

Ready or Not:

PROTECTING THE PUBLIC'S HEALTH FROM
DISEASES, DISASTERS
AND BIOTERRORISM

2019



Acknowledgements

Trust for America's Health (TFAH) is a nonprofit, nonpartisan public health policy, research, and advocacy organization that promotes optimal health for every person and community and makes the prevention of illness and injury a national priority.

The *Ready or Not* report series is supported by generous grants from the **Robert Wood Johnson Foundation**. Opinions in this report are those of TFAH's and do not necessarily reflect the views of the foundation.

TFAH BOARD OF DIRECTORS

Gail Christopher, DN

*Chair of the TFAH Board
President and Founder, Ntianu Center for
Healing and Nature
Former Senior Advisor and Vice President
W.K. Kellogg Foundation*

David Fleming, MD

*Vice Chair of the TFAH Board
Vice President of Global Health Programs
PATH*

Robert T. Harris, MD

*Treasurer of the TFAH Board
Senior Medical Director
General Dynamics Information Technology*

Theodore Spencer

*Secretary of the TFAH Board
Senior Advocate, Climate Center
Natural Resources Defense Council*

Stephanie Mayfield Gibson, MD

*Senior Physician Advisor and Population Health
Consultant*

Cynthia M. Harris, PhD, DABT

*Director and Professor
Institute of Public Health, Florida A&M University*

David Lakey, M.D.

*Chief Medical Officer and Vice Chancellor for
Health Affairs
The University of Texas System*

Octavio Martinez, Jr. MD, DrPH, MBA, FAPA

*Executive Director
Hogg Foundation for Mental Health
The University of Texas at Austin*

Karen Remley, MD, MBA, MPH, FAAP

*Former CEO and Executive Vice President
American Academy of Pediatrics*

John Rich, MD, MPH

*Co-Director
Center for Nonviolence and Social Justice
Drexel University*

Eduardo Sanchez, MD, MPH

*Chief Medical Officer for Prevention and Chief of
the Center for Health Metrics and Evaluation
American Heart Association*

Umair A. Shah, MD, MPH

*Executive Director
Harris County, Texas Public Health*

Vince Ventimiglia, JD

*Chairman, Board of Managers
Leavitt Partners*

REPORT AUTHORS

Rhea K. Farberman, APR

*Director of Strategic Communications and Policy
Research*

Dara Alpert Lieberman, MPP

Director of Government Relations

Matt McKillop, MPP

Senior Health Policy Researcher and Analyst

John Auerbach, MBA

President and CEO

CONTRIBUTORS

Kendra May, MPH

Consultant

Zarah Ghiasuddin

TFAH Intern

This edition of *Ready or Not* was published in 2019 based on data available in 2018. Going forward *Ready or Not* will be published annually in January.

TFAH wishes to recognize and thank Glen Mays, PhD, MPH and Michael Childress, MS of the University of Kentucky's National Health Security Preparedness Index (NHSPi) for their collaboration and expertise. *Ready or Not* and the NHSPi, both supported by the Robert Wood Johnson Foundation, are complementary projects working together to measure and improve the country's health security and emergency preparedness. TFAH looks forward to a continued partnership.

PEER REVIEWERS

This report benefited from the insights and expertise of the following external reviewers. Although they have reviewed the report, neither they nor their organizations necessarily endorse its findings or conclusions.

E. Oscar Alleyne, DrPH, MPH

*Senior Advisor for Public Health Programs
National Association of County and City Health
Officials*

James S. Blumenstock

*Chief Program Officer for Health Security
Association of State and Territorial Health
Officials*

Asha M. George, DrPH

*Executive Director
Blue Ribbon Study Panel on Biodefense*

Elizabeth Jungman, MPH, JD

*Director, Public Health
Pew Charitable Trusts*

Executive Summary

One lesson from recent events is that emergencies happen. And happen often. From disease outbreaks to natural disasters to man-made crises, the stakes are high: Americans face serious health risks and even death with increasing regularity. Therefore, as a nation, it's critical to ask, "Are we prepared?"

The public health emergencies of the past year—an unusually severe flu season, confounding cases of acute flaccid myelitis, two major hurricanes, and the deadliest fire season in California's history—reinforce the need for every jurisdiction to be vigilant about preparing for emergencies in order to safeguard the public's health.

The Ready or Not: Protecting the Public's Health from Diseases, Disasters and Bioterrorism series from Trust for America's Health (TFAH) has tracked public health emergency preparedness in the United States since 2003. The series has documented significant progress in the nation's level of preparedness as well as those areas still in need of improvement.

A fundamental role of the public health community is to protect communities from disasters and disease outbreaks. To this end, the nation's health security infrastructure has made tremendous strides since 2001 by building modern laboratories, maintaining a pipeline of medical countermeasures, and recruiting and retaining a workforce trained in emergency operations. Yet, unstable and insufficient funding puts this progress at risk, and a familiar pattern takes shape: underfunding, followed by a disaster or outbreak, then an infusion of onetime supplemental

funds, and finally a retrenchment of money once attention wanes. What's more, states are uneven in their levels of preparedness. Some—often those that most frequently face emergencies—have the personnel, systems, and resources needed to protect the public. But others are less prepared and less experienced, elevating the likelihood of preventable harms. This unstable funding and uneven preparation undermines America's health security.

Ready or Not examines the country's level of public health emergency preparedness on a state-by-state basis using 10 priority indicators. (See Table 1.) Taken together, the indicators are a checklist of priority aspects of states' readiness for public health emergencies. However, these indicators do not necessarily reflect the effectiveness of states' public health departments. Improvement in these priority areas often requires action from other agencies, elected officials, or the private sector.

This edition of the series finds that states have made progress in key areas, including public health funding and participation in provider compacts and coalitions. However, performance in other areas—such as flu vaccination, hospital patient safety, and paid time off for workers—has stalled or lost ground.

Ready or Not: *Protecting the Public's Health from Diseases, Disasters and Bioterrorism*

TABLE 1: Top-Priority Indicators of State Public Health Preparedness

INDICATORS			
1	Incident Management: Adoption of the Nurse Licensure Compact.	6	Water Security: Percentage of the population who used a community water system that failed to meet all applicable health-based standards.
2	Cross-Sector Community Collaboration: Percentage of hospitals participating in healthcare coalitions.	7	Workforce Resiliency and Infection Control: Percentage of employed population with paid time off.
3	Institutional Quality: Accreditation by the Public Health Accreditation Board.	8	Countermeasure Utilization: Percentage of people ages 6 months or older who received a seasonal flu vaccination.
4	Institutional Quality: Accreditation by the Emergency Management Accreditation Program.	9	Patient Safety: Percentage of hospitals with a top-quality ranking (Grade A) on the Leapfrog Hospital Safety Grade.
5	Institutional Quality: Size of the state public health budget, compared with the past year.	10	Health Security Surveillance: The public health laboratory has a plan for a six- to eight-week surge in testing capacity.

Notes: The National Council of State Boards of Nursing organizes the Nurse Licensure Compact. The federal Hospital Preparedness Program of the U.S. Office of the Assistant Secretary for Preparedness and Response supports healthcare coalitions. The U.S. Environmental Protection Agency assesses community water systems. Paid time off includes sick leave, vacation time, or holidays, among other types of leave. The Leapfrog Group is an independent nonprofit organization. Every indicator, and some categorical descriptions, were drawn from the NHSPI, with one exception: public health funding. See “Appendix A: Methodology” for a description of TFAH’s funding data-collection process, including its definition. Source: National Health Security Preparedness Index.⁴

Hospitals in most states have a high degree of participation in healthcare coalitions. On average, 89 percent of hospitals were in a coalition and 18 states had universal coalition participation.

TFAH’s research found:

- **A majority of states have made preparations to expand capabilities in an emergency, often through collaboration.** In 2018, 31 states participated in the Nurse Licensure Compact,² which allows registered nurses and licensed practical or vocational nurses to practice in multiple jurisdictions with a single license. In an emergency, this enables health officials to quickly increase their staffing levels. For example, nurses may cross state lines to lend their support at evacuation sites or other healthcare facilities. The number of states participating in the compact is up by five from 26 in 2017.³ In addition, hospitals in most states have a high degree of participation in

healthcare coalitions. On average, 89 percent of hospitals were in a coalition and 18 states had universal coalition participation, meaning every hospital in the state was part of a coalition. Such coalitions bring hospitals and other healthcare facilities together with emergency management and public health officials to plan for, and respond to, events requiring extraordinary action. This increases the likelihood that patients are served in a coordinated and efficient manner during an emergency.

Finally, 44 states and the District of Columbia had a plan to surge public health laboratory capacity for six to eight weeks as necessary during overlapping emergencies or large outbreaks.

The *Ready or Not* report groups states and the District of Columbia into one of three tiers based on their performance across the 10 indicators. This year, 17 states scored in the top tier, 20 and the District of Columbia placed in the middle tier, and 13 were in the bottom tier. (See Table 2.)

TABLE 2: Top-Priority Indicators of State Public Health Preparedness
State performance, by scoring tier, 2018

Performance Tier	States	Number of States
Top Tier	AL, CO, CT, FL, ID, KS, MA, MD, MO, MS, NC, NE, NJ, RI, VA, WA, WI	17 states
Middle Tier	CA, DC, GA, HI, IA, IL, LA, ME, MI, MN, MT, ND, NH, NM, NV, OK, OR, SC, TX, VT, WV	20 states and DC
Bottom Tier	AK, AR, AZ, DE, IN, KY, NY, OH, PA, SD, TN, UT, WY	13 states

Note: See “Appendix A: Methodology” for scoring details. Complete data were not available for U.S. territories.

- Most residents who got their household water through a community water system had access to safe water.** On average, just 6 percent of state residents used a community water system in 2017 that did not meet all applicable health-based standards. Water systems with such violations increase the chances of water-based emergencies in which contaminated water supplies place the public at risk.
- Most states are accredited in the areas of public health, emergency management, or both.** In 2018, the Public Health Accreditation Board or the Emergency Management Accreditation Program accredited 42 states and the District of Columbia; 26 states were accredited by both groups. Eight states (Alaska, Hawaii, Indiana, New Hampshire, South Dakota, Texas, West Virginia, and Wyoming) were accredited by neither. Both programs help ensure that necessary emergency prevention and response systems are in place and staffed by qualified personnel.
- Seasonal flu vaccination rate, already too low, fell further.** The seasonal flu vaccination rate among Americans ages 6 months or older dropped from 47 percent in the 2016–2017 season to 42 percent in the 2017–2018 season. This drop-in coverage may have exacerbated the severity of the 2017–2018 influenza season and the high number of illnesses, hospitalizations and deaths due to flu. Healthy People 2020, a set of federal 10-year objectives and benchmarks for improving the health of all Americans by 2020, set a seasonal influenza vaccination-rate target of 70 percent annually.⁴
- In 2018, only 55 percent of employed state residents, on average, had access to paid time off.** Those without such leave are more likely to work when they are sick and risk spreading infection. In the past, some infectious disease outbreaks have been linked to or exacerbated by the absence of paid sick leave.⁵
- Only 28 percent of hospitals, on average, earned a top-quality patient safety grade.** Hospital safety scores measure performance on such issues as healthcare-associated infection rates, intensive-care capacity, nursing staff volume, and an overall culture of error prevention. In the absence of diligent actions to protect patient safety, deadly infectious diseases can take hold or strengthen.

There are a host of concrete actions to further protect the public's health that TFAH recommends be taken by federal, state, and local officials; the healthcare system; academia; and the private or nongovernmental sectors.

Those that are of highest priority include:

- Providing stable, dedicated, and sufficient funding for preparedness activities and a significant funding increase for core public health capabilities.
- Establishing a complementary emergency response fund to accelerate crisis responses.
- Maintaining a long-term investment in the Global Health Security Agenda framework and global preparedness and response programs to help prevent infectious disease threats from becoming global crises.
- Following the National Biodefense Strategy (NBS) with transparent goals, implementation plans, and budgets for all relevant agencies.
- Closely monitoring the transition of the Strategic National Stockpile and significantly strengthening the “last mile” of distribution and dispensing.
- Developing a multiyear strategic vision and fully funding surveillance infrastructure, for fast, accurate outbreak detection at all levels of government.
- Bolstering the Hospital Preparedness Program and multisector healthcare collaboration as well as adopting state policies to improve healthcare delivery during disasters.
- Adopting comprehensive climate change adaptation plans, including a public health assessment and response.
- Increasing public and private investments in efforts to combat antimicrobial resistance, including through diagnostic, stewardship, detection, and treatment methods.
- Supporting vaccine infrastructure and first-dollar coverage of recommended vaccines.
- Promoting health equity in emergency preparedness planning, response, and recovery, including through the appointment of a chief equity or resilience officer.

Taken together, action on TFAH's recommendations would make the United States safer for all its residents.

See page 26 for a complete description.

This report was updated on Mar. 19, 2019, to reflect revised data submitted by the Delaware Department of Health and Social Services pertaining to its change in public health funding from fiscal year 2017 to 2018. The state's public health funding fell by 1.8 percent in FY 2018, not by 18.1 percent.

SERIOUS RISKS PERSIST ON CENTENNIAL OF 1918 FLU PANDEMIC

Mid-2018 marked the 100th anniversary of the deadly 1918 influenza pandemic, which is estimated to have sickened one-third of the world's population and killed at least 50 million people.⁶ The pandemic killed approximately 675,000 people in the United States alone, lowering U. S. life expectancy by 12 years from 1917 to 1918. Caused by an H1N1 virus, the flu took the life of a high number of otherwise healthy people ages 20 to 40. This outbreak struck during World War I, where it spread rapidly among troops living in close quarters—more American soldiers died from the flu than on that war's battlefield.⁷

In 1918, scientists had not yet discovered viruses. There were no vaccines to prevent viral infection, no antiviral drugs to treat illness, and no antibiotics to treat secondary bacterial infections, such as pneumonia.⁸ While today there is a global influenza surveillance system to detect flu viruses with pandemic potential, and vaccines and medicines to prevent and treat infections, the world is also now so interconnected that an outbreak in Boston could trigger an infection in Beijing in less than a day.

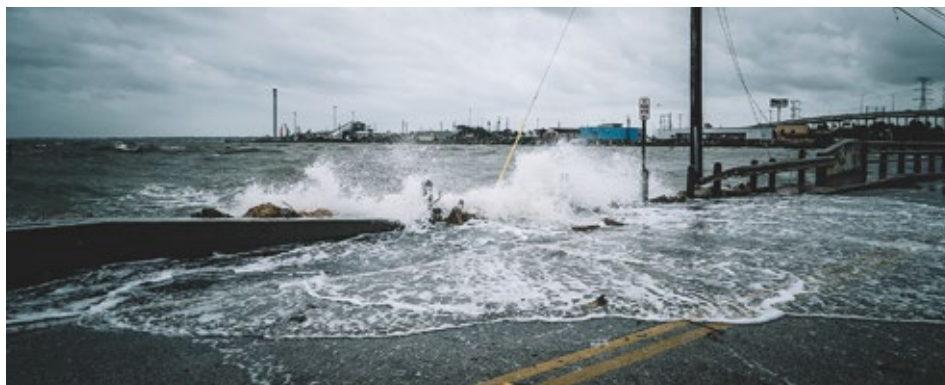
Despite having successfully reconstructed the virus that was the cause of the 1918 outbreak, scientists still do not know

what made it so lethal.⁹ However, experts believe a future pandemic will likely be caused by an influenza subtype for which there is little or no preexisting immunity in humans.¹⁰ “The thing that keeps me up at night is pandemic flu,” Dr. Robert Redfield, the director of the Centers for Disease Control and Prevention, said. “Our best preparation for that pandemic is to optimize our response to seasonal flu.”¹¹ To that end, the United States must improve surveillance and be able to quickly develop—and mass-produce and distribute—broadly effective vaccines, while also creating cheaper and more effective treatments.¹²

CLIMATE CHANGE INCREASING LIKELIHOOD AND SEVERITY OF EXTREME WEATHER

According to the Center for Climate and Energy Solutions, a nonprofit advocacy group, climate change is expected to increase the frequency, intensity, and consequences of some types of extreme weather events,¹³ including:

- Drought,¹⁴ which can contribute to food insecurity and exacerbate wildfires.¹⁵
- Extreme heat, which in a typical year already kills more people in the United States than hurricanes, lightning, tornadoes, earthquakes, and floods combined.¹⁶ Extreme heat is especially dangerous for medically vulnerable people. It also worsens droughts and increases the risk of wildfires.¹⁷
- Heavy rains,¹⁸ which cause catastrophic flooding, landslides, and contaminated waterways.¹⁹
- Hurricanes, which sometimes have more destructive wind speeds, precipitation, and storm surges.
- Wildfires, which can now burn more land and are more difficult to extinguish.



In 2017 alone, at least 15 extreme weather events across the globe were made more likely by climate change, according to studies published by the American Meteorological Society.²⁰

On top of possible federal action, states and localities can act to mitigate these threats, particularly the dangers they pose to people with health ailments or in poor living conditions.²¹ For example, land-use planning can reduce loss of life and property from wildfires.²² Zoning rules that limit building in flood-prone areas reduces

the dangers from floods, and replacing nonpermeable surfaces with “green infrastructure,” such as rain gardens and bioswales, reduces stormwater runoff and subsequent flooding.²³ In drought-prone areas, green infrastructure can retain stormwater for later use.²⁴ Cooling centers can keep vulnerable populations safe during heat waves, and green roofs can reduce the urban heat island effect.²⁵ Finally, preserving coastal wetlands, dunes, and reefs can help absorb storm surges from hurricanes.²⁶

Report Purpose and Methodology

TFAH's annual *Ready or Not* report series tracks states' readiness for public health emergencies based on 10 key indicators that collectively provide a checklist of top-priority issues and action items for states and localities to continuously address. By gathering together timely data on all 50 states and the District of Columbia, the report assists states in benchmarking their performance against comparable jurisdictions. This research was completed after consultation with a diverse group of subject-matter experts and practitioners.

Ready or Not and the National Health Security Preparedness Index

The indicators included in this report were drawn from, and identified in partnership with, the National Health Security Preparedness Index (NHSPI), with one exception: a measure of state public health funding-level trends, which reflects how equipped key agencies are to prepare and respond to emergencies. The NHSPI is a joint initiative of the Robert Wood Johnson Foundation and the University of Kentucky.

See "Appendix A: Methodology" for a detailed description of how indicators were selected and scored.

While states' placements in *Ready or Not* and the NHSPI largely align,

there are some important differences. The two projects have somewhat different purposes and are meant to be complementary, rather than duplicative. With its 140 indicators, the Index paints a broad picture of national health security, allowing users to zoom out and holistically understand the extent of both individual states' and the entire nation's preparedness for large-scale public health threats. In slight contrast, *Ready or Not*, with its focus on 10 select indicators, focuses attention on a subset of the Index and spotlights important areas for stakeholders to prioritize. Going forward, TFAH and the NHSPI will work together to help federal, state, and local officials use data and findings from each project to make Americans safer and healthier.

Measuring performance

Ready or Not was first published in 2003. Over time, the series has tracked significant progress in the nation's emergency preparedness, but notable vulnerabilities remain. To help states track their own progress, TFAH will strive to maintain continuity among the indicators tracked in this edition of the report for the next several years.

