

THE WAY FORWARD: PREPARING AMERICA FOR A SECOND WAVE



CONGRESSMAN ANDY KIM

REPRESENTING NEW JERSEY'S 3RD
CONGRESSIONAL DISTRICT

MEMBER OF THE HOUSE SELECT SUBCOMMITTEE
ON THE CORONAVIRUS CRISIS

SEPTEMBER 2020

TABLE OF CONTENTS

| | |
|--|-----------|
| IMPROVE DIAGNOSTIC TESTING INFRASTRUCTURE..... | 5 |
| ALLOCATE ROBUST FEDERAL FUNDING FOR TESTING..... | 5 |
| ENSURE TESTING AFFORDABILITY..... | 6 |
| BOLSTER THE SUPPLY CHAIN..... | 6 |
| IMPROVE COMMUNICATION BETWEEN HEALTH CARE SYSTEMS.... | 7 |
| UTILIZE ALTERNATIVE TESTING METHODS FOR SCREENING..... | 8 |
| FOCUS ON AT-HOME TESTS..... | 8 |
| CONDUCT FREQUENT TESTING OF VULNERABLE POPULATIONS AND WORKERS IN SUPERSPREADER SETTINGS..... | 9 |
| | |
| STRENGTHEN CONTACT TRACING..... | 10 |
| ALLOCATE TARGETED FEDERAL FUNDING FOR TRACING..... | 10 |
| UNIFY THE APPROACH TO CONTACT TRACING..... | 11 |
| ESTABLISH GUIDELINES FOR PROPER CASE INVESTIGATION..... | 11 |
| INVEST IN PROPER TRAINING AND RECRUITMENT OF TRACERS.... | 12 |
| INSTITUTE PROPER ISOLATION AND QUARANTINE PRACTICES..... | 13 |
| PROTECT PRIVACY AND CONFIDENTIALITY | 13 |

INCREASE AVAILABILITY AND QUALITY OF PERSONAL PROTECTIVE EQUIPMENT (PPE).....15

UTILIZE THE DEFENSE PRODUCTION ACT EFFECTIVELY.....15

ESTABLISH TRANSPARENT DISTRIBUTION MECHANISMS AND FORMULAS.....16

PRIORITIZE AREAS WITH VULNERABLE POPULATIONS.....16

ESTABLISH A QUALITY MANUFACTURING CLEARINGHOUSE FOR PPE.....17

DISTRIBUTE PPE RAPIDLY IN AREAS WITH HIGH INFECTION RATES.....17

DETERMINE APPROPRIATE LEVEL OF FEDERAL SUPPORT FOR STATES.....18

ESTABLISH MECHANISMS TO PREVENT PRICE GOUGING.....18

IMPLEMENT EARLY WARNING SYSTEMS AND INDICATORS.....20

IMPLEMENT WASTEWATER TESTING IN LOCALITIES.....20

IMPLEMENT TEMPERATURE TRACKING TECHNOLOGIES.....21

DEVELOP FEDERAL GUIDANCE FOR BENCH-MARKED RESPONSES.....21

STREAMLINE USE OF ELECTRONIC HEALTH RECORDS.....22

INTRODUCTION

The federal government's response to the COVID-19 pandemic has been insufficient to meet the scale of the threat. The lack of a national testing and contact tracing strategy, continued shortages of personal protective equipment, and the absence of innovative methods to create early warning systems have led to a series of calamitous outcomes that have cost lives and livelihoods.

As of the writing of this report in September 2020, the COVID-19 pandemic has infected over 6.8 million Americans and killed nearly 200,000.¹ Although the rate of infection has been declining nationally in recent weeks after increasing over the summer, the United States is still experiencing tens of thousands of new cases daily. As we work to reduce cases and deaths, we must prepare for another potential wave of the virus.

Another wave, coupled with the emergence of flu season in October, could strain and overwhelm an already fragile health care system. A resurgence in cases could jeopardize the lives of hundreds of thousands while pushing businesses to the brink of collapse. After witnessing the large-scale loss of life and significant economic damage caused by the pandemic, America can no longer afford to respond haphazardly.

This report, the result of interviews with public health experts and congressional testimony received through the House Select Subcommittee on the Coronavirus Crisis, aims to show the way forward. The report intends to guide us towards an America with national plans informed by science that allow us to learn from the inadequacies of the past six months and prepare for a potential second wave of the virus.

