaccine is far from materializing, but the topic has already commanded immense public attention and generated its own pool of misinformation.[130,131] Vaccine misinformation extends beyond the advent of social media platforms. Examples of vaccine-hesitant people and the anti-vax movement perpetuating vaccine misinformation and organizing disinformation campaigns have a long lineage.[132,133] Misinformation on future COVID-19 vaccines has already begun and ranges from traditional rumors questioning vaccine safety to more complicated narratives espousing that a future COVID-19 vaccine was created alongside the virus and that major organizations are planning to use a COVID-19 vaccination campaign as a cover for covert tracking operations or for financial gain.[134,135] Recent research has also shown that outside parties have leveraged social media technologies and strategies, including automated bots and online trolls, to disperse vaccine-related misinformation.[136] Given the history of vaccine misinformation, an overpopulated information landscape, and the trend of social media communication during the first 6 months of the COVID-19 pandemic, it is likely that public health communicators will face a difficult communication landscape when it comes time to share messaging for a COVID-19 vaccination campaign.[137] While not the sole factor in determining behavior adoption, a failure to effectively communicate the value of receiving COVID-19 vaccines could reduce public adoption.[138]

Health communicators in the pandemic face the enduring problem of how best to engage, educate, and empower audiences who have diverse beliefs and life circumstances. Past communication experience with vaccines shows the importance of engaging with key audiences to discern the narrative components that resonate best with them.[139,140] To develop effective health and risk communication messages, communicators need to understand their audience's values, attitudes, perceptions, and beliefs.[141-144] Messages that are unaware of such factors are often ineffective and, worse, can move audiences further away from the desired protective behavior.[145] Given the diverse nature of social identities in the United States, vaccination communications will need to be tailored to specific audiences that are key to an equitable and effective COVID-19 response (eg, essential workers, parents, groups with high comorbidity rates, communities of color, vaccine-hesitant persons). The United States has already witnessed divisions in regard to COVID-19, with certain communities pushing back against public health interventions like business closures, social distancing, and mask wearing. Research has shown that this often falls along political lines in the country,[86,146-148] a scenario that further complicates communication efforts.

Best Practices

Despite the existing challenges in communicating about SARS-CoV-2 vaccination, past research suggests specific steps that can be taken to ensure meaningful and relevant communication and to mitigate the effects of misinformation.

Put communities' well-being at the center of SARS-CoV-2 vaccine communication, rejecting any political trappings. The politicized nature of the COVID-19 pandemic in the United States is well documented, and there is potential for it to worsen as the country enters the 2020 election cycle.[149] The public health community and its partners should work to avoid the political arena when providing vaccine communication: Offer advice as an apolitical entity with only the interest of the health and well-being of the country's residents in mind. Even after conveying these intentions, additional actions will likely be needed to lessen the risk of COVID-19 vaccines being seen in a political context. In order to set realistic public expectations and provide an outlet for public comments, transparent communication around the vaccine development process, plans of manufacturing, vaccine characteristics (eg, delivery mechanism, dosage, adjuvants), and allocation strategies should start as soon as possible. Engaging the public early in the process to voice their concerns and be part of the communication process will add a level of transparency to the messages sent out and can build community trust.[150] Baseline trust in social and political institutions will vary by group in the United States, and it will be a challenge for public health authorities to maintain public trust if they are pulled into larger political conversations.

Start engaging communities now to discern the matters of most importance to them in relation to SARS-CoV-2 vaccine and keep listening. Meaningful community engagement presents an opportunity to foster relationships, build trust, and better understand community values. Scientific facts typically are not enough to motivate people about health risks and protective behaviors, including vaccination; there is evidence that community and individual values and social norms often are more influential.[151] The HPV vaccine, for instance, was largely heralded as a safe and effective instrument for cancer prevention, yet public worries about the stigma of treating a sexually transmitted disease and about teenage sexuality outweighed facts about its effectiveness in certain US groups.[152] In the case of COVID-19, it will be essential to ascertain, apart from scientific facts (eg, community immunity), what alternate reasoning could prompt vaccination—for example: being free to return to work, school, or worship? adhering to social and cultural norms (eg, altruism, collective

obligation)? lowering risk of SARS-CoV-2 infection for vulnerable loved ones? Conducted early on, such formative research—that is, study of a target audience's attitudes, behavior, and practices to determine the appropriateness or "fit" of public health communication—can inform message testing efforts and thus raise the likelihood that communication about COVID-19 vaccination is effective. Ongoing communication efforts also need to be dialogic or 2-way. Public health agencies and their partners need to seek opportunities (eg, Facebook Live sessions, online community meetings, hotlines) for community members to ask questions about vaccines and share concerns that they may have.