New to the series in this edition is a three-tiered grouping system. States are grouped into tiers based

on their performances across the 10 indicators. Partial credit, also new, was provided for some indicators in order to draw finer distinctions among states and within states over time. States were placed into the three tiers—top tier, middle tier, and bottom tier—based on their relative performance across indicators.

State Public Health Funding

TFAH collected data for fiscal year 2018 and for earlier years from states' publicly available funding documents. With assistance from the Association of State and Territorial Health Officials (ASTHO), data were provided to states for review and verification. Informed by the Public Health Activities and Services Tracking project at the University of Washington, TFAH defines "public health programming and services" to include communicable disease control; chronic disease prevention; injury prevention; environmental public health; maternal, child, and family health; and access to and linkage with clinical care.

TFAH excludes from its definition of "public health programming and services" insurance coverage programs, such as Medicaid or the Children's Health Insurance Program, and inpatient clinical facilities.

Health Threats: A Review of 2018

From a historic seasonal flu season to extreme weather that upended millions of lives, 2018 offered plenty of evidence that much more work must be done to ensure the health and safety of all Americans. Some policy advancements strived to address these challenges, such as the National Biodefense Strategy and the Global Health Strategy Agenda renewal. These represented positive steps in an increasingly dangerous world.

This section outlines major public health incidents, actions, research findings, meetings, and federal hearings across three domains: disease outbreaks; severe weather and natural disasters; and biological, chemical, radiological, and nuclear terrorism.

Disease Outbreaks

Notable incidents

- Hepatitis A.** In June 2018, the Centers for Disease Control and Prevention (CDC) warned of ongoing hepatitis A virus outbreaks,²⁷ primarily among those who reported drug use and/or homelessness. The hepatitis A virus is a highly contagious, short-term liver infection for which vaccination is the best prevention. In October, the Advisory Committee on Immunization Practices, which develops recommendations for the CDC, voted unanimously to add people without homes to the list of populations that should receive routine hepatitis A vaccinations.²⁸
- Seasonal flu.** The 2017–2018 season was a “high-severity” flu season,²⁹ with large numbers of visits to outpatient clinics and emergency departments, record hospitalization rates, and high numbers of influenza-associated pediatric deaths.³⁰ There were about 80,000 flu-related deaths, the most since the 1976–1977 season.³¹ One possible contributing factor: only 42 percent of Americans received a flu shot in 2017–2018.³²
- Foodborne outbreaks.** Multistate foodborne illness outbreaks included several cases of salmonella infections found in eggs, chicken, raw turkey, pasta salad, chicken salad, melon, cereal, raw sprouts, kratom, tahini, and coconut. Other outbreaks included cyclospora in salad mix and vegetable trays, listeria in pork products and deli ham, *vibrio parahaemolyticus* in imported fresh crab meat, and *E. coli* in romaine lettuce.³³
- Acute flaccid myelitis.** The CDC confirmed more than 165 cases, across a majority of states, of acute flaccid myelitis in children, which affects the nervous system—especially the spinal cord—and can lead to temporary or permanent paralysis. This followed weaker outbreaks, starting in 2014.³⁴

Ready or Not:
*Protecting the
Public’s Health
from Diseases,
Disasters and
Bioterrorism*

Notable actions

- **Global health security.** In November, the Global Health Security Agenda (GHSA), an initiative that aims to accelerate and optimize global health security, launched GHSA 2024, a plan to evaluate risks and close gaps.³⁵
- **Antimicrobial resistance.** In September, the U.S. Food and Drug Administration (FDA) announced a new antimicrobial resistance strategy based on four pillars: (1) developing new antibiotics, diagnostic tests, and vaccines; (2) promoting stewardship in human and veterinary settings; (3) improving surveillance of antimicrobial use and resistance; and (4) advancing regulatory science to bring about breakthroughs in antibiotic development.³⁶ Antibiotic resistance poses a serious public health threat, as illnesses that were once treatable become untreatable, leading to dangerous infections and even disability or death.
- Also, in September, the CDC and HHS launched the **Antimicrobial Resistance (AMR) Challenge**, a year-long program to accelerate the fight against antimicrobial resistance across the globe. The Challenge is based on a “one health” approach which recognizes the health connections between humans, animals and the environment.
- **Health Security National Action Plan.** More than 40 federal departments/agencies developed and published the Health Security National Action Plan based on the 2016 Joint External Evaluation (JEE) of the United States. The JEE, which evolved out of the Global Health Security Agenda, involved

a peer-review with international experts from the World Health Organization (WHO), and resulted in a set of comprehensive scores and specific recommendations for the United States. The National Action Plan consolidates information about federal programs in a long-term coordination process to strengthen health emergency preparedness and response capacities for all hazards, specifically addressing the 2016 JEE recommendations and aiming to increase the U.S. scores on a follow-up JEE in 2021.

Notable research findings, meetings, and federal hearings

- Between 2009–2015, Norovirus was the most common cause of foodborne outbreaks, followed by salmonella.³⁷
- The number of reported illnesses transmitted by ticks, mosquitoes, or fleas more than tripled from 2004–2016.³⁸ Tickborne diseases were most prevalent, especially Lyme disease. In addition, a new invasive Tick species,³⁹ the Asian Longhorn Tick, was identified. The Asian Longhorn is able to transmit several diseases to humans. West Nile virus was the most commonly transmitted mosquito-borne disease in the continental United States, while dengue, chikungunya, and Zika were prevalent in the U.S. territories and in other countries.
- One in seven babies born in the U.S. territories to mothers who contracted Zika virus infection during pregnancy had an associated birth defect, a neurodevelopmental problem, or both.⁴⁰ Early interventions have been shown to improve cognitive, social, and behavioral functioning in these children.
- According to research by the Pew Charitable Trusts and the CDC, tighter antibiotic stewardship is needed in urgent care settings to reduce inappropriate prescriptions for acute respiratory conditions that are viral or noninfectious, including the common cold, bronchitis, influenza, and viral pneumonia.⁴¹
- The U.S. Government Accountability Office (GAO) examined the U.S. public health system’s capacity to respond to infectious disease threats, evaluating three preparedness and capacity-building programs: Epidemiology and Laboratory Capacity for Infectious Diseases, Hospital Preparedness Program, and Public Health Emergency Preparedness. GAO found uneven performances among these programs’ state and local government grant awardees in the areas of electronic lab reporting, epidemiological capacity, and laboratory capacity.⁴²
- An assessment by researchers and practitioners of epidemiological capacity in state health departments found significant understaffing, particularly among epidemiologists dedicated to evaluating personal and public health services and researching new or improved solutions to health problems.⁴³
- The CDC published *Public Health Surveillance: Preparing for the Future*, a status report on its strategy since 2014 to streamline and better integrate its systems to regularly collect, analyze, use, and share data to prevent and control disease and injury. The report documented faster notification, easier reporting systems, quicker understanding of emerging health threats, and improved disease tracking.

Severe Weather and Natural Disasters

Notable incidents

- **Extreme weather.** Two major hurricanes pummeled the East Coast in 2018. When Hurricane Florence made landfall in North Carolina in September, it produced days of unyielding rainfall, causing catastrophic flooding and at least 51 deaths.^{44,45} Weeks later, Hurricane Michael crept through the Gulf of Mexico toward the Florida panhandle, where the warm waters quickly fueled it from a Category 2 storm to a Category 4 within 24 hours.⁴⁶ Michael leveled entire towns and caused at least 35 deaths.⁴⁷ To the west, Hurricane Walaka wiped Hawaii’s tiny East Island off the map.⁴⁸ In October, the Commonwealth of the Northern Mariana Islands was devastated by Super Typhoon Yutu.⁴⁹
- **Wildfires.** More than 7,000 wildfires scorched more than 1.6 million acres in California in 2018.⁵⁰ The Camp Fire was the deadliest in California’s history, killing 86 people.⁵¹ The Mendocino Complex Fire—the merging of the Ranch Fire and the River Fire—was the largest wildfire in California history and took nearly two months to contain.⁵² The Carr Fire produced “fire whirls” with wind speeds equal to an EF-3 tornado—143 miles per hour⁵³—and killed eight people.⁵⁴ Colorado, Nevada, Oregon, and Washington also dealt with large wildfires.^{55,56,57,58} Wildfires produce smoke that can affect air quality hundreds of miles away. In August, Seattle’s air quality was rated “unhealthy for all,” as smoke from wildfires well north, east, and south



of the city drifted into the area.⁵⁹ In November, amid the Camp fire, some parts of California had air that ranked among the dirtiest in the world.⁶⁰

Notable actions

- In 2018, the HHS secretary declared public health emergencies for the California wildfires; for hurricanes in Florida, Georgia, North Carolina, South Carolina, and Virginia; for Typhoon Yutu on the Commonwealth of the Northern Mariana Islands; and for an earthquake in Alaska. Declarations were renewed for the continued response to Hurricane Maria in Puerto Rico and the U.S. Virgin Islands.⁶¹ (Nationwide public health emergency declarations for the opioid crisis were also renewed.⁶²) Such declarations enable certain flexibilities for each jurisdiction, such as waiving or modifying requirements by the Centers for Medicare and Medicaid Services.



Notable research findings, meetings, and federal hearings

- Three major reports authored by the United Nations,⁶³ 13 U.S. federal agencies,⁶⁴ and 24 academic institutions and the United Nations,⁶⁵ respectively, warned about the current and future risks of a changing climate. The reports left no doubt about the urgency of the situation.
- The American Public Health Association (APHA) and the Public Health Institute released *Climate Change, Health, and Equity: A Guide for Local Health Departments*, which summarizes the science of climate change and its impact on health, particularly among low-income communities and communities of color. The report connects what is known about climate impacts and related solutions with the work of local health departments. The authors recommend that climate change be integrated into public health emergency preparedness efforts, emphasizing surveillance, health system and community resilience, and preparations for the displacement of vulnerable populations.⁶⁶
- The Federal Emergency Management Agency (FEMA) released its *2017 Hurricane Season After-Action Report*, which analyzes the agency's preparation for, immediate response to, and initial recovery operations for the three major hurricanes that occurred in quick succession in 2017—Harvey, Irma, and Maria—while simultaneously responding to historic wildfires in California. FEMA found its major challenges involved mounting a sufficient response for concurrent, complex incidents; sustaining whole community logistics support (including collaboration among individuals, businesses, faith-based and community organizations, nonprofits, schools and academia, media outlets, and all levels of government⁶⁷); responding during long-term infrastructure outages; and supporting food, shelter, and housing activities at unprecedented levels. Among the actions FEMA took to improve its operations, based on its findings, were to update its hurricane plans and procedures; to improve staffing processes during incidents; to dramatically increase meal and water supplies in the Caribbean; and to add 300 new emergency generators to its inventory.⁶⁸
- The GAO released *2017 Hurricanes and Wildfires: Initial Observations on the Federal Response and Key Recovery Challenges*, which examines the challenges that slowed and complicated FEMA's responses to hurricane and wildfire disasters, including staffing shortages, logistical obstacles, and the incapacitation of local responders, on top of limited local preparedness in Puerto Rico and the U.S. Virgin Islands.⁶⁹
- An independent assessment of deaths resulting from Hurricane Maria, commissioned by the governor of Puerto Rico and performed by the George Washington University's Milken Institute School of Public Health, estimates that 2,975 people died between September 2017 and February 2018 due to the storm or its aftermath.⁷⁰ Risk of death was persistently highest for seniors and those living in low-income areas.

All-Hazards Policy Actions

Notable actions

- In July, the FDA approved TPOXX (tecovirimat) as a treatment for smallpox—the first drug of its kind.⁷¹ While smallpox was eradicated in 1980, it still exists in small quantities at two research labs in the United States and Russia,⁷² and perhaps other locations, and there are longstanding concerns that it could be used as a bioweapon.
- In September, the White House released its National Biodefense Strategy. Among other actions, the strategy calls for the creation of a Cabinet-level steering committee, to be chaired by the HHS secretary, to provide strategic guidance in preparing for, countering, and responding to biological threats. The strategy also outlines how the United States can better coordinate with international partners, industry, academia, nongovernmental entities, and the private sector on all elements of a national biodefense strategy.⁷³
- In October, responsibility for the management of the Strategic National Stockpile moved from the CDC to the U.S. Office of the Assistant Secretary for Preparedness and Response, the office within the HHS that was created in 2006 to coordinate the federal responses to health emergencies.⁷⁴ The stockpile is a national repository, distributed throughout the country in secure locations, of medical countermeasures and supplies for

use during a major disease outbreak, bioterror or chemical attack, or other public health emergency.⁷⁵ The move, intended to streamline and align medical countermeasure operations under ASPR, generated questions from some in Congress and the public health community about the potential impact on existing countermeasure capabilities and on the provision of support and technical assistance to state and local jurisdictions.

- In October, the CDC updated its framework of public health emergency preparedness and response capabilities,⁷⁶ which through the Public Health Emergency Preparedness (PHEP) cooperative agreement, provides standards for states and localities, helping them to plan, operationalize, and evaluate their public health emergency preparedness.
- In September, December and again in January 2019, the House passed the Pandemic and All-Hazards Preparedness and Advancing Innovation Act of 2018. The legislation, if enacted, would reauthorize the U.S. Department of Health and Human Services (HHS) emergency preparedness and response programs, including programs to research and develop medical countermeasures for biological threats. However, the legislation did not pass the Senate before Congress adjourned for the year and many authorities expired.

Notable research findings, meetings, and federal hearings

- In February, the Blue Ribbon Study Panel on Biodefense released *Budget Reform for Biodefense: Integrated Budget Needed to Increase Return on Investment*, which recommends moving toward a strategic, well-informed, and coordinated biodefense spending approach that will support more sound investments, close capability gaps, and reduce inefficiencies.⁷⁷
- In May, the Johns Hopkins Center for Health Security convened U.S. national security and epidemic response experts to participate in a mock pandemic tabletop exercise involving a novel and deadly influenza virus that is released by bioterrorists and that kills 150 million people worldwide within one year—15 million in the United States alone.⁷⁸ At the completion of the “Clade X” exercise, the center issued six policy recommendations, two of which were (1) to maintain a national public health system that can manage the challenges of pandemic response, and (2) to build the capacity to develop new vaccines and drugs quickly.
- In October, the Blue Ribbon Study Panel on Biodefense released *Holding the Line on Biodefense: State, Local, Tribal, And Territorial Reinforcements Needed*. The report recommends several steps to increase the capability of state, local, tribal, and territorial governments to share with the federal government the burden of large-scale biological event preparedness, response, and recovery.⁷⁹

Ready or Not: *Protecting the Public's Health from Diseases, Disasters and Bioterrorism*

Assessing State Preparedness

While it is important that every state be ready to handle public health emergencies, each faces its own mix of threats, and some are more prepared than others. To help states assess their readiness, and to highlight a checklist of top-priority concerns and action areas, this report examines a set of 10 select indicators. The indicators, drawn heavily from the National Health Security Preparedness Index (NHSPI), a joint initiative of the Robert Wood Johnson Foundation and the University of Kentucky, capture core elements of preparedness. Based on states' standing across the 10 indicators (see "Appendix A: Methodology" for scoring details), states were placed into three tiers. (See Table 3.)

TABLE 3: Top-Priority Indicators of State Public Health Preparedness

State performance, by scoring tier, 2018

Performance Tier	States	Number of States
Top Tier	AL, CO, CT, FL, ID, KS, MA, MD, MO, MS, NC, NE, NJ, RI, VA, WA, WI	17 states
Middle Tier	CA, DC, GA, HI, IA, IL, LA, ME, MI, MN, MT, ND, NH, NM, NV, OK, OR, SC, TX, VT, WV	20 states and DC
Bottom Tier	AK, AR, AZ, DE, IN, KY, NY, OH, PA, SD, TN, UT, WY	13 states

Note: See "Appendix A: Methodology" for scoring details. Complete data were not available for U.S. territories.

Importantly, the implications of this assessment, and responsibility for continuously improving, extend beyond any one state or local agency. Indeed, most require sustained engagement and coordination by a broad range of policymakers and administrators.

Moreover, some indicators (for example, public health funding) are under the direct control of public officials, whereas improvement in other indicators (for example, seasonal flu vaccination) will require multisector, statewide efforts, including by residents.

INDICATOR 1: ADOPTION OF NURSE LICENSURE COMPACT

KEY FINDING: 31 states participated in the Nurse Licensure Compact in 2018.

Workforce shortages can impair a state’s ability to effectively manage disasters or disease outbreaks, potentially resulting in poorer health outcomes for those affected. Therefore, the capacity to quickly increase the availability of qualified medical personnel is critical.

This indicator examines whether states have adopted legislation to participate in the Nurse Licensure Compact (NLC). Launched in 2000 by the National Council of State Boards of Nursing, the NLC permits registered nurses and licensed practical nurses to practice with a single multistate license—physically or remotely—in any state that has joined the compact. The NLC provides standing reciprocity, with no requirement that an emergency be formally declared.

To help make participation in the compact more viable for states, the National Council of State Boards of Nursing enhanced its requirements in 2017–2018, adding a requirement for state and federal criminal background checks, and standardizing licensure requirements among participating states, among other changes.⁸⁰

The NLC has been crucial to response efforts after several recent disasters.⁸¹ In 2017, when Hurricane Harvey struck Texas, healthcare systems were overwhelmed, and nurses from many member states were able to immediately assist those in need. In 2018, when Hurricane Florence left severe damage in South Carolina from rain, flooding, and high winds, DaVita Renal Dialysis Centers were in dire need of nurses. Thanks to South Carolina’s membership in the compact, DaVita was able to recruit nurses from other NLC states without delay. A few weeks later, when flooding from Hurricane Michael forced at least one hospital in the state to evacuate, nurses from other member states were able to assist.

As of November 2018, 31 states had adopted the NLC.⁸² (See Table 4.) Five states (Florida, Georgia, Oklahoma, West Virginia, and Wyoming) began to formally implement the compact in January 2018, and two (Kansas and Louisiana) are scheduled to do so in July 2019. In contrast, Rhode Island exited the NLC in July 2018.

TABLE 4: 31 States Participated in the Nurse Licensure Compact
Participants and nonparticipants, 2018

Participants			Nonparticipants	
Arizona	Maine	South Carolina	Alabama	Minnesota
Arkansas	Maryland	South Dakota	Alaska	Nevada
Colorado	Mississippi	Tennessee	California	New Jersey
Delaware	Missouri	Texas	Connecticut	New York
Florida	Montana	Utah	D.C.	Ohio
Georgia	Nebraska	Virginia	Hawaii	Oregon
Idaho	New Hampshire	West Virginia	Illinois	Pennsylvania
Iowa	New Mexico	Wisconsin	Indiana	Rhode Island
Kansas	North Carolina	Wyoming	Massachusetts	Vermont
Kentucky	North Dakota		Michigan	Washington
Louisiana	Oklahoma			

Note: Kansas and Louisiana are scheduled to begin implementing the NLC in July 2019.

Source: National Council of State Boards of Nursing.⁸³

INDICATOR 2: HOSPITAL PARTICIPATION IN HEALTHCARE COALITIONS

KEY FINDING: Widespread hospital participation in healthcare coalitions was common in 2017; only four states (California, New Hampshire, Ohio, and South Carolina) reported that 70 percent or fewer of their hospitals participated in coalitions supported by the HHS Hospital Preparedness Program.