IMPROVE DIAGNOSTIC TESTING INFRASTRUCTURE

While the overall number of COVID-19 diagnostic tests in our nation has expanded, that increase has come at the expense of the timely return of results. Months into this crisis, there are still lengthy delays in turnaround times for test results, largely caused by supply shortages coupled with accelerating demand for tests. Although many diagnostic test results can be returned in a matter of hours, reports from across the country have shown that patients have experienced test result wait times of ten or more days.² Testing backlogs and delays complicate tracing and isolation efforts, which decrease the likelihood of containing the spread of the virus. The federal government must develop a targeted and comprehensive strategy to ensure a maximum turnaround of time of 48 hours to inform non-critical patients and even faster turnaround times to inform hospitalized patients.



ALLOCATE ROBUST FEDERAL FUNDING FOR TESTING

State and local governments have faced large budget shortfalls due to COVID-19; the Center for Budget and Policy Priorities projects a cumulative \$555 billion shortfall among states alone over their 2020-2022 fiscal years.³ Without continued robust federal funding, states will not be able to expand testing capacity and will instead need to cut local services in areas like health care, which will further hamper COVID-19 response efforts. The Paycheck Protection Program and Health Care Enhancement Act, which was enacted in late April, included \$25 billion to increase testing, but much more is needed. Future stimulus bills must include robust funding for state and local governments to expand testing efforts while maintaining critical services. If enacted, the Heroes Act would allocate another \$75 billion for COVID-19 testing, contact tracing and isolation measures, which is in line with a recommendation made by the Rockefeller Foundation's National COVID-19 Testing Action Plan.⁴



ENSURE TESTING AFFORDABILITY

In order for testing to be most effective, it must be accessible and affordable to everyone. While the Families First Coronavirus Response Act (FFCRA) and the Coronavirus Aid, Relief, and Economic Security (CARES) Act greatly expanded coverage for COVID-19 testing, gaps still exist in federal law that have led to individuals receiving surprise medical bills, including those who are uninsured.⁵ This is particularly problematic given that studies show that lower income individuals are at higher risk of exposure to the virus and are often at risk for worse outcomes due to higher rates of underlying conditions.⁶ In addition, these individuals are more likely to interact with other people, increasing the risk of further spreading the virus. Testing must be free for all individuals, especially low-income and uninsured populations, through federal support.



BOLSTER THE SUPPLY CHAIN

Since March, there have been reports of shortages in every step of the testing supply chain including kits, testing platforms, reagents, swabs, and Personal Protective Equipment (PPE). Supply chain disruptions can have a significant impact on testing capacity and turnaround time. A survey conducted by the Association for Molecular Pathology between April and May 2020 reported that 85% of laboratories have experienced supply chain interruptions that have delayed and/or decreased testing.⁷ Reports show that these challenges have persisted months later.⁸

The Department of Health and Human Services, in conjunction with other relevant interagency partners like the Department of Defense, should work with test kit manufacturers and testing component producers to increase transparency and communication throughout the manufacturing and distribution process of testing supplies. Specifically, the agencies should work with manufacturers to make clearer to laboratories the real-time supply availability, the anticipated delays from manufacturing to allocation, and where applicable, the allocation plan.



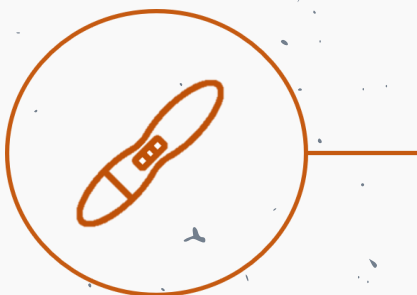
IMPROVE COMMUNICATION BETWEEN HEALTH CARE SYSTEMS

Communication has lacked between health care providers and testing laboratories, especially those located in different geographic areas. This is in part because there is no federal entity that is monitoring testing capacity nationwide and facilitating linkages between these groups. For example, hospitals across the country use a variety of different software platforms and have burdensome administrative procedures for setting up sample transportation, billing and reporting, which has led to many providers only using the commercial labs with which they have existing relationships.⁹ Poor communication can also impede efforts to triage and meet surges in demand. The Department of Health and Human Services should establish an electronic platform where a health care provider could input their testing needs and learn in real time which laboratory has the capabilities to test the quickest.]This platform should also make clear the real-time limitations of laboratory capacity to all users.



