

Reimagining Public Health in the Aftermath of a Pandemic

The coronavirus disease 2019 (COVID-19) pandemic is an unprecedented challenge for society, affecting those already subject to unacceptable health inequalities and resulting in vast economic impacts. The pandemic reminds everyone of the value and necessity of public health.

In the context of an era that will be shaped by COVID-19, we outline the coming series of challenges and transitions in public health and the needed actions over the next 5 years to reinvent our public health systems. Multiple limitations in current US and global public health systems have been uncovered by the pandemic, including insufficient preparedness and surveillance capabilities complicated by long-standing and worsening health inequalities and the rapid spread of misinformation that needs to be countered. We foresee 3 phases for public health over the next 5 years: (1) reactive crisis management, (2) efforts to maintain initial gains, and (3) efforts to sustain and enhance progress.

A reinvented public health system will depend highly on leadership and political will, rethinking how we categorize and address population-level risk, employing 21st-century data sciences, and applying new communication skills. (*Am J Public Health*. 2020;110:1605–1610. <https://doi.org/10.2105/AJPH.2020.305861>)

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See also Morabia, p. 1590, and the *AJPH Reimagining Public Health* section, pp. 1605–1623.

The worldwide pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a medical and public health emergency on an unprecedented scale that began only several months ago. Its full impact is not yet manifest, and the course and full consequences of the pandemic are still uncertain. But public health has already been altered, and the prevention measures used for epidemic control have become household words (e.g., social distancing, contact tracing). The reasons behind the rapid spread of coronavirus disease 2019 (COVID-19) in the United States are becoming clearer (e.g., travel, large gatherings, cryptic transmission) as are the public health actions needed to control spread.¹ However, the striking toll of mortality from the virus in the United States compared with many other industrialized nations is alarming and raises questions about preparedness, capacity, political will, and the underlying health of the population. Like other pandemics, this one has thrived on inequity, causing substantially higher mortality among those living in poverty and in some racial and minority groups as well as in the elderly and chronically ill.^{2,3} We are also starting to realize the devastating economic impacts on the United States and the world; these impacts come with sweeping consequences for physical and mental health and the health of the population.^{4,5}

The emergence of the pandemic and the severity of its course have proven to be a powerful and heeded reminder to all of the value of public health. Public health and epidemiology are now more recognized by the general public and policymakers than ever before. Part of this visibility relates to media attention (including social media), which is known to affect public health policy and practice.^{6,7} We compared the media hits via Media Cloud⁸ for the terms “public health” and “epidemiology” in the periods January 1 to June 1, 2019, versus January 1 to June 1, 2020 (Figure 1). We found a more than 1000% increase in media coverage of public health and epidemiology, an increase that leads to this question: at this extraordinary moment, how do we turn this increased attention into sustained actions that will enhance public health and improve health and equity?

We address this question as we consider (1) the future course that public health will take as it addresses

the challenges brought by the COVID-19 pandemic over the next 5 years, and (2) the pandemic’s direct and indirect consequences for population health. We acknowledge the strains on resources to support public health and the competition for governmental funds across diverse sectors.

THE PUBLIC HEALTH FAULT LINES

The enormous stress of the COVID-19 pandemic has shown the vulnerabilities of long-standing weaknesses in our public health and health care systems (we do not address the latter sector here). The pandemic has revealed disturbing and far-reaching problems in public health systems globally and in the United States—nationally and at the state and local levels—and spotlighted large populations made vulnerable by chronic illness and health inequalities.^{3,9,10}