Lowe Llaguno / Shutterstock.com

The federal Hospital Preparedness Program, which is managed by the HHS's Office of the Assistant Secretary for Preparedness and Response, provides grants to states, localities, and territories to develop regional coalitions of healthcare organizations that collaborate to prepare for, and respond to, medical surge events.⁸⁴ Coalitions prepare members with critical tools, including medical equipment and supplies, real-time information, enhanced communication systems, and well-trained healthcare personnel.⁸⁵

Broad participation by hospitals in healthcare coalitions means that when disaster strikes, systems are in place to coordinate the response, freeing hospitals to focus on clinical care. For example, when a train derailed on the border of two counties and two coalitions in Washington state in December 2017, nine participating hospitals across three counties used a shared tracking system to streamline the documentation and distribution of 69 patients, and to aid family

reunification.⁸⁶ The Houston area's coalition, which comprises 25 counties that are home to 9.3 million people and 180 hospitals, coordinated activities, such as evacuations and patient transfers, during and after Hurricane Harvey in 2017.⁸⁷ More recently, after Hurricane Florence knocked out communication capabilities at a major regional hospital in North Carolina, the area coalition established a backup system within eight hours.⁸⁸

On average, 89 percent of hospitals in states belonged to a healthcare coalition in 2017, with universal participation, meaning every hospital in the state was part of a coalition, in 17 states (Alaska, Colorado, Connecticut, Delaware, Hawaii, Louisiana, Minnesota, Mississippi, Nevada, North Dakota, Oregon, Rhode Island, South Dakota, Utah, Vermont, Virginia, and Washington) and the District of Columbia. (See Table 5.) However, some states, such as Ohio (25 percent) and New Hampshire (47 percent) lagged behind.

TABLE 5: Widespread Participation of Hospitals in Healthcare Coalitions
Percent of hospitals participating in healthcare coalitions, 2017

States	Percent of Participating Hospitals
AK, CO, CT, DC, DE, HI, LA, MN, MS, NV, ND, OR, RI, SD, UT, VT, VA, WA	100%
ID, WI	98%
GA, WV	97%
KS	96%
AL, NE, NC, OK	95%
ME	94%
KY	93%
WY	92%
TN	91%
MI	90%
MD	89%
IL	88%
MO	87%
NY, PA	86%
MT	83%
MA, NJ	82%
AR	81%
IA, TX	80%
IN	75%
FL	73%
AZ	72%
NM	71%
CA	70%
SC	56%
NH	47%
OH	25%

Note: This indicator measures participation by hospitals in healthcare coalitions supported through the federal Hospital Preparedness Program of the Office of the Assistant Secretary for Preparedness and Response.

Source: NHSPI analysis of data from the Office of the Assistant Secretary for Preparedness and Response, U.S. Department of Health and Human Services.

INDICATORS 3 AND 4: ACCREDITATION

KEY FINDING: Most states are accredited by one or both of two well-regarded bodies—the Public Health Accreditation Board and the Emergency Management Accreditation Program—but eight are not.

The Public Health Accreditation Board (PHAB), a nonprofit organization that administers the national public health accreditation program, advances quality within public health departments by providing a framework and a set of evidence-based standards against which they can measure their performance. Among standards with direct relevance to emergency preparedness are assurances of laboratory, epidemiologic, and environmental expertise to investigate and contain serious public health problems, policies and procedures for urgent communications and maintenance of an all-hazards emergency operations plan.⁸⁹ Through the process of accreditation, health departments identify their strengths and weaknesses, increase their accountability and transparency, and improve their management processes, which all promote continuous quality improvement.⁹⁰

Emergency management, as defined by the Emergency Management Accreditation Program (EMAP), encompasses all organizations in a given jurisdiction with emergency or disaster functions, which may include prevention, mitigation, preparedness, response, and recovery. The EMAP helps applicants ensure—through self-assessment, documentation, and peer review—

that they meet national standards for emergency response capabilities.⁹¹

The PHAB and the EMAP each provide important mechanisms for improving evaluation and accountability. Accreditation by these entities demonstrates that a state’s public health and emergency management systems are capable of effectively responding to a range of health threats. Priority capabilities that are tested include identification, investigation, and mitigation of health hazards; a robust and competent workforce; incident, resource, and logistics management; and communications and community-engagement plans.^{92,93} (States sometimes aim to meet applicable standards, but do not pursue accreditation.)

As of October 2018, both the PHAB and the EMAP accredited 26 states and the District of Columbia and an additional 16 states were accredited by one or the other. (See Table 6.) Just eight states (Alaska, Hawaii, Indiana, New Hampshire, South Dakota, Texas, West Virginia, and Wyoming) were not accredited by either body. This analysis includes state level accreditations only, it does not include accredited local or tribal health departments. In some instances, local public health departments are accredited in states that may not be.

TABLE 6: 42 States and the District of Columbia Accredited by PHAB and/or EMAP
Accreditation status by state, October 2018

PHAB and EMAP			PHAB only	EMAP only		No Accreditation
Alabama	Illinois	New York	Delaware	Georgia	North Carolina	Alaska
Arizona	Kansas	North Dakota	Maine	Iowa	Pennsylvania	Hawaii
Arkansas	Maryland	Ohio	Minnesota	Kentucky	South Carolina	Indiana
California	Massachusetts	Oklahoma	Montana	Louisiana	Tennessee	New Hampshire
Colorado	Mississippi	Rhode Island	Oregon	Michigan	Virginia	South Dakota
Connecticut	Missouri	Utah	Washington	Nevada		Texas
District of Columbia	Nebraska	Vermont				West Virginia
Florida	New Jersey	Wisconsin				Wyoming
Idaho	New Mexico					

Note: These indicators track accreditation by the PHAB and the EMAP. States with conditional or pending accreditation at the time of data collection were classified as having no accreditation. States sometimes aim to meet applicable standards but do not pursue accreditation.

Sources: NHSPH analysis of data from the PHAB and the EMAP.

INDICATOR 5: STATE PUBLIC HEALTH FUNDING TRENDS

KEY FINDING: A majority of states held their public health funding steady or increased it in fiscal year 2018, but 17 states and the District of Columbia had reduced funding.

Healthier communities are more resilient. Funding for public health programs that support the infrastructure and workforce needed to protect health—including the ability to detect, prevent, and control disease outbreaks and mitigate the health consequences of disasters—is a critical ingredient of preparedness. General public health competences—such as those pertaining to epidemiology, environmental hazard detection and control, infectious disease prevention and control, and risk communications—and targeted emergency response resources are needed to ensure that routine capabilities are maintained, and that surge capacity is readily available for emergencies. Skilled public health employees are often redeployed during emergencies to provide surge capacity, so health departments must maintain adequate numbers of trained personnel.

According to the Public Health Activities and Services Tracking project at the University of Washington, state public health programming and services span six core areas:

- 1) Communicable disease control.** Public health services related to communicable disease epidemiology, hepatitis, HIV/AIDS, immunization, sexually transmitted diseases, tuberculosis, etc.
- 2) Chronic disease prevention.** Public health services related to asthma, cancer, cardiovascular disease, diabetes, obesity, tobacco, etc.
- 3) Injury prevention.** Public health services related to firearms, motor vehicles, occupational injuries, senior fall prevention, substance-use disorder, other intentional injuries, and other unintentional injuries.

4) Environmental public health. Public health services related to air and water quality, fish and shellfish, food safety, hazardous substances and sites, lead, onsite wastewater, solid and hazardous waste, zoonotic diseases, etc.

5) Maternal, child, and family health. Public health services related to the coordination of services; direct service; family planning; newborn screening; population-based maternal, child, and family health; supplemental nutrition, etc.

6) Access to and linkage with clinical care. Public health services related to beneficiary eligibility determination, provider or facility licensing, etc.

The overall infrastructure of public health programming supports states' ability to carry out emergency responsibilities. But public health funding is typically discretionary, making it vulnerable to neglect or retrenchment, especially when times are tight. This can undermine emergency preparedness activities and weaken response and recovery efforts.

Fortunately, a majority of states (32) increased public health funding and one state (Wyoming) held it steady in fiscal year 2018. (See Table 7.) But 17 states and the District of Columbia reduced the money they directed to these vital activities, increasing the likelihood that they will be less prepared and less responsive in the moments that matter most. It is worth noting that this indicator does not assess the adequacy of states' public health funding.



Jonathan Weiss / Shutterstock.com

TABLE 7: State Public Health Funding Held Stable or Increased in 33 states
Public health funding, by state, fiscal 2017–2018

State	Percentage Change
Alabama	1.7%
Alaska	-13.8%
Arizona	-0.1%
Arkansas	-2.8%
California	2.8%
Colorado	1.5%
Connecticut	6.5%
Delaware	-1.8%
D.C.	-1.1%
Florida	0.8%
Georgia	6.4%
Hawaii	10.5%
Idaho	1.3%
Illinois	1.6%
Indiana	9.7%
Iowa	-0.5%
Kansas	16.8%
Kentucky	-6.3%
Louisiana	16.4%
Maine	-17.1%
Maryland	5.0%
Massachusetts	1.1%
Michigan	18.0%
Minnesota	-0.1%
Mississippi	-9.9%
Missouri	3.7%
Montana	-5.9%
Nebraska	4.1%
Nevada	30.2%
New Hampshire	2.9%
New Jersey	5.2%
New Mexico*	-1.8%
New York	-4.5%
North Carolina	6.0%
North Dakota	12.2%
Ohio	5.8%
Oklahoma	-5.4%
Oregon	2.7%
Pennsylvania	7.5%
Rhode Island	0.4%
South Carolina	9.4%
South Dakota	-3.5%
Tennessee	-1.2%
Texas	-12.1%
Utah	3.9%
Vermont	-1.3%
Virginia	0.5%
Washington	13.5%
West Virginia	3.4%
Wisconsin	1.0%
Wyoming	0%

Note: Owing to differences in organizational responsibilities and budgeting, funding data are not necessarily comparable state to state. See “Appendix A: Methodology” for a description of TFAH’s data-collection process, including its definition of public health funding.

Source: TFAH analysis of states’ public funding data.

INDICATOR 6: COMMUNITY WATER SYSTEM SAFETY

KEY FINDING: Few Americans drink from community water systems that are in violation of applicable health-based standards required by the Safe Drinking Water Act. But room for improvement remains.

Nothing is more critical to human life than safe drinking water. It is essential for consumption, sanitation, and the efficient operation of the healthcare system. In the United States, 90 percent of the population gets water from a public water system, and the U.S. Environmental Protection Agency (EPA) sets legal limits on contaminants in drinking water, including microorganisms, disinfectants and their by-products, chemicals, and radionuclides;⁹⁴ the EPA also requires states to periodically report drinking-water quality information.⁹⁵ Water systems must report any violations, such as failing to follow established monitoring and reporting schedules, failing to comply with mandated treatment techniques, violating any maximum contaminant

levels, and failing to meet customer-notification requirements.⁹⁶

The United States has one of the safest public drinking-water supplies in the world, but some communities, particularly low-income communities, struggle to maintain constant access to safe water. The most prominent water-contamination crisis in recent years occurred in Flint, Michigan, where a 2014 change in water supply caused distribution pipes to corrode and to leach lead and other contaminants into the drinking water. Tens of thousands of residents, including young children, have been exposed to high levels of lead and other toxins.⁹⁷ In children, even low levels of exposure can damage the nervous system and contribute to learning disabilities, shorter stature, impaired hearing, and impaired formation and function of blood cells.⁹⁸

Yet, across the nation, on average, only 6 percent of state residents used a community water system in 2017 that failed to meet all applicable health-based standards, according to the EPA. What's more, that share was 0 to 1 percent in Alabama, Connecticut, Hawaii, Illinois, Indiana, Maine, Maryland, Michigan, Montana, Nevada, Oregon, Vermont, and Washington. (See Table 8.) But in five states (New York, North Dakota, Oklahoma, Pennsylvania, and Utah), more than 15 percent of residents used a community water system with health-based violations at some time during the year. New York's share was 46 percent, a sharp increase from earlier years, after a violation at the massive New York City water supply system. In years prior to 2017, New York state's water quality was more comparable to that of other states.

TABLE 8: Few Americans Used Contaminated Community Water Systems
Percent of state populations who used a community water system in violation of health-based standards, 2017

States	Percent of Population
HI, VT	0%
AL, CT, IL, IN, ME, MD, MI, MT, NV, OR, WA	1%
CA, MN, NH, SD	2%
FL, MA, MS, MO, SC, VA, WI	3%
ID, KS, NE, NJ, OH, WY	4%
DC, NC, TN, TX	5%
AK, LA	6%
AR, RI	7%
AZ, CO, GA, WV	8%
IA	9%
DE	11%
KY, NM	12%
ND, OK	16%
PA, UT	20%
NY	46%

Note: Some state residents use private drinking-water supplies, rather than community water systems. Private supplies are not captured by these data. Only regulated contaminants are measured.

Source: NHSPI analysis of data from the EPA.

INDICATOR 7: ACCESS TO PAID TIME OFF

KEY FINDING: Just over half of workers in states, on average, had some type of paid time off (for example, sick leave, vacation, holidays) in 2018. Most states were closely clustered to that midpoint, with few outliers.

When workers without paid leave get sick, they face the choice of going to work and potentially infecting others or staying home and losing pay—or even their jobs. Similarly, when workers without paid leave have children who get sick, they face the choice of sending their sick child to school and potentially infecting others or, again, staying home with their child and losing pay or even their jobs. Therefore, paid time off, especially dedicated sick leave, can strengthen infection control and resilience in communities by reducing the spread of contagious diseases and bolstering workers’ financial security.

This is particularly important for industries and occupations that require frequent contact with the public. For example, people working in the food service and childcare industries commonly have no paid sick leave.⁹⁹ This often leads service employees to work throughout a bout of the flu, or return to work before their symptoms have fully subsided, when one or two days off could have dramatically reduced workplace infections.^{100,101} At a societal level, flu rates have been shown to be lower in cities and states that mandate paid sick leave.^{102,103}

Paid time off also increases access to preventive care among workers and their families, including routine checkups, screenings, and immunizations. Delaying or skipping such care can result in poor health outcomes and can ultimately lead to costlier treatments. Workers without paid sick days are less likely to get a flu shot, and their children are less likely to receive routine checkups, dental care, and flu shots.¹⁰⁴

In 2018, 55 percent of workers in states, on average, had some type of paid time off, according to the Current Population Survey, which is sponsored jointly by the U.S. Census Bureau and the U.S. Bureau of Labor Statistics.¹⁰⁵ Connecticut (65 percent), the District of Columbia (65 percent), and Texas (68 percent) stood out as states where relatively high percentages of workers had such benefits, whereas fewer workers had them in South Carolina (46 percent), South Dakota (46 percent), Utah (46 percent), and Wyoming (45 percent).¹⁰⁶ (See Table 9.)

TABLE 9: 55 Percent of Workers, On Average, Received Paid Time Off
Percent of employed population with paid time off, 2018

States	Percent of Workers
TX	68%
CT, DC	65%
OR	63%
GA	62%
MS	61%
AL, MD, IA, NY, WA	60%
HI, MA	59%
NE, VA	58%
NH, RI, VT, WI	57%
CA, FL, WV	56%
AL, CO, MO, MT, NV	55%
IL, NM, OK	54%
KS, LA, ME, NC, TN	53%
NJ	52%
MN, PA	51%
AZ, DE, ND	50%
ID	49%
AR, IN, KY, MI, OH	48%
SC, SD, UT	46%
WY	45%

Note: Paid time off includes sick leave, vacations, and holidays. The measure’s data are estimated based on a survey of a sample of the general population.

Source: NHSPI analysis of data from the Annual Social and Economic Supplement of the Current Population Survey.

INDICATOR 8: FLU VACCINATION RATE

KEY FINDING: Flu vaccination coverage fell for the 2017–2018 season, with a smaller share of every age group analyzed receiving a vaccine. On average, 43 percent of state residents ages 6 months or older were vaccinated—well below the recommended level.

Vaccination is the best prevention against the seasonal flu. The CDC recommends that everyone ages 6 months or older get vaccinated annually, yet, year after year, even with a steady increase among adults over the past three decades,¹⁰⁷ less than half of Americans do. The 2017–2018 flu season in the United States was the deadliest in nearly 40 years; it is estimated that more than 900,000 people were hospitalized, and about 80,000 people died¹⁰⁸—tragically underscoring the importance of annual vaccination.

Vaccination is particularly important for people at high risk of severe flu-related illnesses, including young children, pregnant women, people with certain chronic health conditions, and older adults. In addition to protecting Americans from the seasonal flu, establishing a cultural norm of vaccination, building vaccination infrastructure, and establishing policies that support vaccinations can help prepare the country to vaccinate all Americans quickly during a pandemic or disease outbreak.

Under the Affordable Care Act, all routine vaccines recommended by the Advisory Committee on Immunization Practices, including flu shots, are fully covered when provided by in-network providers, except in states that have not expanded their Medicaid programs in accordance with the act.

During the 2017–2018 flu season, 43 percent of state residents ages 6 months or older were vaccinated on average, according to the CDC.¹⁰⁹ Only Rhode Island succeeded in vaccinating a majority (50.1 percent), followed Maryland (49.3 percent) and Massachusetts (49.7 percent). (See Table 10.) Vaccination rates were lowest in Louisiana and Wyoming (35.3 percent each), Florida (35.6 percent), and Tennessee (36.4 percent). (Adult data were not available for the District of Columbia.)

Children, particularly young children, were more likely to be vaccinated than were adults. Nearly 58 percent of Americans ages 6 months to 17 years were vaccinated in 2017–2018,¹¹⁰ compared with just 37 percent of adults.¹¹¹

TABLE 10: Less than Half of Americans Received a Seasonal Flu Vaccination
States seasonal flu vaccination rates for people ages 6 months or older, 2017 – 2018

State	Vaccination Rate, Ages 6 Months or Older
Rhode Island	50.1%
Massachusetts	49.7%
Maryland	49.3%
Washington	48.5%
Minnesota	48.4%
New Jersey	48.1%
Virginia	48.1%
South Dakota	47.7%
Delaware	47.6%
West Virginia	47.6%
Iowa	47.1%
Nebraska	47.0%
Connecticut	46.3%
North Carolina	46.0%
Pennsylvania	46.0%
Colorado	45.2%
North Dakota	44.9%
Oklahoma	44.9%
Mississippi	44.3%
Kentucky	44.1%
South Carolina	44.1%
New Hampshire	43.7%
New Mexico	43.7%
Vermont	43.6%
Hawaii	43.2%
Ohio	42.8%
Alabama	42.4%
Missouri	42.4%
Montana	42.1%
Arkansas	41.7%
Maine	41.2%
Kansas	41.1%
Oregon	40.5%
New York	40.4%
Wisconsin	40.4%
Alaska	40.2%
California	40.0%
Illinois	39.9%
Michigan	39.5%
Nevada	39.1%
Arizona	38.9%
Georgia	38.7%
Utah	38.5%
Texas	37.6%
Idaho	37.0%
Indiana	37.0%
Tennessee	36.4%
Florida	35.6%
Louisiana	35.3%
Wyoming	35.3%
District of Columbia	Data incomplete

Note: These data are calculated from a survey sample, with a corresponding sampling error. Adult data were not publicly reported for the District of Columbia. Source: Centers for Disease Control and Prevention.¹¹²

INDICATOR 9: PATIENT SAFETY IN HOSPITALS

KEY FINDING: On average, roughly a quarter of hospitals received an “A” grade in the fall 2018 hospital safety assessment administered by the Leapfrog Group, a nonprofit advocate for safety, quality, and transparency in hospitals.