UTILIZE ALTERNATIVE TESTING METHODS FOR SCREENING

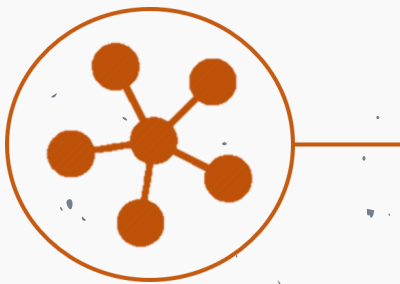
Individual polymerase chain reaction (PCR) tests are widely regarded as the most reliable testing method to detect active infections. However, because most samples must be sent to centralized labs, which are experiencing supply chain issues and are operating without a system in place to route samples based on momentary lab capacity, there have been long lags in returning test results. A recent survey conducted by a collaboration of universities in July showed that 10% of the individuals surveyed had to wait 10 or more days to get results.¹⁰ Prolonged delays diminish the value of the results and complicate contact tracing efforts. If used appropriately, pool testing and wide deployment of rapid point of care antigen tests can help reduce testing bottlenecks, improve surveillance screening capabilities, and limit the virus' spread. Different testing methods should be evaluated for its appropriate screening or diagnostic use based on its performance within a specific community setting.



FOCUS ON AT-HOME TESTS

The Food and Drug Administration (FDA) has issued multiple emergency use authorizations for at-home collection kits, which has allowed patients to self-collect samples at home.¹¹ While at-home collection is an important step in the right direction, more must be done to support the availability of affordable at-home testing, like paper-strip tests that could detect the presence of the virus within 15 minutes.¹² At-home tests have a lower sensitivity detection than traditional PCR tests but can be mass produced relatively quickly.

For screening and surveillance, it is not necessary to have the same level of sensitivity as diagnostic tests. The FDA should expeditiously award emergency use authorizations for rapid over-the-counter low-cost tests with lower sensitivity standards, provided there is sufficient evidence backing the relative accuracy, usefulness, and safety of the tests. The FDA should ensure that these tests are accompanied with clear and concise directions to minimize user error issues.



CONDUCT FREQUENT TESTING OF VULNERABLE POPULATIONS AND WORKERS IN SUPERSPREADER SETTINGS

Certain occupations come into physical contact with infected populations on a more regular basis and/or are regularly in touch with a wide swath of communities. All workers in these occupational categories like the health care and service industries should be tested regularly, while accounting for the level of exposure risk. These workers must also be able to take time from their critical positions without losing their livelihoods, so that there are no incentives to forgo testing or continue working while potentially spreading virus.

Individuals at greater risk of viral complications such as older adults and individuals with underlying medical conditions should also be tested regularly while accounting for the level of exposure risk and vulnerability to the virus. Individuals in this higher risk pool should also be given prioritized access to at-home test sample collection kits now and at-home tests when they are made available.

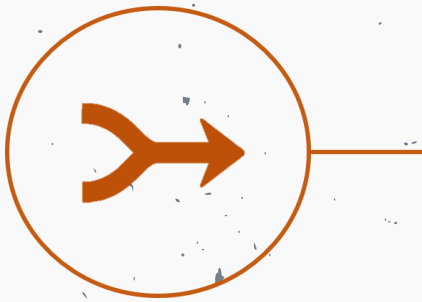
STRENGTHEN CONTACT TRACING

Contact tracing is a crucial component of pandemic containment; it is needed to break chains of transmission and ensure cases are unable to escalate beyond control. Despite experts predicting the need to recruit approximately 100,000 contact tracers nationally to identify, monitor, and provide support to people who are or may have been infected by the disease, only a fraction of that number has been recruited.¹³ These recruits have faced overwhelming need while often receiving inadequate training and limited ability to provide social services for those who require support to quarantine. In order to ensure that a second wave of infections does not lead to uncontrollable spikes in cases, the federal government must work swiftly to strengthen contact tracing efforts.



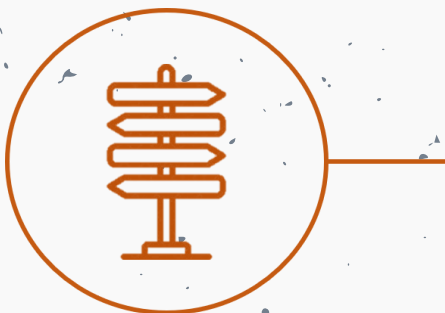
ALLOCATE TARGETED FEDERAL FUNDING FOR TRACING

The CARES Act provided some critically needed funding for states to combat the crisis. In the bill, funding for contact tracing is included within one umbrella category for testing and other public health response measures. As a result, funding intended to strengthen contact tracing efforts is able to be repurposed to testing or other priorities. This may lead to limited, if any, resources allocated to contact tracing. In order to strengthen contact tracing efforts across the country, Congress should establish a separate line item for contact tracing funding in future legislation. The funding should be commensurate with the challenge and magnitude of the contact tracing need. All contact tracing funding should also have stipulations mandating all states receiving the funding to track expenditures to ensure accountability.