Use surveys to identify the prevalence of attitudes and beliefs across the US population, among specific subpopulations, and, over time, to detect any changes. Survey research conducted serially (ie, repeatedly over time) and involving the US public as a whole, as well as specific subgroups, can capture a range of quantitative data through which public health authorities can better understand the communication context, develop essential messages, tailor them to specific audiences, deliver them via the most effective routes, monitor their impact, and make adjustments as necessary. To inform a communication campaign about COVID-19 vaccination, important lines of inquiry for surveys of the public include perceived susceptibility and severity of COVID-19 disease, safety and effectiveness of the vaccine, trust in public health authorities, trust in the vaccine process, credible sources for information, cognitive and affective measures of risk perception (for the disease itself and for vaccine side effects), local social norms, perceived influential others, and racial factors in health care.

Invest in qualitative research to identify specific community concerns, hopes, and trusted spokespersons in connection with COVID-19 vaccination. Research efforts to better understand COVID-19 vaccine perceptions among essential, hesitant, and underserved groups are necessary to counteract the current COVID-19 infodemic. In particular, qualitative research approaches can help uncover participants' reasoning and interpretations in their own words and provide insight into "how" and "why" participants feel, think, or behave a particular way.[153,154] These findings can help public health authorities to develop more meaningful, trusted, and influential communication strategies. During the 2009 H1N1 pandemic, Seattle-King County Public Health improved their outreach in minority communities through exploratory research with the African, African American, Native American, and Russian/Ukrainian communities. A third party, the Center for Multicultural Health, conducted key informant interviews and focus groups with community leaders and representatives to elicit community themes around H1N1 and the H1N1 vaccine.[155] The research also uncovered practical improvements to the delivery of H1N1 messages for these groups, including which spokespeople specific communities trusted to deliver health messages, how language barriers and health literacy status affected uptake, and over what channels and in what format people preferred to receive health-related information.

Engage a broad network of trusted spokespersons who can deliver and reinforce a unified message about COVID-19 vaccination. Domestically, COVID-19 communication has lacked a unified message across trusted sources, adding to an already fractured public perception of the pandemic and its solutions.[156] Identifying a network of trusted spokespeople will be essential for an effective communication campaign around future COVID-19 vaccines. To motivate people to take protective actions like vaccination requires that they hear a salient and specific message repeatedly, delivered by multiple trusted messengers and via diverse media channels.[157] Effective public health and safety communication involves a repetitive streaming of personally compelling

information: It is an ongoing process and not a single act.[158] Locally experienced public health risk communicators also stress the importance of using outside groups who have relationships with the community, instead of direct government involvement. While the government often has the resources and expertise to complete this work, trust cannot be built overnight, and minority groups have often experienced a history of government abuse that may make it harder build trust.[159] Trusted sources delivering tailored messages to key audiences will mitigate some of the challenges inherent in the COVID-19 information landscape. Additionally, involving these trusted spokespeople can help reduce the impact of misinformation on the formation of misperceptions about a SARS-CoV-2 vaccine and hesitancy that inhibits uptake. It is also important for communities themselves to share messages (ie, messages going viral). Recommendations from family and friends may carry more weight than recommendations that come only from government officials and other spokespeople. Any campaign needs to consider how to encourage others to share vetted messages via social networks on- and offline.

