

**Summaries of Findings and Recommendations from Six Reports on COVID-19 Response
by an Ad Hoc Team of Former Members of
President's Obama's Council of Advisors on Science and Technology
November 2020**

A subset of the former members of President Obama's Council of Advisors on Science and Technology (here OPCAST)—ten people who had been particularly active in producing the six OPCAST reports between 2009 and 2016 that dealt with issues related to pandemic preparedness and response—came together starting in March of this year to consider how insights from those studies might be combined with more recent research and current observations to develop insights about how the U.S. response to the COVID-19 pandemic could be improved.

The members of the team, who have taken part as individuals, on their own time, and without compensation, are: Christine Cassel, University of California, San Francisco; Christopher Chyba, Princeton University; Susan L. Graham, University of California, Berkeley; John P. Holdren, Harvard University (OPCAST Co-Chair, COVID-19 Team Convener); Eric S. Lander, Broad Institute of MIT and Harvard (OPCAST Co-Chair); Richard Levin, Yale University; Ed Penhoet, University of California, Berkeley; William Press, University of Texas, Austin (OPCAST Vice Chair); Maxine Savitz, National Academy of Engineering (OPCAST Vice Chair); and Harold Varmus, Weill Cornell Medicine (OPCAST Co-Chair).

Their effort has led to the production of six reports, addressing

- the national strategic pandemic-response stockpile (May 20)
- the role of contact tracing (June 18)
- the role of public health data in controlling the spread of COVID-19 (July 28)
- testing for the pathogen (August 18)
- recommendations for the coming COVID-19 commission (September 21)
- epidemiological modeling needs (September 28)

Each report has been distributed, upon completion, to selected members of the Trump COVID-19 team and the Biden campaign staff, selected governors and members of Congress, selected public health experts outside government, and the media. The reports have also been posted on the OPCAST team's website, <http://opcast.org>.

The OPCAST team has tried to avoid duplication of the work of the COVID-19 committee chaired by Harvey Fineberg at the Academies of Science, Engineering, and Medicine, and it has not addressed issues related to the development, testing, and distribution of vaccines or the development and testing of therapies.

In what follows here, we provide a set of summaries of key findings and recommendations for the six reports. For additional information, please consult the website or contact the Team Convener, John Holdren, at john_holdren@hks.harvard.edu.

Recommendations for the National Strategic Pandemic-Response Stockpile

(Report May 20, 2020, Update November 2020)

Summary

Eight months since declaring the COVID-19 a national emergency, the federal government has still not resolved the problems of availability and distribution of sufficient Personal Protective Equipment (PPE) and other medical equipment and devices. Now the number of new cases is surging, the flu season is approaching, and colder weather is forcing people indoors, resulting in greater demands on hospitals and healthcare organizations. The availability of adequate PPE and medical supplies is once again an urgent matter.

The CARES Act provided \$16 billion to the Strategic National Stockpile (SNS) for critical supplies. As of July 31, 2020 (the last date for which we have information), the Department of Health and Human Services (HHS) reported it had obligated \$8.4 billion of the \$10.7 billion it had planned to use for SNS.

The May 20 report on the SNS by the OPCAST pandemic team provides information regarding the background, rationale, funding, and organization of the SNS. In 2013, the SNS was reauthorized until the end of FY2018. On October 1, 2018 the full responsibility for the SNS was transferred from the Centers for Disease Control and Prevention (CDC) to the HHS Assistant Secretary for Preparedness and Response (ASPR). On April 2, 2020 the longstanding mission of SNS was changed from providing adequate supplies to state, local, tribal and territorial responders during a health emergency to supplementing state and local PPE and medical supply needs.

In the absence of a national SNS plan, the work of federal and state governments and the private sector to secure supplies is fragmented, leading to increases in prices as multiple sources bid against one another for the same products. Implementation of the Defense Production Act (DPA) appears to have been sporadic and relatively narrow, with some misuse of funds. In addition to the issue of the adequacy of the supply of PPE, there is concern about the quality, particularly of masks.