UNIFY THE APPROACH TO CONTACT TRACING

States vary in their prioritization of contact tracing. While some states, including Massachusetts, New York, and New Hampshire,¹⁴ have invested heavily in contact tracing to break chains of transmission, other states have invested little if any resources in developing and maintaining a contact tracing system. The divergence in approaches presents challenges for monitoring efforts across the country. In order to unify the approach while allowing states the autonomy to manage their own priorities, the federal government should propose and mandate a set of core indicators each state would need to publish in order to receive federal funding. These should include, but not necessarily be limited to: turn-around time for testing results, percentage of cases interviewed and isolated within 24 hours of case report, percentage of contacts notified and asked to quarantine within 24 hours of contact elicitation, percentage of new cases arising among contacts in quarantine, and percentage of new cases linked to another known case. States should also make data public, to the extent that it is known, regarding the numbers of cases and outbreaks by type of exposure or environment. Country-wide adoption of standardized indicators would allow the public health officials to better understand the transmission of the disease in real time.



ESTABLISH GUIDELINES FOR PROPER CASE INVESTIGATION

The Centers for Disease Control (CDC) outlines the following steps for proper case investigation: case identification and prioritization, rapid notification of exposure, contact interview, quarantine/isolation instructions and testing, assessing self-quarantine support needs, medical monitoring, and close out.

Local health departments should adhere to this structure and adopt their own standardized policies and procedures for investigations such as interview guidelines and call scripts in order to increase the efficacy of the investigation. The federal government should provide information on methods proven to be effective as well as further resources to states in order to fund comprehensive investigations.



INVEST IN PROPER TRAINING AND RECRUITMENT OF TRACERS

Without comprehensive training, supervision, and access to social and medical support for patients and contacts, health departments are unable to conduct contact tracing.¹⁵ Training must involve elements of effective communication; problem solving, emotional intelligence, cultural sensitivity, and privacy while recruiting should be expanded based on caseload. Training for case investigators and contact tracers should include both knowledge and skills-based training. Each state should aim for an average of 15 contact tracers per 100,000 population and contact tracing hires should be prioritized from the hardest-hit and most vulnerable communities.^{16,17} Supervisory structures should also be funded to ensure quality assurance and standards of practice for case investigation and contact tracing. In order to ensure proper training and recruitment, the federal government must provide funding for each state to train tracers and increase the number of needed individuals based on the caseload.



INSTITUTE PROPER ISOLATION AND QUARANTINE PRACTICES

The CDC's current guidelines recommend self-isolating for at least 10 days after first experiencing signs of COVID-19 and quarantining for 14 days after coming into contact with someone who has the virus. For persons who never develop symptoms but test positive for the virus, isolation and precautions can be discontinued after 10 days after their first date of a positive diagnostic test for COVID-19. Local public health workers are responsible for monitoring the isolation and quarantine practices of traced individuals. In order to conduct their jobs properly, these workers must have access to social services and should be able to offer housing for contacts unable to separate themselves from others.¹⁸ The federal government must provide adequate guidance and resources to states to enable public health workers to provide support to people to help them isolate or quarantine appropriately. They must also provide housing and resources to those unable to isolate or quarantine at home. Income replacement is a critical need for some people who may go without pay during the isolation or quarantine period.



PROTECT PRIVACY AND CONFIDENTIALITY

The effectiveness of the contact tracing system is contingent on trust between local public health officials and the community. Individuals who are diagnosed with or exposed to COVID-19 would not be able to openly and honestly provide information to public health workers should they fear a breach of privacy.

Approaches to ensuring the confidentiality and security of data should be integrated into training at all levels to ensure that public health workers are using best practices related to privacy and security of sensitive information. The CDC provides guidance on the key principles of community engagement and how to build relationships with community partners that can assist public health facilities in their efforts. State and local governments should adopt these principles and monitor contact tracing programs to ensure that best practices of privacy, confidentiality, and data security are being followed. Public health departments should communicate with the public to let them know how their identities and data are being protected during the contact tracing process.