Amplify vaccine-affirming, personally relevant messages to neutralize misinformation about SARS-CoV-2 vaccine and vaccination operations. Following their declaration of the COVID-19 infodemic, the WHO convened experts to solicit ideas on how to communicate effectively in the burgeoning and volatile information environment.[160] The findings from this technical collaboration included an emphasis on audience analysis and outreach as a component for effective communication with global populations. The findings echo that it is essential to deliver messages where key communities are and in ways that are most likely to resonate, given their situations. Seeding the communication landscape with beneficial, personally meaningful narratives to keep potentially harmful information from taking root and spreading is an important strategy to counter misinformation while other effective countermeasures are developed. Other proposed interventions include "inoculating" vulnerable audiences with messages that effectively counter a misinformed argument before the argument is sent, correcting misinformation directly to interrupt propagation of that message, and tasking social media sites to alter their algorithms, promote trustworthy sources, and censor false information and misinformation.[161-163] There is, however, no singular best practice for counteracting misinformation; multiple approaches are needed.

Action Items

To ensure clear, accurate, and personally relevant communication that is also capable of crowding out misinformation, the federal government in particular needs to take steps to sponsor necessary social science research, develop communication templates, and work with state and local stakeholders to tailor and amplify pro-vaccination messages in ways that meet the needs of diverse communities.

- **The US government should sponsor rapid efforts for public-stakeholder engagement, formative research, and message development in connection with SARS-CoV-2 vaccines.** HHS, with the support of Congress, should open lines of research funding for rapid response research projects—executed by independent third-party entities—that can work immediately to engage with high-priority communities on issues around COVID-19 vaccines. Nationwide formative research, including both quantitative and qualitative approaches (eg, surveys, focus groups, key informant interviews), on public perceptions and concerns around a COVID-19 vaccination campaign should begin as soon as possible and should have the financial support to facilitate several follow-up activities that track changes in public opinion. Message development and testing will be important given

the complex communication landscape, including new details to convey about the vaccines (eg, manufacturing methods, number of doses, adjuvant use, multiple vaccines, questions about mixing and matching of doses from different vaccines).

- **The CDC should apply its research capabilities in risk communication and community engagement in concert with a broader coalition with local connections, including state and local health departments, universities, and community organizations.** An equitable and effective COVID-19 vaccination campaign requires ongoing dialogue with, and message targeting to, key population groups that have been underserved in the past. Communication research may be more effectively outsourced to academic or local organizations that have long-standing relationships with community leaders and have built levels of trust through years of continued collaboration. State and local health officers, along with interagency and nongovernment partners, should work to aid in the identification of key groups within their jurisdictions. Additionally, CDC should ensure that COVID-19 vaccination information is accessible for various literacy levels, non-English speakers, and the disability community. Local public health departments often lack the resources needed to compile communication tools, especially translations of public health material, for a large number of target populations.

- **The NIH, the CDC, and the NLM should compile and make publicly available a database of COVID-19 vaccine–related communications research.** The NLM should curate a centralized repository of the key themes and inflection points concerning public perception of COVID-19 vaccines, as well empirically tested vaccination messages. Such a resource can enhance the communication efforts of traditional and nontraditional actors as they work to improve SARS-CoV-2 vaccine uptake. Literature from the 2009 H1N1 influenza pandemic, too, can inform efforts, and the repository can similarly include these communication studies.

Recommendation #5:
Establish Independent Representative Bodies to Instill Public Ownership of the Vaccination Program

Current Scenario

The US public is caught between an infectious disease that threatens their health and well-being and protective public health measures that nonetheless confine and chafe. The protracted COVID-19 pandemic has placed multiple stresses on the American people: the threat of illness and death, the isolating effects of physical distancing measures, and the uncertainties and hardships associated with disrupted economic and schooling activities. The public's patience is understandably wearing thin. OWS is taking revolutionary steps to develop SARS-CoV-2 vaccines as swiftly as possible and, along the way, to inspire hope that relief from the pandemic's multiple burdens is coming. Despite vaccination's promise of release from the confines of the pandemic and nonpharmaceutical interventions, some members of the US public—including those most at risk of COVID-19's impacts—may still be reluctant to embrace this public health measure. Baseline vaccine hesitancy in the United States, coupled with current opposition to mask wearing and physical distancing despite active COVID-19 disease, suggests that public health authorities need to rethink how best to manage the pandemic and to spur recovery.

