Preventing COVID-19 and Its Sequela: "There Is No Magic Bullet... It's Just Behaviors"

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INTRODUCTION

Coronavirus disease 2019 (COVID-19), the disease caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is the most devastating infectious disease in a century.[1] Rapid transmission of the virus across the U.S. since January 2020 was fueled by the continued travel-associated asymptomatic and presymptomatic importation, community spread through large gatherings, introductions into high-risk workplaces and densely populated areas, and limited diagnostic testing hindering containment.[2] Despite implementing mitigation strategies, the acceleration during March has highlighted the deficiencies and limitations of the U.S. public health infrastructure and preparedness.

In the future, COVID-19 is expected to recur in waves (seasonal or otherwise).[3] COVID-19 leads to serious complications, including acute respiratory distress syndrome,[4] myocardial injury,[5] renal insufficiency,[6] stroke,[7] and other conditions, all associated with high mortality. As effective treatments become available for COVID-19, it is likely that mortality will be lowered but not without long-term sequela in survivors, including pulmonary fibrosis, heart failure, chronic kidney disease, neurologic deficits, and psychological problems.

The best way to prevent this potential tsunami of chronic complications and the associated increased healthcare costs is by halting the transmission of COVID-19. Although efforts to develop a vaccine are underway, a vaccine is probably not realistic in <18 months. Even if a vaccine becomes available, it is uncertain what its protective efficacy and durability will be and whether population uptake will be sufficient to establish herd immunity. Given the relatively low effectiveness of recent influenza vaccines and concerns about serious long-lasting complications associated with their use, not all Americans are likely to readily participate in vaccination even if they are easily accessible and affordable.[8] Thus, for the moment, as Dr. Deborah Birx, the Nation's Coronavirus Response Coordinator, stated at the March 31, 2020 White House Coronavirus Task Force Briefing, "There is no magic bullet, no magic vaccine or therapy. It's just behaviors."[9]

IS THE U.S. HEALTH COMMUNICATION STRATEGY OPTIMAL?

Those words by Dr. Birx emphasize the formidable challenge to prevent further virus spread and the central importance of the only evidence-based preventive strategy currently available: population-wide behavior change. On the basis of more than 5 decades of research on polio and other infectious diseases, an individual's health behaviors depend on one's knowledge and beliefs about the disease, its perceived severity, personal susceptibility, costs versus benefits of behavior change, cues and supports available for following the prescribed behavior, and social context and local policy. Although messages to promote hand washing, social distancing, wearing masks, and other COVID-19–protective behaviors flattened the curve during the initial phase of mitigation, now that Governors and civic leaders across the U.S. are opening businesses again, Americans are confronted with critical questions central to preventing COVID-19: Are U.S. public-facing health communication strategies informed by the best science? Are the strategies sufficiently agile (with changing policies and changing behavioral opportunities) to flexibly engage individuals through real-time digital and other channels of communication and counter sources of misinformation? And are strategies appropriately tailored and targeted to those most at risk of contracting and spreading the virus? Changing

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Quote in title from Deborah Birx, White House Coronavirus Response Coordinator, Coronavirus Task Force Briefing, March 31, 2020, Washington, DC: White House.

population behavior surely will require more than the equivalent of simply removing the pump handle as Dr. John Snow famously did to halt the 1850s cholera epidemic in England.

The dominant governmental media narrative is missing the behavioral science expertise that is central to maximally achieving protective behaviors. The effort should draw on the nation's deep reservoir of behavioral science talent to complement the leadership of renowned scientists such as Drs. Fauci and Birx. Information about COVID-19 has been disseminated to individuals through public service announcements on TV, radio, digital and social media, and in the print media. Despite this, when RTI International surveyed 1,021 Americans in March 2020 to assess their knowledge about COVID-19 and their support for community mitigation strategies, they found significant gaps in respondents' knowledge and behavior: One third of those surveyed incorrectly believed that most people infected will die from COVID-19 and that antibiotics prevent infection. Most strikingly, only 33% said that they refrained from shaking hands.[10] A more recent survey of 630 U.S. adults vulnerable to complications of the infection found that almost a third of respondents could not correctly identify symptoms or ways to prevent infection, with 1 in 4 adults perceiving that they were not at all likely to get the virus.[11]