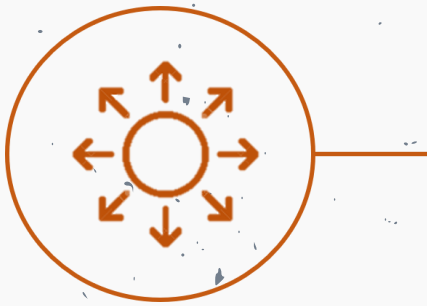
INCREASE AVAILABILITY AND QUALITY OF PERSONAL PROTECTIVE EQUIPMENT (PPE)

The pandemic drove demand for PPE dramatically higher than supply within a matter of weeks. Health care facilities that had previously relied on a sole-source PPE procurement chain were forced to rely on alternative and informal networks. Stock-outs plagued the country and prices for PPE rose drastically. Smaller health centers, such as long term care facilities, were priced out of the market and large, unregulated amounts of low-quality PPE flooded the country. In order to ensure that an adequate amount of quality PPE is available to all levels of health care providers moving forward, the federal government should strengthen and mainstream the vetting and price transparency of PPE while working with the states to ensure equitable and adequate distribution of equipment.



UTILIZE THE DEFENSE PRODUCTION ACT EFFECTIVELY

The federal government routinely invokes the Defense Production Act (DPA) to ensure the production and distribution of vital defense equipment. In May 2020, demand for PPE outpaced supply dramatically with two-thirds of front line health care workers unable to secure lifesaving face masks.¹⁹ Although private-sector companies began to voluntarily produce and supply equipment, these donations were inconsistent and haphazard. In order to ensure sustained and equitable access to vital defense equipment, the government should continue to leverage and more frequently invoke the DPA for the production of PPE. Increased use of the DPA for PPE production would strengthen domestic capacity to produce standardized, vital equipment and meet the needs of the population. Moreover, the Department of Health and Human Services should continue to work with the Department of Defense to invest in incentives for companies under the DPA directive to ensure their sustained vitality.



ESTABLISH TRANSPARENT DISTRIBUTION MECHANISMS AND FORMUALS

The urgent demand of PPE across the country has exposed the need for a transparent distribution mechanism within the Strategic National Stockpile (SNS). Early in the crisis, states received assistance from the SNS inconsistently. While some states received more than requested, others such as Illinois, Massachusetts, and Maine received far less than requested.²⁰ The lack of visibility and complex bureaucracy which characterizes the current SNS request and distribution process is inhibiting lifesaving supplies from being sent to health care workers in need. In order to streamline this process and ensure that supplies are being distributed effectively, consistently, and equitably, the federal government should develop and implement a visible PPE storage and distribution mechanism.



PRIORITIZE AREAS WITH VULNERABLE POPULATIONS

Nursing home residents in long term care facilities (LTCs) account for 35-40% of COVID-19 deaths in the United States.²¹ Unlike hospitals and high volume health care facilities, nursing homes are often unable to purchase in bulk from PPE supply companies and are forced to rely on informal networks to secure required materials. The inability to receive adequate and consistent PPE results in higher rates of infection and transmission within and outside of the LTC facility. In order to increase a response for PPE in highly vulnerable populations, the federal government should capitalize on the COVID-19 Pandemic Vulnerability Index (PVI) developed by the National Institute of Health (NIH) to identify and distribute PPE to the relevant state governments. The federal government should work with the state and private-public partnerships in order to distribute PPE to high transmission areas.



ESTABLISH A QUALITY MANUFACTURING CLEARINGHOUSE FOR PPE

The overwhelming need for PPE across the country has disrupted traditional medical supply chains. Health care professionals have had to rely on alternative sourcing of PPE from personal and informal networks.²² Doing so has increased delays in health care provision, exacerbated access inequality, and introduced low quality equipment across the country. In order to ensure health care professionals are able to access quality PPE consistently, the federal government should develop an online platform, or clearinghouse, in which manufacturers and their PPE products are vetted to ensure quality in a rigorous, systematic manner. The Department of Health and Human Services, in conjunction with other relevant federal agencies, should also collect information from manufacturers on their ability to sell products in various bulk quantities to ensure a range of users would be able to access the products. Products available from these manufacturers would be published with their corresponding price to mitigate price gouging, ensure quick access to health care providers, essential workers, and governments, and increase transparency in supply.