The CARES Act gave the Food and Drug Administration (FDA) the authority to monitor the supply of PPE and medical devices. The FDA and the National Institutes of Standards and Technology (NIST) need to work together with standard-setting groups to develop and promulgate standards for N95 respirators and other PPE. For the federal government to assume its appropriate role in protecting the American public, it is also necessary that the federal government, states, public health groups, and health systems know where supplies are and how they can be allocated to those in greatest need.

The recommendations made in our May report are even more relevant and urgent now. Additional concerns are described in our November update to that report, including leadership and management, the use of the DPA, the role of the FDA, and the coordinated use of existing PPE and medical supplies and devices. Our two most important recommendations follow.

Recommendation 1. The White House should appoint a COVID-19 stockpile and supply chain coordinator, whose office would coordinate with the relevant agencies the development of a national plan including the logistics of manufacturing and distributing PPE, medical equipment, therapeutics, vaccines, and test kits both for the national stockpile and for the states.
(November update)

Recommendation 2. In the next stimulus or supplemental appropriation legislation, Congress should appropriate \$30 billion for federal and state stockpile replenishment and preparedness.
(May 20 report)

Please see the report and the update for additional recommendations.

The Role of Contact Tracing in the Control of Microbial Epidemics, including COVID-19

(Report June 18, 2020, Update November 2020)

Summary

SARS-CoV-2, the coronavirus that causes COVID-19, is primarily transmitted directly from one infected human being to another when viral particles from the infected person enter the body, most commonly through the respiratory tract. The only definitive way to know whether people are infected by SARS-CoV-2 is to test them for the presence of viral RNA, normally done using sensitive polymerase chain reaction (PCR) molecular tests.

Transmission can occur before an infected person exhibits symptoms; some infected people remain asymptomatic but are contagious, nonetheless. Although further transmission can be prevented by isolating people as soon as they are exposed to an infected person—and can be reduced by keeping people apart (social distancing) and by blocking some viral particles through the use of face masks—in practice, close contact with infected people and attendant transmission will still occur for a variety of reasons.

Once an infected person is identified, using contact tracing to identify the other people to whom the newly identified infected person might have transmitted the virus can reduce the spread of the virus. Additionally, by identifying the person from whom the virus was transmitted and sequencing the viral genomes of both parties to the transmission, much can be learned about the evolution of the virus.

Contacts must be identified and tested or quarantined *quickly*, to reduce the spread of the virus. Infected and possibly infected people then must be given advice and assistance, medical and often financial. Identifying contacts can be done by a combination of expert human interviews and digital tools. Human contact-tracing has a history of success, but it is labor intensive and subject to delays and lack of subject cooperation. Digital contact tracing can identify contacts unknown to the infected person quickly and notify those contacts immediately of possible exposure, but it is an emerging technology with incomplete infrastructure and uncertain user acceptance. Both forms of contact tracing can raise privacy concerns.

Digital contact tracing has been used successfully in other countries and in some U.S. states. As of mid-November, fifteen states and the District of Columbia have rolled out public health apps using digital technology based on the Google-Apple Exposure Notification framework. As states roll out their apps, there needs to be more consistent, positive, and persuasive messaging.

The topics summarized above are discussed in detail in our contact-tracing report of June 18. An update to the report summarizes some successful deployments of testing and contact tracing since then, the slow but promising rollout of digital contact determination, and some means to increase the numbers of trained human contact tracers.

It is not too late to strengthen the Nation's attack on the COVID-19 pandemic and its preparedness for future pandemics. Better testing, contact tracing, and methods for controlling the spread of this and other infectious diseases are essential. To that end, the report and the update make the following recommendations.

Recommendation 1. Establish a unit with responsibility for testing and contact tracing at the Department of Health and Human Services (HHS). The unit would serve as a clearing house for the development of digital contact-tracing tools, determine the amount of funding needed to carry out combined human/digital contact tracing and immediate testing of people exposed to the virus, and analyze and document experiences and best practices in testing, contact tracing, and quarantining that have been used by Federal, state and local entities to reduce COVID-19 transmission.

Recommendation 2. Provide adequate Federal funding for contact tracing and diagnostic tests, in some combination of already authorized funds and additional appropriations. The April 2020 Paycheck Protection Program and Health Care Enhancement Act provided \$11 billion directed to states and localities for testing and contact tracing. The May 2020 House HEROES Act contains \$75 billion in its COVID-19 National Testing and Contact Tracing Initiative (\$60 billion for testing and \$15 billion for contact tracing), but the Senate did not act on that proposed legislation.

