I am pleased to announce the release of the “2021 National Preparedness Report (NPR)”. The 2021 NPR is framed entirely within the timeline of a global disaster: the coronavirus disease 2019 (COVID-19) pandemic. This pandemic demonstrated the need for the emergency management community to continue to have agile policies to address emerging risks in complex operating environments and the ability to continue to operate when normal operations are disrupted. As of December 2021, there have been 5.275 million fatalities worldwide due to the pandemic, with 791,000 of those fatalities in the United States. In 2020, COVID-19 was the third-leading cause of death in the United States. Despite this, other disasters still took place, and responders and health workers still needed to respond to those disasters and treat patients in this new environment. In this way, COVID-19 forced changes in the landscape of emergency management and fundamentally altered how we responded to incidents in 2020 and will continue to do so in the future.

We can’t afford to ignore the reality that communities across the country are experiencing climate change firsthand. Events like wildfires and hurricanes are becoming more frequent, more severe, and are lasting longer. Sadly, this is our new normal. Beyond record temperatures, people are witnessing how climate change acts as a force multiplier—turning storms, floods, and fires into profound, long-term, cascading incidents. According to the National Oceanic and Atmospheric Administration’s (NOAA) data, last year alone, there were 22 “billion dollar” disasters. This shattered the previous annual record of 16 and is simply unsustainable when we consider future risks. Disasters also exacerbate pre-existing inequalities and result in inequitable outcomes. The President introduced the Justice40 initiative this year to help reduce those inequities. The Justice40 Initiative’s goal is to deliver 40% of relevant federal investments to disadvantaged communities and track performance through the establishment of an Environmental Justice Scorecard. This report contains a discussion on steady-state inequalities and offers management opportunities that can help to increase our nation’s resilience and reduce disaster-related vulnerabilities.

As the scope, scale, and frequency of weather-related incidents increases, it is clearer than ever that underserved and vulnerable communities are disproportionately impacted by disasters. This reality has vast implications for our preparedness as a Nation. As we evaluate current and future risks, and devise how to prepare for them, we must continue to affirm our commitment to the consistent and systematic fair, just, and impartial treatment of all individuals.

Over the coming years, the Federal Emergency Management Agency (FEMA) will continue to evaluate the Nation’s preparedness from an all-hazards perspective. Understanding the risks that face our communities, and the Nation’s capabilities to address the impacts of those risks, allows us to identify opportunities to address shortfalls and gaps.

Deanne Criswell
FEMA Administrator
EXECUTIVE SUMMARY

The 2021 National Preparedness Report (2021 NPR) summarizes progress made, and challenges that remain, in building and sustaining the capabilities needed to prevent, protect against, mitigate, respond to, and recover from the threats, hazards, and incidents that pose the greatest risk to the Nation. For this report, the Federal Emergency Management Agency (FEMA) used the events of 2020 to draw broader conclusions about national risk and capabilities and identified management opportunities to build those capabilities and reduce risk. This annual report offers all levels of government, Tribes, the private and nonprofit sectors, and the public practical insights into preparedness that support decisions about program priorities, resource allocation, and actions that can create more resilient communities. The information in this report was gleaned from open-source research, data analysis of FEMA products such as the community Threat and Hazard Identification and Risk Assessment (THIRA) and Stakeholder Preparedness Review (SPR), and an interagency data call of more than 75 offices throughout the federal government.

The 2021 NPR follows the risk-based analysis approach of the 2020 NPR, with the following additional key features.

- **Risks:** This section includes an examination of how novel pathogens such as SARS-CoV-2 are approached as emerging risks at their onset (even though pandemics are an expected risk and are not inherently emerging) because the details of transmission, treatment, and impacts are initially unknown.

- **Capabilities:** This section was expanded to include a discussion of preliminary data from the first National SPR. The National SPR is an assessment of national capabilities to address national targets.

- **Management Opportunities:** This section is new to the NPR and includes factors that Federal, state, local, Tribal, and territorial (SLTT) governments and organizations could take advantage of when developing strategies to enhance their capabilities.

There are three opportunities in this report that are broken into specific areas for consideration:

- **Management Opportunity One** comprises a justification for a preparedness investment strategy to help close capability gaps and improve current capabilities, and an examination of strategic partnerships and diversified funding mechanisms that could help the Nation better reach its goals.

- **Management Opportunity Two** contains an explanation of what all levels of government are doing or can do to manage climate change, and how climate change exacerbates existing vulnerabilities.

- **Management Opportunity Three** includes a discussion of the National Preparedness System (NPS) and the importance of maintaining the connections between the components of this system, including the THIRA/SPR, threat and hazard modeling, and planning.

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i “Community” THIRA and SPRs refer to those completed by states, urban areas, tribes, and territories.
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INTRODUCTION

Individuals and communities, the private and nonprofit sectors, faith-based organizations, Tribes, and all levels of government must work together to achieve the National Preparedness Goal: “A secure and resilient Nation with the capabilities required across the whole community to prevent, protect against, mitigate, respond to, and recover from the threats and hazards that pose the greatest risk.” In 2020, traditional methods of cooperation to build all-hazards resilience and achieve this goal—from preparedness actions such as exercises and trainings to undertaking new mitigation projects—were completely upended by the coronavirus disease 2019 (COVID-19) pandemic. The nature of the COVID-19 virus has led to restrictions for in-person contact in every community across the Nation and changed the landscape of emergency management and disaster response. It challenged responders’ abilities to conduct response and recovery operations and altered traditional response and recovery approaches for the unprecedented number of disasters that occurred in 2020. From identifying essential personnel, to using alternate work locations, to sustaining essential functions, COVID-19 drove the Nation to employ continuity of operations concepts, principles, and doctrine to be more prepared and resilient. Amid one of the worst wildfire seasons in history across the American West, a record-breaking hurricane season in the East, civil unrest, and mass shootings, the emergency management community grappled with both the safety of impacted residents and ensuring the safety of responders supporting response and recovery operations.

It is imperative that the risk management community learns from the experience of COVID-19 while still preparing for other types of disasters. The National Preparedness Report (NPR) contains an evaluation of the Nation’s preparedness capabilities and identifies where challenges and opportunities for improvement remain. As an annual requirement of Presidential Policy Directive (PPD) 8, and consistent with the Post-Katrina Emergency Management Reform Act (PKEMRA) reporting responsibilities, FEMA has assessed the Nation’s preparedness posture through the NPR since 2012. This report provides partners across the Nation with insights into risks and associated capabilities to support decisions regarding program priorities, resource allocations, and community actions.

This year’s report is the product of rigorous open-source research, analysis, and input from stakeholders at the state, local, Tribal, and territorial (SLTT) and federal levels. FEMA conducted open-source research that included academic, public sector, private sector, and media sources to identify existing or emerging risks, national preparedness policy developments, and innovative programs being implemented at all levels of government. FEMA also engaged with more than 75 offices within federal departments and agencies to better understand both the threats and hazards that challenge their respective departments and the actions taken to strengthen their preparedness efforts. Finally, FEMA conducted a quantitative and qualitative

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ii For the purposes of this report, “resilience” is defined as ability to adapt to changing conditions and withstand and rapidly recover from disruption. (Source: Department of Homeland Security [DHS] Risk Lexicon)

iii For the purposes of this report, “mitigation” refers to hazard mitigation: ongoing and sustained action that eliminates or reduces the potential effects of hazards. Mitigation measures may include zoning and building codes, floodplain buyouts, and analysis of hazard-related data to determine where it is safe to build or locate temporary facilities. Mitigation can include efforts to educate governments, businesses, and the public on measures they can take to reduce loss and injury. Technical measures can include the development of technologies that result in mitigation and can be used to support mitigation strategy. Mitigation includes those capabilities necessary to reduce loss of life and property by lessening the impact of disasters. Mitigation capabilities include, but are not limited to, communitywide risk reduction projects; efforts to improve the resilience of critical infrastructure and key resource lifelines; risk reduction for specific vulnerabilities from natural hazards or acts of terrorism; and initiatives to reduce future risks after a disaster has occurred. (Source: DHS Risk Lexicon)
analysis of preparedness assessment data to better understand preparedness capability strengths and gaps nationwide. While the scope of this report is domestic, national preparedness is strengthened through engagement and cooperation with international partners and organizations, and the sharing of expertise, experiences, and best practices.

Last year’s NPR grounded discussions of national preparedness in the risks that drive the Nation’s capability requirements and presented federal and SLTT partners and emergency management decision-makers with findings that better inform opportunities to improve preparedness. This year’s NPR further builds on that risk-focused approach, incorporating national preparedness data and the incidents of 2020 to draw broader conclusions about national risk, capability, and potential management opportunities.

The report includes a discussion of the Risks the Nation faces—Catastrophic Risk, Systemic Risk, and Emerging Risk—and how those risks drive the Nation’s capability requirements. The Capabilities section provides a high-level overview of the Nation’s current posture and discusses how capabilities are used to manage risk. Next, the Management Opportunities section offers suggestions for building capabilities to address risks. The report ends with a Conclusion summarizing the contents of the analysis.
The Nation faces catastrophic, systemic, and emerging risks. The following sections contain an introduction and discussion of each of these risk types followed by an examination of how threats and hazards in that category have recently impacted the Nation or could impact people in the future.

Communities also face conventional risks that stem from a range of hazard types distinguished by their high probability of occurrence, such as flooding, winter storms, heat waves, power outages, and localized tornadoes. In fact, in 2020, nearly all U.S. residents (98%) perceived risk from at least one hazard type. Although conventional risks are often considered a fourth type of risk, the NPR does not detail these risks in depth outside of their contribution to larger catastrophic incidents that have national-level preparedness implications (i.e., multiple conventional risks occurring simultaneously causing widespread impacts). The threshold between conventional, catastrophic, and systemic risks is not defined. A conventional hazard, affecting a small geographical area, could become a catastrophic or systemic risk if it exacerbates existing vulnerabilities.

In addition to providing an all-hazards perspective, this year’s NPR draws upon examples and lessons learned from COVID-19 in the analysis of the risk types described above. Data from the community Threat and Hazard Identification and Risk Assessment (THIRA) provides some insight into how SLTT governments viewed pandemic risk before the onset of COVID-19. Although many communities (42%) that completed the December 2019 THIRA did identify a pandemic as a threat or hazard of greatest concern, it is not possible to fully anticipate the effects or behavior of a novel virus: the COVID-19 pandemic resulted in the first ever nationwide emergency declaration under the Stafford Act and is the first incident ever to result in major disaster declarations, under the Stafford Act, for all 50 states, four Tribes, five territories, and the District of Columbia. As the first pandemic of this magnitude to affect the United States in a century, COVID-19 impacted American society and cast new light on the Nation’s risk landscape. To prepare for the future, communities must reflect on their response to and recovery from COVID-19 to understand their vulnerabilities and how the pandemic exploited those vulnerabilities.

As the Nation prepares for the impacts of both all-hazards and specific incidents, risk managers must also address the factors that may exacerbate those impacts, such as climate change and racial, social, and financial inequity. These risks and vulnerabilities are explored in more depth in this section.

RISK MANAGEMENT OPPORTUNITIES

The Nation can address current risks through simultaneously enhancing capability, engaging in various risk management opportunities, and reducing vulnerabilities. The Capabilities and Management Opportunities sections of this report cover these strengths and opportunities in more detail.

The 2020 NPR identified four opportunities for risk management:

- **Risk Avoidance**: Strategies or measures that effectively remove exposure to a risk.
- **Risk Control**: Deliberate actions that reduce the potential for harm or maintain it at an acceptable level.
- **Risk Transfer**: Action that shifts some or all risk to another entity, asset, system, network, or geographic area.
- **Risk Acceptance**: An intentional or unintentional choice to manage the potential impact of an incident without avoiding, controlling, or transferring the risk.
CATASTROPHIC RISK

UNDERSTANDING CATASTROPHIC RISK

Catastrophic risks include many incident types and are distinguished by their magnitude, which challenge response capabilities across the Nation.

Catastrophic risk includes conventional risk types but describes incidents that produce impacts of such magnitude that the whole Nation is challenged to effectively respond. There is no firm threshold between conventional and catastrophic incidents, and concurrent lower-magnitude incidents may create catastrophic conditions. Instead, the definition of a catastrophic incident varies based on incident context and perspective. In a nationally catastrophic incident, resource shortfalls are widespread and emergency managers may have limits on their authorities, requiring decision-makers to prioritize the use of resources rather than addressing all outstanding needs.

The National THIRA identifies several types of possible nationally catastrophic incidents, including earthquakes along the New Madrid Seismic Zone or Cascadia Subduction Zone; hurricanes in Texas, Florida, and Hawaii; a pandemic; and space weather. The COVID-19 pandemic has been a nationally catastrophic incident, highlighting persistent national vulnerabilities in ways that most previous localized or regional disasters have not. For example, prior to COVID, in the previous seven years combined, only 23 Tribes had worked directly with FEMA for disaster assistance. In contrast, over the course of one year in the pandemic, over 90 Tribes elected to work directly with FEMA for assistance under the COVID-19 declarations. With expanded awareness of these risks and vulnerabilities, the whole community can improve all-hazards preparedness.

The rest of this section explores vulnerabilities that the COVID-19 pandemic exposed that are relevant to future catastrophic incidents. These vulnerabilities include:

- Concurrent incidents
- Steady-state inequities that drive unequal outcomes during and after disasters; and
- Lean, efficient systems that operate close to capacity and maintain little surge capacity.

iv For the purposes of this report, a catastrophic incident “is one of such extreme and remarkable severity or magnitude that the Nation’s collective capability to manage all response requirements would be overwhelmed, thereby posing potential threats to national security, national economic security, and/or the public health and safety of the Nation.”

v The 2020 NPR also reported on the National THIRA, which has not been updated since the release of that report.
DISASTERS HAVE INDIRECT IMPACTS

Disasters have indirect impacts on individuals, communities, organizations, and systems, that may persist after the incident itself has ended. Because these impacts often fall outside the scope of traditional emergency management, recognizing and responding effectively can be difficult.

One key indirect impact of the focused COVID-19 response appears to be potential impacts to other public and individual health threats, such as monitoring drug-resistant and novel pathogens, continuing to vaccinate against influenza and other managed viruses, and maintaining routine medical services. COVID-19 also highlighted the mental health and domestic violence impacts that often accompany large-scale disasters. Disasters interrupt public information, outreach, and monitoring of populations vulnerable to domestic abuse, while removing protections afforded by work or school. Stay-at-home orders intended to mitigate the spread of infectious disease may have unintentionally increased vulnerabilities for at-risk populations. Indirect disaster impacts like these are important to consider and address in preparedness, response, and recovery efforts.

CONCURRENT INCIDENTS

When a community’s capacity to provide critical services is overwhelmed by incident impacts, state and federal resources may be available to support local emergency response and recovery efforts. When multiple large-scale incidents require simultaneous support, however, state and federal capability may be strained, reducing capacity to ongoing recovery efforts and to respond to additional incidents. In this way, incidents that would not individually challenge national capabilities may contribute to a disaster or catastrophic disaster.

As a result of climate change, disasters of certain types are becoming more common, as are response and recovery efforts that may extend for months or years. Figure 1 and Figure 2 demonstrate disasters are increasingly concurring; there were more disaster declarations open at the end of 2020 than at any other point since 1953, when data collection began. The number of disasters that were either declared in, or still open at the end of 2020 makes up almost 20% of all federally declared disasters since 1953. FEMA, its federal partners, and, in some cases, international partners, have continued to support an increasing volume of simultaneous response and recovery efforts.

Multiple simultaneous conventional incidents impact mutual aid planning and agreements by reducing the viability of both lending and receiving assistance. For example, the timing and severity of California’s 2020 wildfire season stressed local capacity, as large wildfires occurred earlier than expected, and impeded standard patterns of state-to-state mutual aid. With disasters becoming more severe and an increasing share of the population living in at-risk areas, communities may find mutual aid less available for multiple incident types, potentially delaying response to and recovery from a severe incident.

In many cases, the nature of certain disasters may negatively impact or exacerbate the needs resulting from other concurrent incidents. For example, the greater demand for personal protective equipment (PPE) throughout the country due to the pandemic reduced availability for first responders in HAZMAT and wildfire incident response. At the same time, strong storms forced the closing of COVID-19 testing sites in Florida and the Washington, DC area, while western wildfires also shuttered testing sites and suspended test processing in Oregon and California.

Maintaining response operations for simultaneous disasters may also potentially

vi Federal guidance documents, including the National Response Framework (NRF), assume this structure of locally executed, state managed, and federally supported response.
Disaster Concurrence, 1953-2020

Figure 1: This graph displays the duration of all 4,498 disaster declarations issued between 01/01/1953 and 12/31/2020. Select disasters are highlighted for their extraordinary duration and/or impact.

Number of Open Disaster Declarations per Week, 1953-2020

Figure 2: This graph displays the volume of open disasters each week between 01/01/1953 and 12/31/2020. Each of the 4,498 disasters declared in this period is added to that volume on its declaration date and removed on its closure date.

In responding to the concurrent incidents of 2020, the emergency management community employed lessons learned from 2017, when national response and recovery capabilities were challenged in the response to hurricanes Harvey, Irma, and Maria as well as hurricanes Jose and Nate and a historic wildfire season throughout the West. These resource-absorbing concurrent incidents—alongside disasters without a discrete beginning and end—are forcing emergency managers at all levels to operate at a new tempo,
managing multiple disasters simultaneously all at different phases. The emergency management cycle once viewed as a phased and cyclical process of mitigation, preparedness, response, and recovery is no longer the norm.

**STEADY-STATE INEQUITIES DRIVE UNEQUAL OUTCOMES AFTER DISASTERS**

Wealth inequality in the U.S. has been increasing in recent decades. Disasters often magnify existing social and economic trends such as wealth inequality, driving inequities in disaster recovery. Many disasters in the U.S. cause physical damages; the primary recovery system is based on the restoration of public and private property, which disproportionately benefits homeowners. Homeowners are more likely to be able to afford insurance, which reduces their risk to disasters. They may also be better positioned to take advantage of post-disaster business opportunities during the recovery period. After a disaster, damages and cascading impacts can disproportionately affect low- and moderate-income residents and/or renters and those experiencing homelessness. Disasters can result in lost jobs, reduced housing stock, and damage to transportation infrastructure. These effects could result in people having to move, pay higher rates for housing, or use a large portion of their savings for related expenses.

The pandemic demonstrated how this dynamic can play out on a large scale. The impacts of COVID-19 caused a significant and national economic downturn. Mitigation measures like stay-at-home orders and closures of nonessential businesses resulted in widespread unemployment, business shutdowns, and a general decline in economic prosperity. As in other past disasters, financial hardship was not equally felt throughout the economy. Lower-income workers across the economy and workers in sectors most impacted by shutdowns were more likely to become unemployed.

Before any incident or event, it is possible to project which groups are likely to experience disproportionate consequences and plan for ways to reduce those impacts. Some populations are more vulnerable or experience disasters differently than others due to their economic status, race, geography, disability status, incarceration, or gender. COVID-19 and other disasters in 2020 further exposed these inequities and emphasized the importance of deliberate and inclusive planning. Moving forward, additional planning and funding at the local, state, Tribal, and federal levels can help the Nation ensure protections are in place when it is necessary to enact widespread emergency response measures for all people in America. Centering equity in the process includes providing an equal voice at the planning table to underserved communities, such as American Indian or Alaska Native persons, Asian persons, Black or African American persons, Hispanic or Latine persons, people from other racial and ethnic minority groups, people with disabilities, and people with lived experience of homelessness or incarceration. Data metrics should be established to ensure that people living in non-congregate shelters are rehoused at rates that will help reduce inequity in outcomes.

In 2020, FEMA and its federal partners released a new resource to expand awareness of risk likelihood across the Nation: The National Risk Index (NRI). The NRI integrates data on risk from 18 natural hazards with data on community vulnerability and resilience. It displays a holistic view of risk at the county and Census tract level. Many of the hazards included in the NRI, such as riverine flooding, hurricanes, and strong winds, are those that communities expect to occur with some degree of regularity and for which they prepare. The NRI is an important tool for emergency planners and all community members working to reduce their vulnerability and prepare for adverse incidents.

The NRI’s inclusion of social vulnerability and community resilience metrics alongside estimates of hazard risk acknowledges a key theme in emergency management: the conventional risk landscape evolves as natural and social conditions change the fundamentals of risk (i.e., severity of impacts, vulnerabilities, and probabilities of occurrence). One important trend in this area is
the increasing share of the U.S. population living in at-risk areas, such as the expanding wildland-urban interface. A significant portion of built structures in the U.S. are located in natural hazard hot spots—areas where the risk of wildfire, flood, tornado, hurricane, or earthquake are in the top 10% of risk values—and new construction continues to increase risk exposure in those areas. Households with lower incomes, including people with disabilities and Black, Indigenous, and other people of color (BIPOC) are more likely than others to live in high-risk areas, and may therefore experience disproportionate impacts from natural incidents such as wildfires and floods.\textsuperscript{vii} Compounding this inequitable exposure to risk and disaster impacts is the frequency of

\textsuperscript{vii} For more information, please refer to the "Steady-State Inequities Drive Unequal Outcomes" portion of the "Risk" section of this report.

### SOCIAL DETERMINANTS OF HEALTH AND COVID-19

#### Infection Rates

**Social Determinants of Health**

Social Determinants of Health (SDOH) are the conditions in the environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health and quality-of-life outcomes and risks. SDOH are grouped into five areas: economic stability, education access and quality, health care access and quality, neighborhood and built environment, and social and community context. SDOH inequities that affect these groups, such as poverty and health care access, are interrelated and influence a wide range of health and quality-of-life outcomes and risks.

**Hispanic or Latino, and Black or African American Persons**

Long-standing chronic health (e.g., asthma, diabetes, obesity, heart disease) and social inequities have put many people from racial and ethnic minority groups at increased risk of getting sick and dying from COVID-19. Hispanic or Latine persons were three times more likely than non-Hispanic White persons to be hospitalized due to COVID-19, and both Black or African American persons and Hispanic persons are about twice as likely to die from COVID-19 as non-Hispanic White persons.

In some areas, Black patients made up one-third of COVID-19 hospitalizations, yet less than 20% of the population was Black, according to CDC. Early data from New York City showed that Black and Hispanic or Latine patients were twice as likely to die from COVID-19 as White patients. Similarly, in Louisiana, where 32% of the state population is Black, Black persons accounted for 70% of COVID-19-related deaths. Meanwhile, White Americans in Louisiana account for 62% of the population but only 28% of COVID-19 deaths.

**Incarcerated Populations**

Additionally, incarcerated populations, which tend to be disproportionately Black and Hispanic people, often live in overcrowded conditions that increase the risk of infectious disease. In 2017, White persons accounted for 64% of the U.S. adult population, but only 30% of the sentenced prison population. In contrast, Black persons represented 12% of the adult population but 33% of the prison population, and although Hispanic persons represented 16% of the adult population, they accounted for 23% of people who are incarcerated. Although incarceration rates have decreased since 2007, long-standing demographic trends mean that Black and Hispanic people are more exposed to, and more frequently dying from, COVID-19 in correctional and detention facilities. As of June 25, 2021, there were at least 2,715 deaths among persons who are incarcerated or detained.
natural incidents such as flooding and wildfires, which is increasing due to climate change. High-risk areas are increasingly experiencing damaging disasters while still recovering from prior incidents, which compounds and extends community recovery. Stronger community-level planning and understanding of underlying socio-economic environments will leave the SLTT response network better poised to respond initially and reduce over reliance on the Federal Government.

Inequities Affecting Black Persons, American Indian and Alaska Native Persons, and People from Other Racial and Ethnic Minority Groups

In addition to economic disparities and impacts, research increasingly shows that BIPOC were disproportionately affected by COVID-19 in the U.S. According to data from the U.S. Centers for Disease Control and Prevention (CDC), as of December 26, 2020, non-Hispanic American Indian or Alaska Native people had a cumulative COVID-19 hospitalization rate about 3.1 times that of non-Hispanic White people. COVID-19 hospitalization rates among non-Hispanic Black people and Hispanic or Latine people were both about 2.1 times the rate of non-Hispanic White people.