Hospitals can be dangerous places for patients. Every year, as many as 440,000 people die from hospital errors, injuries, accidents, and infections, collectively making such incidents the third leading cause of death in the United States.^{113,114} Keeping hospital patients safe from preventable harm is an important element of preparedness; those hospitals that excel in safety are less likely to cause or contribute to a public health emergency and are better positioned to handle any public health emergencies that put routine quality standards to the test.

The Hospital Safety Score is calculated by the Leapfrog Group using 27 evidence-based metrics that measure the success of healthcare processes and outcomes. The measures track such issues as healthcare-associated infection rates, the number of available beds and qualified staff in intensive-care units, nursing staff volume, patients’ assessments of staff communications and responsiveness, and a hospital’s overall culture of error prevention.¹¹⁵ These measures are especially critical for health system readiness for emergencies and outbreak prevention and control, which includes workforce training and availability, surge capacity, and infection-control practices.

In the Leapfrog Group’s fall 2018 assessment, 28 percent of general acute-care hospitals across the United States, on average, met the requirements for an “A” grade. But results varied widely state to state, from no hospitals in Delaware, North Dakota, or the District of Columbia receiving the top score, to a majority of hospitals doing so in New Jersey (57 percent), Oregon (55 percent), and Virginia (52 percent). (See Table 11.) Hospitals with “F” grades were in California, Florida, Illinois, Indiana, Louisiana, Mississippi, New York, New Jersey, New Mexico, and South Carolina. These states also had hospitals with higher scores.

TABLE 11: Hospital Patient Safety Scores Vary Significantly by State
States percentage of hospitals with “A” grade, fall 2018

State	Percent of Hospitals
New Jersey	57%
Oregon	55%
Virginia	52%
Massachusetts	44%
Texas	43%
North Carolina	43%
Rhode Island	43%
Ohio	43%
Colorado	41%
Maine	40%
Michigan	40%
Louisiana	39%
Illinois	39%
Pennsylvania	38%
Utah	36%
Nevada	35%
Georgia	35%
Mississippi	34%
Florida	34%
Hawaii	33%
Montana	33%
Wisconsin	33%
California	32%
Kansas	32%
New Hampshire	31%
South Carolina	30%
Idaho	30%
Wyoming	30%
Oklahoma	26%
Alaska	25%
Minnesota	25%
Washington	24%
Kentucky	24%
Missouri	23%
Tennessee	23%
Indiana	23%
Arizona	22%
Maryland	20%
Alabama	19%
Vermont	17%
West Virginia	17%
New Mexico	14%
Arkansas	10%
South Dakota	10%
Iowa	9%
New York	8%
Connecticut	8%
Nebraska	7%
Delaware	0%
District of Columbia	0%
North Dakota	0%

Note: This measure captures only general acute-care hospitals.

Source: The Leapfrog Group.¹¹⁶

INDICATOR 10: STATE PUBLIC HEALTH LABORATORY SURGE CAPACITY

KEY FINDING: Virtually every state reported having a plan in 2017 for a six- to eight-week surge in laboratory testing capacity to respond to an outbreak or other public health event.

Public health laboratories are essential to emergency response. They help detect and diagnose health threats as they emerge, and they track and monitor the spread of those threats, which can help public health officials learn how to control them. Public health labs exist in every state and territory and are the backbone of the Laboratory Response Network (LRN), a national network of laboratories that provide the infrastructure and capacity to respond to public health emergencies.¹¹⁷

When a disaster or disease outbreak strikes, public health laboratories must be able to surge to meet increased demand, just like hospitals and other responders. The Association of Public Health Laboratories defines internal surge capacity as a “sudden and sustained increase in the volume of testing that a LRN reference laboratory can perform in an emergency

situation, implementing substantial operational changes as defined in laboratory emergency response plans and using all resources available within the laboratory.”¹¹⁸ Surging capacity can require staff movement or reassignment, extra shifts, and hiring. Labs also have to plan for infrastructure factors, such as sufficient biological safety cabinets and chemical fume hoods; amount and type of supplies; space for intake, processing, and storage of samples; versatility and capacity of analytical equipment and instruments; personal protective equipment; and power supply.¹¹⁹

In 2017, the District of Columbia and all states except Arkansas, Georgia, New Jersey, Oregon, Utah, and Vermont reported to the Association of Public Health Laboratories that they had a plan for a six- to eight-week surge in testing capacity. (See Table 12.)

TABLE 12: Nearly Every State Planned for a Laboratory Surge
State public health laboratories had a plan for a six- to eight-week surge in testing capacity, 2017

Had a Plan				No Plan
Alabama	Iowa	Nevada	Texas	Arkansas
Alaska	Kansas	New Hampshire	Virginia	Georgia
Arizona	Kentucky	New Mexico	Washington	New Jersey
California	Louisiana	New York	West Virginia	Oregon
Colorado	Maine	North Carolina	Wisconsin	Utah
Connecticut	Maryland	North Dakota	Wyoming	Vermont
Delaware	Massachusetts	Ohio		
District of Columbia	Michigan	Oklahoma		
Florida	Minnesota	Pennsylvania		
Hawaii	Mississippi	Rhode Island		
Idaho	Missouri	South Carolina		
Illinois	Montana	South Dakota		
Indiana	Nebraska	Tennessee		

Note: This indicator tracks only the existence of a plan, not its quality or comprehensiveness, or the frequency in which it is used or tested. Georgia and New Jersey reported that they had a plan for a six- to eight-week surge in 2018; Montana and West Virginia reported that they did not have a plan in 2018.

Source: NHSPH analysis of data from the Association of Public Health Laboratories.

Ready or Not: *Protecting the Public's Health from Diseases, Disasters and Bioterrorism*

Recommendations

Securing a nation against major public health threats requires action by policymakers at all levels, public health practitioners, the healthcare delivery system, academia, and the private or nongovernmental sectors. What follows is a description of actions these stakeholders should take to improve the country's health security. Cutting across these recommendations are three common themes:

- 1) **Sufficient resource allocation.** There is a need for both a stable and dedicated budget as well as a readily available supplemental funding process for emergency preparedness and response and for health security programs.
- 2) **Modern technologies and innovations.** There are continual needs to update and improve emergency preparedness as materials and tools improve and lessons are learned.
- 3) **Skilled multisector leadership and collaboration.** Multiple organizations, agencies, and sectors must be involved in planning to ensure adequate response and minimal harm.

TFAH supports the following recommendations across 11 high-priority areas:

Priority Area 1: Funding a Modern Public Health and Emergency Preparedness Infrastructure

Every person deserves the protection of a modern public health system equipped to surmount 21st-century threats. Indeed, protecting communities from disasters and disease outbreaks is a fundamental responsibility of the public health community. Public health departments, healthcare providers, and emergency management officials must work together to prevent and respond to threats.

The U.S. health security infrastructure has made tremendous progress since the 9/11 terrorist attacks by building modern laboratories, maintaining a pipeline of medical countermeasures, and recruiting and retaining a workforce trained in emergency operations. Yet, unstable and insufficient funding puts this progress at risk. Too often, there has been a chronic cycle of stagnant funding, followed by a

disaster or outbreak, then an infusion of onetime supplemental funds, and finally an erosion of money once attention wanes. This pattern undermines health security. A modern health security infrastructure requires reliable funding to support preparedness capabilities and staffing, emergency funds for major crises, and flexibility to recover and rebuild resilient communities.

Since 2001, federal funds to support and maintain state and local public health preparedness have been cut by about 28 percent (from \$940 million in fiscal 2002 to \$675 million in fiscal 2019), and funding for healthcare emergency preparedness has been cut nearly in half (from \$515 million in fiscal 2004 to \$265 million in fiscal 2019). Researchers estimate that state and local public health

agencies face a \$13 per-capita shortfall,¹²⁰ on average, to achieve full foundational capabilities—“the cross-cutting skills that need to be present in state and local health departments everywhere for the system to work anywhere.”¹²¹ These capabilities, such as all-hazards

preparedness, assessment and surveillance, communications, and partnership development, are critical to protecting communities from emergencies.

Long-term investments, such as Public Health Emergency Preparedness cooperative agreements and the

Hospital Preparedness Program, have helped communities respond to many emergencies without additional federal support. But larger or more demanding emergencies and outbreaks necessitate both base preparedness funding and a surge of resources.

RECOMMENDATIONS:

● **Provide stable, dedicated, and sufficient funding for preparedness activities and a significant funding increase for core public health capabilities.** Continued investment is crucial in specialized programs that support health security, including Public Health Emergency Preparedness, the Hospital Preparedness Program, and medical countermeasures programs. Congress should also significantly increase overall funding for the CDC, which supports national, state, local, tribal, and territorial health security capabilities, as well as more generalized core public health capabilities, such as epidemiology, communications, and information technology. As the 2017 hurricane season demonstrated, public health and healthcare systems must be strong and collaborative to reduce the health impacts of emergencies. Following Hurricane Maria in Puerto Rico, the provision of healthcare and behavioral health services, assessment and mitigation of environmental health threats, prevention of outbreaks, and surveillance of ongoing health effects were all severely curtailed. Such foundational capabilities cannot be built or rebuilt overnight in an emergency.

The 22 by 22 campaign, led by the Association of State and Territorial Health Officials¹²² and joined by over 70 partners, urges Congress to increase funding for the CDC by 22 percent by federal fiscal year 2022 in order to equip the public health system to face 21st

century threats. Members of the Public Health Leadership Forum, which found that only 51 percent of Americans are served by a comprehensive public health system, recommends the creation of a Public Health Infrastructure Fund to assure protection for all communities.¹²³

- **Establish a standing public health emergency response fund to accelerate crisis responses.** In addition to stable core funding, governments need readily available funds on hand to respond to crises. When the Zika outbreak began in 2016, it took nearly nine months for Congress to appropriate funds, and even more time for states to access them. Congress should place sufficient money into a public health emergency response fund to serve as a temporary bridge between preparedness and supplemental emergency funds. It should be used for acute emergencies that require a rapid response to save lives and protect the public. Such funding should not come from existing emergency preparedness resources, nor should it supplant other cuts made to such resources.
- **Federal agencies and state policymakers should update policies to allow for expedited emergency responses.** Usual—sometimes time-consuming—administrative policies and practices can become impediments to a quick response during an emergency. Federal and state policymakers should review and update personnel laws to facilitate

the rapid hiring of emergency response workers when a disaster strikes. In addition, policymakers should streamline the traditional procurement processes and create mechanisms for the rapid release of emergency supplemental funding. Advance planning and testing of accelerated personnel, procurement, and other administrative processes, including the consideration of contingency contracting (as is done with indefinite delivery, indefinite quantity contracts), will avoid dangerous delays in emergencies when every minute counts.

- **The federal government should permit states and grantees to braid or blend emergency funding streams that support response and recovery.** Emergency funding for an event may be allocated to multiple federal agencies. However, the coordination of funding across agencies can be impeded by differing agency policies and practices. This can lead to disconnected and less effective emergency responses on the ground. To prevent this inefficiency, policymakers should adopt practices that allow for braiding funding from various sources to support a single initiative or strategy at the state, community, or program level. Braided funds remain in separate and distinguishable strands for tracking purposes but can have coordinated application processes and funding cycles, jointly funded line items, and uniform reporting mechanisms.

Priority Area 2: Bolstering Global Health Security

Disease can spread from an isolated, rural village to any major city in just 36 hours.¹²⁴ Food, people, and supply chains move across the globe, and America's economy and security depend on the safety of those movements. However, many nations are still not prepared to detect and respond to disease threats, as the outbreak of Ebola in the Democratic Republic of the Congo demonstrates.

The Global Health Security Agenda (GHSa) is an international, multisector commitment by more than 64 nations, international organizations, and nongovernmental stakeholders to build countries' capacity to protect against infectious disease threats before they become severe.¹²⁵ Its goal is to build health systems that prevent and detect outbreaks and respond effectively

when they occur.¹²⁶ America's 2018 National Biodefense Strategy shares this objective, setting a goal to "strengthen global health security capacities to prevent local bio-incidents from becoming epidemics."

U.S. investment in global health security received a onetime increase of \$909 million in the 2015 Ebola supplemental funding appropriation,¹²⁷ but significant annual funds are needed to help build and maintain the domestic capacity in GHSa-target nations. The United States reaffirmed support for the GHSa in November 2018 when HHS Secretary Alex Azar announced a commitment of \$150 million.¹²⁸ However that announcement involved funding that had already been appropriated, rather than ongoing or new investments.¹²⁹

RECOMMENDATION:

- **The United States should maintain a significant long-term investment in the GHSa framework and global preparedness and response programs.** The United States is a

key partner in the GHSa and must maintain its leadership in the effort. The U.S. commitment requires robust annual funding to maintain and improve these programs.¹³⁰



Priority Area 3: Improving Leadership and Coordination

Every recent crisis illustrates strengths and weaknesses in coordination, leadership, and collaboration across governmental and nongovernmental organizations. For example, the Federal Emergency Management Agency's (FEMA) after-action report on the 2017 hurricane season found that the agency had inadequate plans for a devastating disaster, underestimated resources needed, lacked staff and clarity of roles with partner entities, and failed to leverage information—all of which contributed to delays in response and recovery.¹³¹ (As of this writing, a similar after-action report has not been made publicly available for agencies within the HHS or other federal departments.)



micheelmond / Shutterstock.com

Many 21st-century threats will not be addressed by a single agency. During the devastating 2017 hurricane season, for instance, public health officials in Florida, Texas, Puerto Rico, and the U.S. Virgin Islands identified critical public health needs that would not be addressed by FEMA funding, such as post-emergency trauma and environmental

health injuries and illnesses. The HHS, FEMA, the State Department, the U.S. Agency for International Development, the Defense Department, and the Environmental Protection Agency, among others, all play a part in modern health security. Therefore, specialized efforts to ensure coordination and skillful, timely leadership are crucial.

RECOMMENDATIONS:

- **Congress should quickly pass and fully fund the Pandemic and All-Hazards Preparedness and Advancing Innovation Act.** This legislation authorizes most federal public health security programs and proposes strategies to improve their effectiveness.
- **The National Biodefense Strategy (NBS) should be followed by transparent goals, implementation plans, and budgets for all relevant agencies.** The strategy—which directs biodefense priorities for multiple agencies—sets goals around risk awareness, prevention, preparedness, rapid response, and recovery. The National Biodefense Strategy will only be successful if it is backed by adequate funding and programmatic support and involvement of relevant public health agencies. Implementation of the strategy should be transparent and should allow for routine

stakeholder engagement and continue to align with and advance the U.S. Health Security National Action Plan and other national security strategies.

- **HHS, the CDC, and the Office of the Assistant Secretary for Preparedness and Response (ASPR), and FEMA should clarify roles and address gaps within the government's Emergency Support Functions.** Disaster survivors, especially those with disabilities or in need of ongoing care, can fall through the cracks between federal agencies' response functions.¹³² FEMA's after-action report for the 2017 hurricanes called for cross-sector Emergency Support Functions to integrate FEMA capabilities with the public, the private sector, and volunteer actions to ensure the right capability reaches the survivor at the right time.¹³³ The ASPR and the CDC should coordinate and align their preparedness

and response activities, including private-sector and volunteer-organization engagement, taking care to maintain systems and policies that are working well, to avoid duplicative efforts, and to keep experts connected to key functions.

- **Policymakers and public health officials should develop, in advance of an event, a framework for decision making related to isolation, quarantine, movement, and monitoring decisions during extraordinary outbreaks.** Federal, state, and local public health and infectious disease experts should convene to agree on a framework that helps states make movement and monitoring decisions that are based on scientific and medical evidence; that preserves social and economic continuity to the greatest extent possible; and that is in the best interest of the public's health.

Priority Area 4: Accelerating Development and Distribution of Medical Countermeasures



Medical countermeasures (MCMs), the FDA-regulated biologics, drugs, and devices used in public health emergencies, represent one of the best defenses against natural and man-made health threats. With effective and timely vaccines, diagnostics, and treatments, diseases can be prevented or contained before becoming global crises—but only if they reach the right people at the right time. The United States has made tremendous progress in improving the pipeline of medical countermeasures to protect against chemical, biological, radiological, and nuclear (CBRN) threats. But this progress could be undermined by unstable funding and insufficient support for MCM development and

deployment. Many small companies in the CBRN sector depend on government investment, so stable funding and transparency are important.

The United States is not adequately prepared for a flu pandemic, as existing vaccines are only partially effective and still take too long to produce. Too few new antibiotics are being produced to meet the threat of antimicrobial resistance, and companies continue to move away from antibiotic development. As the Zika and Ebola outbreaks demonstrated, the next health security crisis could be an unanticipated disease with few, if any, MCM options in development.

RECOMMENDATIONS:

- **Provide significant funding over the long term for the entire MCM enterprise, including new funding models and promising technologies.** Long-term funding that is coordinated and transparent would offer more certainty to the biotechnology industry and researchers and would strengthen public-private partnerships. Public and private investors should support innovative funding models for biodefense, similar to the Coalition for Epidemic Preparedness Innovations or the Combating Antibiotic Resistant Bacteria Biopharmaceutical Accelerator (CARB-X) and the BARDA Division of Research Innovation and Ventures (DRIVE) acceleration program models. The United States should invest in innovative, flexible technologies and capabilities that will enable faster production of products.^{134,135}
- **Closely monitor the impacts of the transition of the Strategic National Stockpile (SNS) from the CDC to the**

ASPR. Oversight of the SNS moved from the CDC to the ASPR in 2018. The HHS must ensure that this significant transition does not negatively affect readiness by separating the CDC's expertise and its well-established relationships with states and localities from SNS operations, or through duplicative systems and procedures that complicate responses. HHS should also ensure proper procedures for purchase decisions, including regular input of the Public Health Emergency Countermeasures Enterprise (PHEMCE), an interagency coordinating body. Officials should continue supporting state and local MCM distribution capabilities, clarify roles between the CDC and the ASPR in day-to-day activities and incident response, avoid administrative duplication and delay, and restore necessary funding and staff for the CDC. The HHS should also measure and evaluate the success of the leadership transfer.

- **Strengthen the last mile of distribution and dispensing.** While transitioning SNS functions to the ASPR, state and local health departments must continue to be key partners in coordinating distribution and dispensing to targeted populations. Funding, planning, training, and engagement of health departments for this purpose should be improved, and private-sector distributors and supply-chain partners should be integrated into planning, exercises, and responses. Investments in new technologies should also consider last-mile delivery needs by investing in innovative delivery and distribution methods. HHS, including the CDC, should work with healthcare professionals and state and local partners to develop standardized guidance for distributing and dispensing MCMs to children, people who are homebound, and other target groups. Finally, the CDC and FDA must monitor and assess MCM use nationally during emergencies.¹³⁶

Priority Area 5: Improving Disease Surveillance

Health security requires efficient and effective disease detection.