Recommendation 3. Provide both short-term and long-term funding for multi-agency research to advance the use of science and technology to control and reduce the spread of infectious disease. Topics might include efficient screening mechanisms in public places for pre-symptomatic people, more effective and efficient diagnostic and serological tests, more effective methods for human and digital contact tracing, human factors that govern the success or failure of methods to control and reduce disease spread, security and privacy considerations and their interplay with policy directives in times of emergency, and scientific understanding of the nature of coronaviruses and the mechanisms by which they spread.

Recommendation 4 (from the Update). Institute digital contact tracing in all major Federal government facilities, including military bases, agency buildings and campuses, the White House and executive office buildings, and judicial facilities. Digital contact tracing should be integrated with diagnostic testing and human contact-tracing programs in every facility, and with state and international programs where they exist.

The Role of Public Health Data in Responding to the COVID-19 Pandemic

(Report July 28, 2020, Update November 2020)

Summary

The response to the COVID-19 pandemic has exposed weaknesses in the US public health system and inadequacies in the nation's ability to anticipate, prepare for, and respond to serious infectious epidemics. The experience of 2020 shows the need to strengthen the infrastructure for collection, analysis, and sharing of data to enable an effective public health response to any threat.

U.S. health data come from state and regional data bases, some of which are reported to and synthesized by the Centers for Disease Control and Prevention (CDC). The federal system creates challenges for optimal data collection, but modern digital data technology exists that could largely overcome those problems. The primary barriers to achieving dynamically reported shared data are: (1) barriers to the access to clinical data; (2) lack of stable, consistent governance shared by CDC and states; and (3) chronic underfunding of public health entities at every level.

The 2009 HITECH Act charged the National Coordinator for Health Information Technology with creating a national data infrastructure that "improves public health activities and facilitates the early identification and rapid response to public health threats and emergencies, including bioterror events and infectious disease outbreaks". The major focus of the Office of the National Coordinator (ONC) to date, however, has been to implement electronic health-record (EHR) systems for hospitals and clinical settings by linking payment incentives to adoption and "meaningful use" in patient care.

Too little attention has been paid to data sharing that would allow the efficient use of the same data for public health purposes such as syndromic surveillance and early identification of illness clusters. The information-blocking practices of EHR vendors led to a provision in the 21st Century Cures Act requiring open data access. This laudable legislation was focused on the important goal of giving patients access to their own complete health records, but it is also important to make the same data available for authorized public health purposes.

States and local public health entities have various data-reporting requirements, and they share data with CDC, which has its own surveys and data centers. While recognizing the significance of the states' constitutional responsibility for public health, we think COVID-19 has demonstrated the need for a more substantial federal capability to coordinate and share data and analytics for timely national policy efforts. There have been several constructive attempts at collaborative governance models linking CDC and states in data gathering, reporting, and response, but these efforts have not proven adequate to the challenge of the current pandemic and have not been sustained. A stable, high-functioning, governance model, coupled with a state-of-the-art, platform-architecture design and adequate incentives for data sharing and the development of apps, is necessary for the success of a national public health infrastructure.

CDC and state/local public health entities have been hampered for decades by underfunding. Clinical services (funded by the Centers for Medicare and Medicaid Services) and biomedical research (largely funded by the National Institutes of Health) have too long dominated the federal health funding agenda. COVID-19 has exposed the consequences of this unevenness in the national biomedicine and public health system. Short-term funding to create strategic data capabilities and to link state and federal data systems is urgently needed. Equally important is longer-term investment in modernizing the data-science capabilities of public health operations at every level. Investments for both time scales should be foremost in recovery/stimulus legislation before the Congress this year but also must be part of the national health agenda for the future.

Modern data science, were it put to use, could both serve public health needs and make the U.S. healthcare delivery system more patient-centered and more efficient. Our July 28 report makes a number of actionable recommendations to these ends. The three most important are:

Recommendation 1. Accelerate implementation of Interoperability requirements for EHRs to allow data sharing with public health authorities, which could be done easily through ONC regulatory changes initiated in the 21st Century Cures Act.