In 1988, the Institute of Medicine defined the 3 core

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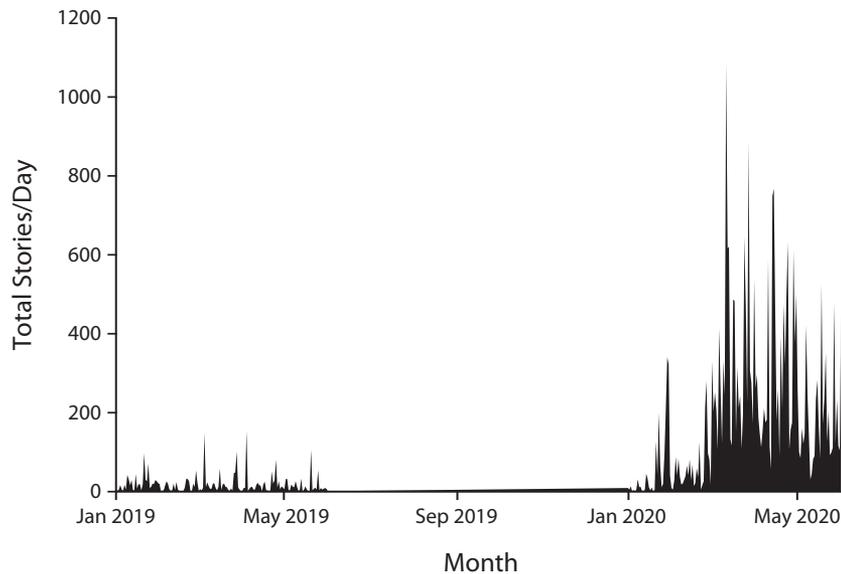


FIGURE 1—Change in Media Coverage of Public Health and Epidemiology: United States, January 1–June 1, 2019, and January 1–June 1, 2020

functions of public health as assessment, policy development, and assurance.¹¹ Have these core functions been adequately met as we confront the pandemic? Assessment is the capacity to track the health status of the population and identify emerging diseases. Surveillance is the foundation of assessment in the public health system, and COVID-19 has revealed a system troubled by lack of investments in preparedness for surveillance and other core public health activities. These problems include insufficient capacity for testing and developing testing, a lack of sensitive surveillance methods, and insufficient capability to carry out needed large-scale case investigations. We face these challenges even though public health surveillance dates back to the first recorded epidemic in 3180 BCE in Egypt¹² and has long been a cornerstone of modern public health practice.¹³ For COVID-19, a surveillance system needs to be built that is based in contemporary data

sciences, employs reliable and valid random testing (both for active virus and immunity), and is supported by adequate laboratory infrastructure.

Policy development during the COVID-19 pandemic has been a patchwork; the lack of credible national leadership taking evidence-based approaches has left state and local public health agencies to deal with their epidemics without coordinated planning and optimized resource management. Even in the context of the stresses this pandemic has caused, the gaps have been evident in the lack of integration across public health agencies and in the lack of channels between the siloed realms of public health and health care.¹⁴ We were insufficiently prepared; we do not have the needed workforce in place¹⁵—the assurance function. We are now scrambling to do so. For example, contact tracing as done in the past, although effective, is labor intensive and relies on self-reported knowledge of the interpersonal networks of

physical interactions.^{16,17} Information technology has much to offer to support contact tracing, but the development of new tools (e.g., mobile phone applications) is proceeding too slowly.

Beyond the failure in meeting the 3 core functions of public health, the pandemic pulls back the curtain on the consequences of long-standing and growing inequalities in the United States and the more recently soaring “deaths of despair” (i.e., suicide, chronic liver disease, and fatal drug and alcohol poisoning).¹⁸ The number of vulnerable people is staggering and set to grow because of rising poverty. It is clear that the impact of COVID-19 is widely disparate across population subgroups; being able to work from home and maintaining social distancing are far easier for those in white-collar occupations. Well-known social determinants of health remain relevant, including income inequality, poor housing, unsafe working conditions, inadequate access to medical care, and

disparities in the criminal justice system.^{19–21} Consequently, the poor are disproportionately affected, and being Black or Latino and also poor amplifies risk further. For example, in New York City, Blacks’ COVID-19 death rates are more than 2 times higher than those of Whites or Asians.²²

We also see the consequences of failing to reduce the chronic disease comorbidities that are driving mortality from COVID-19. We have long known that chronic diseases such as heart disease, cancer, cerebrovascular disease, and diabetes are common leading causes of death, even though they are preventable to a substantial extent.²³ A cross-sectional study of 5700 COVID-19 patients from 12 hospitals in New York City found that the leading comorbidities were hypertension, obesity, and diabetes, a pattern that seems to be universal.³ But prevention and control measures for chronic diseases were not previously sufficient and have now been lessened during the pandemic, as our public health and health care systems have been consumed with the response to COVID-19; we anticipate that resources will continue to be directed away from chronic diseases for the short term.