COVID-19 also disproportionately affected Tribal communities in the United States and Indigenous communities worldwide. Tribal communities in the U.S. have an increased risk of chronic conditions including diabetes and heart disease. In addition, adults with disabilities are three times more likely than adults without disabilities to have heart disease, diabetes, cancer, or stroke. Thus, these underlying medical conditions put adults with disabilities at higher risk for severe infection, hospitalization, or even death from COVID-19 infection. Many tribal communities may have limited access to clean water, a key component of infection control. In the Navajo Nation, about 15% of the population does not have access to piped water in their homes and in May, 2020, the Navajo Nation had the highest infection rate per capita in the country. Additionally, many Tribes do not have a tax base comparable to state and local governments and instead rely on public-facing enterprises to fund government services. These enterprises, such as casinos and tourism-related businesses, largely had to shut down during the pandemic, impacting the essential services they fund, such as health clinics.

For those who work in essential settings such as health care facilities, farms, factories, grocery stores, and public transportation, it is challenging to avoid exposure to COVID-19. Crowded housing conditions and densely populated areas also contribute to likelihood of exposure. Dependency on public transportation to get to work and the inability to work from home make social distancing difficult. COVID-19 demonstrated how many jobs of lower wage require consistent exposure to the public; these jobs are disproportionately filled by people of color. According to the Bureau of Labor Statistics (BLS), nearly 25% of employed Hispanic and Black or African Americans in the U.S. work in the service industry, compared with 16% of non-Hispanic White workers (Figure 3). Black or African American people also account for 30% of licensed practical and licensed vocational nurses. These factors can result in exposure to the virus.

Individual access to health care also affects health risks. Barriers to health care access, such as lack of insurance or lack of access to paid sick leave, disproportionately impact members of racial and ethnic minority groups. In 2019, racial and ethnic minorities made up 40% of the U.S. population but accounted for 59% of the nearly 29 million nonelderly (i.e., those under the age of 65) uninsured people in the U.S. Health care access can also be limited for these groups by other factors, such as lack of transportation, childcare, or ability to take time off from work; communication and language barriers; cultural differences between patients and providers; physical accessibility of health care facilities; health care provider’s lack of training on serving the health care needs of people with disabilities; and historical and current discrimination in healthcare systems. These financial and occupational factors compound to
EXPANDING VULNERABILITIES: HOUSING

The COVID-19 pandemic and nationwide mitigation measures have impacted low-income households in especially severe ways. Job losses were concentrated in the service industry and other sectors that pay low average wages, and households with high housing costs and low incomes often have little financial cushion. As of July 2020, 13.8 million adults—one in five renters—reported being behind on rent; households of color reported disproportionately higher rates of missed payments.

EXPANDING VULNERABILITIES: ECONOMIC INEQUALITY

When looking for assistance with housing and other forms of aid after a disaster, people with lower incomes and in poverty face specific barriers to interacting with bureaucratic systems. Research has highlighted barriers like lack of knowledge of the systems through which disaster survivors receive aid; discomfort with these systems; and issues in getting to and from disaster assistance centers, such as transportation, childcare, and work schedules.

Furthermore, federal disaster assistance programs are often structured to support those who suffer losses rather than focusing on those with the greatest need. As FEMA’s National Advisory Council describes, “[the] Individual Assistance Program is more accessible to those with time, income, and access. In its Affordability Framework, FEMA recognized that over half of the uninsured residents in the highest flood hazard area meet the Department of Housing and Urban Development’s definition of low income, suggesting that those most in need of insurance are unable to buy it.”

Employed People by Occupation, Race, and Hispanic or Latine Ethnicity, 2018 Annual Averages

Figure 3: Employed people by occupation, race, and Hispanic or Latine ethnicity, 2018 annual averages. Note that percentages are rounded, and in some cases may not add up to 100%. Source: Bureau of Labor Statistics
significantly and inequitably increase the chances of undiagnosed and untreated cases of COVID-19.

Pregnant people also face healthcare inequities. Approximately 700 people die each year in the U.S. as a result of pregnancy related complications, and BIPOC people are two to three times more likely to die from a pregnancy-related complication than White pregnant people. Approximately two-thirds of pregnancy-related deaths in the U.S. could be prevented. In 2020, CDC launched the “Hear Her” campaign to raise awareness of potentially life-threatening warning signs, to improve communication between patients and their healthcare providers, and to empower pregnant and post-partum people to express their concerns. COVID-19 complicated the healthcare inequities pregnant people already faced. Pregnant people with COVID-19 are at an increased risk for preterm birth and may be at an increased risk for other poor pregnancy outcomes.

Inequities Affecting Rural Residents

Threat and hazard types may have differing impacts depending on where they occur. During the COVID-19 pandemic, rural residents, who make up 19% of the total population of the U.S., experienced disproportionate impacts that did not affect people living in urban areas.

Many people living in rural areas have long emergency medical services (EMS) response times and do not have ready access to healthcare facilities and treatment options, increasing their risk for poor health outcomes. According to a 2019 survey, one out of every four people living in rural areas were unable to access the health care they needed at some point within the last few years. Of those, 23% explained that a healthcare facility was too far away or difficult to get to. This trend may be related to rising closures of rural healthcare facilities. Over 100 facilities across 48 states closed between 2013 and 2020, and many more are financially vulnerable. Additionally, health care facilities within rural areas tend to have lower access to intensive care unit (ICU) beds, and reduced access to testing and equipment. As of December 2018, there were more than 7,000 communities in the U.S. that identified a shortage of health professionals, nearly 60% of which were in rural areas.

In addition, rural residents tend to be older and are more likely to have comorbidities, like cardiovascular disease, that increase the risk of a severe reaction to COVID-19. Overall, rural populations are not only more vulnerable to COVID-19 but, because there are fewer healthcare providers in rural areas and a greater share of residents without health insurance, they also face elevated risk from other health challenges and disabilities such as heart disease, cancer, unintentional injury, chronic lower respiratory disease, and stroke.

Inequities Affecting Persons with Disabilities

Just over one-quarter (26%) of adults in the U.S. have a disability. Although most people with disabilities are not at higher risk for becoming infected with or experiencing severe symptoms from COVID-19, some people with disabilities might be more likely to get infected or have severe illness due to secondary conditions related to their disability, such as underlying medical conditions. Residing in congregate living settings may also result in increased exposure to COVID-19. Additionally, disruptions to support services during an ongoing disaster, including housing, medical, transportation, personal assistance, community support services, and mental health and crisis counseling, may disproportionately impact people with disabilities and increase their risk of adverse outcomes.

For example, individuals with disabilities residing in congregate care facilities such as nursing homes and group homes have been disproportionately impacted by COVID-19. They have often been separated from family and support professionals for extended periods, creating barriers to physical and mental health, mobility, and communication. In addition, some people with disabilities faced challenges accessing COVID-19 testing sites, increasing their risk of contracting or spreading the disease.
COVID-19 testing sites were often not physically accessible despite regulations established under the Americans with Disabilities Act and the Rehabilitation Act of 1973, that establishes accessibility standards. These experiences indicate the urgency of addressing gaps in emergency preparedness and response considerations for people with disabilities.

**Inequities Affecting Women**

Working parents and, disproportionately, mothers, experienced significant employment disadvantages because of COVID-19. Disruptions to daycare centers, schools, and afterschool programs placed the burden of childcare responsibilities on 15.5 million working mothers, who account for 25% of working women. In response, working mothers are more frequently reducing their hours or leaving their jobs entirely; 1.4 million fewer mothers were working in the U.S. in December 2020 compared to December 2019. This may lead to mid- to long-term disadvantages in career advancement and income for millions of women.

Women have been especially disadvantaged during the COVID-19 pandemic. In the early part of the pandemic, April 2020, the unemployment rate for adult women was 15.5 percent—the highest rate ever recorded since the BLS began its data collection in 1948. Women make up a significant portion of those employed in many of the industries hardest hit by COVID-19, including the retail, entertainment, and service industries. Of the net 9.8 million jobs lost between February and December 2020, 55% of them previously belonged to women at the time of job loss. In December 2020 alone, the economy experienced a net job loss of 140,000; women lost approximately 156,000 jobs while men gained 16,000 overall. During that month, the unemployment rates for women of color in the U.S. (9.1% for Latina women and 8.4% for Black women) were higher than the overall unemployment rate for women (6.3%) and the unemployment rate for White women (5.7%).

Prior to COVID-19, nearly half of all working women—46%, or 28 million—worked in jobs paying low wages, but that share was higher among Black women (54%) and Hispanic or Latina women (64%) than among White women (40%).

In addition, a disproportionate number of health care and social workers, who have been on the front line of the pandemic, are women. In 2020, women accounted for 74% of all health care practitioners and technical occupations, 85% of healthcare support personnel, 87% of healthcare social workers, and 85% of all other social workers in the U.S. Although this vulnerability has general impacts on the economy and workforce, it specifically impacts women because they are more likely to be exposed to and contract COVID-19 in their work.

**THE TAKEAWAY: STEADY-STATE INEQUITIES**

Disaster impacts are not distributed equitably or efficiently. BIPOC, rural residents, people with disabilities, people with low incomes, and women face structural barriers that may reduce their capacity to prepare for, respond to, and recover from disasters. Additionally, being a member of more than one of these and other groups can lead to compounding inequities. This has been documented not just in the COVID-19 pandemic, but in countless other disasters, including Hurricane Katrina, Superstorm Sandy, and the Camp Fire, as well as technological disasters like power outages in Texas and various industrial accidents and hazardous materials releases. In the face of increased severe weather events caused by climate change, people in America will be more vulnerable, especially BIPOC and low-income households. Increasing threats could stretch emergency responders thin, especially as threats strike vulnerable and less resilient communities. Further complicating these inequities is the fact that public health and disaster relief organizations have evolved to better meet the needs of some groups more than others. The result is often that those who are most in need of preventative interventions are least likely to receive them.
LEAN AND EFFICIENT SYSTEMS MAINTAIN LIMITED SURGE CAPACITY

The U.S. relies on lean and efficient systems that operate close to capacity. These systems are well-calibrated to meet current demand with little waste but are often less capable of accommodating a surge in demand, making them vulnerable in the event of a disaster.

Healthcare Systems

In the U.S. as of 2019, most hospitals (84%) were operated by the private sector. In recent decades, healthcare systems, and hospitals in particular, have aimed to reduce operating costs by reducing excess and unused capacity, including beds and inventory. Advancements in capacity and staffing management have improved health care facilities’ efficiency, but often at the cost of steady-state capacity, leaving hospitals less equipped to manage a large-scale and long-term surge of patients.

Nationwide, total ICU availability decreased from around 50% of beds at the end of March 2020 to roughly 35% by mid-July 2020. As the volume of new COVID-19 cases climbed in December 2020, ICU occupancy averaged above 73% for states and territories over the month, and equaled or exceeded 100% in many places. Throughout the winter of 2020, at-capacity hospitals were forced to divert ambulances, delay nonemergency procedures, and turn away COVID-19 patients with little chance of survival in large cities as well as small communities.

The capacity shortage was more pronounced in low-income communities. In addition to the healthcare inequities described in earlier sections, even before the COVID-19 pandemic there was less ICU capacity in areas where median income was below $55,000. Nearly half of communities with a median income below $34,999 experienced significant shortages of ICU beds for residents aged 50 or older during the COVID-19 pandemic.

In addition to physical capacity limitations, COVID-19 highlighted staffing limitations in healthcare systems, an ongoing public health challenge. Before the pandemic, experts widely discussed shortages in nursing staff and predicted a nationwide shortage of nearly 140,000 physicians by 2030. In this context, healthcare workers have reported high levels of stress, burnout, anxiety, and depression, with nurses and women more likely to report mental strain. Fatigue and burnout compound staffing shortages, reducing the capacity of medical workers when they are needed most. Traveling nurses, who can normally assist hospitals experiencing surges, were fully deployed across the country during the COVID-19 pandemic and were not able to support all hospitals needing additional staff. In a pandemic situation, these widespread staffing shortages introduced risk: some healthcare facilities had to choose between quarantining staff that tested positive for COVID-19 or allowing those individuals to continue working and caring for patients.

Limited medical surge capacity and disaster readiness have hindered previous disaster responses as well. For example, many hospitals in Louisiana could not meet the needs of their communities after Hurricane Katrina. Roughly 57% of the state’s doctors were displaced by the storm, leading to hospital short staffing. Healthcare resources and services proved insufficient to cope with the medical demands of the affected populations. Many facilities experienced extended power outages, as well as disruptions to running water, sewage, and communication systems. Problems were exacerbated by higher patient volumes and individuals seeking temporary shelter in community hospitals.

The long-term nature of the pandemic has stressed U.S. healthcare systems in unprecedented ways. The vulnerabilities that lengthy catastrophic incidents expose should be taken into consideration when assessing health care capabilities. In particular, healthcare facilities’ ability to surge to support large-scale

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viii Per DHS Lexicon Terms and Definitions, 2017 Edition, “private sector” is defined as “entities and persons, including for-profit and non-profit, which are not part of any government [federal, state, territorial, local, or tribal].”
INSURANCE OPTIONS: INSURING AGAINST CATASTROPHIC RISK

Businesses may wish to consider all available insurance options for disasters, which may include:

**Business interruption insurance** may compensate a business for categories of costs in the event of catastrophic incidents. These categories include 1) profits that would have been realized if the disaster had not occurred; 2) operating expenses that must be paid despite inability to operate; and 3) expenses incurred because business operations had to be moved while damaged original premises were restored for use.

**Catastrophe bonds**, explored in past NPRs, remain popular options to insure against significant loss and damage. A catastrophe bond insures the issuer, or sponsor—a reinsurance company, municipality, or other actor exposed to disaster risk—against a catastrophic incident or the losses associated with such an incident. In 2020, catastrophe bond issuance reached a record $10 billion.

Unlike conventional policies, which reimburse the policyholder for their losses, **parametric insurance policies** insure the policyholder against the incident itself. If a natural incident exceeds a threshold, such as an earthquake above a certain magnitude, the policyholder will receive the agreed-upon coverage amount. Policyholders receive payment much faster under a parametric policy, but risk losses exceeding the level of coverage.

Medical incidents such as a pandemic may be an important marker of preparedness moving forward. This may require reconsidering lean operation models in favor of systems that are more flexible to changing demand.

**Economic Systems**

Economic systems are optimized toward normal business operations and are not usually designed to handle sudden, large shifts in demand. There are many advantages to this approach. Excess and rarely used inventory or production capacity can limit economic growth. Unfortunately, when the system is stressed, it is often unprepared to meet surge requirements. This vulnerability is often most pronounced for small businesses, which rely on consistent consumer demand, and often have limited credit resources to weather downturns. During the COVID-19 pandemic, business bankruptcy filings had increased by 28% as of September 2020, driven primarily by small business filings. These businesses are critical to the U.S. economy: as of 2014 (the most recent date for which data is available), small businesses accounted for roughly 43% of the U.S. gross domestic product. In addition, nearly half of people in America either own or work for a small business, and they create nearly two out of every three new jobs in the U.S. each year. This is particularly true for new and young businesses, which account for nearly all net new job creation and almost 20% of gross job creation. Despite this, small businesses were particularly financially vulnerable. The median business with more than $10,000 in monthly expenses had only about two weeks of cash on hand at the end of March 2020, and three-quarters of small businesses had enough cash on hand to cover at most two months of expenses, indicating widespread pre-existing economic vulnerabilities among small businesses.

In August 2020, extreme heatwaves in California—which are projected to become more common as the climate continues to change—caused an unexpected increase in electricity demand. At the same time, a combination of market practices and inadequacy in resourcing and planning created a demand–supply imbalance. Energy operators were forced to implement rolling blackouts to avert a massive power outage. Supply shortfalls remain relatively rare, but
their risk is increasing as hot weather pushes air conditioning usage beyond normal peak demand hours. In addition, widespread heat waves may require all electricity resources to be used locally, limiting normal capacity to transfer electricity between regions to alleviate potential shortfalls. Grid operators can continue to improve service reliability by integrating variable generation by wind and solar, deploying smart grid technologies, and expanding energy storage capacity.

Extreme weather remains the primary threat to electricity transmission and distribution infrastructure. Although data is not yet available on the number or duration of outages in 2020, extreme weather disrupted service for millions in the U.S. The August 2020 derecho that affected 90,000 square miles of the Midwest left over a million customers without power, and an unusually early ice storm in Oklahoma interrupted service to nearly 400,000 customers. These incidents illustrate the risk that catastrophic incidents may pose to vulnerable infrastructure systems nationwide, particularly as climate change increases the risk of extreme and unusual weather incidents.

THE TAKEAWAY: EFFICIENT SYSTEMS

American health care, manufacturing, and business systems have long sought peak efficiency. In normal operations, this works extremely well. Even with regional disruptions, there is generally enough capacity across the country or world to maintain operations. However, as the COVID-19 pandemic demonstrated, efficient systems are frequently unable to withstand national and international disruptions. Hospitals quickly hit capacity, and many businesses suffered while others struggled to meet increased demand. Efficiencies can also introduce regional vulnerabilities, as demonstrated by the California blackouts precipitated by extreme heat. Systems designed for steady-state efficiency but inflexible in the face of change may leave the country vulnerable to future nationwide disruptions.
Physical and cyber interconnectedness is a central feature of modern societies, and although it enables efficiencies that we have come to rely on, it also creates the risk of wide-ranging cascading impacts. Systemic risks are distinguished by their interconnectedness. Systemic risks are those that propagate across boundaries of situational awareness or operational control, potentially amplifying damage across systems. For example, if an incident severely damages a major port, then residents of the surrounding communities may find essential goods like fuel more difficult to acquire as supply chains adjust to using different transportation systems.

Recent years have demonstrated that systemic risks often grow faster than the capabilities needed to manage them. This section highlights some of those risks: supply chain vulnerability, aging infrastructure, misinformation, and cybersecurity.

The Nation prioritizes the protection and resilience of the 16 CI sectors whose physical and cyber systems and assets enable critical services throughout the Nation. Incapacity of any of these systems, such as the energy or communications sectors, would debilitate physical security, economic stability, or public health and safety.

Health and Safety of Critical Infrastructure Personnel

Health threats, including COVID-19, threaten the safety of the CI personnel who enable essential services. During other disasters, physical damage to infrastructure facilities may impact reopening and recovery; in contrast, a pandemic incident can prevent staff from supplying and accessing...
goods and services. Although many types of incidents can create health hazards, it is likely that pandemics and public health disasters impact CI staff on an entirely different scale.

Overall, many critical infrastructure sectors responded flexibly to protect their staff from COVID-19. Some energy utilities added additional control room spaces to increase redundancy and allow for social distancing. Others enabled or temporarily expanded telework or temporarily housed staff on site to ensure continuity of operations. CI personnel in some sectors, however, such as healthcare, food and agriculture, and law enforcement, were more severely impacted.

Staffing shortages were especially pronounced in the health care and public health sectors as the virus impacted health care workers and their families. As of April, 2021, there have been over 3,600 fatalities due to COVID-19 among healthcare workers. The pandemic reduced healthcare workers’ availability and capability to serve at a time when their expertise was most needed. These staffing shortages have not only affected patient care, but the wellbeing of staff as well.

To alleviate the shortage of healthcare workers, nearly all states adjusted their healthcare worker licensing processes. Many states began recognizing nursing and medical licenses from other states. Several states also waived licensing and application fees, permitted nursing students and recent graduates to work, and welcomed retired nurses back into the workforce. In addition, relaxed telehealth rules have allowed more patients to access care remotely. The current shortage and continued departure of healthcare providers from healthcare has diminished national healthcare capability and capacity that likely will continue for years without innovative approaches.

Beyond public health and health care, workers in the food and agriculture and emergency services sectors were also disproportionately affected by COVID-19. The close quarters in worker housing, during transportation of workers, and within agricultural and food processing facilities make social distancing difficult and increase the risk of disease transmission, while workers often have little access to sick leave and health insurance. Outbreaks at several facilities interrupted supply chains nationwide. Similarly, police and law enforcement officers are often unable to adequately socially distance as they interact with the public or work in correctional facilities. Limiting interactions with the public may negatively impact community relations, especially if officers are simultaneously enforcing public health measures deemed unpopular by some members of the public.

As scientists and public health officials developed best practices for limiting the spread of coronavirus, the Occupational Safety and Health Administration (OSHA), Cybersecurity and Infrastructure Security Agency (CISA), and CDC distributed public health recommendations focused on ensuring the safety of CI workers. CI

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**MEATPACKING INDUSTRY CHALLENGES**

America’s meatpacking supply chain relies on a remarkably small number of facilities: just over 50 locations are responsible for 98% of the cattle slaughter and processing in the United States. The chicken and pork industries are similarly concentrated. Although this increases efficiency, it leaves the supply chain vulnerable to disruption.Shutdowns ricochet up and down the supply chain, harming farmers and raising prices for consumers.

COVID-19 caused significant disruptions to the consolidated meatpacking industry. In Spring 2020, the loss of production capacity because of plant closures have ranged up to 25% for beef slaughter plants, 43% for pork slaughter plants, and 15% for chicken slaughter plants. One plant that processes 5% of the Nation’s pork was closed temporarily when 16% of its staff tested positive for the virus.
employers and managers were also encouraged to work with local public health officials to determine the safest way to reintegrate workers who were potentially exposed to the virus yet did not show symptoms or test positive. CISA also developed and issued the Essential Critical Infrastructure Workers Guidance to assist in prioritizing the ability of essential workers to work safely while supporting ongoing infrastructure operations across the Nation. To reinforce this effort, CISA also partnered with other agencies, such as the Federal Communications Commission (Commission or FCC), to distribute letters to state and local governments highlighting the criticality of non-healthcare sector-specific workforce personnel. Further, the agency coordinated with FEMA and the U.S. Department of Health and Human Services (HHS) on the distribution of cloth face masks to the critical infrastructure sectors. Additionally, CISA alerted Federal and SLTT national security and emergency preparedness organizations about the existence of the CISA-managed Government Emergency Telecommunications Service, Wireless Priority Service, and Telecommunications Service Priority programs that provide tools to aid in the completion of critical missions under circumstances of network stress.

Systemic Risks in Context: Supply Chain Vulnerabilities

The Nation’s lean, efficient supply chain is well-positioned to meet normal demand; as such, it was unprepared to shift as rapidly as demand did in the early weeks and months of the COVID-19 pandemic. Steady state efficient supply chains are demonstrably inelastic, therefore reducing national resiliency. Consumers, faced with lockdowns and stay-at-home orders, bought more household necessities and grocery items. They cooked at home rather than visiting restaurants and cafeterias, and they relied on home deliveries to avoid COVID-19 exposure. The healthcare industry had trouble obtaining PPE and other medical components, including those needed for vaccine manufacture and distribution. These significant changes in behavior and demand, compounded by international supply chain disruptions, led to shortages, waste, and higher prices.

Over the past several decades, the agricultural supply chain has developed two similarly sized but separate streams: one providing food to retail and grocery stores, and another supplying food-service companies like restaurants and schools. Demand from restaurants, fast-food locations, and schools dropped at the onset of the pandemic, while grocery stores saw increased sales as people stocked up and stayed home. However, products meant for food-service locations could not be easily folded into the retail stream. For example, food-service suppliers produce items stored in large packaging intended for restaurants, that consumers would most likely not be able to store. Farmers were forced to dump milk, plough to overturn crops, and cull herds as the pandemic significantly affected the ability to move commodities to end-consumers, impacting current and long-term agricultural production, even as food insecurity doubled across the country.

Although costs for consumer goods increased during the COVID-19 pandemic, prices that farmers receive for their products dropped. American farmers have been facing falling revenue for years as commodity prices continue to decrease while production costs remain high. 

RESTAURANTS: CONNECTING OUR FOOD SYSTEMS

As lockdowns and stay-at-home orders took effect across the Nation, restaurants faced a sharp drop in demand. Many began selling essential grocery items like flour, milk, and produce, which were in some cases unavailable at traditional grocery stores. National chains and local restaurants alike made this shift, which restaurant suppliers supported. Creative solutions like this helped ease demand at grocery stores, provided much-needed sales for restaurants, and helped redirect goods from the food-service supply chain to consumers at home.
relatively steady. In fact, between 2013 and 2018, farmers saw a near 50% drop in net farm income. Farmers' financial stress has a disproportionate impact on rural economies, as demonstrated by the ripple effects of widespread flooding in the Midwest in 2019.

Even as agricultural supply chains stabilized over time, the events of 2020 exposed broader vulnerabilities in the industry. The Nation’s interconnected food system is resilient to smaller, localized incidents, as facilities in other regions can meet demand. In contrast, large-scale incidents that shut down plants in several states, close borders, or prevent temporary and migrant workers from harvesting crops can significantly challenge our food system. Chronic weakness in the food and agricultural sector could even create national security concerns if a large-scale incident disrupts access to safe food.