Recommendation 2. Initiate and support effective shared governance between states and the CDC. The COVID-19 experience is a burning example that ought to motivate the key players to get this done.

Recommendation 3. Use some of the COVID-19 recovery funding to build up the digital expertise and infrastructure at CDC and at the state level. There is already \$500 million in the CARES Act that could be used for this purpose.

Testing for the Pathogen during the COVID-19 Pandemic and Future Ones

(Report August 18, 2020, Update November 2020)

Tests for active infection by SARS-CoV-2—to diagnose disease patients with symptoms or to identify asymptomatic people who are infected—are critical elements in efforts to monitor and control the Covid-19 pandemic. But the launch of such tests in this country was slow; they have not been used in optimal numbers, especially for identifying contagious asymptomatic people; and a well-funded national plan for testing and contact tracing has not been designed or executed.

To persist and spread, any virus must be transmitted from infected to uninfected people. Since that occurs almost exclusively in the case of SARS-CoV-2 through personal interactions, any outbreak could in theory be ended by completely separating everyone from everyone else for two weeks, the duration of most infections. This socially unacceptable solution can be effectively replaced by a more realistic strategy that depends on reliable tests to identify individuals who are infected and that keeps them quarantined when they are infectious.

Sensitive methods for detection of chemical components of virus particles (viral RNA or proteins) enable such an approach, and many tests for SARS-CoV-2—nearly all for detection of viral RNA with a polymerase chain reaction (PCR)-based method—have received Emergency Use Authorization (EUA) from the Food and Drug Administration (FDA). Such tests have been fundamental to ascertaining a diagnosis of COVID-19 in symptomatic individuals, but they have not been optimally used to survey asymptomatic people to identify and isolate those who are contagious. Much of that deficiency can be attributed to a lack of personnel, funds, testing facilities, and public compliance—the result of poor federal leadership and governance, mismanagement of data, confused communication about testing, and inadequate budgets for tests and contact tracing.

To address the persistent inadequacies of testing in the US during the pandemic, our report recommends the following four actions by the federal government.

Recommendation 1. Enact legislation that would provide the funds included in the House-passed version of the HEROES bill (\$60 billion for testing and \$15 billion for contact tracing).

Recommendation 2. Establish a registry maintained by the Centers for Disease Control and Prevention (CDC) to communicate the rationales for and results of testing.

Recommendation 3. Conduct a Congressional review of the responsibilities, including testing-related actions, assigned to major federal agencies during public health emergencies.

Recommendation 4. Develop, in those agencies, public health tools (e.g., research platforms, point-of-care devices, improved informatics infrastructure) to strengthen national preparedness for future epidemics.

Recommendations for the Coming COVID-19 Commission

(Report September 21, 2020)

Summary

The U.S. mortality rate from the COVID-19 pandemic is one of the highest in the world. A non-partisan COVID-19 Commission is needed to examine why and how this disaster happened, and to recommend steps to ensure the United States acts more effectively in future pandemics. Here we offer recommendations for the topics the Commission should address.

The COVID-19 Commission will repeatedly encounter the undervaluing and underfunding, in the United States, of public health capabilities and practices. A prominent manifestation of this shortfall has been the chronic underfunding of the Centers for Disease Control and Prevention (CDC), as well as underfunding of state and city public health agencies. The Commission should address how to place public health agencies on a more appropriate and stable footing. Management of public health data should be a particular focus of the Commission's attention.

In considering the causes of the current pandemic, the Commission will need to improve understanding of the origin of the novel coronavirus and its presumed entry into human populations from animal hosts. It will be important to know more about the roles played by other countries and international organizations at the early stages of the COVID-19 pandemic.

The Commission must evaluate the adequacy of pandemic planning in the United States prior to the COVID-19 outbreak. The failure to have adequate supplies in both the Strategic National Stockpile (SNS) and state stockpiles should be understood, with lessons drawn for future readiness.