DISTRIBUTE PPE RAPIDLY IN AREAS WITH HIGH INFECTION RATES

Areas experiencing high COVID-19 infection rates are unable to receive PPE in a timely and consistent manner. Health care workers across the country have had to deal with delays of up to 3-6 month for requested supplies due to the fact that 70% of US respiratory protection supplies are manufactured in China.²³

In-order to contain the pandemic and prevent flashpoints from spread, the federal government should fund states' deployment of strike teams, consisting of nurses, doctors, paramedics, therapists, volunteers from private businesses, non profits, and the national guard to specific spike areas indicated by NIH's Pandemic Vulnerability Index.



DETERMINE APPROPRIATE LEVEL OF FEDERAL SUPPORT FOR STATES

State governments are unable to respond to the PPE demands of the pandemic unilaterally. Lack of human capacity, resources, and distribution mechanisms prohibit state governments from effectively procuring and distributing the resources needed to address the COVID-19 pandemic. FEMA, in conjunction with other appropriate federal agencies, should work with state governments to distribute donated or subsidized PPE, identified from the federal clearinghouse, to areas which register highly on the COVID-19 Pandemic Vulnerability Index. States who lack the resources for distribution should receive additional funding to be able to ensure equipment is distributed effectively.



ESTABLISH MECHANISMS TO PREVENT PRICE GOUGING

Scarcity of essential PPE has driven up market prices and allowed some individuals and manufacturers to price gouge life saving equipment. Basic equipment, such as masks and gloves, are sold at prices as high as 8 times above the average price.²⁴ Across the health care system, facilities of all sizes are unable to obtain PPE needed to care for patients.

Essential workers are similarly unable to obtain the equipment needed to conduct their jobs safely. In order to prevent price gouging and ensure PPE access to all populations, the Department of Health and Human Services, in conjunction with other relevant federal agencies, should establish a transparent manufacturing platform in which the products and prices from quality manufacturers are public to all consumers. Only prices that do not violate anti-price gouging laws should be considered.

IMPLEMENT EARLY WARNING SYSTEMS AND INDICATORS

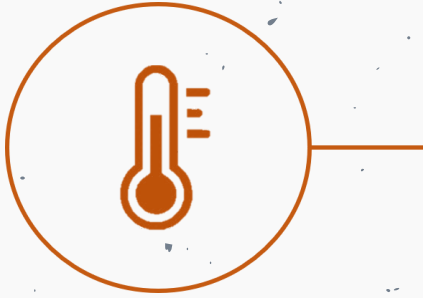
Testing is a critically important tool for combating the spread of COVID-19. Other surveillance tools can and should be used to supplement, not replace, diagnostic testing data and to support mitigation efforts. Emerging technologies and new screening methods can help local and state governments surveil entire populations and help detect an active outbreak before a reported positive case or hospitalization. New screening methods can also help government and public health officials make more informed decisions about resource allocation and closures.



IMPLEMENT WASTEWATER TESTING IN LOCALITIES

Early studies show that wastewater testing, which detects the level of RNA fragments of COVID-19 in untreated wastewater, can be an effective early warning method for screening and identifying infection clusters or outbreaks.²⁵

While this type of testing cannot identify specific positive cases, it can surveil contamination levels among entire populations. Additional research is still needed in this space, but early efforts have shown promising results. The Netherlands, Germany, and Israel, in addition to localities across the US, have already started to sample wastewater from plants to help supplement diagnostic testing data and determine reopening and closure decisions. The federal government should award grants for wastewater testing research efforts to institutions and to states and localities for wastewater testing services.



IMPLEMENT TEMPERATURE TRACKING TECHNOLOGIES

A fever or atypical spike in body temperature can be a relatively easy-to-measure early symptom of COVID-19.²⁶ Technology companies and research institutions have been working to develop devices to monitor body temperatures on a large scale to help detect elevated body temperatures and trends, which could potentially signal an emerging outbreak of COVID-19. Because many infected individuals have a low grade temperature that is hard to detect or no clear symptoms at all, temperature tracking has been shown to be an effective screening tool across masses, not an individual diagnostic tool.²⁷ Over the last few years, smart thermometers have shown promising results that have helped measure the flu's spread.²⁸ The federal government should award grants for additional research or deployment of temperature surveillance technologies to track COVID-19 spread through aggregated data and to develop local illness forecasts.