Modern medical supply chains include facilities across the world that produce supplies quickly and inexpensively, however, at the cost of resilience. The COVID-19 pandemic—like other catastrophic incidents including 9/11, the 2002 severe acute respiratory syndrome outbreak, and the 2011 tsunami in Japan—interrupted supply chains for medical equipment, from PPE to ventilators to testing supplies. As suppliers struggled to meet demand, consumers experienced shortages, high prices, and long waits for lifesaving goods.

Insufficient PPE put many healthcare workers in dangerous situations. Supply shortages were not the only barrier to obtaining PPE. Some suppliers stocked and sold counterfeit and substandard masks, increasing the risk of infection to buyers including hospitals and average consumers. The U.S. Customs and Border Protection (CBP) has seized over 30 million counterfeit N95 and surgical masks since the beginning of the pandemic in 2020. The U.S. Food and Drug Administration (FDA) and the National Institute for Occupational Safety and Health provided information to consumers about identifying approved and effective PPE. The U.S. Department of Homeland Security (DHS) found that this information was misused by counterfeit manufacturers seeking to avoid detection, illustrating a key challenge in information distribution.

International supply chain interruptions also impacted access to materials and ingredients for pharmaceutical products. Of the 21 antibiotics used to treat secondary infections related to COVID-19, 18 come from foreign sources and have been in short supply. The inability to produce these antibiotics domestically may seriously impact public health if another incident were to interrupt their production or distribution more severely. The manufacturing and distribution of COVID-19 vaccines was also hindered by supply shortages of major vaccine components. Limited supply of vaccine inputs, such as disposable reactor bags, reagents, and certain chemicals created up to three-month delays in delivery of these goods. COVID-19 impacts have also limited the supply of other materials such as glass vials and pre-filled syringes.

**Systemic Risks in Context: Aging Infrastructure Vulnerability and Underinvestment**

The aging and degradation of the Nation’s infrastructure is not a new vulnerability and has been described in the 2013, 2014, 2016, 2018, and 2020 NPRs. Despite awareness of this issue, investment to address it has been limited, allowing the risks of infrastructure failure, including interruption to essential services, to persist. The American Society of Civil Engineers’ (ASCE) most recent report card gave America’s infrastructure a mediocre C- overall; this is a marginal improvement from the D+ rating awarded in 2013 and 2017, and indicates a significant gap between the current state of the Nation’s infrastructure and future infrastructure needs.

In recent years, aging and damaged transportation infrastructure have caused many supply chain challenges. Extensive damage from Hurricane Maria in 2017 to Puerto Rico’s transportation infrastructure (particularly roads and trucking infrastructure connected to the port of San Juan) caused delays in transport of necessary supplies from the port to the interior of the
SPACE WEATHER DETECTION

Space weather is a systemic risk that can cause cascading impacts by disrupting or destroying technology and infrastructure critical to the Nation’s security and economy. In fact, it is one of the potentially catastrophic risks identified in the 2019 National THIRA. Space weather, such as solar flares, radiation storms, and geomagnetic storms, can adversely impact satellite and airline operations, communications networks, the global positioning system, and electrical grid operations. An extreme event can result in cascading failures that would affect key services such as water supply, healthcare, and transportation.

Prompt detection of space weather is critical to mitigating its impact as the fastest coronal mass ejections can reach the Earth in as little as 15-18 hours. The impacts can be significant such as when more than six million people lost power due to a coronal mass ejection in 1989. The National Oceanic and Atmospheric Administration (NOAA) and U.S. Department of Defense (DOD) space-weather forecast centers enhance national preparedness by providing timely and accurate forecasting products. Forecast centers rely on measurements from ground and space-based observing platforms to provide operational services that inform preparedness. NOAA and National Aeronautics and Space Administration (NASA) satellites, such as the Deep Space Climate Observatory and the Solar Dynamics Observatory, provide key detection and early warning of these storms, while DOD and U.S. Geological Survey (USGS) sensors, such as magnetometers and solar radio telescopes, provide critical measurements of space weather on Earth’s surface. Combined, these measurements enable continuous and timely space weather watch, warning, and alert products and services for the Nation.

island, demonstrating how the failure of a single point of supply chain distribution can become a major systemic risk. Indeed, the port was so critical that neither local nor federal emergency plans anticipated loss of its capacity. In 2020, congestion at other ports, related to increases in trade volume and labor shortages, delayed the unloading and movement of cargo throughout the country. Similarly, highway congestion costs for trucks increased by 35% between 2012 and 2017; these costs are usually passed on to consumers.

Underinvestment in infrastructure continues to be a challenge. The ASCE projected that at 2020 funding levels, between 2020 and 2039, the Nation would experience a funding gap of $1.3 trillion for bridges, roads, and urban transit systems. These shortfalls could not only lead to poor service, but also could be dangerous. Structurally deficient bridges and roads may not be able to withstand incidents like hurricanes or earthquakes or the increased traffic that evacuations can cause. For example, in February 2017, the Pfeiffer Canyon Bridge in Big Sur, California, was severely undermined by flooding and landslides from heavy winter rains and had to be demolished, cutting off access to the community of Big Sur from the north. Failure of ground infrastructure such as roads and bridges could hinder the movement of emergency supplies throughout the country.

Transmission and distribution (T&D) infrastructure, which carries power from generating stations to customers, is also aging. Investing in station equipment, poles, and overhead power lines helps upgrade aging infrastructure and also help to ensure resilience of the grid during extreme weather events. Wildfires can be caused by T&D infrastructure, a risk that is exacerbated by climate change. Utilities in California spent over $2 billion in 2019 alone on wildfire mitigation measures. These measures included proactively de-energizing lines that cross through areas at risk during high fire-threat conditions, vegetation management, and targeted undergrounding of power lines. As power generation continues to evolve and include a mix of generation sources, T&D infrastructure will need to continue to evolve. Similarly, information and communication technologies (ICT) and networks are vulnerable to threats and
disruptions. ICT is the foundation and enabler for ensuring the maintenance and restoration, and the delivery of essential services and functions including port operations and the delivery of healthcare, fuel, and food. Of particular importance are ICT connections to critical physical infrastructure that control essential functions including the electric grid, pipelines, and wastewater facilities.

The effect of the COVID-19 pandemic on infrastructure funding was immediate, particularly for public transit systems, roads, and airports, which rely on user-generated revenue. When many offices closed, commuting by transit or car plummeted. Several major transit agencies lost more than half of their ridership, leading to millions of dollars in lost revenue. The COVID-19 pandemic also led to a sharp decline in vehicle miles travelled and consequently, gas tax receipts in 2020. The full impact of this revenue loss for state transportation budgets could be as much as $37 billion over 2020 and 2021. On average, state-level Departments of Transportation are projecting 30% revenue declines through the end of 2021. It is estimated that transportation-related changes will account for $46 billion in tax losses for local and state governments. Since the onset of the COVID-19 pandemic in early 2020, the aviation sector has also been dramatically impacted. Airports have lost billions of dollars of revenue as domestic air travel and air cargo have declined significantly. In April 2020, passenger travel was 5% of the level seen in April 2019, and by October 2020, passenger volumes had only rebounded to 32% compared to October 2019.

THE INFORMATION ENVIRONMENT AND CYBERSECURITY

Internet-enabled systems and services enable unprecedented connectivity, which has prompted economic, educational, and other advances. At the same time, greater access to free-flowing and fast-moving information creates the risk that false and harmful narratives may dominate the information environment, while connectivity continues to pose risks of hacking and other cybersecurity hazards. Cybersecurity advancements also require investments in infrastructure, software, and talent, which may stress organizations budgets. For example, the SAFECOM Nationwide Survey showed that over 55% of organizations indicated that they don't have funding for cybersecurity capital investments or operating and maintenance costs.

A Changing Information Environment

Timely distribution of accurate information to those who need it is a crucial risk management capability. On social media and in traditional media, false information can spread quickly, hindering the Nation’s ability to manage risk. As discussed in the 2020 NPR, this trend represents a major national vulnerability that has the potential to significantly reduce the effectiveness of all capabilities across all threats and hazards.

In 2020, misinformation complicated the response to COVID-19. Almost two-thirds of people in America have reported seeing at least some news and information about COVID-19 that

TYPES OF FALSE INFORMATION

The 2020 NPR defined three types of false information which experts and officials continue to monitor:

- **Misinformation**: Misinformation is false information, but not created or shared with the intention of causing harm.

- **Disinformation**: Disinformation is deliberately used to mislead, harm, or manipulate a person, social group, organization, or country.

- **Malinformation**: Malinformation is based on fact, but used out of context to mislead, harm, or manipulate.
they perceived as being fabricated and noted that this causes confusion about the basic facts of the pandemic. In addition to these perceptions, overt disinformation campaigns have sought to create distrust in COVID-19 vaccines. Such messaging appears to suppress individuals’ willingness to get vaccinated and obstructs the response to the pandemic. Overall, widespread misinformation and contradictory communicated information from public health officials clouded accurate public health messaging and may make public health officials seem less trustworthy.

Social media is a large source of misinformation. Nearly three out of four adults now use at least one social media platform, where they are likely to interact with misinformation or fake accounts. Facebook and Twitter both use independent fact checking to flag misleading or otherwise false information, but experts conclude that despite information being marked as false, merely seeing a headline may be enough to plant information in an individual’s mind. Fact checking can even make people more likely to believe that false headlines are accurate.

Although social media does contain misinformation, it is also an excellent way to reach vulnerable populations. Free social media platforms are used by an array of age groups, they can be continually updated, and they can be used to identify geographical locations and groups in need of aid. When developing official content, it’s important to include information in multiple languages, relevant to the audience. It is also critical to provide accessible video information that includes an American Sign Language (ASL) interpreter, captioning, and audio descriptions, all required by the Rehabilitation Act of 1973 and Communication and Video Accessibility Act.

**Cyber Resilience**

The 2020 NPR highlighted increasing technological interconnectedness as a potentially major systemic risk. The impacts of COVID-19 caused people to shift to virtual work, school, and medicine, resulting in an even greater reliance on technology. This increased level of interconnectivity raises questions about the Nation’s capability to manage its associated risks, particularly as the rapid pace of technological change and adoption has historically outpaced capabilities to protect that technology.

**INTERNET ACCESS IS IMPROVING, BUT REMAINS A CHALLENGE**

Early in the pandemic, American home broadband use rose by as much as from 20% to 40% as work (for those who could work from home), school, and entertainment moved online, causing officials to worry that internet infrastructure would not be able to handle the increased traffic. Infrastructure in well-connected areas proved reliable however, and successfully met the demand with little impact on connection speeds.

Not everyone, however, has robust internet access. Modern wired broadband is not available to approximately 2% of people in urban areas, 22% of the rural population and 28% of the population on Tribal lands. The alternative to broadband, satellite access, can be slower and less reliable. Even in areas where internet connection is available, households may lack access due to cost. Lack of internet access impacts people’s ability to access social services, telemedicine, tele-mental health services, and education. Nearly 40% of parents whose child’s K-12 school closed in spring 2020 said their child was likely to face at least one digital obstacle, such as having to do schoolwork on a cellphone or absence of a reliable internet connection at home. This percentage rises to nearly 60% in low-income households. This is a major obstacle for educators and indicates broader issues of resilience and equity at a time when many critical services, including disaster aid applications, are supplemented online or are primarily internet-based.
These increases in technological integration are not temporary COVID-19 management strategies; COVID-19 accelerated several pre-existing trends, including telework. The move toward widespread telework is expected to continue once the pandemic has ended. A cross-sector July 2020 survey of nearly 900 executives found that many office-based companies had been moving toward telework, but the necessity of avoiding travel and gatherings in 2020 accelerated these plans by several years. Studies have shown that half of those employed before the pandemic are now working from home, including over one-third of workers who had previously commuted.

Although this may create efficiencies in some areas, the rapid shift to using online platforms exposed businesses and institutions to increased risks of cyberattacks and intrusions. Cyber intruders disrupted virtual meeting sessions held by schools, churches, and local governments meetings, taking control and often showing inappropriate or offensive content. The Federal Bureau of Investigation ultimately issued a warning to users to increase awareness of the issue.

The rapid movement to virtual and remote platforms in March 2020 precluded many security upgrades, policy updates, and trainings. As employees moved out of secure offices and began relying on less secure home, hotel, and other networks, bad actors increased their targeting of unsecured equipment and networks. Employees themselves also became targets; phishing scams and similar deceptive operations attempted to take advantage of individuals’ stress and increased generosity during crisis. To support a secure transition to telework, CISA released a set of reference materials for Federal Government, non-federal organizations, and at-home workers.

The healthcare sector has been particularly targeted, possibly due to its greater activity and higher profile during the COVID-19 response. CISA warned in October 2020 of “an increased and imminent cybercrime threat” to hospitals and healthcare providers, and identified over 175 vulnerabilities among healthcare entities. In September 2020, Universal Health Services (UHS), one of the United States’ largest hospital management companies, suffered a major cyberattack. UHS employees lost access to computers, phones, and the internet, forcing some hospitals to divert ambulances and delay lab test results. All 400 UHS sites in the U.S. were forced into electronic health record downtime for three weeks, limiting or suspending access to electronic patient records.

Vaccine manufacturing and distribution networks weathered multiple attacks. In July 2020, a joint statement from the U.S., Britain, and Canada blamed a series of attacks targeting vaccine research and development on a Russian government-linked hacker group. The same month, the U.S. Department of Justice indicted two Chinese nationals who were said to have “conducted reconnaissance” against vaccine manufacturer Moderna, as well as two other unnamed American biotech firms. In November 2020, Microsoft reported that vaccine developers in multiple countries were targeted by hacking groups who sent messages to developers with fabricated job descriptions. Additional hacks have targeted the cold chain that keeps the vaccines at the correct temperature during transportation. Fortunately, these attacks do not appear to have slowed vaccine creation or distribution.

Outside of the healthcare industry, the U.S. government fell victim to a major cyberattack. Hackers gained access to government networks by exploiting software used by multiple government agencies. Hackers had free access to email and other systems. It is still unknown how much information was lost. On April 15, 2020 the United States formally named the Russian Foreign Intelligence Service as the perpetrator of the broad-scope cyber espionage campaign that exploited the SolarWinds Orion platform and other information technology infrastructures. The attackers maintained a sophisticated operation to trick networks and providers about their identities, thereby eluding detection for many months. Once aware, CISA and other agencies quickly took steps to mitigate the attack, and continue to update an alert with new information. Private companies were also affected.
Emerging risks are either new risks or familiar risks that evolved due to new or unfamiliar conditions; and therefore, often lack the historic data traditionally used to assess risk. Emerging risks can appear suddenly and often arise from advancements in technology or changes in the threat environment. Emerging risks are risks that are challenging to predict or assess. Because these are either familiar risks evolving in unfamiliar conditions or completely new risks, the historical data that usually support risk assessment are unavailable. This section discusses COVID-19 at its onset as an emerging risk and reviews biohazards and technological risks that may emerge in the future.

**THE EMERGENCE OF COVID-19**

Although pandemics are a known risk and have occurred throughout history, the COVID-19 pandemic, like many novel pathogens, was an emerging risk at its onset. Future variants of the virus may also be an emerging risk in the foreseeable future. Novel pandemics are approached as emerging risks because the details of transmission, treatment, and impacts are initially unknown. Details of how the virus caused infection and spread had to be studied to most effectively create policies to mitigate its transmission. The virus posed many unique challenges that forced new ways of response and innovation across all levels of government, community, and business. As scientists and health officials became aware of the novel coronavirus, they had to build new information about its characteristics before they could test for, message about, treat, and vaccinate against the new illness. All can learn important lessons about all-hazards preparedness from the emergence of COVID-19. In addition, the steps taken to mitigate and respond to COVID-19 enhance national preparedness for future new and emerging risks.

**TYPES OF EMERGING RISKS**

Although the nature of an emerging risk assumes the emergency management community cannot predict its occurrence, it is possible to identify
some emerging technologies and other trends that are likely to create the potential for threats. The following risks are likely to pose threats in the near future and managing them will require both comprehensive resilience and an understanding of the ways in which new technologies may fail or be abused by malicious actors.

**Bio-threats**

Even as COVID-19 becomes a more understood threat, new variants of COVID-19 or a new pandemic could emerge at any time, possibly driven by a more virulent pathogen with more severe impacts. That pathogen may have characteristics that lead to an even greater degree of incapacitation and loss of life. It is also possible that a drug-resistant pathogen could emerge, which would be highly challenging to treat and contain. By examining the potential effects of other pandemics or variants and how COVID-19 compares to these scenarios, the emergency management community can analyze the future risk of both.

Developments in biotechnology—the manipulation of living organisms or their components to produce useful products, such as pest-resistant crops, new bacterial strains, or novel pharmaceuticals—have great potential for furthering medical innovations and saving lives. However, these advancements also come with risks of misuse, especially as biotechnology continue to advance and/or becomes increasingly available for commercial use. Misuse of biotechnology can emerge from accidental mismanagement or a nefarious actor seeking to cause harm.

The increasing commercial availability of and access to biotechnology products increases the risk that they will be used maliciously. There are growing communities in non-traditional fields, including engineers, do-it-yourself (DIY) biological practitioners, and companies who may practice without the same level of oversight as traditional laboratories or pharmaceutical settings. Although these individuals and institutions often contribute to research efforts in a constructive and positive manner, there is still a potential bio-threat risk from both accidental and malicious use. Without proper oversight, it is difficult to regulate DIY biological practitioners’ adherence to laboratory biosafety protocols, which can lead to an increased risk of accidental biological incidents that affect humans, animals, or the environment. Additionally, the prevalence of non-traditional laboratories underscores the potential for chemical, biological, explosive, and nuclear threats originated by malicious criminal and nation-state actors. Even practitioners who use biotechnologies in institutional laboratories risk accidental biological incidents if they are not

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**NATIONAL STRATEGY TO SECURE 5G**

The National Telecommunications and Information Administration released the National Strategy to Secure 5G Implementation Plan in accordance with the Secure 5G and Beyond Act of 2020.

The National Strategy will rely on interagency coordination to fulfill goals of the National Cyber Strategy along four lines of effort:

1. **Facilitating the rollout of 5G domestically**
2. **Assessing the cybersecurity risks to and identifying core security principles of 5G capabilities and infrastructure**
3. **Addressing risks to U.S. economic and national security during development and deployment of 5G infrastructure worldwide**
4. **Promoting responsible global development and deployment of secure and reliable 5G infrastructure.**
correctly implementing the necessary laboratory biosafety practices. Additionally, new biological technologies could be deployed to deliberately cause human infections, target agricultural supply chains, or disrupt existing ecological balances.

**Technology**

As technology continues to advance, the Nation simultaneously benefits from increased connectivity and efficiency and is exposed to increased risk. The rollout of fifth generation (5G) wireless and mobile networks, for example, will bring exponential improvements to the bandwidth, speed, and connectivity of digital networks, enabling everything from smart cities to virtual and augmented reality to telemedicine. Although widespread use of 5G networks is not expected until at least 2022 (with complete rollout years later), telecommunications networks began incrementally introducing 5G-enabled networks and technology in 2018.

As 5G technologies become more widespread, they will introduce specific risks. Like traditional telecommunications technologies, 5G networks will incorporate some physical infrastructure, but they will also be much more reliant on software. Many of the upgrades that currently require changes to hardware will be accomplished through software updates. The inherent cyber vulnerabilities of software will necessitate tools and safeguards that ensure the security of the ecosystem of 5G devices.

An expanded number of connected devices (not just cell phones and laptops, but also cars, refrigerators, and other items) and connective cell towers will be vulnerable to physical manipulation during manufacture, particularly if suppliers rely on untrusted manufacturers. Additionally, with greater numbers of cell towers and other distributed connective nodes, there may be increased vulnerabilities to physical tampering after deployment, possibly resulting in disrupted connections or interception of data.

Network security is a major concern for an exponentially faster and more connected network. A network more reliant on software will use software to perform many of the functions that have traditionally relied on hardware, including some network management functions; this feature creates the risk that a successful attack could lead to bad actors gaining control of the network itself. Essential functions that rely on network technology, such as electricity distribution or water supply, may be vulnerable to these risks. As critical infrastructure operators increase service quality and reliability through real-time data awareness and system optimization, they will need to ensure the security of increasingly connected and automated data and decision-making mechanisms. Although new strategies, such as network slicing, may mitigate some existing and anticipated vulnerabilities, new capabilities and new technologies will create unanticipated risks.

Separate from 5G systems, advancements in and increasing accessibility of machine learning allow for the production of fake audio and video. Deepfakes, as these productions are called, are often technologically detectable, but they appear convincing to an untrained human eye. Deepfake technology has been used harmlessly in the creation of sports ads and TV shows but has also been used to create fake material for political ads, pornography, and revisionist history.

The ability to convincingly manipulate audio or video footage is concerning because this form of evidence is often accepted as fact. The potential for manipulation expands the risk of fraud through impersonation and multiplies misinformation, disinformation, and malign information risks in a fast-moving information environment. Ultimately, the public and private sectors will need to collaborate on solutions for reliably identifying deepfakes and strategies for enhancing the information environment such that the public is less vulnerable to false information. Deepfakes and other forms of manipulated information may cause or intensify systemic risks as they become more common.
EMERGING RISKS

CLIMATE CHANGE AS A DRIVER AND MULTIPLIER OF RISK

As the global climate changes, the Nation continues to experience new and intensified conventional, catastrophic, and systemic risks to life, property, and critical services. Climate change not only alters weather patterns but also produces downstream effects on public health, infrastructure, and the economy.

Changing Baselines Propel Conventional and Catastrophic Risk

Climate change will continue to intensify weather-related incidents such as extreme precipitation, flooding, wildfires, and hurricanes. Certain types of incidents, particularly intense rainfall events, will become more frequent and more likely to occur simultaneously, which may amplify their impacts and cause catastrophic damage. Overall, damages from both conventional and catastrophic incidents will continue to increase. These trends will not be isolated to any one region; climate change will impact every county in the U.S. within 30 years. By 2050, one in three American residents (compared to a historical level of one in six) will be exposed to extreme conditions.

Normal, non-disaster weather patterns will also shift toward the extremes. For example, every region of the United States is warmer now, on average, than 100 years ago, and the number of extremely hot days will continue to exceed the number of extremely cold days. Similarly, high tide flooding in coastal areas will increase as sea levels rise: as soon as 2030, the Western Gulf region may experience 30 days of high tide flooding annually—three times more than today. Changing baseline patterns may alter a location’s character, make communities more or less hospitable, and necessitate changes to emergency management strategies.

Figure 4 depicts potential coastal inundation in the Charleston, South Carolina area due to sea level rise.

Figure 4: Charleston, SC, is likely to be severely impacted by rising sea levels. Figure 4(a) on the left shows the current mean higher high water (MHHW) level, and Figure 4(b) on the right projects the change caused by the MHHW rising by two feet. This change may occur by 2050.


A changing climate will have impacts beyond weather and disasters, including increasing health risks. Drought is associated with respiratory hazards such as dust storms and wildfire smoke that can exacerbate respiratory conditions; high temperatures lead not only to heatstroke but also to
risk; and any disaster causes stress and may create or exacerbate clinical mental health disorders. Low-income communities are especially at risk of serious illness or even death from climate change-related incidents. For instance, during extreme heat waves, many households with low incomes lack the means to cool their homes. At the same time, any disaster may force local health facilities to close, reducing the availability of care. Demographic changes to the U.S. population, including aging and geographic distribution, may increase health vulnerabilities.

Systemic Changes Drive Systemic Risks

U.S. farmers and food producers have always adjusted to weather variations and natural incident impacts but responding to changing baseline conditions will be more challenging. Higher temperatures and intense heat waves will reduce most crop yields and could be life-threatening to livestock. Changing conditions will favor pests and food-borne illness, while increasing concentrations of atmospheric carbon dioxide can make crops themselves less nutritious. Opportunity to avoid these risks is limited, so actors throughout the agricultural supply chain should be preparing for the potentially significant impacts to this essential sector.

In addition, the various risks that climate change poses to the U.S. financial system may interact to magnify shocks and stress the Nation’s ability to sustain long-term economic growth. For example, Americans’ increasing exposure to climate disaster risk increases insurers’ exposure. Highly localized and severe impacts causing significant insured losses may threaten insurers’ solvency. Anticipating such impacts, insurers may be unable to offer affordable coverage or may refuse to offer coverage in extremely high-risk areas. A lack of insurance coverage increases individual risk and vulnerability to disasters.