Best Practice

Shift the public health response to COVID-19—including vaccination—from the position of working *on behalf of* affected communities to working *with* affected communities. Current protests against nonpharmaceutical interventions include criticisms about government over-reach, encroachment on individual freedoms, and a clash with personal values. Similar themes run, in part, through some vaccine-hesitant communities. Bold measures are necessary to change the reality and the perception that COVID-19 vaccination is a top-down program administered without regard to public sentiment, concerns, and priorities. Governance structures for the US COVID-19 vaccination program that incorporate public oversight and community involvement have the potential to inspire greater public confidence in, and a sense of ownership over, the public health intervention. Such "ownership" can strengthen the intent to vaccinate and strengthen distribution systems to reach throughout communities, thus helping to assure the fitting and fair use of a public good. This type of community engagement entails the collaboration of affected and at-risk populations with policymakers and practitioners in the generation, implementation, and evaluation of measures to safeguard public health and safety.[150,164,165]

Action Items

- **The US government should engage an objective, nationally visible third party to advise on best practices for enhancing public trust and health with COVID-19 vaccination.** Federal health agencies should sponsor a national panel of experts convened by a politically neutral entity–for example, the National Academy of Sciences, Engineering, and Medicine—to review, synthesize, and report on best practices in the domains represented by Recommendations #1 to 4, including systems for vaccine allocation, deployment, and communication that also achieve the goals of equity and social cohesion. This standing advisory panel can serve as a resource for the US public as well as the host of government and nongovernment entities—both well-established and newly committed—that are involved in the COVID-19 vaccination enterprise.

- **Each state should establish a public oversight committee to review and report on systems that have an impact on public understanding of, access to, and acceptance of COVID-19 vaccines.** Members of state-level public oversight committees for COVID-19 vaccination should reflect the demographic make-up of the state, incorporate diverse sectors of society including business and faith communities, and involve thought leaders on public health, vaccination, bioethics, and human factors. This neutral and broadly representative body can report to state residents on planning and progress made in connection with COVID-19 vaccination, including efforts being made to ensure that those who need the vaccine the most actually receive it. An accountability mechanism and metrics will be necessary to ensure that allocation is fair, target groups receive vaccine, and underserved populations that have been disproportionately affected during the pandemic are justly attended.

Conclusion

While vaccines represent a promising solution to the COVID-19 pandemic, the development of the vaccines themselves is only part of this solution. Widespread acceptance of these vaccines is also needed. This acceptance, in turn, is not as simple as just making safe and effective vaccines available. It is a complex social endeavor that needs deep engagement around the human element. The purpose of this report is to provide empirically informed recommendations for US policymakers; federal, state, and local public health officials; private funders; professional and community organizations; university researchers; and nontraditional partners new to public health's mission of vaccination to advance Americans' understanding of, access to, and acceptance of vaccines that protect against SARS-CoV-2.

While the content of this report is not all-inclusive of what can, or should, be done to support widespread COVID-19 vaccination, the steps outlined here are important for such a vaccination program to be successful. As experts in a wide variety of vaccination-related topics, we fear that unless these critical steps are taken, any future COVID-19 vaccination campaign will be less than hoped for. A worst-case scenario would involve an inability to stop the ravages of the disease and its cascading social and economic effects; further erosion of public trust in government, public health, and vaccine science; and potential threat to other life-preserving and live-enhancing vaccination efforts. That said, a successful COVID-19 vaccination endeavor promises an alternative future: a return to a sense of normalcy, major innovations in vaccine research and operations, and the investment of US society as a whole in making vaccines a public good in which all can share and derive value.

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Appendix: High-Impact Applied Social Science Research-Setting Agenda for a COVID-19 Vaccination Campaign[17]