Although to some degree, the U.S. faces a health literacy challenge, the failure to adopt recommended protective behaviors is not necessarily just because of a knowledge deficit. For example, social distancing may not be possible for some people because of population density or household overcrowding, the need for public transportation, or the fact that much essential work precludes maintaining social distance. Thus, individual decisions to follow prescribed protective behaviors will ultimately depend, in part, on specific circumstances or external policies.

PRIORITIES TO WIN THE WAR AGAINST COVID-19

Fighting this pandemic will require new weapons and a new resolve on the part of the public. During World War II, Americans undertook dramatic individual and collective changes in behavior to overwhelmingly support the war effort and ensure military superiority to win the war. To defeat the SARS-CoV-2 pathogen and strengthen American public health preparedness for future adversaries, a similar historic national commitment is needed, in which behavior change methodology is a dominant weapon in the nation's public health arsenal. Thus, if Americans are to adopt and adhere to the complex and difficult changes in behavior to prevent further spread of COVID-19 in what Dr. Fauci has described as the inevitable next wave, this enemy needs to be attacked on 3 strategic fronts.

Identifying Gaps in What the Public Understands to Optimally Target Behaviors

There is an urgent need for accurate data about the preventive behaviors of individuals, their perceived susceptibility, their attitudes toward protective behaviors, and the gaps in COVID-19 prevention through population-based surveys. Such surveys should build on what has been learned from previous and emerging work[12] and would seek to understand which individuals know about the Centers for Disease Control and Prevention-recommended protective behaviors (Table 1), where they

Table 1. CDC–Recommended Individual Behaviors to Prevent Infection With the Novel CoV SARS-CoV-2

Behavioral domain	Recommended behavior
Personal protective measures	
Hand hygiene	Wash hands with soap frequently, 20 seconds at a time and especially after touching common items or surfaces
Facial contact	Avoid touching face
Respiratory etiquette	Sneeze or cough into tissue or inside of the elbow; stay at home if symptomatic
Face masks and gloves	Cover your mouth and nose with a cloth face cover and wear gloves
Monitor for symptoms	Monitor for temperature, cough, shortness of breath, malaise, change in smell/taste
Environmental measures	
Surface and object cleaning	Disinfect frequently used items and surfaces
Shelter in place	Stay at home, if possible
Social distancing measures	
Physical distancing	Stay at least 6 feet away from others
Workplace	Work from home, if possible; avoid discretionary travel

Source: CDC.
CDC, Centers for Disease Control and Prevention; CoV, coronavirus; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

obtain information about COVID-19, and their preferred sources (i.e., TV, Internet, social media, radio, print) for obtaining such information. For example, given the relatively low levels of Americans' health literacy and the nation's ethnic diversity and multicultural nature, more scientific data are needed on whether at-risk individuals understand mechanisms of transmission and the life-threatening conditions that can result if necessary preventive measures are ignored. Such surveys could be organized and coordinated by the Centers for Disease Control and Prevention and housed within the new Societal Experts Action Network, an open-access data archive and shared resource for researchers, policymakers, and the public, which maintains probability-based public opinion surveys on COVID-19.[13] Surveys of contemporary multicultural communication and behavior also need to be linked to interventions that incorporate and respect the culture, context, and other sociocultural dynamics in their development and testing.