Over the longer term, the impacts of climate change will alter tax revenue outlooks for many communities. Although some may see revenues increase, many others will become stuck in a negative feedback loop with increasing costs for recovery and mitigation measures and falling revenues as people and businesses leave for areas less likely to be impacted. Facing these interrelated challenges, emergency managers need to carefully balance risk mitigation, transfer, and acceptance strategies. Federal funding is one option to bridge local budget shortfalls and avoid costly disaster impacts; FEMA’s mitigation grants, such as the Building Resilient Infrastructure and Communities (BRIC) program, support communities in planning and building capabilities and capacity, and help enable large projects and innovation based on an approved mitigation plan.

Case Study: Wildfire

Trends toward increasing wildfire severity and longer fire seasons are particularly concerning for emergency managers. Years-long droughts across the West, paired with increasing development in the wildland-urban interface, have exacerbated the destructive power of wildfires and increased risks to life, livelihoods, and property for millions of people. In 2020, California and Oregon bore the brunt of some of the largest and most destructive wildfires in U.S. history. In California, fires burned over 5.3 million acres, destroyed more than 11,000 structures, and cost over $2.3 billion in fire suppression costs. In Oregon, 2,027 fires burned more than 1 million acres, killed 11 people, and destroyed thousands of homes.

Several of the factors that contributed to the unprecedented 2020 wildfire season are linked to climate change. Many of California’s record-setting 2020 wildfires were caused by thousands of dry lightning strikes. Dry conditions were exacerbated by extreme heat in July and August, stands of dead trees left by expanding infestations of bark beetles, and decades of gradual warming extending the fire season by about 75 days.
INTRODUCTION

The Nation manages risks by building and sustaining capabilities to address potential impacts. Communities across the Nation face a wide variety of threats and hazards, each with unique impacts and requirements for managing them. However, as communities and emergency managers face limited resources—including planning, equipment, personnel, training, and exercise opportunities—building the necessary capabilities to effectively meet all incident requirements can be a challenge. To build capability most effectively in the face of these constraints, professional emergency managers use “capabilities-based planning,” which encourages emergency managers to develop capabilities suitable for a wide-range of threats and hazards, particularly when limitations require that resource building and sustainment be prioritized. Capabilities-based planning enables the Nation to prepare to manage multiple risks simultaneously, improving the value of investments and making the Nation better prepared to meet its challenges. For more information, please see Appendix C: National Risk and Capability Assessment.

Communities may need to account for instances in which response and recovery capabilities are split across multiple incident operations. By planning to build capabilities that are used across incident types, particularly those incidents of the greatest threat to a community, emergency managers can prioritize training and exercises, equipment purchases, and planning efforts to best build capability across a variety of threats and hazards. In a prepared nation, capabilities are first locally executed but may incorporate state management and federal support if incident impacts overwhelm local capabilities. The development and sustainment of all-hazards capabilities enhances local capability to implement and manage emergency response, thereby limiting the need for state management and federal support.

This section of the report contains an evaluation of national capabilities in an effort to better understand our preparedness and resilience against all threats and hazards. First, this section contains a review of capability data submitted by states, territories, urban areas, and Tribes through the THIRA and the Stakeholder Preparedness Review (SPR) to understand the baseline level of capability that communities identify they can bring to bear. Next, this section contains an assessment of preparedness and resilience through the lens of the Nation’s capabilities to respond to the COVID-19 pandemic in 2020, focusing on screening operations; logistics and supply chain management; public health; information delivery; body recovery and storage; and economic resilience capabilities. These analyses describe how close the Nation is to meeting its collective capability goals, which together help to achieve the National Preparedness Goal.

ALIGNING TO NATIONAL PREPAREDNESS

The National Preparedness Goal sets a baseline of preparedness to deal with the risks that communities across the Nation face. The Disaster Recovery Reform Act (DRRA) of 2018 expanded on the National Preparedness Goal to emphasize the importance of capabilities-based planning. In support of community capability building, FEMA focuses on helping communities build capabilities for all-hazards across all five mission areas in order to achieve the goal of a more resilient Nation.
LOCAL CAPABILITY TRENDS

This report begins by describing conventional risk, because it is the most common form of risk, and represents the risks that state and local emergency managers are most focused on managing. Because of this, local capability trends are the best way to describe the Nation’s preparedness to manage conventional risks.

Every three years, FEMA requires states, territories, Tribal Nations, and urban areas that receive some types of Federal preparedness grant funding to report their threats and hazards of greatest concern and set preparedness goals (capability targets) through the THIRA. These communities then evaluate how close they are to reaching their goals through the SPR annually. Tribal emergency management capacity may be unknown in some communities and not equally represented in this data, as many Tribes have not completed a THIRA/SPR. To reduce the burden on communities during the ongoing COVID-19 pandemic response, FEMA limited the number of required capability targets that communities needed to assess in 2020 to those focused on pandemic-related capabilities and those targets measuring progress in meeting the Secretary of Homeland Security’s priorities (Table 1). For more information on the THIRA/SPR methodology and required targets, see Community and National Capability Targets in Appendix C.

This section presents overarching trends in community-reported capability data, including areas where communities are closest and furthest from their goals, areas of capability where communities set goals below worst-case scenario impacts, and how communities invest and prioritize funding and resources to build and sustain capability.

Closest to Goals

In 2020, communities overall reported being relatively close to their goals across every required capability target. Of the 15 required targets, more than half of communities reported achieving at least 70% of their target in 14 of them.

Of the 15 targets, communities reported being closest to their goals in five: Intelligence Cycle Auditing/Execution, Unified Operations,

Table 1: 2020 Required THIRA/SPR Targets

<table>
<thead>
<tr>
<th>Mission Area</th>
<th>Core Capability</th>
<th>Target Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-Cutting</td>
<td>Public Information &amp; Warning</td>
<td>Information Delivery</td>
</tr>
<tr>
<td></td>
<td>Operational Coordination</td>
<td>Unified Operations</td>
</tr>
<tr>
<td>Prevention/Protection</td>
<td>Intelligence and Information Sharing</td>
<td>Intelligence Cycle Auditing/Execution</td>
</tr>
<tr>
<td></td>
<td>Access Control and Identity Verification</td>
<td>Credential Acceptance</td>
</tr>
<tr>
<td></td>
<td>Cybersecurity</td>
<td>Cyber Plan Updates</td>
</tr>
<tr>
<td></td>
<td>Interdiction and Disruption</td>
<td>Interdiction/Disruption Activities</td>
</tr>
<tr>
<td>Protection</td>
<td>Physical Protective Measures</td>
<td>Critical Infrastructure Security Plan Updates</td>
</tr>
<tr>
<td></td>
<td>Risk Management for Protection Programs and Activities</td>
<td>Critical Infrastructure Risk Assessment</td>
</tr>
<tr>
<td></td>
<td>Screening, Search, and Detection</td>
<td>Conduct Screening Operations</td>
</tr>
<tr>
<td></td>
<td>Supply Chain Integrity and Security</td>
<td>Supply Chain Risk Preparedness</td>
</tr>
<tr>
<td>Mitigation</td>
<td>Risk and Disaster Resilience Assessment</td>
<td>Threat and Hazard Modeling</td>
</tr>
<tr>
<td>Response</td>
<td>Fatality Management Services</td>
<td>Body Recovery/Storage</td>
</tr>
<tr>
<td></td>
<td>Public Health, Healthcare, and Emergency Medical Services</td>
<td>Medical Care</td>
</tr>
<tr>
<td>Recovery</td>
<td>Economic Recovery</td>
<td>Reopen Businesses</td>
</tr>
<tr>
<td></td>
<td>Health and Social Services</td>
<td>Reestablish Services</td>
</tr>
</tbody>
</table>
Threat and Hazard Modeling, Information Delivery, and Interdiction/Disruption Activities (Figure 5).

Four of the five targets—Intelligence Cycle Auditing/Execution, Unified Operations, Information Delivery, and Interdiction/Disruption Activities—were all identified as targets where communities were close to their goals in the 2020 NPR and are part of the cross-cutting or prevention/protection mission areas where communities have consistently reported being close to their goals.

<table>
<thead>
<tr>
<th>Target [Core Capability]</th>
<th>Percent of Communities Achieving 70-100% of Goal</th>
<th>Community Priority Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intelligence Cycle Auditing/Execution [Intelligence and Information Sharing]</td>
<td>85%</td>
<td>Low 12% Medium 33% High 56%</td>
</tr>
<tr>
<td>Unified Operations [Operational Coordination]</td>
<td>80%</td>
<td>5% Medium 33% High 62%</td>
</tr>
<tr>
<td>Threat and Hazard Modeling [Risk and Disaster Resilience Assessment]</td>
<td>76%</td>
<td>25% Medium 57% High 18%</td>
</tr>
<tr>
<td>Information Delivery [Public Information and Warning]</td>
<td>69%</td>
<td>5% Medium 31% High 65%</td>
</tr>
<tr>
<td>Interdiction/Disruption Activities [Interdiction and Disruption]</td>
<td>69%</td>
<td>17% Medium 36% High 47%</td>
</tr>
</tbody>
</table>

Figure 5: Communities were closest to achieving their goals across the following five targets: Intelligence Cycle Auditing/Execution, Unified Operations, Threat and Hazard Modeling, Information Delivery, and Interdiction/Disruption Activities. Note that percentages are rounded, and in some cases may not add up to 100%.

In most cases, communities place the highest priority for sustaining or building capabilities on those targets which they are closest to achieving. The exception in 2020 was the only target from the Mitigation mission area, Threat and Hazard Modeling, where three-quarters of communities reported being close to their goals but only 18% identified that sustaining or building their modeling capabilities is a high priority. This indicates that although communities are currently close to achieving their goals, there is a potential risk of decline in capability if communities do not continue to prioritize and sustain their capability in this area.

Furthest From Goals

In 2020, there were six areas of capability where 20% or more of communities reported being far from their goals (Figure 6). As in most years, the targets in which communities are furthest from their goals are generally those where communities place a lower priority on building and sustaining capability. For capabilities in which fewer communities identify building and sustaining capability as a high priority, communities risk is seeing a decline if the capability is not sustained effectively. The primary exception in 2020 is the Medical Care capability, where one-fifth of communities reported being far from their goals but nearly two-thirds identified that building or sustaining the capability is a high priority. This indicates that although communities may be far from their goals in this area, they may be more likely to prioritize building and sustaining the capability in coming years.

Most of the targets for which communities identified they are furthest from their goals in 2020 are not consistent with those identified in 2019. One notable change is in Body Recovery/Storage, for which more than one-quarter of communities (26%) reported being far from their goals in 2019. In 2020, fewer communities...
Figure 6: Communities are furthest from reaching their goals across the following six capability targets: Reopen Businesses, Credential Acceptance, Critical Infrastructure Security Plan Updates, Conduct Screening Operations, Critical Infrastructure Risk Assessment, and Medical Care. Note that percentages are rounded, and in some cases may not add up to 100%.

Reported being far from their goals in Body Recovery/Storage—dropping by six percentage points to 20%. During the same period, the percent of communities reporting a high confidence in the assessment of their fatality management capabilities increased by eight percentage points; this may indicate that over the last year, communities may have gained a better understanding of their fatality management capabilities (with no change in capability), reduced their goal level of capability to better align with their goals for capability building, or may have built capability in this area.

In addition to nearly one-quarter of communities reporting being far from their goals in Reopen Businesses, less than half of communities (44%) reported being close to their goals in this area. The COVID-19 pandemic and public health measures placed significant strain on capabilities to Reopen Businesses, and represent an area where communities most frequently set a longer timeframe for achieving their capability goals.

Preparedness Against Worst-Case Scenarios

Communities have limited resources and may not be able to develop every capability to the level required to address potential impacts of a worst-case disaster. As part of the THIRA, communities assess the threats and hazards of greatest concern to their community, including identifying specific impact metrics associated with each threat and hazard (i.e., number of people requiring search and rescue). Communities then use the same metrics to set goals for the level of capability that they want to or plan to eventually achieve. In some cases, communities may choose to set capability targets at a level of capability that is lower than the potential impacts of a worst-case scenario incident, leaving a gap in capability between what communities plan for and what they may need in order to respond to an incident.

In 2020, 100% of communities set targets that were significantly below their anticipated worst-case scenario needs across three targets. Two of the three correspond with targets where communities reported being far from their goals: Critical Infrastructure Risk Assessment and Critical Infrastructure Security Plan Updates. In contrast, communities also set targets significantly below their worst-case scenario for Threat and Hazard Modeling, a target where more than 75% of communities reported being close to their goals, which may indicate that communities are unlikely to plan to meet their worst-case scenario impacts in this area. A majority of communities also reported setting targets far below the maximum impacts in Medical Care. Targets where a majority of communities report setting their goals close to or equal to worst-case scenario impacts include Information Delivery (69% of communities).
Unified Operations (62%), Intelligence Cycle Auditing/Execution (53%), and Conduct Screening Operations (59%). FEMA can use this data to identify long-term gaps that communities may not be planning to address themselves. Because targets with large gaps between capability goals and worst-case scenario capability needs reveal areas where the potential gap is unlikely to be filled by the states, FEMA and its federal partners should coordinate to identify alternative sources of or opportunities to build additional capability.

Prioritizing Resources

SLTT governments have limited resources and need to prioritize funding to sustain and build some capabilities over others. In contrast to the federal efforts to identify and build the capabilities necessary to respond to catastrophic incidents, SLTT capabilities generally focus on relevant, conventional threats, such as those described in the Risks section. This allows them to prioritize the capabilities needed to manage the most frequent or likely threats to their communities; however, they continue to face ongoing challenges in responding to conventional incidents. FEMA has reviewed many of these challenges in past NPRs, such as effectively integrating all emergency management partners; ensuring continuity of key social services provided by non-governmental organizations (NGOs); and ensuring that preparedness, response, and recovery are inclusive of those with disabilities or limited English proficiency. Awareness of these and other known challenges allows emergency managers to pursue mitigation and compensation measures.

To support communities in building and sustaining capabilities, the Federal Government provides federal grants to SLTT governments, businesses, and organizations. Through these grants, recipients can invest in activities that reduce risk, mitigate future impacts, and build resiliency against a wide variety of threats and hazards. A May 2020 U.S. Government Accounting Office (GAO) report found that between fiscal years (FY) 2013 and 2018, communities received $8.3 billion in funding from three of FEMA's preparedness grants (Urban Areas Security Initiative [UASI], State Homeland Security Grant Program [SHSP], and Emergency Management Performance Grant [EMPG]) and applied 87% of the funding toward the cross-cutting core capabilities and those under the response and prevention mission areas. These areas represent the areas where communities consistently report being closest to their goals. Both UASI and SHSP are part of the Homeland Security Grant Program (HSGP), which was established to support communities in building capabilities to manage terrorism risks. Projects paid for by HSGP funds must relate directly to preventing, protecting against, mitigating, responding to, and recovering from acts of terrorism. The HSGP cannot be used to build capabilities related to natural events unless a capability has cross-benefits across both threat types.

In FY 2020, communities spent grant funding on the Planning, Operational Coordination, and Intelligence and Information Sharing capabilities (Figure 7). Consistent with previous years, the targets that communities reported being closest to achieving in 2020 (Operational Coordination and Intelligence and Information Sharing) are those where communities are dedicating larger amounts of grant funding, indicating that federal resources and grant funding are likely key aspects of building and sustaining capabilities. Overall, grant recipients spent more than one-third of total preparedness grant funding (38%) on the five core capabilities that they identified as being closest to their goals, compared to just 13% spent on the targets where they are furthest from their goals.

In some cases, communities are recognizing the need to identify ways to build and sustain capability outside of traditional funding and grant avenues. Changes to laws, such as zoning requirements and building codes, can help communities build capability internally without outside funding requirements. Some states have passed legislation requiring gas stations near highways to maintain generators to ensure power during outages. Other states have established their own state-level temporary emergency power contracts, which reduce the need for
federal Emergency Support Function (ESF) #3 resources and capabilities and increase internal capability. This focus on alternative avenues for building capability indicates that communities are considering resilience more holistically than may be encouraged through traditional capability-building structures. Emergency power contracts may not be sufficient though. Alternate and backup plans for power generation when power infrastructure is disrupted to critical facilities (e.g., hospitals) must be examined and planned for. For example, by decreasing their overall energy and water requirements, critical facilities can improve their capability to operate in degraded environments.
EXAMINING CAPABILITY RELATED TO COVID-19

In 2020, the COVID-19 pandemic resulted in unprecedented demand for communities to trace infections, ensure ongoing supply chains; provide medical care; share critical, accessible, and equitable public information; manage fatalities; and reduce the economic impact on individuals, businesses, and the Nation overall.

The widespread nature of the response to COVID-19 provides an opportunity for FEMA and the federal interagency to review and analyze community and federal capabilities and to better understand the strengths and challenges that emergency managers at all levels of government may face in responding to a wide variety of threats and hazards. This section of the NPR presents an assessment of how prepared the Nation is to respond to any number of threats and hazards through the lens of the Nation’s response to COVID-19 in six areas of capability most impacted by the pandemic: Screening Operations, Logistics and Supply Chain Management, Medical Care, Information Delivery, Body Recovery/Storage, and Economic Recovery.

This assessment also represents the next step in maturing FEMA’s National Risk and Capability Assessment (NRCA), a suite of assessment products that measure risk and capability across the Nation in a standardized and coordinated process. This analysis builds on the national capability aggregation presented in the 2020 NPR and presents additional analysis on how the COVID-19 pandemic highlights areas of resilience and challenges for emergency managers across threat and hazard types. For more information on the NRCA, including past products and the methodology for national capability aggregation, see Appendix C: National Risk and Capability Assessment.

Interdependencies Across Capabilities

The same capabilities are used to manage the impacts of a variety of threats and hazards. These threats and hazards can include multiple simultaneous disasters that can strain local capabilities and require mutual aid or federal support to meet incident needs. The COVID-19 pandemic provides a clear example of the way in which one incident can inhibit capabilities to respond to other incidents. Due to the nationwide and long-term impact of the pandemic, FEMA and communities across the Nation were faced with responding to multiple, simultaneous disasters straining response and recovery capabilities.

One of the most significant impacts on capability was seen during sheltering efforts in response to major hurricanes and wildfires. In line with CDC guidelines, most instances of sheltering required

SHELTERING DURING COVID-19

Shelters established following a January 2020 earthquake in Puerto Rico were among the first to be impacted by and adjust to COVID-19. With thousands of homes damaged or destroyed, about 100 survivors were still in shelters or informal encampments when lockdown was declared in March. Puerto Rico’s health services and community partners established safety protocols and provided PPE, testing, and disinfectants.

FEMA normally favors congregate sheltering during disasters, but the open group environments in schools and community centers increases the risk of COVID-19 transmission. Recognizing this, FEMA changed its policy in July 2020 to authorize non-congregate sheltering in hotels or dormitories to reduce contact between individuals.

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x For more information on the NRCA, refer to Appendix C: National Risk and Capability Assessment or https://www.fema.gov/emergency-managers/risk-management/risk-capability-assessment.
that individuals from different family groups or households either socially distanced or resided in non-congregate housing to limit the spread of COVID-19. Florida identified hotels that could serve as non-congregate sheltering locations and created an interactive map that featured hotels that had expressed interest in sheltering evacuees. Communities were also forced to contend with survivors that had tested positive or were quarantining following exposure to COVID-19. During Hurricane Hanna, Texas opened a shelter specifically designated for families that had been exposed to COVID-19 in order to reduce the spread in other shelters.

The risk of infection associated with COVID-19 also impacted capabilities for responding to wildfires across the Nation. During the 2020 wildfire season, turnaround times for test results varied from 24 hours to a full week and pending or positive test results could cause entire firefighting crews to be removed from service while they quarantined. Wildland firefighters work in close proximity and in austere environments, making social distancing difficult and increasing the impact of quarantines on firefighting capabilities.

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xi CDC does not make requirements for shelters but rather provides recommendations on how to lower the risk of transmitting COVID-19 in shelter settings.
Screening operations are considered one of the primary components of efforts to contain public health emergencies and counter threats to the Nation. This section will focus on health screening due to the COVID-19 pandemic, however, screening can include any activity designed to identify, discover, or locate threats and hazards. Testing is a key process in the effort to contain COVID-19 and mitigate its impacts. Communities rely on screening operations and tracing efforts to identify infected populations, coordinate quarantines of exposed populations,

2018 NATIONAL BIODEFENSE STRATEGY

In 2018, the President published the first National Biodefense Strategy (NBS), which outlined five goals for building the Nation’s capability to understand the threat of, prevent, protect against, respond to, and recover from natural, accidental, or deliberate biological threats.

Goals include focusing on measures to reduce the impacts of biological incidents—including maintaining a vibrant national science and technology base and preparing to collaborate across the country and internationally to support biodefense—and compiling and sharing information to enable effective and appropriate decision-making.

The NBS and the implementing memorandum, National Security Presidential Memorandum 14, are currently under revision.
SCREENING OPERATIONS

PUBLIC-PRIVATE SECTOR INNOVATIONS

Local officials also worked, often in coordination with private sector partners, to develop innovations in tracing efforts such as smartphone apps. The apps, generally designed to include exposure notification alerts, symptoms tracking, and location diaries, were developed to supplement contact tracing efforts to identify individuals at risk of exposure. Some apps also include general information on transmission rates, nearby testing sites, and other key information. Although 22 states, the District of Columbia, and two U.S. territories had released apps as of December 2020, concerns about privacy and app efficacy in accurately identifying exposures have contributed to questions regarding the usefulness of such apps.

and reduce community spread. The Nation’s capability to effectively screen for critical biological elements is key to responding to a number of threats and hazards.

Any number of natural, technological, or human-caused threats and hazards can strain screening operations capability and capacity. Disasters that require laboratories or screening facilities to close operations reduce capability while public health emergencies such as COVID-19 may increase demand to a level that is higher than screening capacity. In addition to a pandemic, screening capability may be required to identify, discover, and/or locate threats or hazards of exposure such as chemical or other biological hazards. The Nation should strive to increase capability both within laboratories and to build stronger infrastructure and mitigation capabilities to ensure redundancy of screening operations in the face of disasters.

Building and sustaining screening capabilities not only increases the Nation’s resilience against public health crises but also serves to build resilience against a wide variety of biological, radiological, and nuclear threats that require rapid identification of threats and impacted populations to protect life, property, and the environment.

Contact Tracing

Contact tracing for COVID-19 was inhibited in part by the limited number of available qualified individuals to conduct screenings. Contact tracing is also only effective when the amount of community spread is low. In some cases, communities relied on volunteer contact tracing programs to supplement local, state, and federal resources. Even after hiring surges, there were still not enough contact tracers across all levels of government during 2020 to fully track and trace all exposures.

Contact tracing for COVID-19 was further hampered by the impact of asymptomatic transmission as infected populations are able

COVID-19 IMPACTS ON PREVENTATIVE CARE AND SCREENING

In addition to the cancellation of non-emergency surgeries, COVID-19 also reduced traditional preventative care and screening operations. CDC reported that the total number of screening tests received by women through CDC’s National Breast and Cervical Cancer Early Detection Program declined by 87% in April 2020 compared to averages from the previous five-year averages for that month. Screening for other types of cancers also saw significant declines during the first three months of the pandemic.

Prolonged delays in screening related to the COVID-19 pandemic may lead to delayed diagnoses, poor health consequences, and an increase in cancer disparities among women already experiencing health inequities.
to spread the infection without knowing. To account for the overwhelmed capacity of contact tracing efforts, CDC developed and worked to continuously improve contact tracing protocols to maximize the impact of limited staff and resource levels.

There was also a steep decline in the number of human immunodeficiency virus (HIV) tests performed by CDC-funded community-based organizations from January to August 2020, with an average reduction in tests of 73%, when compared to 2019. However, after an initial scale back and/or interruption of several activities, funded organizations worked to maintain essential surveillance activities and are back on-track with prevention efforts. Despite the challenges presented by COVID-19, the pandemic provided a unique opportunity and the impetus to ramp-up HIV self-testing efforts nationwide.