Pandemics create a demand for evidence. The COVID-19 pandemic has highlighted the consequences of our posttruth world, with its diminution of science and propagation of falsehoods, complicating public health messaging. We have learned that reliable scientific information can be difficult to come by in the midst of a pandemic, when news travels rapidly and much information is derived from social media. On Twitter, false information spreads farther and more quickly than does accurate information.²⁴ Social bots (automated accounts

impersonating humans) rapidly magnify the spread of false information²⁴ (e.g., antivaccine messages²⁵). Misinformation has been defined as “information that is contrary to the epistemic consensus of the scientific community.”^{26(p434)} Misinformation, conspiracy theories, and hate messages about COVID-19 have proliferated (including Chinese stigmatization²⁷), leading to what some have called an “infodemic.”^{28,29}

Above all, failures in our response to COVID-19 can be traced to a lack of public health investment. The United States has never supported public health adequately, instead spending copiously on health care. Per capita spending on public health is less than 3% of total health care expenditures, and that proportion is shrinking.³⁰ Following the recession of 2008, public health jobs that were lost have not been replaced, and in some regions the volatility of public health employment is higher than for any other sector.³¹ In the United States the size of local health departments’ workforces decreased by 50 000 between 2008 and 2017.³² In state-level public health systems, one third of the workforce intends to leave in the next year.³³ Adequate investment is needed in all aspects of epidemic preparedness (e.g., the Strategic National Stockpile³⁴) and in fully integrating public health systems at the local, state, and federal levels.

Will the COVID-19 pandemic finally force us to consider the root causes of our public health system’s inadequacies?

WINDOWS OF ACTION

Before the COVID-19 pandemic, public health was viewed as entering version 3.0, during which emphasis would be placed

on addressing the social determinants of health.³⁵ That vision will be broadened by what we term “public health reimagined,” a rapidly evolving strategy that will need to be responsive to changing public health needs. We outline 3 anticipated phases for public health over the next 5 years (Table 1), while acknowledging the uncertainty of our projections of timing. These are best estimates; we understand that the precise time frames are unknowable and will be defined by the course of the pandemic.

Phase 1 is focused mainly on response crisis management and short-term shifting of resources; we are in phase 1 at the moment. The fault lines we noted became apparent in phase 1 and will continue to inhibit prevention and control efforts in later phases. In phase 2, we will seek to maintain initial gains with the pandemic, while facing its broad and emerging consequences: mental health and chronic disease management with limited resources, for example. The third phase will focus on sustaining and enhancing progress. It will involve rebuilding with a slowly recovering economy, dealing with the many public health problems that have surfaced, and planning for the next phase of public health.

THE INGREDIENTS FOR CHANGING PUBLIC HEALTH

It is imperative that we emerge from the COVID-19 tunnel with a strengthened public health system. Although this necessity is self-evident, the path to achieving it must be articulated. There have been defining reports that have set new paradigms in public health.^{11,36,37} These challenges

and the sequences of the pandemic’s events present exceptional opportunities to reexamine and reinvent our public health systems. We must build in part on the concept of Public Health 3.0, according to which leaders work across sectors to address the social determinants of health.³⁵ The activities we outline will begin to address some of the challenges laid out in phases 2 and 3.

As a first ingredient, progress depends highly on leadership and political will. In reviewing progress across a variety of public health areas and settings, we see that leadership is the most common determinant in promoting the use of evidence in practice and policy.^{38,39} In the COVID-19 experience, although there has been inadequate leadership at the national level, certain US governors and mayors have taken early and aggressive action in closing schools and businesses, banning public gatherings, and convincing the public of the need to do so.^{40,41} Some public health leaders at state and local levels have likewise become trusted figures.⁴² As public health remains in the forefront, we should be drawing such leaders into championing the strengthening and reforging of public health at this time when the rationale for doing so is evident. A convening of leaders is needed among policymakers, in public health practice, and in the private sector. For the future, we need to identify, elect, and sustain a new generation of policy leaders who will forcefully advocate for the field and be fluent in working in the political sector. Our leaders need to be adept at meeting ever-changing communications challenges and, as has been shown in the COVID-19 pandemic, they need crisis leadership skills (e.g., situational awareness, decisiveness with flexibility).⁴³

We need to rethink how we categorize and address population-level risk to have a better calculus for allocating resources—the second ingredient. Decision-making has been portrayed as balancing the public health and economic consequences of the COVID-19 pandemic, but decision-makers are often challenged by how to arrive at the correct balance point.⁴⁴ We have the tools needed to find the balance point on the public health side, including risk assessment and health impact assessment.^{45,46} On the economic side, we hear regular reports of multiple indicators, including unemployment and the extent to which the economy has been reduced. Public health decision-making needs to be made more holistic as we move forward and the immediate imperative of preventing deaths from COVID-19 abates and its many indirect health consequences emerge.