DEVELOP FEDERAL GUIDANCE FOR BENCH-MARKED RESPONSES

While early warning systems can provide states and localities with helpful data, states and localities have implemented patchwork policies in response to that data. The CDC should issue guidance with clear benchmarks to help state and local officials make informed decisions about resource allocation, closures, and mitigation efforts, especially for congregate settings that are more vulnerable to superspreading incidents like long term care centers and schools.



STREAMLINE USE OF ELECTRONIC HEALTH RECORDS

Currently, there is no single nationwide system capable of tracking suspected and confirmed infections in real-time. This is partly because there are a multitude of siloed electronic health record systems that fail to exchange patient information in a timely manner.²⁹ Further hampering information sharing efforts are requirements for certain information to be manually printed, filled out, and faxed by public health authorities.³⁰ The CDC should invest in an integrated system with appropriate privacy guardrails, which automatically consolidates data in electronic health record systems. This system would help indicate early surges and give public health experts and officials additional time to plan coordinated responses.

REFERENCES

1. Adeline, Stephanie, et al. "Coronavirus Maps: How Severe Is Your State's Outbreak?" NPR, NPR, 13 Sept. 2020, www.npr.org/sections/health-shots/2020/09/01/816707182/map-tracking-the-spread-of-the-coronavirus-in-the-u-s.
2. Courage, Katherine Harmon. "Should We Be Testing Fewer People to Stop the Spread of Covid-19?" Vox, 31 July 2020, www.vox.com/2020/7/31/21336212/covid-19-test-results-delays.
3. "States Continue to Face Large Shortfalls Due to COVID-19 Effects." Center on Budget and Policy Priorities, 8 July 2020, www.cbpp.org/research/state-budget-and-tax/states-continue-to-face-large-shortfalls-due-to-covid-19-effects.
4. National Covid-19 Testing & Tracing Action Plan. Rockefeller Foundation, 16 July 2020, www.rockefellerfoundation.org/wp-content/uploads/2020/07/TheRockefellerFoundation_TestingEcosystem_7_23.pdf.
5. Rodriguez, Carmen Heredia. "COVID Tests Are Free, Except When They're Not." Kaiser Health News, 12 May 2020, khn.org/news/bill-of-the-month-covid19-tests-are-free-except-when-theyre-not/.
6. Koma, Wyatt et al. "Low-Income and Communities of Color at Higher Risk of Serious Illness If Infected with Coronavirus." KFF, 7 May 2020, www.kff.org/coronavirus-covid-19/issue-brief/low-income-and-communities-of-color-at-higher-risk-of-serious-illness-if-infected-with-coronavirus/.
7. "Summary of Recent SARS-CoV-2 Molecular Testing Survey." Association for Molecular Pathology SARS-CoV-2 Molecular Testing, Association for Molecular Pathology, 2020, www.amp.org/AMP/assets/AMP_SARS-CoV-2_Survey_Report_FINAL.pdf?pass=61.
8. Glenza, Jessica. "PPE Shortage Could Last Years, Experts Warn." Salon, Salon.com, 18 Aug. 2020, www.salon.com/2020/08/18/ppe-shortage-could-last-years-experts-warn_partner/.

9. Maxmen, Amy. "Thousands of Coronavirus Tests Are Going Unused in US Labs." Nature News, Nature Publishing Group, 9 Apr. 2020, www.nature.com/articles/d41586-020-01068-3.

10. Lazer, David, et al. "Report #8: Failing the Test: Waiting Times for Covid Diagnostic Tests Across the US." The State of the Nation: A 50-State COVID-19 Survey, Northeastern University, Harvard University, Rutgers University, and Northwestern University, Aug. 2020, covidstates.net/COVID19%20CONSORTIUM%20REPORT%208%20TEST%20JULY%202020.pdf.

11. Abbruzzese, Jason, and Sara G. Miller. "Coronavirus Testing at Home: What You Need to Know." NBCNews.com, NBCUniversal News Group, 9 June 2020, www.nbcnews.com/health/health-news/what-you-need-know-about-coronavirus-testing-kits-n1181141.

12. Kotlikoff, Laurence J. and Michael Mina. "A Cheap, Simple Way to Control the Coronavirus." The New York Times, The New York Times, 3 July 2020, www.nytimes.com/2020/07/03/opinion/coronavirus-tests.html

13. Fortin, Jacey. "So You Want to Be a Contact Tracer?" The New York Times, The New York Times, 18 May 2020, www.nytimes.com/2020/05/18/health/coronavirus-contact-tracing-jobs.html.