Other identified constraints on testing and screening include high rates of infection, limited training and communications issues, or populations refusing to work with contact tracing staff. As tests began to become more widely available in May 2020, over a dozen states were reporting that not enough people were showing up for testing and available appointments were going unused, indicating that states may have overestimated their screening needs or that individuals were not fully taking advantage of available tests.

Ultimately, effective screening operations are critical to successfully managing public health crises, but account for just one aspect of community mitigation measures and efforts to curb the transmission and spread of threats and hazards. As positive cases increased, the effectiveness of screening operations and contact tracing was reduced, and communities were forced to rely on public messaging and medical capabilities to manage the impacts of the pandemic.
LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Supply chains are critical to enabling national capability across all major threats and hazards. Even short-lived impacts to the supply chain can prevent individuals and communities from accessing critical capabilities. During most disasters, FEMA is charged with responding while managing supplies and resources domestically, as well as coordinating the movement of resources from unaffected areas to impacted areas. The worldwide nature of the COVID-19 pandemic meant that countries across the globe were competing for the same resources. Within the U.S., every level of government was seeking the same PPE resources. As a result, COVID-19 placed unprecedented strain on the emergency management community’s ability to acquire, manage, and allocate life-saving resources to impacted communities.
LEVERAGING THE DEFENSE PRODUCTION ACT

To counter supply chain issues, increase screening capacity, and secure scarce medical resources, the Federal Government leveraged multiple authorities within the Defense Production Act (DPA) of 1950 related to production, procurement, allocation, and export restrictions. Such actions included providing assistance to private sector organizations to enable them to rapidly produce 21 critical testing materials, implementing priority ratings to ensure that domestic private sector companies filled government orders first, setting a temporary restriction on the export of critically needed items, and the coordination of voluntary agreements among manufacturers and providers to close gaps in domestic supply. To help avoid conflicting use of DPA authorities, COVID-19-related actions were restricted and required advance recommendation by the Unified Coordination Group and approval by the White House Task Force.

As discussed above, COVID-19 saw multiple disruptions to the Nation’s supply chains, causing shortages in both household staples, like toilet paper, and critical response assets, like PPE. These shortages are evidence of National capability gaps that, unless closed, are likely to be seen again. Gaps such as these could be seen in future large-scale incidents where widespread impacts reduce manufacturing and alter logistical capabilities. This section will explore the supply chain gaps identified during COVID-19 and what those observed gaps may mean for the Nation’s future performance during large-scale incidents.

Reduced Laboratory Testing

COVID-19 disrupted the supply chain for critical laboratory materials needed to screen for both COVID-19 infections and traditional, clinical testing for patient care. The high demand for COVID-19 testing overloaded laboratory capabilities, extending the turnaround time for results. As cases rose in July 2020, laboratories began reporting that they had doubled their daily capacity for processing tests (compared to two months prior) and that the average processing time for tests was seven days.

Screening operations for COVID-19 were also hindered by delays and gaps in the distribution of testing kits and materials. Initial research and development delays were compounded by manufacturing challenges, resulting in testing kits that did not work being sent to numerous state and local public health labs. During peaks in demands for testing, individuals faced long lines, that may have discouraged testing and/or limited availability of tests.

Supply chain impacts overwhelmed screening operations beyond COVID-19. Laboratories across the U.S. were plagued by shortages of testing items that are needed both for testing for COVID-19 and critical for unrelated routine patient care activities. In particular, laboratories have reported shortages in testing items necessary to measure antibiotic susceptibility.

SUPPLY CHAIN DISRUPTIONS EXACERBATE VULNERABILITIES

In 2013, CDC published the first Antibiotics Resistance Threats Report, which outlined the dangers of antibiotic resistance. In 2019, CDC reported that 2.8 million antibiotic-resistant infections occur in the U.S. each year and result in more than 35,000 deaths.

Laboratory materials shortages due to COVID-19 have reduced capabilities for identifying and tracking antibiotic resistant bacteria. Limitations on tracking have compounded concerns surrounding the emergence and spread of new forms of resistance that threaten the U.S.
and resistance, which is considered an urgent threat by CDC. An inability to effectively screen for these bacteria may result in patients being prescribed the incorrect antibiotics or dosage, which can either lead to under-treatment or over-treatment.

A reliance on international, just-in-time supply chains for testing materials can indicate a gap in capability to respond to other pandemics or biological threats. The ability to quickly identify threats and track infected populations is a key aspect of mitigating the impacts of these threats and hazards and disruptions to the supply chains that produce critical testing materials, which may indicate the potential for future shortfalls in screening and testing.

Medical Supply Disruptions

One of the most widespread challenges faced during COVID-19 was the limited availability of critical PPE and supplies. Just-in-time supply chain industry standards proved ineffective in handling the surge in need for PPE and shortages led vendors to significantly increase prices early in the Nation’s response. HHS officials also noted that misunderstandings surrounding the purpose of the Strategic National Stockpile, inadequate state medical supply stockpiles, and competition between states seeking resources served to exacerbate resource shortages across the country. In September 2020, the GAO reported that ongoing constraints with the availability of certain types of PPE and testing supplies remained due to a supply chain with limited domestic production and high global demand, exposing vulnerabilities to future pandemic and biological threats and hazards.

In response to medical equipment shortages, the Federal Government leveraged the DPA to increase the production of critical medical equipment including testing supplies and PPE. To address shortages of ventilators and other critical medical equipment, the Coronavirus Aid, Relief, and Economic Security (CARES) Act provided the FDA with authority to help prevent or mitigate medical device shortages during, or prior to, a public health emergency. Leveraging these authorities enabled the Federal Government to exercise and enhance capabilities to meet incident needs in response to widespread shortfalls. In addition, Small Business Administration (SBA) staff utilized small business domestic suppliers and distribution firms throughout the country for PPE and medical equipment to attempt to bridge the gap in the supply chain.

The impacts of COVID-19 were exacerbated by ongoing gaps in both the global medical supply chain and in the Nation’s ability to produce critical medical supplies domestically, resulting in persistent concerns about the availability of PPE throughout the pandemic. Relying on foreign sourcing for raw materials and active pharmaceutical ingredients can leave the U.S. vulnerable to supply chain disruptions. Distribution challenges also emerged as a result of national restrictions on exports, shipping container shortages, cold chain capacity for vaccines, and challenges with getting existing inventory where it is most needed.

Supplying Food, Water, and Critical Goods

The COVID-19 pandemic also served as a reminder that every community in the United States relies on an extensive supply chain for critical goods like water, food, and household

SUPPLY CHAIN SHORTAGES AFTER HURRICANE MARIA

U.S. hospitals faced widespread shortages of IV saline bags in the wake of Hurricane Maria which damaged and temporarily shut factories responsible for manufacturing a significant portion of the Nation’s supply. The shortage was exacerbated by an increased demand as a result of a worse-than-typical flu season and exposed the cascading vulnerabilities related to reliance on one or few supply chains for critical medical equipment.
supplies. As the pandemic resulted in multiple national lockdowns, raw materials and completed goods experienced delays in exports that ultimately reduced manufacturing capability. As communities began to implement lockdowns and other public health measures, the population shifted from “food away from home” typically consumed at schools, restaurants and work, to food consumed at home. Protective measures at distribution centers and along interstate routes also served to hamper routine truck deliveries to grocery stores. These conditions, along with consumer panic buying, further complicated an already difficult situation.

Although supply chains were eventually able to meet demands and grocery stores were restocked, the vulnerabilities exposed during the initial responses to COVID-19 are indicative of the potential impacts of other catastrophic disasters that could significantly degrade or destroy transportation and logistics infrastructure such as earthquakes. A reliance on supply chains is even more critical for rural communities where disruptions could mean significant impacts on food and good availability due to the remote or inaccessible nature of their locations.

FOOD INSECURITY IN ALASKA

Alaska, in particular, is at risk of significant impacts due to disruptions in the food supply chain. A 2014 report estimates that 95% of the $2 billion of food Alaskans purchase is imported through long supply chains from Mexico, Europe, Asia, and the lower 48 states. Delays or disruptions to global supply chains can mean that Alaskans do not have access to food and household goods if infrastructure is impacted; Alaskans may also feel the impact if there is higher demand in states or countries that export goods to Alaska that either reduces the availability of exports or increases the price to a level that is inaccessible.

The Alaska Division of Agriculture is working to provide micro-grants for food security. Through these grants, Alaskan authorities hope to encourage individuals and organizations to identify innovative ways to improve Alaska’s food security. Funding will be prioritized for projects that will increase local food production and storage, or education efforts to support local home-growing.
PUBLIC HEALTH AND HEALTHCARE SYSTEM CAPACITY

The impact of COVID-19 on medical care represents the cascading effect that public health risks can have on other capabilities and that can in turn increase the possibility of catastrophic consequences. The high transmissibility of COVID-19, increased susceptibility of some populations to the health risks caused by the virus, and gaps in screening capabilities and public messaging resulted in significant peaks in positive cases which overwhelmed local hospitals and required local public health providers to rely on state, regional, and federal support. In a National Institutes of Health (NIH) study of 558 U.S. hospitals from March to August 2020, nearly one in four COVID-19 deaths (23.2%) was potentially attributable to hospitals strained by surging caseloads. Future catastrophic disasters could similarly stress the Nation’s public health and healthcare system capabilities while a regionally focused incident, or one with greater impact, could risk overwhelming them.

Planning

One of the key gaps in pandemic preparedness was the lack of a sufficient pandemic plan that addressed a nationwide incident and accounted for interagency operations, resource shortages, and an integrated federal approach to supporting SLTT partners. Federal plans did not envision FEMA leading the federal response during a pandemic and neither FEMA nor HHS understood the domestic supply chain at the beginning of the response. Federal preparedness efforts did not adequately anticipate the magnitude of the national response to the COVID-19 pandemic, including resource shortages. Pandemic plans at FEMA assumed the Agency would be supporting HHS efforts during a public health response based on the Pandemic and All-Hazards Preparedness Act, which authorizes the HHS Secretary to lead all federal
PARTNERING TO REDUCE STRESS IN MEDICAL CARE PROVIDERS

In April 2020, the mayor of New York City announced a partnership with DOD to provide mental health services to healthcare workers and first responders on the frontlines of the COVID-19 pandemic in the city. The program tailors elements of DOD’s combat stress management and resilience program for military personnel to individuals that faced long shifts, significant personal risk, limited PPE, and significant caseloads during the initial peak of infections in March and April 2020.

Public health and medical response to public health emergencies and incidents covered by the National Response Framework (NRF) and PPD 44, which designated HHS as the lead for infectious disease outbreaks.

**Staffing**

Significant strain on healthcare organization staffing is a major challenge for COVID-19 response and represents a risk for future disasters. During COVID-19, congregate facilities in many communities such as long-term care facilities, homeless shelters, and group homes, experienced staffing shortages as well that required supplemental personnel to assist with patient care and other related tasks.

States grappling with significant spikes in cases turned to traveling nurses as a key resource in meeting healthcare needs during the pandemic. States altered licensing processes to allow for travel nurses to receive positive adjudication of.

PREVENTING DISCRIMINATION IN CRISIS CARE

Crisis standards of care may be necessary in severe public health emergencies. Crisis standards of care, or protocols for altered standards of care, should be planned and implemented in non-discriminatory ways.

In particular, resource allocations based on individual assessments and prognostic scoring systems may not adequately score individuals with disabilities, leading to adverse medical decisions for patients with disabilities. In other cases, reduced staffing during crisis care may negatively impact individuals that require direct support from hospital or long-term care home staff.

At the beginning of the COVID-19 public health emergency, the HHS Office for Civil Rights clarified that civil rights laws remained in effect during disasters or emergencies and provided best practices for ensuring non-discrimination in crisis standards of care.

As a best practice, stakeholders should carefully plan for crisis standards of care, including medical resource limitations, in advance of disasters or during steady-state times. Stakeholders include populations at risk of discrimination, and medical, emergency management, and civil rights protections experts. Plans should include provisions that ensure that if crisis standards of care are necessary, they are not implemented in discriminatory ways. Clinicians should be trained in principles of crisis standards of care.

* "Crisis standards of care" is defined as “a substantial change in usual healthcare operations and the level of care it is possible to deliver, which is made necessary by a pervasive (e.g., pandemic influenza) or catastrophic (e.g., earthquake, hurricane) disaster.” Reference: Institute of Medicine (US) Forum on Medical and Public Health Preparedness for Catastrophic Events. Crisis Standards of Care: Summary of a Workshop Series. Washington (DC): National Academies Press (US); 2010. Related IOM Work on Crisis Standards of Care. Available from: https://www.ncbi.nlm.nih.gov/books/NBK33749/
licensing requests more quickly. CDC also updated recommendations to include strategies to mitigate healthcare personnel shortages by reducing the duration of quarantining procedures following exposure. The FCC also adopted the $200 million COVID-19 Telehealth Program on April 2, 2020. The COVID-19 Telehealth Program was established by the Commission in response to the public health emergency brought about by the COVID-19 pandemic. Through this program the Commission distributed the $200 million Congress appropriated under the CARES Act to help health care providers provide telehealth services to patients at their homes or mobile locations in response to the COVID-19 pandemic.

COVID-19 highlighted the risks and difficulties that medical care providers face while responding to disasters, including fatigue, mental wellness, and verbal and physical attacks on clinicians by patients and family members. CDC, HHS’s Office of the Assistant Secretary for Preparedness and Response (ASPR), and the Substance Abuse and Mental Health Services Administration had previously released guidance for first responders and other medical professionals to identify sources and impacts of stress as well as measures and practices for stress reduction. Prolonged, or particularly difficult disasters, can have negative impacts on public health and medical care personnel, which may reduce capability if individuals choose to leave the service as a result. The HHS Division of Community Mitigation and Recovery’s Behavioral Health Program provides tailored educational activities to meet workforce needs. The program developed and adapted virtual webinar and training curricula to enhance their target audience’s understanding of stressors during COVID-19, as well as adverse stress conditions and evidence informed coping and mitigation strategies for individuals, organizations, and leadership across sectors. The Behavioral Health Program has supported resiliency and wellbeing within various workforce groups, including healthcare, first responders, emergency managers, public health, behavioral health providers, and SLTT workers.

**Hospital Capacity and Equipment**

COVID-19 also exposed the strain that multiple incidents can have on medical care capabilities. In response to overwhelmed medical facilities, some communities implemented updates to cardiac arrest protocols and other protocols for emergency services transporting patients. Surges of patients rapidly exceeding capacity and/or capability of EMS and/or hospitals required healthcare providers to implement crisis care, with or without the support of their organizations or jurisdictions. In Los Angeles, emergency medical technicians (EMT) were instructed not to bring people with little chance of survival to hospitals, where waits to drop off patients reached up to eight hours at some points, and to conserve oxygen in the field among shortages. The New York State Department of Health also released updated triage protocols to reduce the number of non-critical patients transported to hospitals. EMTs and hospital healthcare providers repeatedly indicated their most important concern in the pandemic’s response was adequate PPE which was in many instances unavailable for long periods of time.

One study found that hospital admissions among older adults increases after a disaster, which can stress already taxed hospital and public health capacity. Another study found that patients admitted to a hospital during a mass casualty incident were more likely to have a longer length of stay and higher charges—regardless if they were admitted for incident-related issues or unrelated illnesses—than individuals who were hospitalized outside of mass casualty incidents.

The experience from COVID-19 demonstrates how one catastrophic incident or multiple, concurrent incidents could each have the potential to overwhelm local hospital systems and inhibit lifesaving services. During disasters that result in higher numbers of individuals requiring medical care or where individuals requiring care are highly concentrated in a small area, local hospital capacity may be overwhelmed and require mutual aid or federal resources to meet demand. In other instances, a series of smaller incidents all requiring medical care capabilities could overwhelm local capability, particularly if they are focused in a small geographic area. In cases where capacity is exceeded, communities may be able to transport injured survivors to nearby communities or states for additional support, but even this capability may be inhibited if a catastrophic disaster results in significant impacts to transportation infrastructure limiting access to neighboring communities.
Federal Surge Capacity

Federal resources were key to supporting SLTTs in responding to the COVID-19 pandemic. In particular, local communities relied on federally funded National Guard members to help mitigate staffing shortages; distribute meals, PPE and equipment; staff testing and screening centers; and contribute to the vaccination effort in the majority of states and territories, as necessary. In addition, CDC’s Global Rapid Response Team (GRRT), composed of multidisciplinary CDC public health experts ready to deploy on short notice, pivoted their global focus to support the domestic COVID-19 response. The GRRT deployed over 476 staff in 2020-2021. These GRRT team members supported 49 states, tribal, local, and international health departments, as well as the CDC’s emergency operations center. In total, they contributed a total of 54,382 person-days of support to the response over that period. The U.S. Public Health Service Commissioned Corps deployed to help control the spread of COVID-19 and traveled with evacuees to provide medical care. At FEMA’s request, DOD deployed two Navy medical hospital ships to New York City and Los Angeles, mainly providing care for non-COVID infected patients, and freeing up capacity for infectious disease treatment at local hospitals. Also at the request of the Federal Government, the U.S. Army Corps of Engineers (USACE) organized the construction of alternative care facilities in areas where cases threatened to overwhelm local hospital capacity, although staffing and equipment shortfalls at the facilities ultimately reduced their capacity for medical care. Following initial coordination challenges, FEMA implemented new policies to ensure adequate staffing and equipment plans were in place ahead of construction.

An over-reliance on federal surge capacity to respond to disasters could ultimately contribute to capability gaps in the long term. The emergency management community, for instance, relies heavily on DOD resources in response and recovery operations during and after disasters. If facing multiple threats at home and abroad, DOD could be challenged to simultaneously manage its defense missions and its support to federal authorities for domestic emergency management operations, specifically in the areas of production, supply, and distribution of critical resources. Increased requirements on the federal surge capacity could contribute to further strain on community-level resources and capabilities and could risk overwhelming public health and health care capacity.

Vaccine Development

On May 15, 2020, the White House announced the appointment of the chief advisor and chief operating officers for Operation Warp Speed, a public–private partnership initiated by the U.S. government to facilitate and accelerate the development, manufacturing, and distribution of COVID-19 vaccines, therapeutics, and diagnostics. Federal funding through Operation Warp Speed enabled private sector partners to begin development with new technologies, opening the door to more efficient vaccine development in the future.

Operation Warp Speed allowed HHS, CDC, and DOD to expedite the development of a vaccine against COVID-19 through funding, infrastructure building, and the pre-purchase of vaccines prior to development and distribution. HHS’s funding enabled private sector companies to significantly reduce the risks associated with vaccine development (e.g., loss of funding and resources or failures in development). Funding from the Federal Government also enabled companies to explore new technologies for developing vaccines, which may shorten vaccine timelines in the future, further building national capabilities against future risks.

VACCINATION DISTRIBUTION PREPAREDNESS

To help SLTTs prepare for the vaccine rollout, FEMA’s National Exercise Division supported multiple regional mass vaccination exercises in 2020. Topics of focus included integrating federal and SLTT decision-making; managing the complex logistics of storing and distributing vaccine resources; and public messaging to effectively communicate with target populations.
The COVID-19 pandemic shed light on the difficult nature of spreading accurate and critical messaging during a disaster. Although past disasters have required focused messaging to smaller portions of the population, the nationwide impact of COVID-19 required that information be shared with a much larger population.

COVID-19 highlighted information delivery shortfalls that occurred as a result of both emerging and systemic vulnerabilities. The emerging and novel nature of COVID-19 hindered SLTT and Federal Government efforts in providing clear, consistent, accessible, and accurate information from the beginning. The lack of clear information allowed for misinformation and disinformation to thrive and was compounded by the systemic risk that widespread social media creates when misinformation and disinformation are easily and rapidly shared amongst thousands of users.

Although most incidents require quick and accurate messaging to smaller populations, the COVID-19 pandemic required public health officials and community leaders to face an unprecedented challenge: communicate and update often-changing information to a Nation of 330 million people. If measures are not
Although the quick dissemination of information to the general public during incidents is critically important, emergency managers should also strive to ensure that information is available and accessible for people with disabilities as well as people with other access and functional needs (AFN) in the same manner and timeframe as for the rest of the public. Although the White House Coronavirus Task Force conducted daily briefings to share information and spread awareness of public health measures, its official dissemination of COVID-19 information was not always geared toward vulnerable populations and faced delays:

- The White House released guidance on avoiding large gatherings, canceling discretionary travel, and recommending that schools be closed on March 16, 2020, but did not release a Spanish-translation of the guidelines until three days later.
- A federal judge ruled that an ASL interpreter was required during all live coronavirus briefings at the White House beginning on October 1, 2020. This represented the first time that an interpreter provided ASL interpretation during a live televised White House press briefing.

Tribes are supported by the Indian Health Service, which faced challenges in disseminating information to both rural and urban populations and addressing the needs of American Indians and Alaska Natives living on reservations and other Tribal areas.

Having coordinated approaches to information sharing is integral to effective incident management and ensuring public safety for any threat or hazard. Especially during the response phase when time is limited, it is critical to have as unified an effort as possible between relevant agencies and organizations. The issues with information delivery during COVID-19 highlight a lack of capability that would negatively impact response efforts for any significant incident. Regardless of the threat or hazard, the public and emergency managers will rely on clear messaging to navigate their communities and avoid further harm.

**Message Development**

Shortfalls in data collection ultimately impacted the Nation’s ability to develop effective messaging early on in the pandemic. Due to the emerging nature of the virus, public health messages were frequently changing based on updates to guidance.
as a result of new information. The pandemic also changed how people communicate. Virtual meetings replaced in-person meetings. Although the shift to virtual communication was swift, it was challenging, at first, for the Nation’s emergency managers to ensure that public health messaging was adequately accessible for everyone, including people with disabilities and AFN. When teleconferencing became the primary method of work communication, some jurisdictions faced challenges in providing sign language interpreters or communication access real time translation, which provides instantaneous captions. As remote and hybrid work environments persist, government and business processes should continue to be refined for the provision of accessible communication options for virtual and other meetings.

In April 2020, as additional information about the virus and the prevalence of asymptomatic patients became clearer with time, CDC and public health officials released updated guidance advising the public to wear cloth masks in public spaces. Although some states immediately implemented mask mandates, inconsistent implementation of CDC guidelines across communities hampered the Nation’s ability to present a unified public safety message. At the peak, 33 state governments implemented mask mandates, although restrictions varied across states.

The challenges that agencies faced in developing and crafting messages highlights a critical aspect of emerging threats and hazards that hinder national capability. Community support and mental health and crisis counseling may not be accessible to people with disabilities or available to those with limited English proficiency and may place them at a higher risk of other adverse outcomes. During incidents where impacts are unknown or unexpected, communities may be challenged to develop effective messages from the beginning in order to provide critical information and ultimately reduce the likelihood of false information. Throughout the pandemic, false and misleading information has exploded across mainstream and social media outlets. Inaccurate information about the source of the virus, the severity of the virus’ impact, and public health measures thrived.

**Message Delivery**

Communications challenges existed before COVID-19 but have become more prevalent due to the increased need to disseminate information across large populations. Changing and sometimes conflicting public messaging and professional guidance created issues with compliance, consistency, and comprehension. The large and diverse number of entities involved, and differing topics of information, has led to confusion about communication and duplication of outreach efforts, workshops, meetings, and other communications despite the significant support and resources available to share information. To overcome messaging challenges, emergency managers and community leaders leveraged a combination of Wireless Emergency Alert and Emergency Alert System notifications and localized notification systems to provide the public within specific service areas information pertaining to COVID-19 mitigation policies and availability of PPE and vaccines.

Additionally, due to its widespread use by the public, emergency managers and private sector companies have effectively used social media to provide critical information during disasters,
including disaster-specific information on
sheltering, infrastructure damage, and estimated
timeframes for service restoration. However,
relying on social media as a message delivery
platform can result in challenges to properly
delivering messages to the entire population,
especially to individuals without access to power
sources or internet due to incident impacts. As
such, social media should only be used as one of
many avenues for delivering public warnings and
messages as impacted populations may not have
access to power sources, the internet, or may not
have social media accounts and would rely on
alternate forms of communication.

During COVID-19, emergency managers and
public health organizations have turned to
social media to spread accurate information
about the virus. CDC developed ready-made,
easy-to-use captions, sample messages, and
infographics that users could copy and post on
their Facebook, Instagram, or Twitter accounts.
Topics for these digital resources ranged from
encouraging individuals to stay home or measure
the risk in their everyday activities, to mask
wearing, and countering inaccuracies surrounding
the COVID-19 vaccines (Figure 8). Research
suggests that the use of social media platforms
can positively influence awareness of public
health behavioral changes and public protection
against threats such as COVID-19. Public health
authorities may use social media platforms as an
effective tool to increase public health awareness
through dissemination of brief messages to
targeted populations. The ability to target
messages to specific populations may enhance
messaging capabilities during an incident, with
communities able to focus specific messages on
specific subsets of the population, as required.