Aside from the direct health and economic impacts of COVID-19, the pandemic provides an opportunity to view medical and public health issues through a new lens, one that embraces the interconnection of the 2 sectors. Primary care, with its emphasis on prevention, is a key bridge.⁴⁷ As an example, consider the multilayered comorbidities associated with COVID-19. In the first layer, the effects of COVID-19 are greatly exacerbated among individuals with existing chronic diseases (e.g., diabetes, cardiovascular and cerebrovascular diseases).⁴ Underlying these diseases is a set of well-established risk factors, including unhealthy diet, limited physical activity, tobacco use, and lack of cancer screening—the so-called actual causes of death.^{48,49} Most evidence-based practices and policies are aimed at

TABLE 1—Public Health Phases During the COVID-19 Pandemic and Its Aftermath: United States, March 2020–April 2025

Phase	Period, Mo	Characteristics of the Pandemic	Prevention and Control Measures	Related Health and Economic Challenges
1. Initialize the response	0–6	Steep epidemic curve with high peaks in some regions Travel-related spread	Implementation of multiple community mitigation strategies Limited testing availability	Rising mental health concerns Isolation caused by mitigation resulting in rising need for support, particularly among disadvantaged populations Declining vaccine coverage and early detection (e.g., cancer screenings) Rapid job losses
		Concentration of cases in areas with high population density Disproportionate burden in some groups (minorities, the elderly, individuals with chronic disease comorbidities)	Begin vaccine testing Initial testing of therapies	Rapid drop in gross domestic product Nearly all resources are devoted to COVID-19 treatment and addressing immediate economic impacts
2. Maintain initial gains	7–18	Sporadic surges in cases Spread to rural areas and areas with inadequate mitigation	Need for ongoing mitigation Wide variation in mitigation by region	Ongoing mental health challenges Rising inequalities from loss of low-wage jobs
			Increase in testing Therapeutic options expanded	Economic resources mainly dedicated to ongoing COVID-19–related needs
3. Sustain and enhance progress	19–60	Sporadic surges in cases with lower peaks in the epidemiologic curve Potential for herd immunity	A viable primary prevention strategy is available (a safe and effective vaccine) Need to prepare for the next pandemic	A gradual economic recovery is under way Urgent needs to rebuild our public health system and reprioritize

these risk factors.⁵⁰ Yet more fundamental for health are those risks in a deeper layer—the social determinants and their root causes (structural inequities and unequal allocation of power and resources), which are fundamental to population health and patient health. Although they are a target of Public Health 3.0, addressing these root causes has proven intractable, as they are structurally embedded in our society and are a seemingly permanent barrier to reducing behavioral and environmental risk factors.⁵¹

A greater emphasis is needed on a systems approach for addressing social determinants of health that more fully considers the interconnections between risk factors, the environment, and social and economic factors.⁵² Race-based discrimination through one system is reinforced in other, interlocking systems

(e.g., housing, transportation, economic segregation) and a systems-based approach identifies the leverage points with the highest potential for impact.^{52,53} These efforts will also require closer integration of data on social determinants of health in electronic health records, which appears to be feasible.⁵⁴

It is imperative to examine and reinvent core public health systems—the third ingredient—in part by bringing 21st-century data sciences more fully into public health. For example, surveillance systems need to be more creative and nimble.⁵⁵ Syndromic surveillance, used extensively following 9/11, can be expanded to incorporate a variety of real-time data.⁵⁵ Novel data streams can be integrated in surveillance⁵⁶ and might include communication traces obtained from mobile phones,¹⁷ digital surveillance that relies on the

Internet (e.g., social media sites),⁵⁷ and methods that employ artificial intelligence and Big Data simulations.⁵⁸ In Australia and China, COVID-19 surveillance is being supported by cell phone applications, but a public health team needs to be in place for follow-up, testing, and, in some cases, isolation. New tracking systems need to adequately address privacy concerns, including the potential for discrimination.⁵⁹