Utilizing Digital Technology to Efficiently Target At-Risk Individuals and Tailor Interventions

The nationwide prevention effort would be vastly strengthened if federal, state, and local governmental authorities utilized the full spectrum of health communication technologies to reach at-risk populations. For example, at hotspots or areas of impending risk, push notifications to reinforce social distancing, hand washing, and use of masks could be sent to every mobile phone there until government leaders and public health authorities believe the risk has been lowered substantially. Such notifications could be sent by the National Emergency Broadcast System, AMBER Alert (the Department of Justice's Nationwide System of Emergency Response), or even by active alerts through the National Weather Service or other emergency mass text alert systems to provide the cues and nudges to activate behavioral change. Moreover, the digital technology sector engaged in social media should be tapped to harness its full potential to tailor and disseminate interventions using behavioral science to reach specific population segments—not one-size-fits-all.[14,15] The emerging effort by Michael Bloomberg to develop smartphone apps to trace every person who comes into contact with COVID-19−infected individuals is another example of how clever strategic use of digital technology could strengthen the national response.[16]

Advancing Pandemic Behavioral Science—for Now and the Future

Much of what was learned in response to the HIV/AIDS epidemic of the 1980s and outbreaks of influenza, Ebola, and severe acute respiratory syndrome provides the foundation to guide the nation's scientific response to COVID-19.[17] However, the behavioral and social science evidence needs to be updated and expanded. For example, in addition to individual threat perception, there needs to be a better understanding of other factors such as social context, how science is being communicated and the extent to which people understand and accept the science, the alignment between individual and collective interests, perceptions of leadership, and the psychological burden of stress and coping.[18]

As a wide range of influences at different levels affect COVID-19−protective behaviors and such influences interact across different levels, the ecologic model (Figure 1) is an ideal framework to incorporate the different levels and influences in developing and testing interventions.[19] Consequently, multilevel interventions may be most effective in achieving and sustaining the appropriate behaviors. For example, interventions designed to change individual attitudes and behavior regarding social distancing may be more effective if they are congruent with government policy that supports it and a conducive workplace environment. However, government policy and a conducive workplace alone will not be sufficient without complementary strategies to communicate, educate, and motivate the at-risk individual.

Such multilevel studies are necessary to further understand the influences on protective behavior and evaluate the effect of novel behavioral interventions, especially those that are digitally mediated, to facilitate adoption and maintenance of COVID-19−preventive behaviors. There remain major research challenges. For example, should studies evaluate behaviors separately, such as physical distancing, hand washing, and wearing of masks, or should they evaluate a comprehensive composite outcome? What is the relative importance of individual-level behaviors? Are government policies for physical distancing more potent than individual messages? Finally, to achieve sufficient variation across different levels and test interactions, such studies will need to be large.