Although targeted messaging through social
media provides emergency managers with
an avenue for focused messaging, there are
systemic risks surrounding misinformation
and disinformation, as noted in the 2020 NPR.
Spreading accurate information across social
media can be more difficult than spreading false
information, as evidenced during COVID-19.

Research suggests that misinformation spreads
more rapidly on social media and is more likely to
earn a retweet than verified news. A study found
that areas of the country with greater exposure
to television programming that downplayed the
severity of COVID-19 early in the pandemic saw
greater numbers of cases and deaths as portions
of the population failed to follow public health
guidelines. The distortion of facts may inhibit
public health measures; a lack of confidence in
vaccines—as evidenced by significant vaccine
hesitancy—and failure to adhere to social
distancing and mask mandates are likely to cause
more infections and deaths over time.

During an emergency, emergency managers, first
responders, and impacted populations all rely
on accurate, accessible, and timely information
to inform operations and next steps, such as
sheltering and evacuation routes. With the
spread of misinformation and disinformation
or distrust in official sources of information,
emergency managers may fail to distribute life-
and property-saving information to affected
populations and survivors may choose not to
adhere to emergency messages or measures.
As such, emergency managers should strive to
counter existing information delivery challenges

![Figure 8: Example of a CDC-developed digital resource to
counter misinformation surrounding COVID-19
vaccines. Source: CDC, Social Media Toolkit: COVID-19
Vaccinations, https://www.cdc.gov/coronavirus/2019-
n cov/communication/vaccination-toolkit.html]
through the development of clear, coordinated communications from all authoritative accounts and sources.

**Policy as Messaging**

SLTTs across the Nation have been forced to coordinate and weigh the risks of the virus and impacts to the economy. In many cases, such tradeoffs introduced conundrums where schools were closed for in-person learning, but restaurants and bars were allowed to continue serving patrons, generally with strict masking and occupancy requirements.

In place of a concrete and unified national message, policy decisions from state and local leadership function as roadmaps for what is and is not a risk for spreading the virus. In particular, areas where policies were inconsistently applied (e.g., one community enforced stricter closures or restrictions than neighboring jurisdictions did), individuals traveled to areas with fewer restrictions to access venues like churches, parks, and gyms. In some areas, the movement of people from areas with stricter mandates and higher incidences of cases to areas with fewer mandates preceded an increase in cases in the neighboring community.

As the circumstances of disasters change, officials must provide timely and consistent updates and messaging. Inconsistent policy and messaging from federal, state, and local officials and public health organizations contributes to overall reduced efficacy of public health measures. The lack of coordinated messaging across all levels of government in response to COVID-19 may also indicate the vulnerabilities of public messaging infrastructure and coordination against future risks, particularly those that impact populations nationwide. The limited coordination in response to COVID-19 highlighted the impact that ineffective information delivery can have on public health measures and how it may ultimately result in greater strain on other capabilities. Ineffective approaches to public health messaging remain a critical vulnerability.
BODY RECOVERY/STORAGE

National Capability Achievement
National Capability: Will struggle to manage with current capabilities.

| Percent of Communities reporting POETE Gaps |
|------------------|---|
| Planning         | 70% |
| Organization     | 69% |
| Equipment        | 76% |
| Training         | 66% |
| Exercises        | 63% |

Current Capabilities Relative to Community Goals

<table>
<thead>
<tr>
<th>Planning</th>
<th>19%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization</td>
<td>30%</td>
</tr>
<tr>
<td>Equipment</td>
<td>51%</td>
</tr>
</tbody>
</table>

Percent of Communities
- 0-29% Target Achieved
- 30-69% Target Achieved
- 70-100% Target Achieved

BODY RECOVERY/STORAGE

The COVID-19 pandemic has placed an unprecedented strain on fatality management capabilities across the Nation. Although COVID-19 resulted in more than 342,000 fatalities in the United States in 2020 alone, communities, with the help of mutual aid and federal resources, have continued to effectively store and manage fatalities throughout the pandemic. Many of the most catastrophic risks the Federal Government considers, however, are likely to result in significantly higher capability needs over shorter periods of time and may overwhelm local capabilities.

Planning

One of the most significant shortfalls associated with fatality management during COVID-19 was the lack of planning. The Pandemic Influenza Plan (Update IV from December 2017) did not include any references to or recommendations for fatality management services, despite describing scenarios where deaths can reach up to two million. Without effective planning in place at all levels, community capability to manage fatalities is much more likely to be overwhelmed in this scenario despite effectively managing the impacts of COVID-19.

In particular, COVID-19 created cascading problems for fatality management because
of unexpected deaths, concurrent illness and mortalities, reduced capacity due to public health measures, and the lack of resources. COVID-19 stressed fatality management operations to new extremes; there was a large volume of analytics available to emergency managers about hospital bed capacity but not morgue capacity; a lack of national guidance for mortuary/morgue operators and funeral home staff during a biological incident; and an overarching challenge to provide death investigators with PPE, causing a buildup of decedents at funeral homes and coroner’s offices.

**Geographic Spread**

A key aspect of the successes associated with fatality management during COVID-19 is the fluctuations in geographic peaks. During initial response efforts, the exceeding demand on funeral homes to retrieve fatalities from hospitals was compounded by reductions in the available personnel at cemeteries and crematoriums. As initial peaks in cases and fatalities dropped, and shelter-in-place orders were reduced, fatality management services were reestablished. The variations in impacts allow capabilities to be spread more effectively, enabling communities to recover from shorter peaks more effectively than they may have from longer, more drawn-out incidents. In contrast, during incidents with catastrophic impacts focused in a small area or single region (such as an earthquake) communities may face challenges in coordinating fatality management resources, particularly when incident impacts limit suitable transportation routes and reduce the availability of shared resources.

**Federal Surge Capacity**

Communities relied on deployed federal resources (e.g., Disaster Mortuary Operational Response Teams, mobile morgues, and refrigerated trucks) to meet capability needs early in the COVID-19 pandemic. During peak times of infections and hospitalizations, when the significant number of fatalities exceeded traditional hospital and morgue capacity, hospitals relied on federal capability to properly store fatalities until hospital or morgue staff were able to manage them effectively.

Stronger community-level planning and understanding of the underlying socio-economic environments will leave the SLTT response network better poised to respond initially and reduce overreliance on the Federal Government. If communities continue to rely on federal capabilities to manage fatalities, they may be exposing themselves to vulnerabilities for future risks. In instances where fatalities are much higher, concurrent operations reduce federal capability, or catastrophic impacts to infrastructure limit the ability to share and deploy fatality management capabilities, communities may find their capacity to store and manage fatalities overwhelmed.
The response and recovery from COVID-19 will be the largest relief assistance program in American history to date. During the latter half of 2020 the economy recovered some of what was lost during the initial drop in economic activity at the outset of the pandemic, but uncertainties surrounding variants and future risks highlight the need for increased economic resilience.

In response to long-term incidents such as pandemics, the economy works to recover losses while simultaneously building resiliency to future shocks. The Federal Government implemented several solutions to help support recovery and resilience in the face of COVID-19. Such quick-turn actions like these can be leveraged in the face of future national economic instability resulting from catastrophic disasters.
Quick-Turn Economic Policy

Economic resilience during the COVID-19 pandemic was characterized by quick-turn economic policymaking and policy changes that gave individuals, businesses, and communities the opportunity to counter the effects of the pandemic.

Through legislation passed in 2020, including the CARES Act and the Families First Coronavirus Response Act (FFCRA), Congress introduced programs to prevent interruptions to social safety nets and expanded programs to reduce the adverse economic effects of the COVID-19 pandemic. These acts represented a rapid legislative solution to the dramatic global reduction in economic activity that occurred because of necessary social distancing and other public health measures. The CARES Act was, as of December 2020, the largest supplemental appropriation in American history, providing approximately $2.08 trillion in funding to medical care and research, vaccine and therapeutic development, rental assistance programs, expanded unemployment benefits, tax credits, SLTT grants, and business loans. Under the FFCRA, more than 60 million Americans became eligible for paid sick leave and expanded family and medical leave benefits. Together, these acts and other relief packages helped to address the three main components of economic recovery: capital access, which includes the ability to pay employees; employee availability; and customers initiating transactions. Programs established through the relief packages mitigated some of the barriers to these components. The Paycheck Protection Program, established by the CARES Act and implemented by the SBA, provided small businesses with funds to pay employees up to eight weeks of payroll and benefits. According to BLS, only 23 percent of private sector workers in the United States have access to paid family leave. The FFCRA, through a program administered by the U.S. Department of Labor, provided paid leave for specified reasons related to COVID-19 to eligible employees working for covered employers. The CARES Act and the American Rescue Plan Act provided extended unemployment compensation, and the CARES Act and American Recovery Plan Act provided economic impact payments to eligible Americans.

ASSESSING ECONOMIC IMPACTS AND SOLUTIONS

The Federal Government offers the following resources to help assess how disasters may impact different areas of the country and how resources can be allocated and implemented:

- **County Economic Impact Index**: Goal is to identify regions whose local economies may be more adversely affected during medium to long-term disruptions with near real-time data.
- **County High-Level Economic Recovery and Resilience Index**: Provides an assessment tool to assist in recovery planning and resource allocation decision-making.
- **CDC/ATSDR Social Vulnerability Index**: Uses 15 U.S. census variables to help local officials identify communities that may need support before, during, or after disasters.
- **U.S. Census Bureau Community Resilience Estimates**: Provides estimates to help local planners, policy makers, public health officials, and community stakeholders assess the potential resiliency of communities and plan mitigation strategies.
- **U.S. Census Bureau OnTheMap for Emergency Management**: Provides U.S. population and workforce statistics, in real time, for areas being affected by natural disasters.
Locally, officials have also worked to update economic policies to allow for stronger resilience in the face of COVID-19 impacts. Cities, including New York, turned streets into pedestrian walkways and seating areas for restaurants to accommodate outdoor seating requirements. Multiple states loosened alcohol laws in order for bars and restaurants to generate more income while indoor dining was restricted. For low-to-middle-income customers, financial stress from the pandemic led to a higher frequency and longer duration of energy bill nonpayment. Governors and state utility regulatory commissions instituted statewide moratoriums on utility disconnections and some SLTT officials have taken further measures to reduce the financial burden of utility bills.

Quick-turn policies like those passed in response to COVID-19 represent one way that rapid responses to changing economic conditions likely prevented more costly and persistent cascading consequences.

**INFORMING NEXT STEPS**

Evaluating community capability helps the Federal Government assess how prepared and how resilient the Nation is to respond to and recover from all threats and hazards. While the COVID-19 pandemic placed an unprecedented strain on community and national capabilities, the Nation also had to respond to other disasters throughout the year, emphasizing the importance of an all-hazards, “capabilities-based planning” approach to emergency management.

In each of the six areas of capability most impacted by the pandemic (i.e., Screening Operations, Logistics and Supply Chain Management, Medical Care, Information Delivery, Body Recovery/Storage, and Economic Recovery), there have been demonstrable gaps in capability identified through the COVID-19 response. Due to the interdependency of all capabilities, the observed capability gaps from this real-world incident provide an opportunity for the Nation to validate and update its understanding of how best to manage those risks posed by all threats and hazards. Considering the identified strengths and shortfalls in capability over the past year, the Nation has an opportunity to apply lessons learned in a strategic, data-driven way. The next section presents potential opportunities informed by this analysis for the federal interagency and the Nation to improve preparedness overall.
MANAGEMENT OPPORTUNITIES

This section focuses on management opportunities that the Federal Government, SLTTs, and the private sector could use to build capability and address capacity gaps. Exactly how these can be achieved and who could take ownership of each strategy will differ across all levels of government, NGOs, and the private sector. These are not prescriptive mandates and are instead meant to spark ideas and inform interested parties of potential paths forward.

DEVELOP A PREPAREDNESS INVESTMENT STRATEGY

A preparedness investment strategy would build on the management opportunities outlined in this section. This is not a new idea for FEMA; the statutory justification for a preparedness investment strategy comes largely from two documents: PKEMRA and the DRRA. Section 652 “Reporting Requirements” in PKEMRA identifies the requirement to “submit [annually to Congress] an estimate of the resources of the Agency and other Federal agencies needed for and devoted specifically to developing the capabilities of Federal, State, and local governments necessary to respond to a catastrophic incident,” which FEMA addresses annually as part of the NPR. Section 1242 of the DRRA created a stronger foundation for this idea by introducing the following two requirements:

1. Complete a national preparedness assessment of capability gaps at each level based on tiered, capability-specific performance objectives to enable prioritization of grant funding; and
2. Identify the potential costs for establishing and maintaining those capabilities at each level and determine what capabilities Federal agencies should provide.

In May 2020, the GAO issued a recommendation echoing this sentiment, stating that “FEMA should, following the completion of the 2021 National Preparedness Report, determine what steps are needed to address the Nation’s emergency management capability gaps across all levels of government and inform key stakeholders, such as the Office of Management and Budget and Congress, about what level of resources will be necessary to address the known gaps.” In the same way that FEMA’s NRCA laid the groundwork for understanding the Nation’s capability gaps, a strategy must be developed to bridge that understanding with the actual methods and cost of closing the Nation’s capability gaps. This methodology is consistent with the first three parts of the National Preparedness System (NPS) cycle by first identifying risk, evaluating the requirements and costs, and then executing to build the capabilities necessary. This strategy would outline a potential path forward for tactically targeting investments to close capability gaps and meet the DRRA requirements.

**Management Opportunity 1.1**: Clarify roles and responsibilities for maintaining capabilities and closing capability gaps.

**Management Opportunity 1.2**: Establish priorities that align resources—budgetary and grants—to capability gaps and determine how investments can be translated to improve outcomes through maturing capabilities.

**Management Opportunity 1.3**: Identify opportunities to partner with private sector and non-profit organizations and integrate them into preparedness and response structures to enhance capabilities.
Management Opportunity 1.1: Clarify roles and responsibilities for maintaining capabilities and closing capability gaps.

Building national capability is extremely complicated because capabilities are largely decentralized among individuals, local communities, the private and nonprofit sectors, states, and the Federal Government. However, in guidance outlined in the NRF describing the way the Nation leverages its capabilities for disasters, FEMA supports response operations that are “locally executed, state managed, and federally supported.” This structure suggests that each level of government can contribute to filling the capability gaps below it. To ensure this response structure is manageable, all entities must build capability in a coordinated way. This includes building to manage collective risk, building capability at the level where it is most useful, and strategically building redundancy for capabilities. One mechanism that emergency managers at all levels should use to achieve this is the National Qualification System (NQS), which provides foundational guidelines on the qualification of personnel resources within the National Incident Management System (NIMS).

Many organizations and jurisdictions have established processes for qualifying, certifying, and credentialing deployable incident personnel. However, there are still gaps and inconsistencies in certain disciplines and mission areas. The NQS supports the National Preparedness Goal by creating a network of qualified personnel for potential nationwide deployment. The NQS is designed to help fill gaps and bring the varying qualifications programs into some alignment. It provides the tools for jurisdictions and organizations to implement their own qualification and certification process by establishing common terminology and processes. These enable jurisdictions and organizations to communicate planning needs and exchange information with one voice, and to have a common understanding of the qualifications for defined positions. By incorporating the guidance of the NQS, organizations will know specifically how to ask for the personnel they need during disasters—as well as what they are getting in return—and can ensure they deploy personnel who have the qualifications needed for the job.

The National Urban Search & Rescue (US&R) Response System is an example of a capability that is transferable between different levels of government. Established under FEMA in 1989, US&R is a framework for organizing federal, state, and local partner emergency response teams as integrated federal disaster response task forces. Nineteen states have NIMS Type 1 US&R task forces, which can both support their respective state and local governments after an incident, or deploy nationally and internationally if an incident’s impacts exceed SLTT capabilities and the impacted community, state, or government officially requests outside help. Although this construct presents a clear picture for how all levels of governments can work together to build and maintain capabilities, the reality of how capabilities are developed and used often differs. This is partly because every state and community has varying levels of capability and there is not a clear cutoff or level of control in any one core capability. This creates a challenge when identifying resources necessary to build the capability or clear command and control of responsibility for components of a capability.

Another example of a resource to help identify capability gaps is the Nationwide Communications Baseline Assessment. Directed by statute, the CISA is required to assess the current state of federal, state, local, and tribal governments public safety emergency communications capabilities every five years. The results provide a national and statistically valid snapshot of public safety agencies’ emergency communications capabilities and their current use, and to identify gaps that remain for interoperability to be achieved. The results of the assessment inform the goals and objectives of the National Emergency Communications Plan.

One example of the challenges surrounding the development of capabilities is post-disaster housing. Based on data last collected in 2017, a majority of communities identified housing as primarily a federal responsibility. To try to fill housing gaps, the Federal Government has provided housing, including modular and temporary housing, for multiple incidents. This solution is insufficient, expensive, and
unsatisfying to survivors, who would rather have more sustainable accommodations. In this example, communities are better positioned to sustain a steady-state housing capability than the Federal Government. More information on why communities report housing as a primarily federal responsibility when they may be better positioned to manage this capability can be found in the Housing section of the 2020 NPR. An assessment of SPR data indicates that communities may be unsure of how to build housing capability in the long term.

Although states and communities may not have the resources to build housing to accommodate either steady-state or post-incident needs, states and communities do establish the zoning and property laws that incentivize or disincentivize new construction. The Federal Government is also limited in investing in new public housing capabilities because of the Faircloth Amendment, which limits the number of federally supported public housing units to a level established in October 1999. Housing is a great example of a capability being owned by different stakeholders that hold differing parts of the solution but would require all three actors to work together for a solution (e.g., federal investment or incentives for housing expansion along with changing zoning laws to accommodate meeting local housing demands). Creating a housing stock that accommodates community needs was exemplified in Houston, Texas during Hurricane Harvey. In the 2020 NPR, Houston was highlighted as a success story because it had affordable and available housing to meet post-disaster demands.

As SPR data suggest, communities may need guidance on how to build capability and resources to support investments in areas with the largest gaps, such as housing. Policymakers must clarify roles and responsibilities for closing capability gaps, including how best to balance responsibilities for funding those efforts. To address these challenges, the focus of an investment strategy should be to:

- Work with whole community partners (federal, SLTT, private, or nonprofit sector) to assess how they should work together to build and maintain capability in a flexible and dynamic manner. This analysis will consider existing capabilities, the utility to the partner, the cost of development and maintenance, and whether the capability can be shared;

- Develop public-facing doctrine containing principles of coordinated capability investment, so that partners understand what resources will be available to them and how they can best support the Nation’s mission to manage its risk. This doctrine should not include capability level requirements because the goal is to improve awareness and communication to better coordinate strategy, not set requirements; and

- Support the implementation of the NQS by developing guidance and tools that will address capability gaps identified in the SPR data and in other assessments.

Clarifying roles and responsibilities is an important first step in the process of addressing capability gaps, because it lays the foundation upon which SLTTs and the Federal Government can establish priorities that align resources to strategically target capability gaps.

Management Opportunity 1.2: Establish priorities that align resources—budgetary and grants—to capability gaps and determine how investments can be translated to improve outcomes through maturing capabilities.

Not all capabilities are equally important and not all risks are managed the same way. The 2020 NPR laid out different critical considerations for different types of risks. Successful investments require the Nation to make hard decisions about which vulnerabilities and capabilities are top priorities for reducing and building.

Trends across recent NPRs (2013–2017) show that communities consistently report the strongest capabilities in the cross-cutting, prevention, and response areas and the lowest in the protection and recovery areas (economic recovery, disaster housing, natural and cultural resources, cybersecurity, supply chain integrity and security). From FY 2013 through 2018, jurisdictions received approximately $8.3 billion in preparedness grants funds primarily from
DEVELOP A PREPAREDNESS INVESTMENT STRATEGY

the SHSP, UASI, and the EMPG. Using multiple grant programs to build all-hazard preparedness can be complex because each grant program has different requirements for use and different costs associated with implementation and oversight. HSHP is specifically authorized in statute for prevention, protection, and response to terrorism whereas EMPG is authorized as an all-hazards grant program in the Stafford Act. For example, HSGP requires funds to be spent on capabilities with a terrorism nexus, regardless of what was identified as the largest capability gap by a community in their THIRA/SPR. HSGP is a valuable primary funding source when examining core capabilities for prevention and protection-funded activities. In SPR Step 3, communities report that EMPG is a larger source of primary funding for building and sustaining capability. This corroborates information gathered from communities that HSGP is more useful for improving prevention and protection capabilities, whereas EMPG helps to bridge the gap for other all-hazard capabilities. The challenge for communities is determining how best to use limited local resources to apply for and manage grant programs that have similar, but not completely overlapping, purposes.

Of the approximately $8.3 billion in preparedness grants funds, jurisdictions directed about $7.3 billion (87%) of the funds to capabilities in the cross-cutting, prevention, and response mission areas. Jurisdictions directed about $1.1 billion, or about 13% of the $8.3 billion, to capabilities in the mitigation, protection, and recovery mission areas. Of this total, jurisdictions directed the least amount of funds to capabilities in the recovery mission area—$78 million, or about 1%. FEMA encourages jurisdictions to invest grant funds to address capability gaps, and jurisdictions are now required to spend some of their HSGP funding on National Priority Areas. The National Priority Areas, however, are specific to terrorism prevention, protection, and response in accordance with HSGP’s authorizing statute. As a result, these priority areas do not cover all aspects of emergency management. This leads communities to assess their prioritization areas for investments based on a combination of specific grant program requirements and the most practical utilization of funds, which may not always align with the areas of greatest need. Part of communities’ calculus may also be driven by the fact that more funds are available to communities in the mitigation, response, and recovery mission areas post-disaster (e.g., in the case of BRIC [mitigation] and Public Assistance [response and recovery], increased funds are tied directly to costs of disasters).

A more consistent approach to grant funding prioritization would be to create performance measures around closing national gaps, determine which vulnerabilities and capabilities are priorities for reducing and building, and institute policies that formally connect prioritized vulnerabilities and gaps to funding, including grants.

The NRCA includes high-level information on the Nation’s gaps, but in order for FEMA to align resources to closing those gaps, that information must be presented in the form of a performance measure. A performance measure is a way of setting a common metric that can identify progress toward an agreed-upon outcome in order to establish the efficacy of a program or policy course of action.

As part of the process to develop an investment strategy, National performance goals should be developed, accounting for capabilities at each level of government. Communities use their THIRA targets as performance goals and SPR reporting to provide information in support of the National goals. Additionally, each level of government should work to understand how those goals interact to build ideal, resilient national capability, and what risk is being accepted across each target. Critically, plans should be developed to manage this accepted risk (i.e., future planning documents should use the areas of accepted risks to identify the challenges and solutions to the disaster mission areas). The goal of this effort is not to be prescriptive to

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xii DRRA authorized FEMA to set aside an additional amount equal to 6% of the estimated disaster grants for each disaster pursuant to sections 403, 406, 407, 408, 410, and 416 of the Stafford Act. This set-aside funds the BRIC program.
SLTT partners, but to coordinate and define the roles that all levels of government would play in providing and supporting the development of capabilities, so that SLTT partners can make more informed risk management decisions.

Finally, processes should be put in place to directly align investments, including grants, in support of identified priorities. All levels of government should review investments against national and local priorities and establish a process to identify the highest priority gaps. Ensuring that adequate funding is available to respond to, recover from, mitigate against, and prepare for human-caused incidents and increasingly severe natural disasters involves a complex relationship across all levels of government: federal, state and territorial, Tribal, and local.

Now is the time to strategically invest in long-term mitigation and resilience strategies to reduce the Nation’s risk exposure during future disasters. Although there is no common answer for all SLTTs, the impacts of COVID-19 and the recovery process could be an opportunity for resilient recovery. SLTTs can make lasting and meaningful investments in a variety of ways such as reducing steady-state inequities; increasing the resilience of national critical functions, supply chains, and critical infrastructure; or bolstering preparedness capabilities to address emerging risks related to climate change and information security.