Disease surveillance is a multisectoral, multilayered system that requires accurate diagnostics; fast communication between clinicians, clinical laboratories, and their state, local, tribal, and territorial (SLTT) public health counterparts; efficient reporting between SLTT and federal agencies; and a well-trained workforce at all levels. The CDC is investing in Advanced Molecular Detection capacity to enable state and local public health laboratories to study the genetic makeup of pathogens, to examine vaccine effectiveness, to detect outbreaks and their sources faster, to develop better diagnostics, and to understand the spread of transmission. However, due to funding constraints, these advancements are being implemented in a piecemeal fashion.

As new technologies enable earlier and more accurate identification of pathogens and outbreaks, public health surveillance must adapt. For example, culture-independent diagnostic tests of enteric diseases speed up diagnosis but may complicate the detection of outbreaks by forgoing the submission of cultures to public health laboratories.^{137,138} And earlier detection of pathogens—the result of innovation—necessitates more boots on the ground to investigate sources of pathogens.

In 2018, the CDC released a progress report on the implementation of its public health surveillance strategy.¹³⁹ The progress report found that the “CDC maintains more than 100 surveillance systems, which creates

a reporting burden and duplication of effort for partners, discrepancies among the data elements, and the need to use multiple information technology systems.” The CDC has made progress in addressing the reduction of redundant surveillance systems and the faster reporting of data, but significant effort is still needed to support effective disease surveillance. Some remaining challenges for public health include recruiting and retaining health informatics specialists, data scientists and other qualified staff; upgrading laboratory and IT technologies; adapting surveillance systems to newer diagnostics; and building into reporting systems electronic case reporting, two-way communication with clinicians, and interoperability.

RECOMMENDATIONS:

- **Develop a strategic budget plan and fully fund surveillance and data infrastructure for fast, accurate outbreak detection at all levels of government.** The CDC, in consultation with public health and nongovernmental partners, should submit to Congress a multiyear strategic vision and professional judgment budget estimate for what is needed to upgrade bio-surveillance capacity and interoperability at all levels of government. The estimate should account for workforce needs, public health laboratory and epidemiological capacity, and technological upgrades.
- **The CDC should be sufficiently funded to fully implement its internal strategic plan for improving surveillance and public health data.**¹⁴⁰ Implementation should include reducing the number



of siloed systems and requiring all grants and cooperative agreements that have a surveillance element to meet updated data standards. More states should use electronic messaging for notifiable diseases and other

streamlined data exchange mechanisms and should actively participate in national syndromic surveillance. Public health officials must also have a coherent strategy for incorporating nongovernmental data into surveillance.

Priority Area 6: Ensuring a Qualified Public Health Workforce



Even as technology allows health agencies to identify pathogens more quickly, or to respond to disasters more effectively, much of the work of protecting the public's health

security is done by people. Public health professionals investigate and respond to potential infectious disease outbreaks and/or environmental risk factors, operate specialized

laboratories, educate and train first responders and other key agencies and organizations, organize incident commands, communicate with the public, and provide life-saving medical countermeasures. These capabilities require training and experience.

Unfortunately, the public health workforce continues to dwindle. While layoffs and attrition in local health departments appeared to slow in 2017 after many years of decline,¹⁴¹ the local public health workforce fell by 56,360 jobs from 2008 to 2017,¹⁴² and the state public health workforce for the United States fell by 9 percent from 2010 to 2016.¹⁴³ A 2017 survey of the governmental public health workforce found nearly half could leave their organizations within the next five years, including many who may leave the public health field altogether.¹⁴⁴ These reductions could threaten health security by eroding leadership, scientific expertise, and core capabilities.

RECOMMENDATIONS:

- **Support and fund the recruitment and training of experienced public health professionals.** A highly trained health security workforce cannot simply be hired after a disaster occurs and cannot be supported long-term by supplemental or emergency funding. Federal, state, and local policymakers must prioritize stable funding for public health departments to ensure that they have a pipeline of skilled workers in such pressing areas as vector control and public health informatics. Public health curricula should emphasize cultural and linguistic competency, with a focus on health equity opportunities in emergency preparedness. Health departments should prioritize these skills when making hiring decisions. Student-loan repayment programs, leadership training, addressing barriers to hiring, and other incentives could help attract medical, science, management, communications, and informatics experts into the sector. Federal grants should require staff to receive public health emergency strategic skills training. Health agencies should also have plans and capacity to protect their workers during emergencies.
- **Ease hiring at the federal, state, and local level.** In an emergency, it can be difficult to hire people quickly. Each state has its own rules for staffing and contracting, which may not align with priorities during an emergency response. The HHS should offer guidance to states in effectively hiring and contracting during emergencies. HHS agencies should also have authorities to make immediate offers and competitive salaries to a range of emergency response staff, such as epidemiologists and logisticians.

Priority Area 7: Ready the Healthcare System to Respond and Recover

The healthcare delivery system plays a critical role in emergency response. It can be the focal point for widespread vaccination, as it was for the H1N1 pandemic in 2009. It can screen those at elevated risk to determine current health status and provide preventive counseling, as it did in response to the Zika outbreak in 2015–2016. And it can provide urgent care to those with injuries or illnesses in a disaster. It has a special role in protecting and treating those who may be most vulnerable in a crisis, such as frail older adults, young children, pregnant women, people with chronic conditions or disabilities, and those already being cared for in acute-care and long-term-care facilities.

Sometimes healthcare facilities are ill-prepared for major emergencies. For example, in 2017, after Hurricane Irma struck Florida, 12 residents of a Florida nursing facility died when the building lost air conditioning for several days.¹⁴⁵ This tragedy called into focus the remaining challenges in preparing facilities for disasters. The Hospital



Preparedness Program, administered by the ASPR, provides funding to states to develop healthcare coalitions— within state or regional collaborations between hospitals, public health, emergency management, and other healthcare organizations—to collaborate in meeting the healthcare preparedness needs of their communities.

In 2018, the HHS initiated a demonstration program called the

Regional Disaster Health Response System intended to create a more comprehensive disaster health system.¹⁴⁶ The nascent program provides grants to hospital-led partnerships to build a disaster health response network, align policies for clinical excellence in disaster response, increase statewide medical surge capacity, improve situational awareness, and evaluate capabilities.¹⁴⁷

RECOMMENDATIONS:

- **Bolster the Hospital Preparedness Program and multisector healthcare collaboration.** The Hospital Preparedness Program needs robust annual funding to ensure every state has strong healthcare coalitions that meet the program’s objectives, and the program must strive for quality improvement and the ability to meet the needs of the healthcare delivery system. Healthcare coalitions must continue to build and diversify their memberships and fully integrate

into regional emergency response. Multisector collaboration from across the healthcare spectrum is integral to major responses, especially by helping with managing surges of patients at acute-care facilities. Congress should provide additional funding— not supplanting existing hospital preparedness funds—for tiered, regional disaster healthcare systems. These entities should coordinate and leverage existing coalitions to address statewide and regional preparedness challenges.



- Clarify and strengthen policies regarding disaster healthcare delivery.** States have varied policies and practices governing the delivery of healthcare during emergencies, including those pertaining to contracting and hiring, licensure and credentialing, use of telehealth, liability for healthcare providers and volunteers, and adoption of crisis standards of care in the context of scarce resources. The ASPR should review barriers to healthcare response and recovery and should provide guidance for states to clarify laws and policies regarding healthcare disaster readiness and volunteer management. State policymakers should adopt best practices and policies that promote healthcare readiness, such as the Nurse Licensure Compact, the EMS Personnel Licensure Interstate CompAct, the Uniform Emergency Volunteer Health Practitioners Act, and crisis standards of care guidelines.

- Prepare every healthcare facility for outbreaks and disasters.** Every healthcare facility—from private practices to major hospitals—should be prepared for a range of potential events. The Centers for Medicare and Medicaid Services (CMS) should strengthen, implement, and ensure compliance with the emergency preparedness rule for participating healthcare facilities. Healthcare facilities should start with the requirements of the CMS preparedness rule¹⁴⁸ and CDC’s antibiotic stewardship core elements,¹⁴⁹ but healthcare facilities should also have clear, well-communicated plans for infectious disease screening and containment, incident command, capacity to deal with a surge of patients and healthcare volunteers, continuity of operations, evacuation, and crisis communications. All healthcare systems should offer appropriate training and provide

protective measures, such as vaccines and personal protective equipment, for healthcare workers at all levels, including for those who work outside of clinics.

- Meet health needs of populations at risk for a disproportionate impact during disasters.** Healthcare providers, policymakers, and emergency personnel need to ensure that planning and response efforts include attention to the special needs of populations that are particularly at-risk. Examples of the need for such attention include older adults who have had high death and injury rates in weather-related emergencies, such as in Hurricane Katrina in New Orleans and in the recent fires in California. People with chronic conditions that require medication or regular treatment, such as dialysis, may be at greater risk in disasters due to power outages, inability to evacuate safely, and lack of access to specialized care. Health systems, payers, providers and other community-serving organizations should ensure continuity of care and services for such individuals during disasters or other health emergencies.

The American Academy of Pediatrics recommends that both the Hospital Preparedness Program and the Public Health Emergency Preparedness program address the needs of children and incorporate the needs of children into their programs’ performance measures.¹⁵⁰ According to Save the Children, the United States still lacks a coordinated national strategy to improve pediatric emergency transport and care in disasters, and no federal agency has been designated as the lead on prehospital emergency medical services preparedness.¹⁵¹

Priority Area 8: Preparing for Environmental Threats and Extreme Weather

Health departments have an important role to play in helping communities adapt for, and mitigate, the adverse effects of climate change and extreme weather. Climate change may affect health, including by exacerbating cardiovascular and respiratory diseases, waterborne outbreaks, vector-borne diseases, and heat-related deaths.^{152,153} Large-scale droughts and floods are leading to food and water insecurity in some regions of the globe.^{154,155} The 2018 U.N. climate change report stated that reducing global warming could

prevent millions of premature deaths.¹⁵⁶ The frequency and severity of storms and flooding, as well as wildfires, is forcing many health departments to regularly respond to natural disasters, which detracts from their ongoing prevention and health-protection work. Other environmental health threats, such as algal blooms and lead in drinking water, have required multisector responses in several states. Every health department should prepare for these growing threats to human and animal health.



RECOMMENDATIONS:

- **Every state should have a comprehensive climate change adaptation plan that includes a public health assessment and response.**

Public health and environmental agencies should work together to track concerns, coordinate risk management and communications, and prioritize the necessary capabilities to reduce and address threats. States and localities should investigate what additional capacities are needed and identify vulnerable populations and communities.

- **Improve coordination and alignment of public health and environmental agencies.** Public health agencies at all levels must work with environmental, homeland security, and other agencies to undertake initiatives to reduce known health threats from extreme weather. Public health agencies must educate

the public about ways to avoid potential threats. State and local public health officials should ensure that environmental health is incorporated into emergency operations planning and incident command. In addition, funding for programs at the CDC's National Center for Environmental Health and Agency for Toxic Substances and Disease Registry is essential for tracking and mitigating environmental health risks, such as contaminants, heat, and unsafe water.

- **Develop sustainable state and local vector-control programs.** A 2017 assessment of local vector-control organizations found that 84 percent of respondents were in need of improvement in core competencies.¹⁵⁷ The vector-borne disease program at the CDC should be broadly expanded and should receive robust funding to support state and local capacity to prevent and

detect vector-borne diseases, such as Zika, West Nile Virus, and Lyme disease.

- **Guarantee clean water for all U.S. residents, including after disasters.** All states should include water security and sewage removal in their preparedness plans, and they should build relationships between health departments and local environmental and water agencies. The CDC should include national guidance and metrics for planning for a range of water-related crises. Measures that should be taken to protect a safe water supply include addressing the ongoing problem of lead and other toxins in drinking water, and taking steps, such as those in the EPA's Clean Water Rule, to reduce the potential for waterborne illnesses and to increase protection against potential acts of biological and chemical terrorism on America's drinking and agricultural water.

Priority Area 9: Building Resilient Communities and Promoting Health Equity

Health disparities, underlying inequities in access to care and services, and the effects of social determinants of health are exacerbated during health emergencies. People with low incomes are often at risk of increased impact of a health emergency because they may have fewer resources to draw on to secure their safety during an evacuation. Many communities of color can suffer disproportionately during a disaster due to unequal access to services before

and after an event. Individuals with limited English proficiency may not receive timely messages in their primary language in the period leading up to and during an emergency. Residents who are concerned about their immigration status may be reluctant to accept government assistance. Frail older adults and individuals with serious chronic illnesses or with access and functional needs may also face serious challenges during an evacuation and

relocation to a shelter. Those with behavioral health diagnoses may find their symptoms worsened by stress and lack of access to regular services during emergencies. Community resilience and preparedness planning must recognize health inequities to address systemic barriers to services and must ensure inclusive planning, especially for populations that may face a disproportionate impact of disasters.¹⁵⁸

RECOMMENDATIONS:

- **Improve social determinants of health.**

Public health leaders should serve as the chief health strategists for their communities, working with partners to address social and economic factors that influence the health and well-being of communities.¹⁵⁹ Health departments should use community partnerships and data to understand systemic barriers to services for traditionally underserved communities that could be addressed before a disaster. Improving the health of communities helps them prepare for, respond to, and recover from emergencies. This may include working on economic policies that reduce poverty and improve health, such as low-income tax credits, and that improve working and living conditions, such as paid sick leave and affordable housing. Attention to social determinants also involves reducing racism and other forms of discrimination, which can lead to poorer health and uneven responses to community-wide emergencies.

- **Public health departments should build strong cross-sector partnerships that advance health equity.** Communities should create chief equity officer or

resilience officer positions to work across programs and agencies to advance equity in community-resilience work and to ensure that it is incorporated into preparedness policies and plans.¹⁶⁰ Innovative partnerships and funding models can also be used to build equity and resilience. The Public Health 3.0 model (a 21st century public health model) promotes initiatives to foster shared funding, services, governance, and collective action between diverse sectors to advance equity.¹⁶¹ These types of organizational structures can enable the blending and braiding of funding from disparate public and private sources to promote a long-term strategy for health equity.

- **Plan with communities, not for them.**

Officials from emergency management and public health agencies should meaningfully engage community members and organizations that might be disproportionately impacted by a disaster—such as people with functional and access needs, people with limited English proficiency, people who live in poverty, and racially and ethnically diverse communities—and involve them

in planning. For example, emergency managers should establish relationships with local independent-living centers and assess the accessibility of their sheltering facilities to ensure they meet the needs of individuals with access and functional needs.¹⁶²

- **Address behavioral health resource gaps and incorporate mental health first-aid and long-term mental health treatment into disaster response and recovery strategies.**

Emergency preparedness plans and funding should address immediate- and long-term behavioral health needs.¹⁶³ Services and supports provided to disaster survivors should also be trauma-informed, should build on the best evidence available, should empower survivors, and should work collaboratively with individuals and their families.¹⁶⁴ Communities can also create “resilience hubs,” which are community-serving facilities meant to both support residents and coordinate resource distribution and services before, during and after a natural hazard event.¹⁶⁵

Priority Area 10: Stopping Outbreaks and Superbugs

Emerging infectious diseases and antimicrobial-resistant superbugs present growing national security threats. The 2018 National Biodefense Strategy centered on infectious disease threats, stating, “An infectious disease outbreak—even in the most

remote places of the world—could spread rapidly across oceans and continents, directly impacting the U.S. population and its health, security and prosperity.”¹⁶⁶ The CDC estimates that at least two million people in the United States get a drug-resistant

infection each year, and at least 23,000 people in the U.S. die from such infections.¹⁶⁷ Preventing, detecting, and responding to outbreaks requires cross-sectoral collaboration between healthcare, public health, academic, and private-sector stakeholders.

RECOMMENDATIONS:

- **Significantly increase public and private investments in innovative initiatives to combat antimicrobial resistance.**

Federal policymakers should increase funding for priorities of the National Action Plan for Combating Antibiotic Resistant Bacteria, including innovative methods of detecting and containing outbreaks, such as the Antibiotic Resistance Solutions Initiative at the CDC. There should be robust public-private investment in antibiotic discovery science, diagnostics, early stage product development, and research through the Biomedical Advanced Research and Development Authority, CARB-X, and other programs. Partners should also work together to decouple antibiotic reimbursement from drug sales so that drug developers are incentivized to innovate, despite efforts to conserve antibiotics.¹⁶⁸

- **Eliminate overuse of antibiotics in agriculture.** The FDA and partner agencies should enforce rules regarding veterinary oversight and the judicious use of antibiotics in food animals, should ensure data collection and publication, should promote antibiotic stewardship programs, and should track the impact of these policies on resistance patterns. Farmers and the food industry should stop using medically important antibiotics to

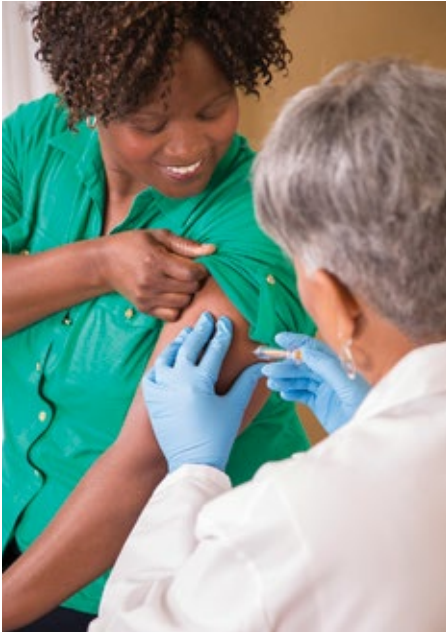
promote growth and prevent disease in healthy animals, as recommended by the World Health Organization,¹⁶⁹ and they should invest in research to develop and adopt husbandry practices that reduce the need for routine antibiotics.

- **Decrease overprescription of antibiotics through implementation of antibiotic stewardship and antibiotic-use reporting.** CMS should finalize, implement, and enforce requirements for all CMS-enrolled facilities to have effective antibiotic stewardship programs that align with the CDC’s Core Elements of Antibiotic Stewardship guidance and that work with public health stakeholders to track progress in prescribing rates and resistance patterns. All relevant facilities must drastically improve their reporting of antibiotic use and resistance through the National Healthcare Safety Network and should adopt stewardship programs that meet the CDC’s core elements. Finally, HHS, CMS, accrediting organizations, healthcare facilities, medical schools, and others should educate providers and patients about the harm of inappropriate prescribing.

- **Modernize food safety practices and policies and work toward better coordination across agencies.** Sufficient federal and state funding should be

devoted to implementing and enforcing the FDA Food Safety Modernization Act (FSMA). The FDA should ensure public health is the top priority as it implements the FSMA’s prevention-based rules to ensure that proposed exemptions do not increase risk from foodborne illnesses. Lawmakers should also modernize meat and poultry laws so that they are more risk-based, science-based, and protective of public health. In the near term, HHS and the U.S. Department of Agriculture should take the lead in providing better organization and coordination across the federal government agencies with food safety roles.

- **Provide job-protected paid sick leave.** Approximately 40 percent of private-sector employees—more than 41 million workers—cannot earn paid sick days to care for themselves or an ill family member.¹⁷⁰ When workers without paid sick leave get sick, they face the choice of working and potentially infecting others or staying home and risking the loss of income or even unemployment. Some industries and occupations that require frequent contact with the public are least likely to provide paid sick leave, enabling diseases to spread through contact with food, coworkers, and the public.