To further strengthen U.S. evidence-based public health preparedness and response capabilities, new transdisciplinary funding opportunities for innovative strategies that use the ecologic framework and incorporate behavioral science, health education, and health communication—in addition to biostatistics, epidemiology, and computer science—should be released through federal agencies and foundations. With the right supportive evidence regarding prevention, there is a high potential that through implementing multilevel approaches, the COVID-19 pandemic could be halted.
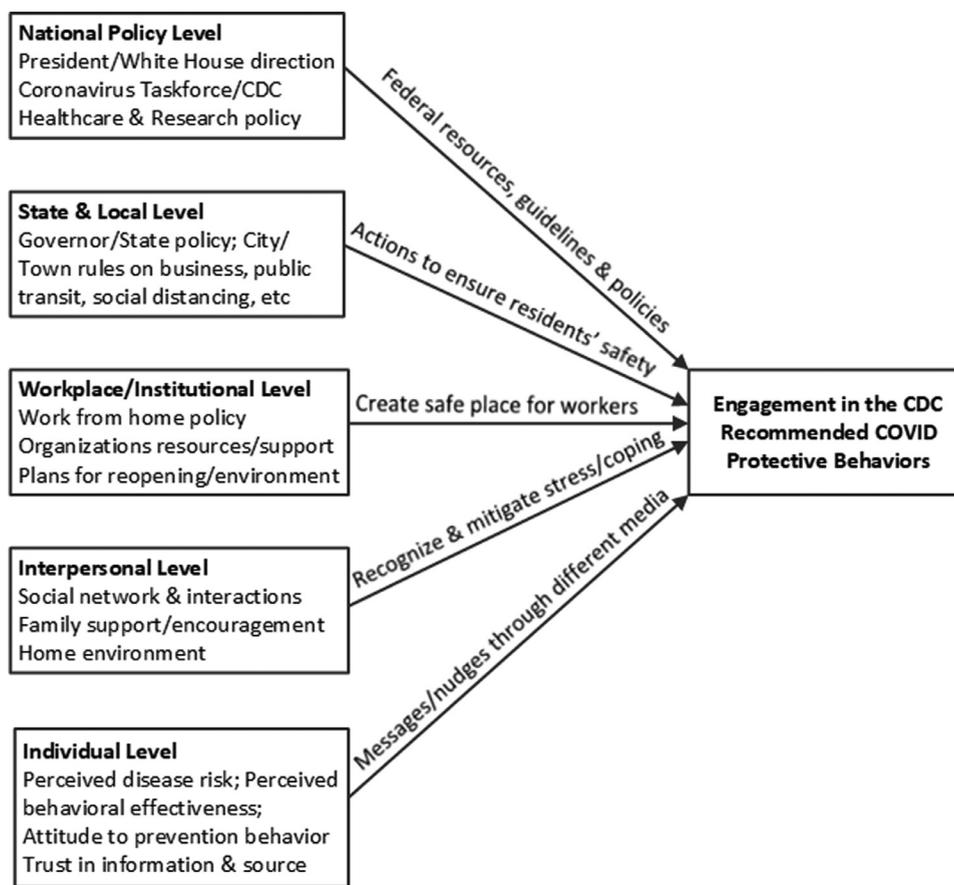
Figure 1. The Ecologic Model showing the different levels (individual, interpersonal, workplace/institutional, state/local, and national) that influence behavior, the associated actions that may influence behavior, and the engagement in the COVID-19–protective behaviors.
Note: Using this framework and the mediators/actions associated with each level, it is possible to develop comprehensive strategies that work through mediators at several levels. When national, state, and local policies are aligned with organizational goals in a conducive family/social environment and the individual is motivated and receptive to behavioral change messages, COVID-19–protective behavior will be maximized.
CDC, Centers for Disease Control and Prevention; COVID, coronavirus disease; COVID-19, COVID 2019.

CONCLUSIONS

The lessons learned from the 1918 influenza pandemic are stark reminders of the daunting challenges for effective prevention. These include 3 main factors:

- public indifference and complacency that can lead people to underestimate their risk;
- using mitigation strategies that go against human nature by requiring people to shelter themselves in rigid isolation to protect others; and
- the problem of outwardly healthy-appearing, asymptomatic people unconsciously acting as a disease-transmission vector and infecting others.[20]

The COVID-19 pandemic—like the 1918 influenza pandemic—is likely to remain endemic and recur in waves in the U.S. and elsewhere notwithstanding viral mutation. Thus, this unprecedented challenge requires audacious out-of-the-box thinking and action.

To win the war against COVID-19, it is imperative to innovatively provide health information and education that is accurate, accessible, persuasive, and relevant as well as culturally and linguistically appropriate and targeted at different subpopulations, especially high-risk individuals. This potentially life-saving behavioral intervention needs to be delivered by a source that the at-risk population trusts and in a format it prefers, tailored to health literacy and behavior, and sufficiently detailed and frequent to facilitate not only the adoption of new behaviors designed to prevent infection or reinfection but also reinforced to maintain this behavior over time.

If "it's just behaviors," preventing further viral spread will require strengthening evidence-based behavioral

change and implementation science strategies to effectively reach the large numbers of at-risk Americans who are anxiously navigating the difficult social terrain to keep themselves and their families safe from COVID-19 and its long-term sequela. In other wars, the U.S. committed resources, technology, and expertise to achieve overwhelming superiority and overcome the enemy. The strategy for winning this contemporary war will demand nothing less.

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