Surveillance systems also need to expand beyond health indicators to track social determinants, such as literacy, unemployment, incarceration, and paying more than 30% of income for housing. As we invest billions of dollars in research on COVID-19 therapies and vaccines, we likewise need to invest more fully in applied public health research on new surveillance methods, contact

tracing, and risk communication, and we need to deepen our understanding of lived experiences.⁶⁰

A reinvented public health system will involve new communication skills and processes—the final ingredient. The COVID-19 pandemic has already taught us about the necessity of having trusted communication channels and the capacity to quickly identify and counter misinformation. First, we need to do a better job of segmenting audiences and reaching each with targeted communications. This challenge should be a point of connection between public health practitioners and the academic community. Partnerships will be needed to learn how to better reach all segments of the population using all of the new channels. For the academic and practice communities, better communication with key stakeholders will be needed to advocate

rebuilding public health systems and advancing evidence-based policies. We already know that researchers are adept at communicating with other researchers but less skilled in reaching non-research audiences.⁶¹ Skilled spokespersons are needed. Generally, the public health community can learn much from business and social marketing, which tailor messages and target audience segments.^{62,63}

Next, we need to frame information in ways that build support for evidence-based policy. The literature on framing shows that individuals interpret the same data in different ways depending on the mental model through which they perceive information.⁶⁴ For example, the preferences in framing evidence among state-level policymakers varies by political party (e.g., more Democrats than Republicans prefer information presented as a story affecting their constituents, more Republicans than Democrats place importance on budget impact).⁶⁵ And finally, we need to systematically and aggressively counter misinformation and fake news.^{26,28} One of the best methods of overcoming misinformation is to flood the media environment with accurate information that is easy to understand, is engaging, and can be quickly shared on mobile devices.^{66,67}

A PATH FORWARD

The COVID-19 pandemic will change the world permanently in ways not yet predictable. The events of the past several months have surfaced immediate health and social needs and pointed directly to the urgent need to redouble our commitment to prevention and public health investment. The

unaddressed mission of public health complicates and worsens the effects of the COVID-19 pandemic. Without explicit attention to social determinants of health, the aftermath of the immediate societal outcomes of COVID-19 will be still greater health inequities.

When at its best, prevention is invisible. During the COVID-19 pandemic, we must keep our eyes on the prize: prevention works and is an excellent bargain. We need to increase the emphasis on return on investment. For a wide range of public health interventions, the return on investment is large—and is highest for legislative approaches.⁶⁸

To inform a new vision for public health and to begin to address the challenges we have described, a broad group should be brought together to plan public health reimaged. We suggest a potential path forward: looking back to other pivotal moments in the evolution of public health. In the past, committees of the (now) National Academies of Sciences, Engineering, and Medicine have been formed for the purpose of visionary planning, and that approach might be followed. Given the phases to come, an ongoing effort will be needed by entities that will be heard. Members of planning groups should include not only scientific leaders and public health educators but, importantly, those who would fund and carry out the findings of this commission (e.g., policymakers, practitioners, business leaders). There are multiple professional stakeholders who are critical to these planning efforts (e.g., the American Public Health Association, the Association of Schools and Programs in Public Health, the Association of State and Territorial Health Officials, the National Association of County

and City Health Officials). Representation is also needed from the public, particularly those experiencing inequalities. Any effort should include a (funded) plan for implementation and evaluation of actions. Core elements of any plan must include ongoing refinement and sustainability.^{69,70}

The lessons of COVID-19 present an opportunity and an urgency to reimagine public health. We must recognize that public health is a public good that deserves greater investment—that message has never been more important. We must reach across the silos of the health system, reduce the burden and costs of poor health, and advance the science to identify and respond more quickly to emerging threats in our changing world. **AJPH**

CONTRIBUTORS

R. C. Brownson conceptualized the original essay and wrote the first draft. T. A. Burke, G. A. Colditz, and J. M. Samet contributed input on the original outline, text to the first draft, and critical intellectual content. All authors provided critical edits on drafts of the essay and approved the final version.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest.

HUMAN PARTICIPANT PROTECTION

No protocol approval was necessary because no human participants were involved in this work.

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