Priority Area 11: Improving Vaccination Rates Across the Lifespan

Despite the effectiveness of vaccines, vaccination rates remain low in many communities across the United States, placing people of all ages at risk for outbreaks and disease. In 2018, the CDC reported that the percentage of children under age 2 who had not received any recommended vaccinations quadrupled since 2001.¹⁷¹ While overall childhood vaccination rates remain relatively high, there are pockets of the United States with much higher rates of unvaccinated children, placing those communities at risk for deadly outbreaks. In addition,

adult vaccination rates remain far below targets in Healthy People 2020, including for hepatitis B, seasonal flu, pneumococcal, and shingles.¹⁷²

These gaps have serious consequences across the lifespan. An estimated 80,000 people died—among them, 185 children¹⁷³—from seasonal flu in 2017–2018, nearly twice what is considered typical during an average flu year.¹⁷⁴ Up to 1.4 million people suffer from chronic hepatitis B, which can cause liver cancer and death, and human papillomavirus which causes more than 27,000 cancers each year.¹⁷⁵

RECOMMENDATIONS:

- **Raise awareness about the importance of vaccination.** Government, healthcare systems, and other partners should use varied and targeted media channels to educate people about the importance, effectiveness, and safety of vaccinations.
- **Minimize vaccine exemptions for schoolchildren and healthcare workers.** States should enact and provide universal childhood vaccinations to ensure children, their classmates, and educators are protected from diseases (except where immunization is medically contraindicated). The National Vaccine Advisory Committee recommends that states with existing Personal Belief Exemptions should strengthen policies so that exemptions are only available after appropriate parent education and acknowledgement of risks to their child and to the community.¹⁷⁶ Healthcare personnel should also be required to receive all Advisory Committee on Immunization Practices (ACIP)–recommended vaccinations to protect staff and continuity of operations, support healthcare infection control, and improve overall patient safety.
- **Ensure first-dollar coverage for recommended vaccines under Medicaid, Medicare, and commercial insurance.** Public and private payers should ensure that ACIP-recommended vaccines are fully covered, as cost-sharing can be a significant barrier to vaccination.¹⁷⁷ All insurance plans should consider pharmacies and other complimentary providers as in-network and receive equal payment for vaccine administration services for their adult and pediatric populations.
- **Support the vaccine infrastructure.** The Vaccines for Children program, the CDC’s immunization program (also called the Section 317 Program), and state immunization information systems provide the infrastructure and systems to states to fill immunization gaps among the uninsured and underinsured, and to track usage, safety, and effectiveness of vaccines. These systems are especially vital during outbreaks for conducting surveillance and targeting vaccines to relevant individuals.

Appendix: Methodology

To assess the strengths and weaknesses of past editions of *Ready or Not*, including the indicators of public health emergency preparedness that they tracked, Trust for America's Health (TFAH) conducted listening sessions with state stakeholders (health officers, directors of public health preparedness, and the Association of State and Territorial Health Officials), national stakeholders (staff from the executive and legislative branches, academia, and other policy leaders), and a cross-cutting panel of advisors. Taking into account the guidance of these groups, TFAH established criteria for selecting indicators. Each needed to be:

- **Significant.** The indicator needed to be a meaningful measure of states' public health emergency preparedness. Significance was first measured by NHSPI using a multi-stage Delphi process with a panel of experts, and then again by TFAH through interviews with additional experts.
- **Broadly relevant and accessible.** The indicator needed to be relevant—and timely data needed to be accessible—for every state and the District of Columbia.
- **Timely.** Data for the indicator needed to be updated regularly.
- **Scientifically valid.** Data supporting the indicator needed to be credible and rigorously constructed.
- **Nonpartisan.** The indicator, and data supporting the indicator, needed to be seen as objective and not rooted in any political goals.

Using these criteria, TFAH aimed to select a broad set of actionable indicators with which it—and other stakeholders, including states themselves—could continue to track states' progress for several years. (Complete data were not available for

U.S. territories.) TFAH will strive to retain all or most of these indicators for multiple years in response to feedback from the reports' end users that such stability would help focus attention on making concrete improvements.

In response to feedback that alignment between indicators tracked by TFAH and the NHSPI would assist state policymakers in the assessment of their readiness, TFAH sought measures that were already incorporated into the NHSPI and that most closely met TFAH's criteria. (There was one exception: a measure of state public health funding-level trends, which the NHSPI does not track.) TFAH then scrutinized the candidates, in consultation with relevant experts, by examining sources, fidelity to the criteria, amenability to scoring, and limitations.

TFAH searched for a suitable measure of states' readiness for extreme weather, which nearly all experts expect to worsen and become more frequent due to global climate change. However, none of the relevant indicators within the NHSPI met TFAH's requirements. Therefore, such a measure was not included in *Ready or Not* this year. TFAH will work with the NHSPI and others to identify such a measure for future editions.

Ready or Not: *Protecting the Public's Health from Diseases, Disasters and Bioterrorism*

Indicator data collection

Data for every indicator except four (those data tied to the Nurse Licensure Compact, public health funding, flu vaccination, and hospital patient safety) were provided to TFAH by the NHSPI. For three of the four (all except public health funding), newer data were available than those that were modeled in the 2018 edition of the NHSPI, so TFAH collected and verified figures from their original sources.

Public health funding data collection and verification

To collect public health funding data for this report, TFAH used states' publicly available funding documents. With assistance from the Association of State and Territorial Health Officials, data were provided to states for review and verification. Informed by the Public Health Activities and Services Tracking project at the University of Washington, TFAH defines public health programming and services as inclusive of communicable disease control; chronic disease prevention; injury prevention; environmental public health; maternal, child, and family health; and access to and linkage with clinical care. Specifically, this definition includes:

- **Communicable disease control.** Public health services related to communicable disease epidemiology, hepatitis, HIV/AIDS, immunization, sexually transmitted diseases, tuberculosis, etc.
- **Chronic disease prevention.** Public health services related to asthma, cancer, cardiovascular disease, diabetes, obesity, tobacco, etc.
- **Injury prevention.** Public health services related to firearms, motor vehicles, occupational injuries, senior falls prevention, substance-use

disorder, other intentional injuries, and other unintentional injuries.

- **Environmental public health.** Public health services related to air and water quality, fish and shellfish, food safety, hazardous substances and sites, lead, onsite wastewater, solid and hazardous waste, zoonotic diseases, etc.
- **Maternal, child, and family health.** Public health services related to the coordination of services; direct service; family planning; newborn screening; population-based maternal, child, and family health; supplemental nutrition, etc.
- **Access to and linkage with clinical care.** Public health services related to beneficiary eligibility determination, provider or facility licensing, etc.

TFAH excludes from its definition insurance coverage programs, such as Medicaid or the Children's Health Insurance Program, as well as inpatient clinical facilities.

TFAH, under the guidance of state respondents, revised data for the base year. (In this report, that was fiscal year 2017.) For some states, this was necessary to improve comparability between the two years when a reorganization of departmental responsibilities had occurred over the period.

All states and the District of Columbia verified their funding data.

Scoring and tier placements

New to the *Ready or Not* series in this edition is a three-tiered grouping system. States are grouped based on their performance across the 10 indicators, and partial credit, also new, was provided for some indicators to draw finer distinctions between states and within states over time. States were placed into

the three tiers—top tier, middle tier, and bottom tier—based on their relative performance across the indicators.

Specifically, each indicator was scored as follows:

- Adoption of the Nurse Licensure Compact: 0.5 point. No adoption: 0 points.
- Percent of hospitals participating in healthcare coalitions: States were scored according to the number of standard deviations above or below the mean of state results.
 - Within one standard deviation above the mean (and states with universal participation): 1 point.
 - Within one standard deviation below the mean: 0.75 point.
 - Between one and two standard deviations below the mean: 0.5 point.
 - Between two and three standard deviations below the mean: 0.25 point.
 - More than three standard deviations below the mean: 0 points.
- Accreditation by the Public Health Accreditation Board: 0.5 point. Not accredited: 0 points.
- Accreditation by the Emergency Management Accreditation Program: 0.5 point. Not accredited: 0 points.
- Size of state public health budget compared with the past year (nominally, not inflation-adjusted).
 - No change or funding increase: 0.5 point.
 - Funding decrease: 0 points.
- Percent of population who used a community water system that failed to meet all applicable health-based standards: States were scored according to the number of standard deviations above or below the mean of state results.
 - Within one standard deviation below the mean (and states with 0 percent of residents who used a noncompliant community system): 1 point.
 - Within one standard deviation above the mean: 0.75 point.
 - Between one and two standard deviations above the mean: 0.5 point.
 - Between two and three standard deviations above the mean: 0.25 point.
 - More than three standard deviations above the mean: 0 points.
- Percent of employed population with paid time off: States were scored according to the number of standard deviations above or below the mean of state results.
 - More than one standard deviation above the mean: 1 point.
 - Within one standard deviation above the mean: 0.75 point.
 - Within one standard deviation below the mean: 0.5 point.
 - Between one and two standard deviations below the mean: 0.25 point.
 - More than two standard deviations below the mean: 0 points.
- Percent of people ages 6 months or older who received a seasonal flu vaccination: States were scored according to the number of standard deviations above or below the mean of state results.
 - More than one standard deviation above the mean: 1 point.
 - Within one standard deviation above the mean: 0.75 point.
 - Within one standard deviation below the mean: 0.5 point.
 - Between one and two standard deviations below the mean: 0.25 point.
 - More than two standard deviations below the mean: 0 points.



Adult flu vaccination data for the 2017–2018 season were not available for the District of Columbia. TFAH imputed its score by comparing its average rate from 2010–2011 to 2016–2017 with the U.S. average vaccination rate over that period as well as the aggregate rate of the 50 states and the District of Columbia.

- Percent of hospitals with a top-quality ranking (Grade A) on the Leapfrog Hospital Safety Grade. States were scored according to the number of standard deviations above or below the mean of state results.
 - More than one standard deviation above the mean: 1 point.
 - Within one standard deviation above the mean: 0.75 point.
 - Within one standard deviation below the mean: 0.5 point.

- Positive number, more than one standard deviation below the mean: 0.25 point.
- No hospitals with a top-quality ranking (Grade A): 0 points.
- Public health laboratory has a plan for a six- to eight-week surge in testing capacity: 0.5 point. Did not report having a plan: 0 points.

In total, the highest possible score a state could receive was 7.5 points.

States whose scores ranked among the top 17 were placed in the top tier. States whose scores ranked between 18th-highest and 34th-highest were placed in the middle tier. States whose scores ranked between 35th-highest and 51st-highest were placed in the bottom tier. (Ties in states' scores prevented an even distribution across the tiers.) This year, states in the top tier had scores ranging from 5.75 to 6.75; states in the middle tier had scores ranging from 5 to 5.5; and states in the bottom tier had scores ranking from 3.75 to 4.75.

Assuring data quality

Several rigorous phases of quality assurance were conducted to strengthen the integrity of the data and to improve and deepen TFAH's understanding of states' performance. During collection of state public health funding data, researchers systematically inspected every verified data file to identify incomplete responses, inconsistencies, and apparent data-entry errors. Following this inspection, respondents were contacted and given the opportunity to complete or correct their submissions.

Endnotes

- 1 National Health Security Health Preparedness Index. “National Trend Data and By State.” <https://nhspi.org/> (accessed December 12, 2018).
- 2 The National Council of State Boards of Nursing. “Nurse Licensure Compact Member States.” 2018. <https://www.ncsbn.org/listofmemberstatesanddates111618.pdf> (accessed December 6, 2018).
- 3 Trust for America’s Health. *Ready or Not? Protecting the Public’s Health from Diseases, Disasters and Bioterrorism*. Washington, D.C.: Trust for America’s Health, 2017. <https://www.tfah.org/report-details/ready-or-not-2017/> (accessed December 6, 2018).
- 4 Office of Disease Prevention and Health Promotion. “Immunization and Infectious Diseases.” *Healthcare-Associated Infections. Healthy People 2020*. U.S. Department of Health and Human Services, last updated December 12, 2018. <https://www.healthypeople.gov/2020/topics-objectives/topic/immunization-and-infectious-diseases/objectives> (accessed December 12, 2018).
- 5 Clemans-Cope L., Perry C.D., Kenney G.M., et al. “Access to and Use of Paid Sick Leave Among Low-Income Families With Children.” *Pediatrics*, 122(2): e480-486, August 2008. DOI: 10.1542/peds.2007-3294.
- 6 Centers for Disease Control and Prevention. “Remembering the 1918 Influenza Pandemic.” National Center for Immunizations and Respiratory Diseases, last updated May 7, 2018. <https://www.cdc.gov/features/1918-flu-pandemic/index.html> (accessed December 6, 2018).
- 7 Byerly C.R. “The U.S. military and the influenza pandemic of 1918-1919.” *Public Health Reports*, 125(Suppl 3): 82-91, 2010. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2862337/> (accessed December 6, 2018).
- 8 Centers for Disease Control and Prevention. “Remembering the 1918 Influenza Pandemic.” National Center for Immunizations and Respiratory Diseases, last updated May 7, 2018. <https://www.cdc.gov/features/1918-flu-pandemic/index.html> (accessed December 6, 2018).
- 9 Centers for Disease Control and Prevention. “Reconstruction of the 1918 Influenza Pandemic Virus.” National Center for Immunizations and Respiratory Diseases, last updated July 17, 2014. <https://www.cdc.gov/flu/about/qa/1918flupandemic.htm> (accessed December 6, 2018).
- 10 Ibid.
- 11 Dickerson J. “CDC Director Warns of Risks of Flu Pandemic, Urges Vaccinations.” *CBS News*, October 30, 2018. <https://www.cbsnews.com/video/cdc-director-warns-flu-epidemic-is-possible-urges-vaccinations/> (accessed December 6, 2018).
- 12 Centers for Disease Control and Prevention. “Remembering the 1918 Influenza Pandemic.” National Center for Immunizations and Respiratory Diseases, last updated May 7, 2018. <https://www.cdc.gov/features/1918-flu-pandemic/index.html> (accessed December 6, 2018).
- 13 Center for Climate and Energy Solutions. “Extreme Weather and Climate Change.” November 15, 2018. <https://www.c2es.org/content/extreme-weather-and-climate-change/> (accessed December 10, 2018).
- 14 Center for Climate and Energy Solutions. “Drought and Climate Change.” November 9, 2018. <http://www.c2es.org/content/drought-and-climate-change/> (accessed December 10, 2018).
- 15 Ibid.
- 16 Center for Climate and Energy Solutions. “Heat Waves and Climate Change.” November 13, 2018. <http://www.c2es.org/content/heat-waves-and-climate-change/> (accessed December 10, 2018).
- 17 Ibid.
- 18 Center for Climate and Energy Solutions. “Extreme Precipitation and Climate Change.” March 29, 2018. <http://www.c2es.org/content/extreme-precipitation-and-climate-change/> (accessed December 10, 2018).
- 19 Ibid.
- 20 Kaplan S. and Fritz A. “Climate Change Was Behind 15 Weather Disasters in 2017.” *The Washington Post*, December 10, 2018. https://www.washingtonpost.com/science/2018/12/10/climate-change-was-behind-weather-disasters/?utm_term=.6d09f73accdb (accessed December 11, 2018).
- 21 Rudolph L., Harrison C., Buckley L., and North S. *Climate Change, Health, and Equity: A Guide for Local Health Departments*. Oakland, CA, and Washington, D.C.: Public Health Institute and American Public Health Association, 2018. https://apha.org/-/media/files/pdf/topics/climate/climate_health_equity.ashx?la=en&hash=14D2F64530F1505EAE7A-B16A9F9827250EAD6C79.
- 22 Syphard A.D., Bar Massada A., Butsic V., and Keeley J.E. “Land Use Planning and Wildfire: Development Policies Influence Future Probability of Housing Loss.” *PLoS ONE*, no. 8, 2013. <https://doi:10.1371/journal.pone.0071708>.
- 23 Center for Climate and Energy Solutions. “Extreme Precipitation and Climate Change.” March 29, 2018. <http://www.c2es.org/content/extreme-precipitation-and-climate-change/> (accessed December 10, 2018).
- 24 Center for Climate and Energy Solutions. “Drought and Climate Change.” November 9, 2018. <http://www.c2es.org/content/drought-and-climate-change/> (accessed December 10, 2018).
- 25 Center for Climate and Energy Solutions. “Heat Waves and Climate Change.” November 13, 2018. <http://www.c2es.org/content/heat-waves-and-climate-change/> (accessed December 10, 2018).
- 26 Center for Climate and Energy Solutions. “Hurricanes and Climate Change.” September 26, 2018. <http://www.c2es.org/content/hurricanes-and-climate-change/> (accessed December 10, 2018).