14. Treisman, Rachel. "Northeast: Coronavirus-Related Restrictions By State." NPR, NPR, 31 Aug. 2020, www.npr.org/2020/05/01/847331283/northeast-coronavirus-related-restrictions-by-state.

15. "Case Investigation and Contact Tracing: Part of a Multipronged Approach to Fight the COVID-19 Pandemic." Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, 29 Apr. 2020, www.cdc.gov/coronavirus/2019-ncov/php/principles-contact-tracing.html.

16. Contact Tracing Workforce Estimator. George Washington University, Fitzhugh Mullan Institute for Health and Workforce Equality, 5 May 2020, www.gwhwi.org/uploads/4/3/3/5/43358451/contact_tracing_brief_05.05.20.pdf.

17. Contact Tracing Workforce Development and Management. Lessons Learned. *Massachusetts COVID-19 Command Center and Partners In Health*. June 2020.

18. "Case Investigation and Contact Tracing: Part of a Multipronged Approach to Fight the COVID-19 Pandemic." Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, 29 Apr. 2020, www.cdc.gov/coronavirus/2019-ncov/php/principles-contact-tracing.html.

19. Wan, William. "America Is Running Short on Masks, Gowns and Gloves. Again." *The Washington Post*, WP Company, 9 July 2020, www.washingtonpost.com/health/2020/07/08/ppe-shortage-masks-gloves-gowns/

20. Dawsey, Josh, and Toluse Olorunnipa. "Governors Plead for Medical Equipment from Federal Stockpile Plagued by Shortages and Confusion." *The Washington Post*, WP Company, 1 Apr. 2020, www.washingtonpost.com/politics/governors-plead-for-medical-equipment-from-federal-stockpile-plagued-by-shortages-and-confusion/2020/03/31/18aadda0-728d-11ea-87da-77a8136c1a6d_story.html.

21. Bernstein, Lenny. "Covid-19 Surges Back into Nursing Homes in Coronavirus Hot Spots." *The Washington Post*, WP Company, 13 Aug. 2020, www.washingtonpost.com/health/covid-19-surges-back-into-nursing-homes-in-coronavirus-hot-spots/2020/08/13/edbff5fe-dd75-11ea-b205-ff838e15a9a6_story.html.

22. Mehrotra, Preeti, et al. "Personal Protective Equipment Shortages During COVID-19-Supply Chain-Related Causes and Mitigation Strategies." *JAMA Health Forum*, American Medical Association, 12 May 2020, jamanetwork.com/channels/health-forum/fullarticle/2766118.

23: *ibid.*

24. Feiner, Lauren. "States Are Bidding against Each Other and the Federal Government for Important Medical Supplies - and It's Driving up Prices." *CNBC*, *CNBC*, 11 Apr. 2020, www.cNBC.com/2020/04/09/why-states-and-the-federal-government-are-bidding-on-ppe.html.

25. "Status of Environmental Surveillance for SARS-CoV-2 Virus." *World Health Organization*, 7 Aug 2020, www.who.int/news-room/commentaries/detail/status-of-environmental-surveillance-for-sars-cov-2-virus.

- 26.** Maragakis, Lisa Lockerd. "Coronavirus Symptoms: Frequently Asked Questions." Coronavirus Symptoms: Frequently Asked Questions, Johns Hopkins Medicine, 26 June 2020, www.hopkinsmedicine.org/health/conditions-and-diseases/coronavirus/coronavirus-symptoms-frequently-asked-questions
- 27.** Brueck, Hilary. "Coronavirus Temperature Scans Are Nothing More than Pandemic Security Theater. In Some Cases, They're Dangerous." Business Insider, Business Insider, 17 Aug. 2020, www.businessinsider.com/coronavirus-temperature-scans-are-useless-security-theater-2020-8
- 28.** Mcneil, Donald G. "The Flu Season May Yet Turn Ugly, C.D.C. Warns." The New York Times, The New York Times, 8 Jan. 2020, www.nytimes.com/2020/01/08/health/flu-season-severity.html.
- 29.** Weingarten, Scott et al. "Building A Real-Time Covid-19 Early-Warning System." Harvard Business Review, 17 Aug. 2020, hbr.org/2020/06/building-a-real-time-covid-19-early-warning-system.
- 30.** Schulte, Fred. "As Coronavirus Strikes, Crucial Data In Electronic Health Records Hard To Harvest." Kaiser Health News, 1 May 2020, khn.org/news/as-coronavirus-strikes-crucial-data-in-electronic-health-records-hard-to-harvest/.