VACCINATION PLANNING COMPONENTS		Known Findings	Novel Inquiries	ADVANTAGE GAINED BY APPLYING THE EVIDENCE
SOCIALLY EVOLVE: Advance Equity and Solidarity	**ALLOCATE:** Facilitate community input and acceptance of prioritization decisions	- In a crisis, a strong sense of vulnerability can prompt people to protest lack of access to scarce vaccine with limited availability. - Preexisting socioeconomic inequalities, especially in healthcare access, can exacerbate concerns about vaccine access. - Enlisting community input into allocation decisions can generate novel solutions, more trust in authorities, feelings of ownership and understanding of decisions, and an informed populace.	- How might traditionally face-to-face public engagement methods (eg, people-centered design, deliberative democracy, principled pluralism) be modified to work in context of physical distancing and uneven communication access so that they remain inclusive and retain positive potential?	- More transparency and community engagement at the outset can increase the chance that people understand and embrace an allocation plan, even one in which they may not be among the first groups to be vaccinated. - Community ownership of allocation decisions can strengthen the intent to vaccinate, thus helping to assure the fitting use of a public good.
	DEPLOY: Have a delivery plan that meets people "where they are"	- Vaccine acceptance increases when government health and human service delivery, as a whole, responds to community priorities and ongoing needs. - Close coordination with health systems for vaccine availability, accessibility, and affordability further increases likelihood of vaccine uptake. - Convenient access (time, location), helpful reminders, and elimination of barriers—including fears of usual points of vaccination—increase uptake. - Healthcare practitioners are a critical linchpin in vaccination: first, as an at-risk population where some individuals may be vaccine hesitant, and second, as trusted intermediaries to the larger public.	- Can embedding COVID-19 vaccine access within a broader system of services (eg, food security, rent assistance), trusted institutions, or familiar places that people frequent strengthen acceptance? - How have local health agencies previously overcome vaccine hesitation in crisis contexts? - What would groups seeking out vaccination perceive as a "safe" place: for example, protections from COVID-19 exposure, absence of immigration officials, presence of a familiar health provider? - What innovative partnerships with mid-level entities (eg, United Food and Commercial Workers Union) can reach non-healthcare essential workers, many from disproportionately affected communities?	- Successful COVID-19 vaccination will likely hinge on concrete actions to meet diverse people where they are—literally in terms of place and figuratively in terms of mindset—while also attending to practical delivery requirements. Americans, especially those with already precarious lives, may define their well-being and experience day-to-day pressures differently than public health policymakers do.
	COMMUNICATE: Inform and update communities using salient terms and trusted messengers	**Setting Expectations** - Novel technology, fast-tracked R&D, use of an adjuvant, and/or accelerated regulatory approval may heighten the perception of a vaccine as "risky," "rushed," and "experimental," fueling public concern. - Past unethical practices (e.g., unconsented testing on Black bodies) and continuing racial bias in health care have led some persons of color to be wary of health authorities and vaccinations in prior emergencies (e.g., 2009 H1N1).	- What is best approach to set public expectations: e.g., striking the right balance between fostering hope for a COVID-19 vaccine and patience in obtaining it (due to safety precautions and allocation); readying people for reports of potential adverse effects while educating them that not all observed effects are attributable to the vaccine? - How can vaccination be encouraged in communities of color with high rates of chronic conditions, or other marginalized communities, while properly addressing wariness toward a novel vaccine?	- More evidence-based, salient, and tempered communication that also conveys trustworthiness is required, in order to help set appropriate public expectations about vaccine timing, efficacy, safety, and supply. "Operation Warp Speed" suggests a fast, space-age solution to the COVID-19 pandemic; yet, this image may inadvertently prompt perceptions of a rush to a vaccine, without due diligence for safety.
		Speaking Meaningfully - Values and world views (eg, independence, collectivism) are enduring influencers in vaccine decision making. - Vaccine misinformation abounds in social media, where users encounter disproportionate negative reports and images, can be moved more by personal stories of adverse effects than the science, and tend to judge disparate ideas as equally valid, regardless of the source's expertise.	- What can counter COVID-19 vaccine misinformation, given diverse agents (eg, individuals, organizations, malicious actors, some political leaders) and media (eg, traditional, social, homemade [street flyers])? - What hesitations do specific groups (eg, essential workers, parents, racial/ethnic minorities) hold? How might their concerns be addressed? - Apart from scientific facts (eg, immunity), what other reasoning could prompt vaccination: for example, being free to return to work or worship quickly?	- Listening and learning about specific COVID-19 vaccine—related hopes and worries, and tracking these sentiments over time and within particular communities, can enhance rollout success. - Authorities also need innovative countermeasures, including identifying and working with trusted spokespersons, to counteract the inadvertent or deliberate misinformation common in social media.

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