The Commission will also need to evaluate the ways in which various components of the nation's medical infrastructure—public health agencies, hospitals, public and private research institutions, and regulatory bodies—responded to the emergency once the virus began to spread in the United States. This focus will need to include the development, provision, and use of tests that detect SARS-CoV-2, including the failures of the CDC to facilitate testing early in the pandemic and to guide the use of available tests later in the pandemic. The Commission should also examine the nation's capacity to provide the funds and trained personnel to perform sufficient contact tracing. Finally, the Commission should examine efforts to speed the development, testing, and production of a vaccine, with lessons drawn for both future outbreaks as well as vaccine production under non-crisis conditions.

The role and effects of the U.S. and state governments, news programs and websites, and social media in spreading information, misinformation, and conspiracy theories should be examined and illuminated. The Commission should produce a classified annex on the role of any foreign nations' misinformation campaigns targeted at government, news programs, or the public.

An especially high burden of disease has been recorded among certain ethnic minorities. The Commission should probe the reasons for these disparities and consider how to minimize them in the future.

New infectious agents with pandemic potential are certain to emerge into the human population in the coming decades. The COVID-19 Commission must help the nation do much better next time, and all the times after.

Epidemiological Modeling Needs New, Coherent, Federal Support for the Post-COVID-19 Era

(September 28, 2020)

Summary

Epidemiological modeling in the first months of the COVID-19 pandemic did not leave the public with a favorable impression. Some models predicted a near-future peak followed by a permanent decline, while others predicted a series of cycles continuing for years. Predictions of cases and deaths varied widely. The strengths and weaknesses of different models—and their dependence on input data—were poorly communicated. Consequently, it was not well understood that as an *observational* field of science allowing few, if any, controlled experiments, epidemiology must rely on mathematical models to assimilate, combine, and interpret necessarily circumstantial data.

Today's epidemiological models span a range of complexity and employ a variety of algorithmic and statistical techniques. The most advanced require the use of supercomputers. All are improved by more and better data. A diversity of approaches is beneficial when there are institutional mechanisms for evaluating models, developing those that show the most promise, and transitioning them to readiness for operational use in a pandemic. Unfortunately, in the United States, these institutional mechanisms have been weak-to-nonexistent.

There is little coordination among the alphabet soup of agencies that provide partial resources for epidemiological modeling, and the trend has been towards decreasing support. The National Institutes of Health (NIH) was at one time a leader, but a combination of budget cuts and retiring staff have hollowed out its program. The National Science Foundation's (NSF) program is of high quality, but not specifically directed towards human disease. Responding to COVID-19, the Centers for Disease Control and Prevention (CDC) has begun to curate and distribute the consensus predictions of models from multiple academic groups, a commendable but ad hoc effort; but CDC has not responded to the needs of the academic community, nor those of the private sector, for access to better and more timely data.

In short, epidemiological modeling is an important but under-supported field of science that lacks a clear home among the federal science-funding agencies. Additional basic research and translational work in the field are needed between pandemics, and greater operational capabilities are needed during epidemics. A close analogy is the federally supported "value chain" that leads from basic atmospheric research (led by NSF) to timely available weather predictions provided by the National Oceanic and Atmospheric Administration (NOAA). The economic value of an analogous value chain for epidemiological modeling and prediction would be large—over time in the trillions of dollars. The overriding need is a clear assignment of responsibility to appropriate federal agencies, along with appropriate budgets for those responsibilities.

Recommendation 1. Designate NSF as the lead *research* agency in epidemiological modeling. NSF has superior outreach into fields necessary for the success of this interdisciplinary field and operates supercomputer centers. Partnering by NSF with both NIH and the Department of Energy (DOE), two agencies with experience in operationalizing translational research is also

necessary. NIH engagement can tether modeling to the biological realities of particular human diseases. DOE is a leader in the use of large-scale modeling in support of its missions and can mobilize the resources of its National Laboratories.

Recommendation 2. Designate the CDC as the lead *mission* agency, with primary responsibility for operationalizing research results, the analog of NOAA's National Weather Service. Only CDC has the ability to gather data from state and local public health agencies and to distribute back to them actionable recommendations.

Additional recommendations are detailed in our September 28 report: consensus-building technical workshops under the auspices of the National Academies; university-based national research centers; the creation within CDC of a new Office of Epidemic Forecasting and Analytics; and a new subprogram in epidemiology within DOE's existing Advanced Scientific Computing Research (ASCR) supercomputing program.