- 27 Centers for Disease Control and Prevention. "HAN Archive—00412: Health Alert Network (HAN). Center for Preparedness and Response, last updated June 11, 2018. <https://emergency.cdc.gov/han/han00412.asp> (accessed December 10, 2018). Centers for Disease Control and Prevention. "Estimated Influenza Illnesses, Medical visits, Hospitalizations, and Deaths in the United States — 2017–2018 influenza season." National Center for Immunizations and Respiratory Diseases, last updated December 18, 2018. <https://www.cdc.gov/flu/about/burden/2017-2018.htm> (accessed January 3, 2019).
- 28 Sun L.H. "Expert Panel Urges Hepatitis A Shots for Homeless in U.S." *The Washington Post*, October 24, 2018. https://www.washingtonpost.com/health/2018/10/24/expert-panel-urges-hepatitis-shots-homeless-us/?utm_term=.fd0d8449563d (accessed December 10, 2018).
- 29 Centers for Disease Control and Prevention. "Summary of the 2017-2018 Influenza Season." National Center for Immunization and Respiratory Diseases, last updated November 2, 2018. <https://www.cdc.gov/flu/about/season/flu-season-2017-2018.htm> (accessed December 10, 2018).
- 30 Garten R., Blanton L., Isa Abd Elal A., et al. "Update: Influenza Activity in the United States During the 2017-18 Season and Composition of the 2018-19 Influenza Vaccine." *Centers for Disease Control and Prevention, Weekly*, 67(22): 634-642, June 8, 2018. https://www.cdc.gov/mmwr/volumes/67/wr/mm6722a4.htm?s_cid=m-m6722a4_w.
- 31 Associated Press. "At Least 80,000 People Died of Flu Last Winter in the U.S., CDC Says." *NBC News*, September 26, 2018. <https://www.nbcnews.com/health/health-news/least-80-000-people-died-flu-last-winter-u-s-n913486> (accessed December 10, 2018).
- 32 Centers for Disease Control and Prevention. "2010-11 through 2017-18 Influenza Seasons Vaccination Coverage Trend Report." *FluVaxView*, National Center for Immunization and Respiratory Diseases, last updated September 27, 2018. <https://www.cdc.gov/flu/fluview/reporthtml/trends/index.html> (accessed December 10, 2018).
- 33 Centers for Disease Control and Prevention. "List of Selected Multistate Foodborne Outbreak Investigations, Foodborne Outbreaks, Food Safety, CDC." National Center for Emerging and Zoonotic Infectious Diseases and the Division of Foodborne, Waterborne, and Environmental Diseases, last updated December 7, 2018. <https://www.cdc.gov/foodsafety/outbreaks/multistate-outbreaks/outbreaks-list.html> (accessed December 10, 2018).
- 34 Centers for Disease Control and Prevention. "Acute Flaccid Myelitis Investigation." National Center for Immunization and Respiratory Diseases, Division of Viral Diseases, last updated December 10, 2018. <https://www.cdc.gov/acute-flaccid-myelitis/afm-surveillance.html> (accessed December 10, 2018).
- 35 Global Health Security Agenda. "What Is GHSA." Last updated May 20, 2018. <https://www.ghsagenda.org/home> (accessed December 10, 2018).
- 36 U.S. Food and Drug Administration. "MCM Issues: Antimicrobial Resistance Information from FDA." Office of the Commissioner, last updated December 7, 2018. <https://www.fda.gov/EmergencyPreparedness/Counterterrorism/MedicalCountermeasures/MCMIssues/ucm620149.htm#science> (accessed December 10, 2018).
- 37 Dewey-Mattia D., Manikonda K., Hall A.J., et al. "Surveillance for Foodborne Disease Outbreaks—United States, 2009-2015." *Morbidity and Mortality Weekly Report, Surveillance Summaries*, 67(SS-10): 1-11, 2018. DOI: <http://dx.doi.org/10.15585/mmwr.ss6710a1>.
- 38 Rosenberg R., Lindsey N.P., Fischer M., et al. "Vital Signs: Trends in Reported Vectorborne Disease Cases—United States and Territories, 2004-2016." *Morbidity and Mortality Weekly Report*, 67: 496-501, 2018. DOI: <http://dx.doi.org/10.15585/mmwr.mm6717e1>.
- 39 Sun L.H. "New tick species capable of transmitting deadly disease is spreading in the U.S." *The Washington Post*, November 29, 2018. https://www.washingtonpost.com/health/2018/11/29/new-tick-species-capable-transmitting-deadly-disease-is-spreading-us/?utm_term=.2961a339099b (accessed January 3, 2019).
- 40 Rice M.E., Galang R.R., Roth N.M., et al. "Vital Signs: Zika-Associated Birth Defects and Neurodevelopmental Abnormalities Possibly Associated with Congenital Zika Virus Infection—U.S. Territories and Freely Associated States, 2018." *Morbidity and Mortality Weekly Report*, 67: 858-867, 2018. DOI: <http://dx.doi.org/10.15585/mmwr.mm6731e1>.
- 41 The Pew Charitable Trusts. "Antibiotic Use in Urgent Care Centers Shows Need for Improvement." *Antibiotic Resistance Project, Issue Brief*, July 16, 2018. <https://www.pewtrusts.org/en/research-and-analysis/issue-briefs/2018/07/antibiotic-use-in-urgent-care-centers-shows-need-for-improvement> (accessed December 10, 2018).
- 42 U.S. Government Accountability Office. "Infectious Disease Threats: Funding and Performance of Key Preparedness and Capacity-Building Programs." *GAO-18-362*, May 24, 2018. <https://www.gao.gov/products/GAO-18-362> (accessed December 10, 2018).
- 43 Arrazola J., Binkin N., Israel M., et al. "Assessment of Epidemiology Capacity in State Health Departments—United States, 2017." *Morbidity and Mortality Weekly Report*, 67: 935-939, 2018. DOI: <http://dx.doi.org/10.15585/mmwr.mm6733a5>.
- 44 Borter G. "Hurricane Florence Death Toll Rises to 51." *Reuters*, October 2, 2018. <https://www.reuters.com/article/us-storm-florence/hurricane-florence-death-toll-rises-to-51-idUSKCN1MC2JJ> (accessed December 10, 2018).
- 45 Huber C. "2018 Hurricane Florence: Facts, FAQs, and How to Help." *World Vision*, December 8, 2018. <https://www.worldvision.org/disaster-relief-news-stories/2018-hurricane-florence-facts> (accessed December 10, 2018).
- 46 Thompson A. "Why Did Hurricane Michael Rev Up to Category 4 So Quickly?" *Scientific American*, October 11, 2018. <https://www.scientificamerican.com/article/why-did-hurricane-michael-rev-up-to-category-4-so-quickly/> (accessed December 10, 2018).

- 47 Breslin S. "Hurricane Michael Death Toll Rises to 35 as Mexico Beach Residents Return to Survey Damage." *The Weather Channel*, October 18, 2018. <https://weather.com/storms/hurricane/news/2018-10-18-hurricane-michael-impacts> (accessed December 10, 2018).
- 48 Maxouris C. and Doug C. "A Category 5 Hurricane Wiped an Entire Hawaiian Island off the Map." *CNN*, October 25, 2018. <https://www.cnn.com/2018/10/25/us/hawaii-island-hurricane-gone-wxc-trnd/index.html> (accessed December 10, 2018).
- 49 Federal Emergency Management Agency. "Northern Mariana Islands Super Typhoon Yutu (DR-4404)." Emergency Support Function Annexes, U.S. Department of Homeland Security, last updated October 31, 2018. <https://www.fema.gov/disaster/4404> (accessed December 10, 2018).
- 50 State of California. "California Statewide Fire Map." Fire Statistics, *Cal.gov*, last updated January 24, 2018. http://cdfdata.fire.ca.gov/incidents/incidents_stats (accessed December 10, 2018).
- 51 St. John P., Serna J., and Lin R. "Here's how Paradise ignored warnings and became a deathtrap." *The Los Angeles Times*, December 30, 2018. <https://www.latimes.com/local/california/la-me-camp-fire-deathtrap-20181230-story.html> (accessed January 3, 2019).
- 52 Maxouris C. and Ahmed S. "The Largest Wildfire in California History Is Finally Contained." *CNN*, September 20, 2018. <https://www.cnn.com/2018/09/20/us/california-mendocino-complex-fire-contained-trnd/index.html> (accessed December 10, 2018).
- 53 KCRA in Sacramento, CA. "NWS: Redding Fire Whirl Reached EF-3 Tornado Wind Speeds." *KCRA*, August 2, 2018. <https://www.kcra.com/article/nws-redding-fire-whirl-reached-ef-3-tornado-wind-speeds/22631009> (accessed December 10, 2018).
- 54 Queally J. "Cal Fire Mechanic Dies near Carr Fire, Bringing Death Toll to 8 as Crews Battle Blazes throughout California." *Los Angeles Times*, August 9, 2018. <https://www.latimes.com/local/california/la-me-california-fires-blog-cal-fire-mechanic-dies-near-carr-fire-1533834957-htmlstory.html> (accessed December 10, 2018).
- 55 DeMay D. "Wildfires Blazing across Washington, Fire Risk High on Monday." *SeattlePI*, August 20, 2018. <https://www.seattlepi.com/washington-wildfires/article/Wildfires-across-Washington-blazing-fire-risk-13168894.php> (accessed December 10, 2018).
- 56 Godlewski N. "The South Sugarloaf Fire in Nevada Has Consumed 88,000 Acres." *Newsweek*, August 23, 2018. <https://www.newsweek.com/sugarloaf-fire-elko-nevada-map-1088050> (accessed December 10, 2018).
- 57 Urness Z. "Oregon Wildfire Costs Hit Record High of \$514 Million in 2018." *Statesman Journal*, October 10, 2018. <https://www.statesmanjournal.com/story/news/2018/10/10/oregon-wildfire-costs-hit-record-high-2018/1581132002/> (accessed December 10, 2018).
- 58 Mitchell K. "Colorado's 2018 Wildfire Season Is One of the Worst on Record, and It's Not Over Yet." *The Denver Post*, August 19, 2018. <http://www.govtech.com/em/disaster/Colorados-2018-Wildfire-Season-is-One-of-the-Worst-on-Record-and-its-Not-Over-Yet.html> (accessed December 10, 2018).
- 59 Sistek S. "Wildfire Smoke Reaches 'Unhealthy' Levels in Seattle: How'd it Get so Bad?" *KOMO News*, August 15, 2018. <https://komonews.com/weather/scotts-weather-blog/wildfire-smoke-reaches-unhealthy-levels-in-seattle-howd-it-get-so-bad> (accessed December 10, 2018).
- 60 Turkewitz J. and Richtel M. "Air Quality in California: Devastating Fires Lead to a New Danger." *The New York Times*, November 16, 2018. <https://www.nytimes.com/2018/11/16/us/air-quality-california.html> (accessed December 11, 2018).
- 61 Office of the Assistant Secretary for Preparedness and Response—Public Health Emergency. "Public Health Emergency Declarations." U.S. Department of Health and Human Services, last updated December 3, 2018. <https://www.phe.gov/emergency/news/healthactions/phe/Pages/default.aspx> (accessed December 10, 2018).
- 62 Office of the Assistant Secretary for Preparedness and Response—Public Health Emergency. "Renewal of Determination That a Public Health Emergency Exists." U.S. Department of Health and Human Services, last updated January 19, 2018. <https://www.phe.gov/emergency/news/healthactions/phe/Pages/opioid-24Jan2018.aspx> (accessed December 10, 2018).
- 63 The Intergovernmental Panel on Climate Change. *Special Report: Global Warming of 1.5° C*. Geneva, Switzerland: The Intergovernmental Panel on Climate Change, 2018. <https://www.ipcc.ch/sr15/> (accessed December 10, 2018).
- 64 National Climate Assessment. *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment Volume II*. Washington, D.C.: U.S. Global Change Research Program, 2018. <https://nca2018.globalchange.gov/> (accessed December 10, 2018).
- 65 Watts N., Amann M., Arnell N., et al. "The 2018 Report of The Lancet Countdown on Health and Climate Change: Shaping the Health of Nations for Centuries to Come." *The Lancet*, November 28, 2018. [https://doi.org/10.1016/S0140-6736\(18\)32594-7](https://doi.org/10.1016/S0140-6736(18)32594-7).
- 66 Rudolph L., Harrison C., Buckley L., and North S. *Climate Change, Health, and Equity: A Guide for Local Health Departments*. Oakland, CA, and Washington, D.C.: Public Health Institute and American Public Health Association, 2018. https://apha.org/-/media/files/pdf/topics/climate/climate_health_equity.ashx?la=en&hash=14D2F64530F1505EAE7A-B16A9F9827250EAD6C79.
- 67 Federal Emergency Management Agency. "Whole Community." Emergency Support Function Annexes, U.S. Department of Homeland Security, last updated May 2, 2018. <https://www.fema.gov/whole-community>.
- 68 Federal Emergency Management Agency. *2017 Hurricane Season FEMA After-Action Report*. Washington, D.C.: FEMA, U.S. Department of Homeland Security, July 12, 2018. <https://www.fema.gov/media-library-data/1533643262195-6d1398339449ca85942538a1249d2ae9/2017FEMAHurricaneAARv20180730.pdf>.

- 69 U.S. Government Accountability Office. "2017 Hurricanes and Wildfires: Initial Observations on the Federal Response and Key Recovery Challenges." GAO-18-472, September 4, 2018. <https://www.gao.gov/products/GAO-18-472>.
- 70 Milken Institute School of Public Health. *Ascertainment of The Estimated Excess Mortality From Hurricane Maria in Puerto Rico*. Washington, D.C.: The George Washington University, 2018. <https://publichealth.gwu.edu/sites/default/files/downloads/projects/PRstudy/Acertainment%20of%20the%20Estimated%20Excess%20Mortality%20from%20Hurricane%20Maria%20in%20Puerto%20Rico.pdf>.
- 71 U.S. Food and Drug Administration, Office of the Commissioner. "Press Announcements: FDA Approves the First Drug with an Indication for Treatment of Smallpox." U.S. Department of Health and Human Services, last updated July 13, 2018. <https://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm613496.htm>.
- 72 National Institute of Allergy and Infectious Diseases. "Smallpox." National Institutes of Health, last updated December 11, 2018. <https://www.niaid.nih.gov/diseases-conditions/smallpox>.
- 73 The White House. *National Biodefense Strategy*. Washington, D.C.: U.S. Government, September 8, 2018. <https://www.whitehouse.gov/wp-content/uploads/2018/09/National-Biodefense-Strategy.pdf>.
- 74 Sun L.H. "Inside the Secret U.S. Stockpile Meant to Save Us All in a Bioterror Attack." *The Washington Post*, April 24, 2018. https://www.washingtonpost.com/news/to-your-health/wp/2018/04/24/inside-the-secret-u-s-stockpile-meant-to-save-us-all-in-a-bioterror-attack/?utm_term=.26384ade8fe9.
- 75 Centers for Disease Control and Prevention. "Strategic National Stockpile." Center for Preparedness and Response, last updated October 9, 2018. <http://www.cdc.gov/phpr/stockpile/stockpile.htm>.
- 76 Centers for Disease Control and Prevention. *Public Health Emergency Preparedness and Response Capabilities*. Atlanta: Center for Preparedness and Response, last updated October 2018. https://www.cdc.gov/cpr/readiness/00_docs/CDC_PreparednesResponseCapabilities_October2018_Final_508.pdf.
- 77 Blue Ribbon Study Panel on Biodefense. Budget Reform for Biodefense: Integrated Budget Needed To Increase Return On Investment. Washington, D.C.: Blue Ribbon Study Panel on Biodefense, February 2018. <https://www.biodefensestudy.org/Budget-Reform-for-Biodefense-Feb-2018.htm>.
- 78 Alexopoulos N. "Clade X Policy Recommendations." Center for Health Security, Johns Hopkins Bloomberg School of Public Health, last updated October 9, 2018. http://www.centerforhealthsecurity.org/about-the-center/pressroom/press_releases/2018-05-15_clade-x-policy-recommendations.html.
- 79 Blue Ribbon Study Panel on Biodefense. Holding the Line on Biodefense: State, Local, Tribal, And Territorial Reinforcements Needed. Washington, D.C.: Blue Ribbon Study Panel on Biodefense, October 2018. <https://www.biodefensestudy.org/Holding-the-Line-on-Biodefense>.
- 80 Jim Puente (director, Nurse Licensure Compact). Interview with Trust for America's Health, December 10, 2018.
- 81 Ibid.
- 82 National Council of State Boards of Nursing. "Nurse Licensure Compact (NLC)." <https://www.ncsbn.org/nurse-licensure-compact.htm> (accessed December 10, 2018).
- 83 Ibid.
- 84 Assistant Secretary For Preparedness and Response. "Introduction to the Hospital Preparedness Program." *Public Health Emergency Fact Sheet*, U.S. Department of Health and Human Services. <https://www.phe.gov/Preparedness/planning/hpp/Documents/hpp-intro-508.pdf> (accessed December 12, 2018).
- 85 Office of the Assistant Secretary for Preparedness and Response. *2017-2022 Health Care Preparedness and Response Capabilities*. Public Health Emergency, U.S. Department of Health and Human Services, November 2016. <https://www.phe.gov/Preparedness/planning/hpp/reports/Documents/2017-2022-healthcare-pr-capabilities.pdf>.
- 86 Office of the Assistant Secretary for Preparedness and Response. "Regional Coordination and Patient Tracking During Passenger Train Derailment Response." Public Health Emergency, U.S. Department of Health and Human Services, last updated April 19, 2018. <https://www.phe.gov/Preparedness/planning/hpp/events/Pages/regional-coord-patient-trckg.aspx>.
- 87 Upton L., Kirsch T.D., Harvey M., and Hanfling D. "Health Care Coalitions as Response Organizations: Houston After Hurricane Harvey." *Disaster Medicine and Public Health Preparedness*, 11 (6), December 2017. <https://www.cambridge.org/core/journals/disaster-medicine-and-public-health-preparedness/article/health-care-coalitions-as-response-organizations-houston-after-hurricane-harvey/65743EE4F17718DF05E9FC212BB17F0D/core-reader>.
- 88 Eastern Healthcare Preparedness Center. "EHPC Communications Unit Supports Regional Hospital." <https://easternhpc.com/ehpc-communications-unit-supports-regional-hospital/?from=12> (accessed December 10, 2018).
- 89 Public Health Accreditation Board. *Public Health Accreditation Board Standards and Measures: Version 1.5*. Alexandria, VA: Public Health Accreditation Board, December 2013. <http://www.phaboard.org/wp-content/uploads/SM-Version-1.5-Board-adopted-FINAL-01-24-2014.docx.pdf>.
- 90 Public Health Accreditation Board. "What Are the Benefits?" <https://www.phaboard.org/accreditation-overview/what-are-the-benefits/> (accessed December 10, 2018).
- 91 Emergency Management Accreditation Program. *Applicant Guide to Accreditation, 2017*. Falls Church, VA: Emergency Management Accreditation Program, 2017. https://www.emap.org/images/2017_Applicant_Guide_.pdf.