High-level national gaps, like those identified in the NRCA and in this report, help the Nation understand where to invest resources. However, that information is not granular enough to explain how communities can efficiently close gaps. For example, some communities can only describe their general gaps in sheltering. The end goal for these communities is to be able to discern their specific, unique needs. Having a defined process to determine how investments such as planning, organization, equipment, training, and exercises should be made helps communities develop functional capabilities, close gaps, and improve outcomes.

Following a roadmap would provide a clearer understanding of investments required to build the Nation’s capabilities, and would provide communities with a better understanding of how they can best invest their resources to fill their specific gaps and mature their capabilities. Capabilities generally fall into three levels of maturity:

**POSSIBLE METRICS FOR GAP PRIORITIZATION:**

- **The relative size of the gap:** All other things being equal, larger gaps relative to National goals would be a higher priority.

- **The impact of insufficient capability on survivors:** Gaps with larger impacts on survivors are a higher priority.

- **The frequency of capability use:** Gaps likely to be exposed more frequently would be a higher priority.

- **The cost of closing the identified gaps:** Gaps that are less difficult and costly to close would be a higher priority.

- **The equitable distribution of gaps:** Gaps that disproportionally affect survivors least capable of managing the consequences would be a higher priority.

- **The difficulty to manage gaps post-incident:** Gaps that would be challenging to manage post-incident would be a higher priority.
• **Mature**: There are assumptions about requirements and new data is collected to refine assumptions.

• **Developing**: There is some understanding of the relationship between capabilities and impacts, but the data needed to test assumptions in order to clarify the relationship is not collected.

• **Less mature**: There is limited or no understanding of how to make assumptions about requirements, or to collect needed data.

Understanding the relationship between capabilities and outcomes is a process of making assumptions based on existing data and testing those assumptions when new data become available, consistent with the NPS cycle of hypothesizing, testing and continuous improvement. Although for some mature capabilities, such as sheltering, this relationship is relatively clear, for others such as those in the prevention and protection mission space, the relationship is much harder to quantify. Sheltering is an example of a mature capability because enough data typically exists to make informed assumptions about the size of the affected population during an incident, the percentage of those who will leave their homes, and the percentage of those who will seek public shelter. In addition, it is possible to collect new data once an incident has occurred. Emergency managers can count and report the number of people who actually used public shelters, allowing them to compare what actually happened to their assumptions and continue to refine those assumptions for the future.

Prevention capabilities are an example of less mature capabilities, because unlike sheltering, which has measurable post-incident effects (e.g., the number of people who used shelters), prevention capabilities must prove a counterfactual (e.g., in the absence of prevention capabilities, there would have been an active shooter incident). The relationship between prevention capabilities and impacts is an area the Nation has invested in in recent years, leading to some gains in understanding but leaving other questions unresolved. For example, FEMA has found that investments in situational awareness are cited relatively frequently by grantees as successfully boosting capabilities associated with preparing for and responding to real-world incidents. At the same time, it may be challenging to generalize accurately the effectiveness of investments in prevention capabilities, or predict the effectiveness of specific investments.

These challenges raise the question of what the ideal level of maturity is for each capability, and how that maturity will be maintained at the appropriate level. The goal of the requirement laid out in DRRA Section 1242 is for FEMA to “identify the potential costs for establishing and maintaining those capabilities at each level.” A preparedness investment strategy could therefore identify both the existing and desired level of maturity for all capabilities and provide a roadmap for reaching the desired level of maturity for those capabilities. A preparedness investment strategy could also include a discussion of which entity is best equipped to manage those capabilities, and a plan to develop an approach for measuring estimated costs. When armed with knowledge of the process for how to close capability gaps, the Nation can subsequently identify capability requirements and align those needs with targeted investments to create a defined, strategic way to close capability gaps. The goals of the preparedness investment strategy also do not need to be limited to creating a better understanding of the relationship between resources and costs. Solutions will vary and some may be direct investments while others may focus more on policy optimization suggestions to improve funding efficacy. The root cause analysis that will drive the strategy will allow for more meaningful understanding of the capability maturity level, funding needs, and building to desired outcomes. Maintaining and continuously building capabilities leads to improved outcomes for all levels of government, and helps the Nation prepare for all-hazards, both current and future.

**Management Opportunity 1.3: Identify opportunities to partner with private sector and non-profit organizations and integrate**
them into preparedness and response structures to enhance capabilities.

Gaps cannot be closed with grants alone. To effectively close gaps, the private sector, including homeowners and businesses, will need to explore ways to build resilience. During disasters, the role of federal and state emergency management is not to take on the role of the private sector but rather to help ensure that the private sector quickly returns to equilibrium post-disaster. The private sector plays an important and irreplaceable role in supporting disaster response and recovery. Incorporating and leveraging the private sector and NGOs, especially through developing private–public partnership programs across all levels of government, can promote coordination and build capability through joint planning, training, and exercises. In addition, mechanisms such as the NBEOC and ESF #14 provide points of contact within the business community and critical infrastructure sectors for emergency managers. The NBEOC operates as a virtual emergency operations center to enhance information sharing between private industry partners and public agencies before, during, and after disasters. ESF #14 supports the coordination of cross-sector operations, including stabilization of key supply chains and community lifelines, among infrastructure owners and operators, businesses, and their government partners. A preparedness investment strategy should include a discussion of the role that private sector entities and NGOs may play in managing capabilities, especially for capabilities where the private sector is the primary owner. This will further aid in targeting investments and resources to create a defined, strategic way to close capability gaps.

One such area where cooperation with the private sector is critical is in managing the supply chain. Across all levels of government, resource management is critical to ensuring the delivery of essential services to citizens. In 2020, the sheer number and complexity of disasters challenged resource management across all levels of government on an unprecedented scale. Competing demands for resources rippling across the global market, such as ventilators, put immense pressure on governments to secure and equitably distribute resources. Tested by these constraints, governments adapted existing mechanisms or created new ones. Moving forward, all levels of government should build upon lessons learned from the 2020 disasters to diversify and innovate flexible, adaptable, and scalable funding sources and partnerships to effectively address resource management needs during future disasters.

A wholly public response to the COVID-19 pandemic would have been insufficient given the breadth and scope of the disaster. Governments were able to respond through a combination of public and private sector relationships to meet citizen demands for PPE and other staple items. Public–private partnerships were key in finding nationally-sourced PPE when available during the initial response to the COVID-19 pandemic. Over the course of 2020, public–private partnerships improved and strong relationships with NGOs were forged; resulting in exponential growth in donations, especially from entities with a focus on humanitarian, corporate-social responsibility. During the ongoing COVID-19 pandemic, many small, community-based organizations focusing on undocumented immigrants, unhoused, unsheltered, or homeless persons have ramped up their services to meet increased demand for food, medicine, care services, and supplies to fill capability gaps at the state and federal level.

Public-private partnerships are also an effective mechanism for the development and distribution of key resources, such as vaccines and medical treatments, during a public health crisis. The World Health Organization encourages public-private partnerships to build on the strengths of both sectors (e.g., the public sector contributes both science and funding, whereas the private sector has strengths in drug discovery and bringing candidate drugs through the trials process to regulatory approval). Successful public-private partnerships have been launched to address multiple aspects of health care including equity in health care and vaccine and drug development and distribution. The International AIDS Vaccine Initiative, established as an independent legal entity in 1996, combined the
philanthropic skills of the Rockefeller Foundation with industry expertise to incentivize research and development of vaccines and support clinical trials for candidate vaccines. Most recently, Operation Warp Speed was initiated as a public-private partnership to develop vaccines for COVID-19. Partners included pharmaceutical companies and multiple federal agencies, including HHS, CDC, NIH, and the Biomedical Advanced Research and Development Authority. This public-private partnership allowed for the concurrent manufacturing of vaccines during safety trials, which were overseen by the Federal Government.

Recognizing the critical role that these organizations play in preparedness and response, various agencies within the Federal Government introduced guidance focused on integrating nonprofit and private sector partners. FEMA’s Supply Chain Resilience Guidance (April 2019) provides emergency managers with recommendations on how to analyze supply chains and to work with the private sector to enhance supply chain resilience. In 2020, ASPR developed the Supply Chain and Industrial Base Assurance Program to promote robust domestic medical countermeasures manufacturing capacity. The program is an effort to establish an enduring and sustainable industrial base and supply chain capability at ASPR and is part of a larger strategic endeavor for the U.S. Government. In July 2021, the FEMA National Integration Center released guidance to help jurisdictions build their own public-private partnerships. The guidance provides a process as well as resources that may be beneficial in the development and implementation of a public-private partnership program.

Public health is not the only area that can take advantage of public-private partnerships. Many private sector companies have developed cross-state collaboration mechanisms to share resources during disasters and for post-disaster recovery efforts. For example, the Jacksonville, Florida Electric Authority (JEA), a community-owned utility, has signed mutual aid agreements with other utilities to help restore power to communities after damaging storms. In 2020, JEA sent crewmembers to Westchester County, New York, after Tropical Storm Isaias, to Lafayette, Louisiana, after Tropical Storm Marco and Hurricane Laura, to Escambia County, Florida, after Hurricane Sally, and to Alexandria, Louisiana, after Hurricane Delta.

The National Flood Insurance Program (NFIP) is another longstanding public-private partnership that provides flood insurance across the United States. Although the Federal Government bears the primary risk for the program, insurance companies are able to write the policies and

THE CALIFORNIA EARTHQUAKE AUTHORITY

The California Earthquake Authority (CEA) was created in 1996. Issuing about two-thirds of the residential earthquake policies sold in California, it is the largest residential earthquake insurer in the US. In addition to earthquake insurance, the CEA also manages the state Wildfire Fund. The CEA is a nonprofit that is privately funded and publicly managed by a five-member board that includes the state’s governor. It was born out of necessity, after insurance companies cut back on issuing new policies in the state after the 1994 Northridge Earthquake. CEA uses about 53% of the funds it takes in to purchase reinsurance, pay contracting fees, and accumulate capital. Reinsurance is spread among 127 reinsurers that together provide $9.2 billion in coverage. CEA also obtains reinsurance through the capital market, such as through catastrophe bonds. These purchases are grouped under their transformer reinsurance program, which is notable due to its structure; CEA has created a repeatable process with uniform documentation, which has eased the complexity of transactions of this nature. As of December 31, 2020, CEA reported $2.125 billion of sources under the transformer reinsurance program that are available to pay claims.
work with homeowners, thereby increasing the distribution of policies. In order to offset the risk to the Federal Government, in both 2012 and 2014, Congress granted FEMA the authority to secure reinsurance (a method of risk transfer) from both the private reinsurance and capital markets. This authority continues and has paid off. After the 2017 hurricane season, FEMA recovered $1.04 billion in reinsurance. Several states also operate insurance programs that use reinsurance for risk transfer. These programs include the Citizens Property Insurance Corporation of Florida, the California Earthquake Authority, and the Texas Windstorm Insurance Association.

Although progress has been made in improving public–private partnerships through federal guidance, opportunities remain to integrate partners more effectively into preparedness and response efforts to improve readiness for future disasters.
ADDRESS STEADY-STATE INEQUITIES, VULNERABILITIES, AND A DYNAMIC RISK LANDSCAPE

Several societal factors play a role in determining how severely a disaster may impact a community. These factors, known as social vulnerability, may hinder a community’s ability to prevent human suffering and financial loss when a disaster occurs. The Social Vulnerability Index (SVI) was developed to provide one way to estimate social vulnerability by using U.S. Census Bureau data on 15 sociodemographic factors to rank and map the social vulnerability levels of U.S. counties and census tracts. By analyzing SVI data, CDC emergency managers can identify socially vulnerable populations that are especially at risk during public health emergencies because of factors like socioeconomic status, household characteristics, race/ethnicity, minority status and language, housing type, and access to transportation.

Although the Nation has made some progress to address the social vulnerabilities that exacerbate the risks posed by disasters, additional work can be done to streamline funding mechanisms, strengthen policies, leverage data, and incorporate financial resilience to better inform decision-makers.

One of the greatest challenges the Nation faces is how to address chronic vulnerabilities in the face of an increasingly dynamic risk landscape that includes long-term recoveries, concurrent disasters, and the potential for emerging risks. Simply maintaining our existing risk management posture will cause the Nation to fall further behind. The impacts of a changing climate and a more interconnected society can exacerbate pre-existing chronic vulnerabilities and their associated risks. This can lead to entrenched vulnerabilities that become harder to address over time. To combat this trend, all levels of government must proactively build resilience and improve continuity capabilities in order to reduce overall risk.

Target Preparedness Funding to Drive Equitable Outcomes

Federal assistance programs do not always reach those in greatest need. For example, damage assessments used to determine financial assistance allocations often are based on property ownership – this disadvantages renters and people experiencing homelessness. Federal assistance programs can also have complex requirements and can be difficult for community members to navigate to determine eligibility and submit requests for assistance. Certain programs also may only be available to those who can afford to buy insurance or pay a required matching fee.

Management Opportunity 2.1: Direct mitigation and preparedness funds to improve equity in outcomes and use a streamlined approach that aligns to mission goals to reduce cost and complexity and improve access to grant programs.

Management Opportunity 2.2: Develop community-level climate adaptation strategies that leverage the resources and expertise of all levels of government and non-governmental partners.

Management Opportunity 2.3: Enhance the Nation’s resilience through adaptation strategies to address sea level rise and other impacts, including climate migration, incentives for residency and new construction in low risk/low hazard areas, and improving building codes and risk management standards.
Research has demonstrated that racial inequities can be exacerbated in communities receiving federal assistance as more privileged populations have better means and access to the assistance programs. By making federal assistance programs less restrictive, less complex, and more accessible to all segments of communities, relief can be delivered more equitably.

Management Opportunity 2.1: Direct mitigation and preparedness funds to improve equity in outcomes and use a streamlined approach that aligns to mission goals to reduce cost and complexity and improve access to grant programs.

FEMA’s National Advisory Council (NAC), an external advisory body, discusses and deliberates recommendations before forwarding them to the FEMA Administrator. Two recommendations made in a recent NAC report (November 2020) pertain to updating preparedness funding administrative policies to ensure FEMA is reaching socially vulnerable populations.

The NAC Recommendation 2020-02 states that FEMA should assess the current process of distributing mitigation and preparedness funds to SLTTs to determine which policies, regulations, and legislation need to be revised so that outcomes are more equitable. Similarly, NAC Recommendation 2020-09 states that FEMA should reduce the cost, complexity, and burden on SLTTs for accessing and implementing federally-funded resilience and readiness programs. These recommendations could be enacted in the following ways: Grant notices and funding prerequisites could be based upon THIRA/SPR community participation relative to applicable hazard mitigation programs. Funding initiatives could require SLTT emergency management agencies to identify culturally, economically, and socially at-risk communities to ensure equitable planning, preparedness, mitigation, and recovery outcomes. Preparedness and mitigation resources should be targeted to communities that are most in need of federal funding to build resilience in those communities.

Managing Impacts of a Changing Climate

Climate change affects the risk profile of the Nation and collective resilience and security. Multiple, concurrent disasters of unparalleled nature are becoming more common, and climate change will likely continue to exacerbate and increase disaster activity in the coming years. The Nation experienced an unprecedented number of disasters in 2020, including one of the most active wildfire season on record across the western United States, a record of 30 named tropical storms and hurricanes, and severe weather, including hailstorms and flooding, across the Midwest. The unique characteristics of each type of disaster influence the strategies required to manage it effectively.

Alongside increasing and inequitable exposure to risk, trends toward stronger and more frequent disasters are intensified by climate change. In 2020, 22 weather incidents each caused over $1 billion in losses; this is the greatest number of billion-dollar disasters the Nation has ever experienced in one year, shattering the previous annual record of 16 incidents set in 2011 and 2017. The average number of billion-dollar disasters has increased over time. In 10 of the years between 1980 and 2020, the Nation experienced at least 10 disasters costing over $1 billion. Eight of those 10 years were after 2010. As the climate changes, the frequency and intensity of many storms, wildfires, and other weather-related disasters will continue to increase. Hurricanes will likely become more intense, with a greater proportion of hurricanes reaching category 4 and 5 levels. Rising sea levels will lead to greater coastal flooding and higher inundation levels from storms, if all other factors are equal. Intense hurricanes will happen more often, and rising sea levels will lead to higher, more damaging storm surges. A warmer atmosphere will hold more moisture, leading to more intense rainfall during many storm events. Extended droughts will become more likely throughout this century, and coupled with warmer temperatures, will increase the frequency of large wildfires, especially in the
Western Continental U.S. and Alaska. Overall, the Nation may face more disasters that do not have a discrete beginning or end, which may require us to continue to rethink the linear framework of preparedness, response, and recovery that prevails in emergency management. When multiple incidents occur simultaneously, strategies must account for limited resources and balance acute needs with competing demands. The following sections outline best practices and opportunities to address chronic vulnerabilities stemming from climate change.

Management Opportunity 2.2: Develop community-level climate adaptation strategies that leverage the resources and expertise of all levels of government and non-governmental partners.

With the risk of increasingly severe and frequent wildfires growing across the Western United States, many communities have pursued adaptation strategies—otherwise known as “mitigation” measures in the emergency management community—to reduce loss of life and damage to property. By leveraging federal, state, Tribal, and NGO resources, communities have been able to identify vulnerabilities and develop adaptation solutions.

Starting in September 2020, communities began submitting applications to FEMA’s new BRIC disaster mitigation grant program. The BRIC program supports states, local communities, Tribes, and territories as they undertake hazard mitigation projects to reduce the risks they face from natural hazards. The BRIC program specifically gives credits for projects that address vulnerable and underserved communities within the competitive funding portion of the program; ensuring that those most in need of assistance can build the capabilities to survive and or recover from future disasters.

There are also resources available to increase wildfire resilience in communities. The National Cohesive Wildland Fire Management Strategy was written through a collaborative process that involved all levels of government, NGOs, and the public. The Strategy has three goals: resilient landscapes, fire-adapted communities, and safe and effective wildfire response. This is done through extinguishing fire when needed, using fire where allowable, and reducing human-caused ignitions. Forest Service programs exist to serve and meet the Strategy’s goals. One example is the Federal Excess Property Program that enhances wildfire and emergency response of state and local fire departments by providing them with...

A COMMON LEXICON: THE IMPORTANCE OF SHARED TERMINOLOGY

Risks and disasters frequently require the attention of experts spanning multiple fields. Establishing common terminology will facilitate cross-field conversations and help to minimize confusion. For example, the emergency management community uses the term “mitigation” to describe risk reduction.

The environmental community uses the same term and others with slightly different meanings:

Mitigation: Reducing and stabilizing the levels of heat-trapping greenhouse gases in the atmosphere.

Adaptation: Adapting to life in a changing climate – this involves adjusting to actual or expected future climate.

free equipment and supplies from DOD. Similarly, the Volunteer Fire Capacity Grant program supports increasing capacities of local fire departments to provide initial attack on wildfires with additional firefighter training and assistance with purchasing equipment. Finally, the agency’s State Fire Assistance program helps State agencies create more fire-adapted communities and resilient landscapes by implementing pre-fire prevention and mitigation programs and emphasizing pre-fire planning and risk reduction in the Wildland Urban Interface. Other examples are Forest Service Community Mitigation Assistance Teams, which work locally with cross-boundary partners to build sustainable mitigation efforts at times when awareness of the need for mitigation is high.

Some communities have explored adaptation strategies that are based on institutional knowledge. In California, state and federal agencies are collaborating with Tribes and leveraging their historical, traditional knowledge of cultural burning, a form of understory-burning, to help reduce wildland fuels (i.e., excess vegetation) and prevent wildfires. Cultural burning promotes ecosystem health by increasing water runoff into streams, creating habitats for plants and animals, and recycling nutrients. Although Tribes have engaged in this practice for thousands of years, these traditional burnings were largely banned in the state due to regulations around fire management. Recent shifts in California’s wildfire adaptation strategies have allowed the practice to resume in an effort to promote more resilient forests.

Research institutions and nonprofit organizations, such as the Insurance Institute for Business and Home Safety (IBHS), have also contributed to the field of climate adaptation through research and actionable tools for public use. IBHS has identified key vulnerabilities for suburban neighborhoods. Nearly all aspects of suburban wildfire mitigation strategies fall into one of two correlated categories: hardening the structure by using fire-resistant materials or reducing the intensity of a potential fire around the structure. Critical elements of a suburban home and its surroundings that can increase or decrease the chance a home survives a wildfire include fuel management, building shape, and use of fire-resistant materials to harden structural elements such as fences, decks, walls, roofs, roof vents, and eave overhangs. These insights build on findings published by the fire protection community and the best experimental and field research to date. Another IBHS resource, the Suburban Wildfire Adaptation Roadmaps, provides decision trees that show the range of vulnerabilities and what to avoid. When put into action by homeowners, and ultimately whole communities, the risk curve can be bent downward and limit the catastrophic reach of wildfires.

**NATURE-BASED SOLUTIONS**

Nature-based solutions are strategically designed engineering projects that restore ecological function to the ecosystem. An ecosystem includes a hydrologic system that can provide natural storm buffers, like saltmarshes that can handle flood waters. Nature-based solutions can be deployed jointly with hardened infrastructure to create a system with additional benefits. Nature-based solutions can improve the resilience of entire communities. When strategically designed and deployed, individual projects can bolster others. Unlike traditional hardened infrastructure, as nature-based solutions mature, they can become more effective. Strategic partnerships are vital to landscape-scale efforts that benefit resilience and preparedness. All levels of government can work together to maximize the broad suite of benefits of nature-based solutions and manage ecologic functions that provides protection from natural hazards.
Management Opportunity 2.3: Enhance the Nation's climate resilience through adaptation strategies to address sea level rise and other impacts, including climate migration, incentives for residency and new construction in low risk/low hazard areas, and improving building codes and risk management standards.

One of the most challenging and far-reaching impacts of climate change is sea level rise and associated flooding. Sea level rise is caused primarily by two factors related to climate change: added water from land-based melting ice sheets and glaciers and the expansion of sea water as it warms. Within just 20 years, hundreds of thousands of homes in over 170 communities along the coastal U.S. will suffer repeated, chronic flooding (Figure 9). In 2017, the U.S. Interagency Sea Level Rise Taskforce estimated that global sea level is very likely to rise at least 12 inches (0.3 meters) above the year 2000 levels by year 2100 on a low-emissions pathway. On future pathways with higher greenhouse gas emissions, sea level rise could be as high as 8.2 feet (2.5 meters) above the year 2000 levels by the year 2100. For perspective, just six feet of ocean-level rise would be enough to redraw the coastline of southern Florida, parts of North Carolina and Virginia, and most of Boston and New Orleans by the end of the century. In the U.S. alone, 13 million people could be forced to relocate due to rising sea levels by 2100.

Climate migration can be a resilience and adaptation strategy in response to climate change-induced hazards. For over 6,000 years, North America’s inhabitants have resided within a climate “niche” in which temperature and precipitation have been most suitable for humans...
to live in. In the United States, that niche today blankets the heart of the country, from the Atlantic seaboard through northern Texas and Nebraska, and the California coast. Our current agricultural, housing, and economic practices are dependent upon the optimal climatic conditions of this zone. By 2070, as the climate warms, that niche could shift drastically northward, even under a moderate climate emissions scenario. The increasing risks associated with a changing climate (e.g., extreme heat and humidity, drought, sea level rise and saltwater intrusion that degrades crops and freshwater sources, poor crop yields, and extreme rainfall causing flooding) may prompt mobility within the U.S., particularly away from coastal areas and much of the South and Southeast.

Few locales in the U.S. have considered climate migration for entire communities as a resilience strategy, and only two—Newtok, Alaska, and Isle de Jean Charles, Louisiana—have actually moved forward with relocation. It has taken over 30 years to begin relocating Newtok and more than 20 years to relocate Isle de Jean Charles.

Additionally, FEMA is updating the NFIP pricing methodology for the first time in 50 years to communicate flood risk more clearly, so policyholders can make more informed decisions on the purchase of adequate insurance and on mitigation actions to protect against the perils of flooding. The new methodology also allows FEMA to equitably distribute premiums across all policyholders based on the value of individual homes and the unique flood risk associated with each property. FEMA coordinated with subject matter experts from the U.S. Army Corps of Engineers (USACE), U.S. Geological Survey (USGS), and NOAA along with experts from across the insurance industry to ensure the new Risk Rating 2.0: Equity in Action system provides more equity and accuracy on insurance premiums. Updating NFIP's pricing methodology is intended to encourage homeowners to purchase flood insurance that matches their property’s risk level and invest in mitigation measures to reduce flood risk.