- 92 Public Health Accreditation Board. *Public Health Accreditation Board Standards: An Overview*. Alexandria, VA: Public Health Accreditation Board, December 2013. http://www.phaboard.org/wp-content/uploads/StandardsOverview1.5_Brochure.pdf.
- 93 Emergency Management Accreditation Program. *2016 Emergency Management Standard*. Falls Church, VA: Emergency Management Accreditation Program, 2016. <https://www.emap.org/index.php/root/about-emap/96-emap-em-4-2016/file>.
- 94 U.S. Environmental Protection Agency. “National Primary Drinking Water Regulations.” Last updated March 22, 2018. <https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations>.
- 95 U.S. Environmental Protection Agency. “Safe Drinking Water Information System (SDWIS) Federal Reporting Services.” Last updated June 27, 2017. <https://www.epa.gov/ground-water-and-drinking-water/safe-drinking-water-information-system-sdwis-federal-reporting>.
- 96 Ibid.
- 97 Centers for Disease Control and Prevention. “CDC Investigation: Blood Lead Levels Higher After Switch to Flint River Water.” *CDC Newsroom*, June 24, 2016. <http://www.cdc.gov/media/releases/2016/p0624-water-lead.html> (accessed December 12, 2018).
- 98 U.S. Environmental Protection Agency. “Basic Information about Lead in Drinking Water.” Last updated March 23, 2018. <https://www.epa.gov/ground-water-and-drinking-water/basic-information-about-lead-drinking-water#health>.
- 99 National Partnership for Women and Families. “Paid Sick Days Improve Public Health.” *Fact Sheet*, October 2018. <http://www.nationalpartnership.org/research-library/work-family/psd/paid-sick-days-improve-our-public-health.pdf>.
- 100 Ibid.
- 101 Kumar S., Grefenstette J.J., Galloway D., et al. “Policies to Reduce Influenza in the Workplace: Impact Assessments Using an Agent-Based Model.” *American Journal of Public Health*, 103(8): 1406-1411, 2013.
- 102 Pichler S. and Ziebarth N.R. “The Pros and Cons of Sick Pay Schemes: Contagious Presenteeism and Noncontagious Absenteeism Behavior.” *VOX CEPR Policy Portal*, May 12, 2018. <https://voxeu.org/article/pros-and-cons-sick-pay>.
- 103 Pichler S. and Ziebarth N. R. “The Pros and Cons of Sick Pay Schemes: Contagious Presenteeism and Noncontagious Absenteeism Behavior.” National Bureau of Economic Research, August 2016. <http://www.nber.org/papers/w22530.pdf>.
- 104 National Partnership for Women and Families. “Paid Sick Days Improve Public Health.” *Fact Sheet*, October 2018. <http://www.nationalpartnership.org/research-library/work-family/psd/paid-sick-days-improve-our-public-health.pdf>.
- 105 Current Population Survey. “Labor Force Statistics from the Current Population Survey.” Bureau of Labor Statistics, U.S. Department of Labor. <https://www.bls.gov/cps/> (accessed December 12, 2018). These data were drawn from an analysis by the NHSPI of data from the Current Population Survey.
- 106 Ibid.
- 107 Centers for Disease Control and Prevention. “Table 68. Influenza vaccination among adults aged 18 and over, by selected characteristics: United States, selected years 1989–2016.” National Center for Health Statistics. 2017. <https://www.cdc.gov/nchs/data/hus/2017/068.pdf>.
- 108 Centers for Disease Control and Prevention. “National Press Conference Kicks Off 2018-2019 Flu Vaccination Campaign.” National Center for Immunization and Respiratory Diseases, last updated September 27, 2018. <https://www.cdc.gov/flu/spotlights/press-conference-2018-19.htm#ref1>.
- 109 Centers for Disease Control and Prevention. “2010-11 through 2017-18 Influenza Seasons Vaccination Coverage Trend Report.” *FluVaxView*, National Center for Immunization and Respiratory Diseases, last updated September 27, 2018. <https://www.cdc.gov/flu/fluview/reportshtml/trends/index.html>.
- 110 Centers for Disease Control and Prevention. “Estimates of Flu Vaccination Coverage Among Children—United States, 2017-18 Flu Season.” *FluVaxView*, National Center for Immunization and Respiratory Diseases, last updated September 27, 2018. <https://www.cdc.gov/flu/fluview/coverage-1718estimates-children.htm>.
- 111 Centers for Disease Control and Prevention. “Estimates of Flu Vaccination Coverage Among Adults—United States, 2017-18 Flu Season.” *FluVaxView*, National Center for Immunization and Respiratory Diseases, last updated October 25, 2018. <https://www.cdc.gov/flu/fluview/coverage-1718estimates.htm>.
- 112 Centers for Disease Control and Prevention. “2017-18 Flu Season.” *FluVaxView*, National Center for Immunization and Respiratory Diseases, last updated November 8, 2018. <https://www.cdc.gov/flu/fluview/1718season.htm>.
- 113 Johns Hopkins Medicine. “Study Suggests Medical Errors Now Third Leading Cause of Death in the U.S.: Physicians advocate for changes in how deaths are reported to better reflect reality.” Johns Hopkins Bloomberg School of Public Health, May 3, 2016. https://www.hopkinsmedicine.org/news/media/releases/study_suggests_medical_errors_now_third_leading_cause_of_death_in_the_us.
- 114 Leapfrog Hospital Safety Grade. “Errors, Injuries, Accidents, Infections.” The Leapfrog Group, last updated November 8, 2018. <http://www.hospitalsafetygrade.org/what-is-patient-safety/errors-injuries-accidents-infections>.
- 115 Leapfrog Hospital Safety Grade. *Scoring Methodology, Spring 2018*. Washington, D.C.: The Leapfrog Group, April 5, 2018. http://www.hospitalsafetygrade.org/media/file/HospitalSafetyGrade_ScoringMethodology_Spring2018_FINAL_.pdf.
- 116 Leapfrog Hospital Safety Grade. “How Safe Is Your Hospital.” The Leapfrog Group, last updated November 8, 2018. <http://www.hospitalsafetygrade.org/>.

- 117 Association of Public Health Laboratories. "About Public Health Laboratories." <https://www.aphl.org/aboutAPHL/Pages/aboutphls.aspx> (accessed December 12, 2018).
- 118 Public Health Preparedness and Response. Surge Capacity Planning Tool for the Laboratory Response Network for Biological Threats Preparedness (LRN-B). Silver Spring, MD: Association of Public Health Laboratories, January 2015. https://www.aphl.org/aboutAPHL/publications/Documents/PHPR_SurgeCapacityLRNB_JAN2015.pdf.
- 119 Ibid.
- 120 Mamaril C., Mays G.P., Branham D.K., et al. "Estimating the Cost of Providing Foundational Public Health Services." *Health Services Research*, 53: 2803-2820, December 28, 2017. <https://onlinelibrary.wiley.com/doi/pdf/10.1111/1475-6773.12816>.
- 121 Public Health Services & Systems Research: Practice-Based Research Networks. "Estimating the Cost of Providing Foundational Public Health Services (FPHS)." June 25, 2016. http://www.publichealthsystems.org/sites/default/files/presentations/NCCIntramural_Research/cbm%20poster_academyhealth_25Jun16.pdf (accessed December 12, 2018).
- 122 Association of State and Territorial Health Officials. "22% by 2022." <http://www.astho.org/2018-Advocacy-Materials/22-Percent-by-2022/> (accessed December 20, 2018).
- 123 Public Health Leadership Forum. "Developing a Financing System to Support Public Health Infrastructure." http://www.resolve.org/site-healthleadershipforum/files/2018/11/PHLF_developing-a-financingsystemtosupportpublichealth.pdf (accessed December 20, 2018).
- 124 Centers for Disease Control and Prevention. "Global Health." Last updated November 28, 2018. <https://www.cdc.gov/globalhealth/index.html>.
- 125 Global Health Security Agenda. "What Is GHSA." Last updated May 20, 2018. <https://www.ghsagenda.org/> (accessed December 10, 2018).
- 126 Centers for Disease Control and Prevention. "Why Global Health Security Matters." Last updated February 13, 2014. <https://www.cdc.gov/globalhealth/security/why.htm>.
- 127 Michaud J., Moss K., and Kates J. "The U.S. Government and Global Health Security." Henry J. Kaiser Family Foundation, November 1, 2017. <https://www.kff.org/global-health-policy/issue-brief/the-u-s-government-and-global-health-security/>.
- 128 U.S. Department of Health and Human Services. "HHS Officials Deliver Remarks at the Fifth Annual Global Health Security Agenda Ministerial Meeting." November 7, 2018. <https://www.hhs.gov/about/news/2018/11/07/hhs-officials-deliver-remarks-at-the-fifth-annual-global-health-security-agenda-ministerial-meeting.html>.
- 129 Centers for Disease Control and Prevention. "FY 2018 Operating Plan." May 30, 2018. <https://www.cdc.gov/budget/documents/fy2018/fy-2018-cdc-operating-plan.pdf>.
- 130 Center for Health Security. "Summary of Key Recommendations Meeting to Solicit Stakeholder Input on forthcoming U.S. Global Health Security Strategy." Johns Hopkins Bloomberg School of Public Health, July 30, 2018. http://www.centerforhealthsecurity.org/our-work/pubs_archive/pubs-pdfs/2018/180820-us-global-health-security-strategy-meeting.pdf.
- 131 Federal Emergency Management Agency. *2017 Hurricane Season FEMA After-Action Report*. Washington, D.C.: FEMA, U.S. Department of Homeland Security, July 12, 2018. <https://www.fema.gov/media-library/assets/documents/167249>.
- 132 McKay J. "Long-Term Recovery Never Ends for Some After Natural Disasters." *Government Technology: Emergency Management*, December 7, 2018. <http://www.govtech.com/em/disaster/Long-Term-Recovery-Never-Ends-for-Some-After-Natural-Disasters.html>.
- 133 Federal Emergency Management Agency. *2017 Hurricane Season FEMA After-Action Report*. Washington, D.C.: FEMA, U.S. Department of Homeland Security, July 12, 2018. <https://www.fema.gov/media-library-data/1531743865541-d16794d43d3082544435e1471da07880/2017FEMAHurricaneAAR.pdf>.
- 134 Center for Health Security. "Implications of Clade X for National Policy." Johns Hopkins Bloomberg School of Public Health, Clade X: A Pandemic Exercise. http://www.centerforhealthsecurity.org/our-work/events/2018_clade_x_exercise/pdfs/Clade-X-policy-statements.pdf (accessed December 12, 2018).
- 135 Center for Health Security. *Technologies to Address Global Catastrophic Biological Risks*. Baltimore: Johns Hopkins Bloomberg School of Public Health, 2018. http://www.centerforhealthsecurity.org/our-work/pubs_archive/pubs-pdfs/2018/181009-gcbr-tech-report.pdf.
- 136 The National Academies of Science, Engineering, and Medicine: Health and Medicine Division. *Building a National Capability to Monitor and Assess Medical Countermeasure Use During a Public Health Emergency: Going Beyond the Last Mile: Proceedings of a Workshop*. Washington, D.C.: The National Academies of Science, Engineering, and Medicine, October 31, 2017. <http://nationalacademies.org/hmd/Reports/2017/building-a-national-capability-to-monitor-and-assess-MCM-use-during-a-PHE-proceedings.aspx>.
- 137 Association of Public Health Laboratories. "Culture-Independent Diagnostics." https://www.aphl.org/programs/food_safety/Pages/Culture-Independent-Diagnostics.aspx (accessed December 12, 2018).
- 138 Centers for Disease Control and Prevention. "Culture-Independent Diagnostic Tests: What Are CIDTs and How Do They Affect Foodborne Illness?" National Center for Emerging and Zoonotic Infectious Diseases and the Division of Foodborne, Waterborne, and Environmental Diseases, last updated July 30, 2016. <https://www.cdc.gov/foodsafety/challenges/cidt.html>.

- 139 Centers for Disease Control and Prevention. *Public Health Surveillance: Preparing for the Future*. CDC Public Health Surveillance Strategy Report: 2014-2018. Atlanta: Centers for Disease Control and Prevention, August 16, 2018. <https://www.cdc.gov/surveillance/pdfs/Surveillance-Series-Bookleth.pdf>.
- 140 Ibid.
- 141 National Association of County and City Health Officials. "Percent of Local Health Departments Reporting Job Lost due to Layoffs and/or Attrition Over Time." National Profile of Local Health Departments, 2016. <http://nacchoprofilestudy.org/wp-content/uploads/2017/01/Figure5-15.jpg>.
- 142 National Association of County and City Health Officials. *The Forces of Change in America's Local Public Health System*. National Profile of Local Health Departments, Chapter 1: "Budget Cuts and Job Losses." Washington, D.C.: National Association of County and City Health Officials, 2018. <http://nacchoprofilestudy.org/forces-of-change/chapter-1/>.
- 143 The Association of State and Territorial Health Officials. *ASTHO Profile of State and Territorial Public Health: Volume 4*. Arlington, VA: ASTHO, 2017. <http://www.astho.org/Profile/Volume-Four/2016-ASTHO-Profile-of-State-and-Territorial-Public-Health/>.
- 144 de Beaumont Foundation, ASTHO, NACCHO, and Big Cities Health Coalition. "Public Health Workforce Interests and Needs Survey: 2017 National Findings," Jan 14, 2019. <https://www.debeaumont.org/phwins/> (accessed Jan 2019)
- 145 Frayer L. "After Deaths During Hurricane Irma, Florida Requiring Changes For Nursing Homes." *NPR*, December 24, 2017. <https://www.npr.org/2017/12/24/573275516/after-deaths-during-hurricane-irma-florida-requiring-changes-for-nursing-homes>.
- 146 Office of the Assistant Secretary for Preparedness and Response—Public Health Emergency. "Partnership for Disaster Health Response Cooperative Agreement." U.S. Department of Health and Human Services, last updated November 13, 2018. <https://www.phe.gov/Preparedness/planning/PDHRCA-FOA/Pages/default.aspx>.
- 147 Office of the Assistant Secretary for Preparedness and Response—Public Health Emergency. "Funding Opportunity Announcement Overview." U.S. Department of Health and Human Services, last updated November 13, 2018. <https://www.phe.gov/Preparedness/planning/PDHRCA-FOA/Pages/overview.aspx>.
- 148 Centers for Medicare and Medicaid Services. "Emergency Preparedness Rule." Quality, Safety & Oversight Group: Emergency Preparedness, last updated July 9, 2018. <https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/SurveyCertEmergPrep/Emergency-Prep-Rule.html>.
- 149 Centers for Disease Control and Prevention. "Antibiotic Prescribing and Use in Hospitals and Long-Term care." National Center for Emerging and Zoonotic Infectious Diseases and the Division of Healthcare Quality Promotion, last updated February 1, 2018. <https://www.cdc.gov/antibiotic-use/healthcare/index.html>.
- 150 American Academy of Pediatrics. *Blueprint for Children: How the Next President Can Build a Foundation for a Healthy Future*. Washington, D.C.: American Academy of Pediatrics, September 2016. <https://www.aap.org/en-us/Documents/BluePrintForChildren.pdf> (accessed November 2017).
- 151 Save the Children. *Still at Risk: U.S. Children 10 Years After Hurricane Katrina*. Fairfield, CT: Save the Children, 2015. https://rems.ed.gov/docs/DisasterReport_2015.pdf (accessed November 2017).
- 152 American Public Health Association. "How Climate Change Affects Your Health." <https://www.apha.org/news-and-media/multimedia/infographics/how-climate-change-affects-your-health> (accessed December 12, 2018).
- 153 The Intergovernmental Panel on Climate Change. *Special Report: Global Warming of 1.5° C*. Geneva, Switzerland: The Intergovernmental Panel on Climate Change, October 2018. http://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf.
- 154 Community Research and Development Information Service. "Persistent Drought Leads to Major Food Security Crisis in Somalia." *Phys.Org*, February 22, 2017. <https://phys.org/news/2017-02-persistent-drought-major-food-crisis.html>.
- 155 International Water Association. "Water Scarcity and Drought." October 5, 2016. <http://www.iwa-network.org/publications/water-scarcity-and-drought/> (accessed December 12, 2018).
- 156 The Intergovernmental Panel on Climate Change. "Approval Session, Technical Summary, IPCC SR1.5." June 2018. http://report.ipcc.ch/sr15/pdf/sr15_ts.pdf (accessed December 12, 2018).
- 157 National Association of County and City Health Officials. *Mosquito Control Capabilities in the U.S*. Washington, D.C.: National Association of County and City Health Officials, October 2017. <https://www.naccho.org/uploads/downloadable-resources/Mosquito-control-in-the-U.S.-Report.pdf>.
- 158 Louissaint N. "Building Community Resilience Through Health Equity." *Domestic Preparedness*, April 5, 2017. <https://www.domesticpreparedness.com/healthcare/building-community-resilience-through-health-equity/>.
- 159 DeSalvo K.B., Wang Y.C., Harris A., Auerbach J., et al. "Public Health 3.0: A Call to Action for Public Health to Meet the Challenges of the 21st Century." *Preventing Chronic Disease*, 14:170017, 2017. DOI: <http://dx.doi.org/10.5888/pcd14.170017>.
- 160 Louissaint N. "Building Community Resilience Through Health Equity." *Domestic Preparedness*, April 5, 2017. <https://www.domesticpreparedness.com/healthcare/building-community-resilience-through-health-equity/>.
- 161 DeSalvo K.B., Wang Y.C., Harris A., Auerbach J., et al. "Public Health 3.0: A Call to Action for Public Health to Meet the Challenges of the 21st Century." *Preventing Chronic Disease*, 14:170017, 2017. DOI: <http://dx.doi.org/10.5888/pcd14.170017>.

- 162 National Council on Independent Living. *Integrating Disability Into Emergency Management: A Blueprint for Saving Lives*. Emergency Preparedness & Response Subcommittee. Washington, D.C.: National Council on Independent Living, July 22, 2018. http://disasterstrategies.org/application/files/2315/3229/1809/Integrating_Disability_Into_Emergency_Management24426.compressed.pdf.
- 163 Save the Children. *Still at Risk: U.S. Children 10 Years After Hurricane Katrina*. Fairfield, CT: Save the Children, 2015. https://rems.ed.gov/docs/DisasterReport_2015.pdf (accessed November 2017).
- 164 Substance Abuse and Mental Health Services Administration. "Trauma-Informed Approach and Trauma-Specific Interventions." U.S. Department of Health and Human Services, last updated April 27, 2018. <https://www.samhsa.gov/nctic/trauma-interventions>.
- 165 Adaption Clearing House. "Resilience Hubs: Shifting Power to Communities and Increasing Community Capacity." Georgetown Climate Center, last updated March 28, 2018. <https://www.adaptationclearinghouse.org/resources/resilience-hubs-shifting-power-to-communities-and-increasing-community-capacity.html>.
- 166 The White House. *National Biodefense Strategy*. Washington, D.C.: U.S. Government, September 8, 2018. <https://www.whitehouse.gov/wp-content/uploads/2018/09/National-Biodefense-Strategy.pdf>.
- 167 Centers for Disease Control and Prevention. "Antibiotic/Antimicrobial Resistance: Biggest Threats and Data." National Center for Emerging and Zoonotic Infectious Diseases and the Division of Healthcare Quality Promotion, last updated November 26, 2018. https://www.cdc.gov/drugresistance/biggest_threats.html.
- 168 Rex J.H. and Otterson K. "Antibiotic Reimbursement in a Model Delinked from Sales: A Benchmark-based Worldwide Approach." *The Lancet Infectious Diseases*, 16(4): 500-505, 2016. <https://www.ncbi.nlm.nih.gov/pubmed/27036356>.
- 169 World Health Organization. *WHO Guidelines on Use of Medically Important Antimicrobials in Food-Producing Animals*. Geneva, Switzerland: World Health Organization, 2017. http://www.who.int/foodsafety/publications/cia_guidelines/en/.
- 170 Institute for Women's Policy Research and the National Partnership for Women and Families. "Workers' Access to Paid Sick Days in the States." *Fact Sheet*, May 2015. <http://www.nationalpartnership.org/our-work/resources/workplace/paid-sick-days/workers-access-to-paid-sick-days-in-the-states.pdf>.
- 171 Hill H.A., Elam-Evans L.D., Yankey D., et al. "Vaccination Coverage Among Children Aged 19-35 Months—United States, 2017." *Morbidity and Mortality Weekly Report*, 67: 1123-1128, 2018. https://www.cdc.gov/mmwr/volumes/67/wr/mm6740a4.htm?s_cid=mm6740a4_e#suggestedcitation.
- 172 Adult Vaccine Access Coalition. "Adult Vaccination Rates Are Low." 2018. <https://www.adultvaccinesnow.org/wp-content/uploads/2018/07/Adult-Vax-Rates.jpg> (accessed December 12, 2018).
- 173 Centers for Disease Control and Prevention. "Summary of the 2017-2018 Influenza Season." National Center for Immunization and Respiratory Diseases, last updated November 2, 2018. <https://www.cdc.gov/flu/about/season/flu-season-2017-2018.htm>.
- 174 Stobbe M. "APNewsBreak: 80,000 People Died of Flu Last Winter in U.S." *Associated Press*, September 26, 2018. <https://apnews.com/818b5360eb7d472480ebde13da5c72b5>.
- 175 Centers for Disease Control and Prevention. "Vaccine-Preventable Adult Diseases." National Center for Immunization and Respiratory Diseases, last updated December 16, 2016. <https://www.cdc.gov/vaccines/adult/vpd.html>.
- 176 National Institutes of Health, National Vaccine Advisory Committee. "Assessing the State of Vaccine Confidence in the United States: Recommendations from the National Vaccine Advisory Committee." *Public Health Reports*, 130: 573-595, November-December 2015. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4612166/> (accessed December 12, 2018).
- 177 Adult Vaccine Access Coalition. "Out-of-Pocket Costs Influence Medicare Vaccination Rates." 2015. <https://www.adultvaccinesnow.org/resources/out-of-pocket-costs-influence-medicare-vaccination-rates/> (accessed December 12, 2018).





1730 M Street, NW, Suite 900
Washington, DC 20036
(t) 202-223-9870
(f) 202-223-9871