Another resource is NOAA’s Digital Coast, which is a constituent-led information platform that

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**FARGO-MOORHEAD METROPOLITAN AREA FLOOD RISK MANAGEMENT PROJECT**

USACE and the Metro Flood Diversion Authority developed the Fargo Moorhead area diversion pilot project to protect the Fargo-Moorhead-West Fargo metro area during times of extreme flooding of the Red River of the North. Project construction, which began in 2017, consists of mitigation components including river control structures, floodwalls, levees, and a 30-mile diversion channel. The Public–Private Partnership Program (P3) contract is the first public–private financing of a civil works project in USACE’s history. Compared to traditional construction delivery, it is estimated that the P3 model will save $330 million and 10 years. It will protect a population of 235,000 and an estimated $19 billion in property value, and will provide an estimated $1.9 billion in public benefits.
includes data, tools, and training opportunities to address issues commonly associated with a changing climate and a growing population. These resources originate from a variety of authoritative sources, but each piece is vetted by NOAA and provided in an easy-to-find, easy-to-use format. This approach helps the data and information reach more people and saves users significant time and money.

USACE’s Revolutionize Civil Works program is another example of federal flood risk management. This program is designed to improve the efficiency and effectiveness of USACE’s water resource projects. The objectives of this initiative are to:

1. Accelerate project delivery in order to start and finish projects faster;

2. Transform project financing and budgeting to accelerate project delivery with fewer resources and less federal involvement; and

3. Streamline permitting and regulation reform processes, eliminating duplicative reviews to expedite project delivery.

Through this initiative, USACE is supporting systemwide structural, nature-based, and non-structural solutions. Enhanced building codes increase resilience and are not designed just “to withstand the event.” USACE is also piloting innovative public private partnerships to finance civil works projects such as the Fargo-Moorhead Metropolitan Area Flood Risk Management Project.
STRENGTHEN PROCESSES WITHIN AND BETTER CONNECT AREAS OF THE NATIONAL PREPAREDNESS SYSTEM

This report has highlighted the many challenges the Nation faced in managing the impacts of COVID-19. The fact that the Nation experienced so many challenges, despite having a relatively mature understanding of pandemic risk and investing in managing it for years, helps us to understand that investments in components of the NPS by themselves are not enough. The NPS can maximize risk reduction only when there are strong links among the individual components.

Maintaining the connections between the pieces of the NPS is vital to achieving the National Preparedness Goal and preserving a level of preparedness necessary to address a wide range of threats and hazards. Communities identify and assess their level of risk through their THIRAs by identifying the threats and hazards of greatest concern and the potential impacts of those threats and hazards. Knowing these potential impacts allows communities to determine the specific capabilities needed to best address those risks; subsequently build and sustain those capabilities; plan on how to deliver them most effectively; validate their assessment of those capabilities through exercises, simulations, or other activities; and then, based on the results of those activities, review and update the information they have regarding those capabilities.

This section focuses on potential opportunities for the whole community to address shortfalls within some of those steps. It also examines ways to help strengthen or repair the breaks in connections between the steps to bring the Nation closer to achieving the National Preparedness Goal. Starting with the risk identification and assessment process, government models should be better connected to and use the same standardized language and impacts as planning documents. These models

In 2019, the National THIRA identified a global respiratory pandemic, contextually described as pandemic influenza, as one of the risks most likely to stress the Nation’s capabilities. Respiratory pandemics have been a national risk since at least 1918. In modern times, emergency managers have updated planning tools and practices and conducted exercises focused on managing the potential impacts of this type of incident. xiii

Figure 10: National Preparedness System

xiii In 2003, "pandemic" was identified as a "National Planning Scenario," one of the scenarios intended to serve as the foundation for the development of homeland security tasks, target capabilities, and standards and performance metrics against which capabilities and tasks would ultimately be measured. In 2005 and 2006, the White House Homeland Security Council outlined the National Strategy for Pandemic Influenza and the National Strategy for Pandemic Influenza Implementation Plan to guide the United States’ preparedness and response activities in an influenza pandemic. This plan was updated in 2009 and again in 2017.
Management Opportunity 3.1: Develop impact models for all of the Nation’s significant threats and hazards, including emerging risks.

Management Opportunity 3.2: Better formalize connections between risk assessments and planning processes.

Management Opportunity 3.3: Build better strategies for planning across all levels of government to manage longer, increasingly complex disasters that have the potential to exceed the Nation’s capabilities.

should also cover all probable major threats and hazards that might impact the Nation, including emerging risks. Following these assessments, information needs to be communicated to decision-makers at all levels in an accessible, clear format, including information on strategies for managing the accepted risks that are inherent in longer, more complex disasters.

Improve Risk Identification and Assessment Processes

Identifying and describing potential risks is an important part of the decision-making process and is the first step in creating a foundation of risk information that should be applied to the other components of the NPS. Only after understanding those potential risks is it possible to provide actionable information for both strategic and operational decision-makers on how to manage that risk.

There are technical and communication challenges involved with improving the risk identification and assessment processes: The Nation needs to continue to mature and expand its access to technical risk information, and that information needs to be effectively communicated to decision-makers in an accessible way. This is a challenge that extends from the Federal Government to the state and local level, and eventually, to businesses and individuals. For this reason, it is important for all levels of government and the private sector to comprehensively identify risks through a holistic approach with experts from both the IT/cyber and physical spaces working together to address the breadth of issues facing their organizations, critical infrastructure, and essential functions.

This section outlines opportunities to improve the availability and utility of risk assessments and modeling and will connect those risk assessments and models to decision-making at all levels of government, as well as the private sector and the individual level.

Management Opportunity 3.1: Develop impact models for all of the Nation’s significant threats and hazards, including emerging risks.

Impact modeling is a technical process that uses data to help predict how an incident might unfold, where it might lead, what the potential impacts could be, and how it might impact different populations. Impact modeling is an important part of assessing the risk of these probable threats and hazards. This information is essential for national planning efforts and understanding how to manage the potential impacts of these incidents, including how to prevent, protect against, mitigate, respond to, and recover from them. Although the scope of impact modeling carried out by departments and agencies for catastrophic planning purposes is extensive and diverse, there are significant coverage gaps in the Nation’s modeling efforts. After conducting a review of the Nation’s impact modeling during the development of the National THIRA, FEMA found significant data gaps, including:
• Scenarios with no existing models (most commonly related to emerging risks, or risks in the prevention and protection mission areas);
• Inconsistencies in the modeled impacts;
• Wide variations in the age of models; and
• Lack of language standardization across models.

To address these challenges, the emergency management community should develop an agreed-upon and comprehensive list of all the Nation’s significant future threats and hazards, align modeling efforts to identify any modeling gaps, and identify strategies for closing those gaps. This will ensure that the Nation has a clear picture of its risks and their likely impacts. The response to COVID-19 offers some lessons learned regarding the decentralized nature of modeling capabilities across all levels of government and the private sector. At the start of the pandemic, there was no singular authoritative voice for impact modeling, leading to conflicting interpretations of the little data available. Although having multiple models can be important for challenging assumptions and establishing a range of possible outcomes, decision-making and communication should be coordinated and based on the best available analysis of those models. Unifying the information space to provide a clear picture early on would have allowed for improved synchronization.

Models should be built around standardized language, like that used in the National THIRA standardized impacts, so that models can be applicable to all hazards at all levels of government. For other types of models, experts could determine where standardization would be beneficial. Although impact models need to remain flexible to meet specific needs, there could also be a baseline of standardized impacts that are common across all impact models, allowing for direct comparisons and translation to planning efforts.

The Nation’s risk modeling capability would ideally be able to accommodate the ever-evolving scope of threats and hazards. The Nation needs to continue to mature its ability to model less conventional threats and hazards; especially emerging risks, for which there is little historical data or predictive models. Although models exist for some incident types, it is not enough for the Nation to assess historical risks and patterns. The Nation requires additional modeling focused on future risks, including the likelihood of more severe disasters or new threats, to best prepare for long-term challenges, rather than relying exclusively on historical data.

To address these challenges, the Nation needs to better understand the connection between less well-understood risks, such as those to cyber systems, and the capabilities needed to manage those risks. One agency, CISA, offers an example of how to build awareness of these connections. CISA is modeling the impacts that an electromagnetic pulse or naturally occurring solar flare would have on the Nation’s critical infrastructure. Efforts like these to model less understood and emerging risks are vital in order to engage in subsequent preparedness activities, such as planning and exercises, and increase the Nation’s resilience against all threats and hazards.

Communities identify and assess their risks in their THIRAs and may use modeling tools and experts to help determine the potential impacts of identified risks. In 2019, only 42% of communities identified a pandemic as a threat or hazard of concern despite the existence of pandemic scenarios that had been modeled for catastrophic planning purposes, signaling a potential lack of awareness about the risk posed by a pandemic and the impacts to public health and the economy.

In 2020, 40% of communities reported using modeling or other tools in order to inform their THIRA scenarios, including a number of previously modeled scenarios developed for
catastrophic plans and data inventories owned by federal departments and agencies. The use of catastrophic planning scenarios in community THIRAs shows that SLTT partners find them useful for their preparedness activities; however, the geographic distribution of the modeled scenarios used in these products is limited and may not encompass every community in the Nation. Widely accessible tools, such as Hazus, are options for communities to develop the relevant models that they need for their risk assessments if existing models are not readily available. Hazus is an example of both a success in sharing information with SLTT partners and a demonstration of the challenges presented by decentralized risk processes. Hazus has become extremely important for SLTT partners attempting to translate risk into projected impacts to their communities. It can be difficult, however, for emergency managers with more limited resources to acquire the expertise, training, or even access to Hazus and other tools like it to tailor models to community-specific needs. Recent improvements in the delivery of Hazus risk assessment information through webinars, Hazus user guidance, and training videos have helped to make this information more readily available than before. However, Hazus still requires significant knowledge to use, and most importantly, does not contain all of the data communities need to run hazard models. Furthermore, Hazus only covers floods, hurricanes, earthquakes, and tsunamis. This means that planners must either pay for new modeling that matches their objectives or use existing modeling that does not allow them to directly connect impacts and desired outcomes.

**Management Opportunity 3.2: Better formalize connections between risk assessments and planning processes.**

The clear identification of impacts and vulnerabilities—as well as capability gaps and areas of concern—within exercises, during response or recovery operations for real-world incidents, and in after-action reviews following exercises or incidents is helpful for emergency management entities in improving or correcting processes and assessing current or future gaps. Documenting and incorporating that information into plans and risk assessments is necessary to ensure preparedness; however, some challenges exist.

One current issue is that the planning cycle and risk assessment cycle are not always formally linked at all levels of government, and there is no standardized body of risk assessments that is used in the development of plans. This can contribute to inconsistent planning efforts, both in terms of the quality of the information in the plan and how well it connects to the operation when it occurs. The lack of a formal connection can lead both risk assessments and plans to be developed and updated separately, or in some cases, not at all.

To strengthen preparedness, all levels of government should practice explicit integration of planning with the other elements of the NPS, which could include such actions as 1) formalizing the connections between risk assessments and plans to integrate new knowledge into existing plans 2) designing plans...
around both capability needed (i.e., unmet needs requirements) and capability possessed to address the need for new or evolved strategies and 3) designing improved plans that prompt leaders to make explicit decisions about what level of risk they accept (Figure 11).

**Management Opportunity 3.3: Build better strategies for planning across all levels of government to manage longer, increasingly complex disasters that have the potential to exceed the Nation's capabilities.**

It is unrealistic for the Nation to have the capability to manage every possible incident. It is crucial, therefore, for decision-makers to be aware of and plan for the risks they accept when managing disasters that have the potential to exceed the Nation's capabilities.

As a result of climate change, incidents are becoming longer, more complex, and require increased support from emergency managers. The traditional emergency management model is based on the notion that incidents have discrete beginnings and endings. Although there will always be acute incidents with discrete beginnings and endings, if risk managers intend to manage the chronic impacts of climate change, they may need to rethink how we manage incidents and the associated accepted risk, to maintain resilient response, recovery, and mitigation capabilities. To manage both forms of risk the emergency management community will require new planning strategies built to support the new paradigm of incidents in which there is no longer a “steady state.”

COVID-19 offers an illustrative example of how a single disaster—notwithstanding other, concurrent incidents—tested the emergency management community’s ability to effectively manage accepted risks. The large-scale interagency operations required to support pandemic response, in addition to shortages of resources, were exacerbated by concurrent operations stemming from regular disaster

“seasons” across the United States. Balancing the pandemic response with the active 2020 wildfire and hurricane seasons taxed the capabilities of the emergency management community at all levels of government. At the federal level, the National Response Coordination Center (NRCC) was not designed or intended to be staffed full-time and as a result FEMA was not prepared to staff the NRCC for a long-duration pandemic incident of national scale. The NRCC has been activated for the longest period in FEMA’s history—606 days since activating the Response Operations Cell on March 5, 2020, as of November 1, 2021. It was activated to the highest operating level (Level 1) for 168 days, starting on March 19, 2020. Comparatively, during the 2017 hurricane season, for hurricanes Harvey, Irma, and Maria, and concurrent wildfires, the NRCC was activated at Level 1 for 76 days (the previous record).

Although much of the emergency management community was aware of the risks associated
STRENGTHEN PROCESSES WITHIN AND BETTER CONNECT AREAS OF THE NATIONAL PREPAREDNESS SYSTEM

with a pandemic, pandemic planning and resources were limited and did not take into account how to manage those accepted risks on a national scale. Challenges started at the data-collection level. According to the FEMA COVID-19 Initial Assessment Report, FEMA was unable to anticipate SLTT requirements due to its insufficient understanding of SLTT-projected consequences and capabilities. In addition, although existing pandemic plans identify information requirements for decision-making, they lacked the specificity and guidance to establish data collection and reporting mechanisms for effective decision-making for a national incident. This meant that decision-makers did not initially have all the information they needed to make informed decisions on issues such as scarce resource allocation and prioritization of medical supplies. In the absence of this information, decision-makers unintentionally accept risk as they seek to make choices regarding risk management.

When accepting risk, emergency managers may consider identifying alternative strategies in the absence of additional resources for managing those risks. This was a shortfall during the COVID-19 pandemic. Most notably, the Nation’s federal pandemic planning did not account for the large-scale interagency operations, resource shortages, and integrated federal approach to supporting SLTT partners required to respond to the pandemic. It is critical that all levels of government develop better strategies for planning to manage some of the accepted risks inherent in longer, more complex disasters like the COVID-19 pandemic. These strategies could include a list of anticipated gaps, prioritizations for which gaps to invest in, and proactive planning to manage those gaps through other means when investments are not being made.
The 2021 National Preparedness Report provides an overview of the Nation's current risk landscape and draws upon examples and lessons learned from the COVID-19 pandemic in its analysis of the three risk types. It also includes an evaluation of national capabilities that helps clarify the Nation’s preparedness and resiliency against all threats and hazards, and management opportunities for closing capability gaps to prepare for those threats and hazards. By building and sustaining capabilities needed to prevent, protect against, mitigate, respond to, and recover from threats, the whole community is better positioned to handle hazards and incidents that pose the greatest risk to the Nation.

Much like last year’s report, the 2021 NPR includes a review of capabilities data submitted by SLTTs through the THIRA/SPR. To reduce the burden on communities during the ongoing COVID-19 pandemic response, FEMA limited the number of required capability targets that communities needed to submit in 2020 to those focused on pandemic-related capabilities and those targets measuring progress in meeting the Secretary of Homeland Security’s priorities. Included among the 15 required capability targets—which spanned the cross-cutting, Prevention, Protection, Mitigation, Response, and Recovery mission areas—were screening operations; logistics and supply chain management; medical care; information delivery; body recovery and storage; and economic resilience.

Reporting of THIRA/SPR data by communities and at the national level allows FEMA and the Federal Government to understand capability needs and informs federal planning and preparedness efforts, including the provision of federal grants focused on building and sustaining community capabilities. Communities overall reported being relatively close to their goals across every required capability target. More than half of communities reported achieving at least 70% of their target for 14 of the 15 capability targets. Communities reported being closest to their goals in the following capabilities: Intelligence Cycle Auditing/Execution, Unified Operations, Threat and Hazard Modeling, Information Delivery, and Interdiction/Disruption. Communities reported being furthest from their goals in foundational activities that typically allow long-term capabilities to be built or sustained. Most of the targets for which communities identified they are furthest from their goals in 2020 are not consistent with those identified in 2019. In 2020, fewer communities reported being far from their goals in Body Recovery/Storage (dropping from 26% to 20%) while at the same time the percentage of communities reporting high confidence in the assessment of their fatality management capabilities increased by eight percentage points. Communities’ experiences during the COVID-19 pandemic may have contributed directly to these reporting trends.

The preparedness actions, spending patterns, and goals of SLTT governments, the Federal Government, and individuals indicate which threats and hazards are of greatest concern to the Nation and demonstrate the Nation’s current capability strengths and areas for improvement. This NPR focuses on how the nationwide disaster declaration for the COVID-19 pandemic resulted in an unprecedented demand for communities to trace infections, ensure ongoing supply chains, provide medical care, share critical public information, manage fatalities, and reduce the economic impact of a disaster on individuals, businesses, and the Nation overall. The widespread nature of the response to COVID-19 provides an opportunity for FEMA and the federal interagency to review and analyze community and federal capabilities and better understand the strengths and challenges that emergency managers at all levels of government may face in responding to a wide variety of threats and hazards. Additionally, although the scope of this report is domestic, national preparedness is strengthened through engagement and
cooperation with international partners and organizations, and the sharing of expertise, experiences, and best practices.

The 2021 NPR also identifies potential opportunities that the Federal Government, SLTTs, and the private sector could use to build capability and address capacity gaps. First, FEMA should develop the foundation of a preparedness investment strategy to help designate whole community responsibilities for closing capability gaps, align resources to close those gaps, and determine how investments translate to improved outcomes through maturing capabilities. Second, all levels of government should collectively address physical, economic, and social vulnerabilities in order to reduce risk exposure and enhance the Nation’s resilience in an increasingly dynamic risk landscape. Third, the whole community should strengthen processes within and better connect the areas of the NPS to address shortfalls in risk identification, impact modeling, and planning.

The COVID-19 disaster placed immense demands on all members of the emergency services and healthcare and public health sectors and has highlighted that significant challenges remain at all levels of government. By closing national capability gaps and increasingly focusing on preparedness and mitigation actions, the Nation can increase its resilience to the most challenging threats and hazards— natural, technological, or human-caused—in a world where the impacts of climate change will increase the frequency, severity, and duration of disasters. FEMA and its partners will use THIRA/SPR data and the National THIRA as part of the NRCA to better measure national preparedness, where the Nation will set national-level capability targets and identify opportunities for closing national capability gaps. Future iterations of the NPR will continue to serve as a mechanism to report on the findings of the NRCA, including the National SPR, as this work progresses.
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<tr>
<th>Acronym</th>
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<td>5G</td>
<td>Fifth Generation</td>
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<td>AFN</td>
<td>Access and Functional Needs</td>
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<td>ASCE</td>
<td>American Society of Civil Engineers</td>
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<td>ASL</td>
<td>American Sign Language</td>
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<td>BIPOC</td>
<td>Black, Indigenous, and People of Color</td>
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<td>BLS</td>
<td>Bureau of Labor Statistics</td>
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<td>BRIC</td>
<td>Building Resilient Infrastructure and Communities</td>
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<td>CARES</td>
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<td>CBP</td>
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<td>COVID-19</td>
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<td>DIY</td>
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<td>EMPG</td>
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<td>Global Rapid Response Team</td>
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<td>Department of Health and Human Services Office of the Assistant Secretary for Preparedness and Response</td>
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<td>Insurance Institute for Business and Home Safety</td>
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<td>ICT</td>
<td>Information and Communication Technologies</td>
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<td>ICU</td>
<td>Intensive Care Unit</td>
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<td>NPR</td>
<td>National Preparedness Report</td>
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<td>NRCA</td>
<td>National Risk and Capability Assessment</td>
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<td>NRCC</td>
<td>National Response Coordination Center</td>
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<td>NRF</td>
<td>National Response Framework</td>
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<td>NRI</td>
<td>National Risk Index</td>
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<td>OSHA</td>
<td>Occupational Safety and Health Administration</td>
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<td>P3</td>
<td>Public/Private Partnership Program</td>
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<td>PCO</td>
<td>Plausible Concurrent Operations</td>
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<td>Post-Katrina Emergency Management Reform Act of 2006</td>
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<td>Small Business Administration</td>
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<td>State, Local, Tribal, and Territorial</td>
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<td>Subject-Matter Experts</td>
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<td>Stakeholder Preparedness Review</td>
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<td>Social Vulnerability Index</td>
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<td>T&amp;D</td>
<td>Transmission and Distribution</td>
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<td>THIRA</td>
<td>Threat and Hazard Identification and Risk Assessment</td>
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<td>UASI</td>
<td>Urban Area Security Initiative</td>
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<td>USGS</td>
<td>U.S. Geological Survey</td>
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Access and functional needs (AFN). Persons who may have additional needs before, during, and after an incident in functional areas, including but not limited to maintaining health, independence, communication, transportation, support, services, self-determination, and medical care. Individuals in need of additional response assistance may include those who have disabilities, live in institutionalized settings, are older adults, are children, are from diverse cultures, have limited English proficiency or are non-English speaking, or are transportation disadvantaged.

Alternative Care Facilities (ACF). Broad term for any building or structure that is temporarily converted or newly erected for healthcare use.

Business Interruption Insurance. Insurance coverage that replaces business income lost in a disaster such as a fire or other natural disasters.

Capability assessment (THIRA/SPR). The process of identifying how a community’s capabilities have changed over the last year and how those changes affect the community’s current capability.

Capability gap (SPR). The difference between the capability target a community sets in THIRA Step 3 and the current capability they determine in SPR Step 1.

Capability goal (THIRA). The amount or level of capability a jurisdiction wants to have, in relation to its current level of capability.

Capability target (THIRA). The level of capability that a community plans to achieve over time in order to manage the threats and hazards it faces. Otherwise known as “standardized targets.”

Cascading impacts. A “domino effect” risk phenomenon related to increasingly interconnected systems, in which a disruption or failure of one system causes impacts that lead to additional disruptions or failures in other, dependent systems.

Catastrophic risks. Catastrophic risks are distinguished by the scale of their impacts. These risks can result from natural, human-caused, or technological incidents. Some examples of catastrophic impacts are widespread damage to buildings and infrastructure, mass casualties or injuries, severe impacts to the environment, or significant disruptions to basic life-sustaining services or government functions.

Changing conditions. Changes such as population growth, development, and weather conditions that will influence mitigation needs and priorities.

Community lifeline. The community lifeline construct is a model that documents the status of indispensable services that enable the continuous operation of essential business and government functions and is critical to human health and safety and/or national economic security. Community Lifelines are a common lens which all responders can use to assess whether critical lifesaving and life-sustaining services are disrupted and, if so, which Core Capabilities are required to provide and restore those services.

Consequence. An effect of an incident, event, or occurrence.

Core capability. Thirty-two distinct critical elements necessary to achieve the National Preparedness Goal.

Critical infrastructure. Assets, systems, and networks, whether physical or virtual, that are considered so vital to the United States that their incapacitation or destruction would have a debilitating effect on security, national economic security, national public health or safety, or any combination thereof.

Defense Production Act (DPA). The primary source of presidential authorities to expedite and expand the supply of materials and services from the U.S. industrial base needed to promote the national defense.
**Disaster relief fund (DRF).** An appropriation against which FEMA can direct, coordinate, manage, and fund eligible response and recovery efforts associated with domestic major disasters and emergencies that overwhelm state resources pursuant to the Robert T. Stafford Disaster Relief and Emergency Assistance Act.

**Disaster Recovery Reform Act (DRRA).** Provides a number of tools for FEMA and other federal and state actors to better respond to natural disasters, and specifically provides a dedicated funding stream for proactive disaster mitigation.

**Electromagnetic Pulse (EMP).** A short burst of electromagnetic energy, which may originate from a natural or human-made incident and can occur as a radiated, electric, or magnetic field or a conducted electric current, depending on the source.

**Emergency support function (ESF).** ESFs are the primary mechanism for grouping Federal functions most frequently used in emergency management. ESFs provide the structure for organizing, planning, and deploying Federal partner support to domestic disasters and emergencies. The Nation’s critical infrastructure is composed of 16 sectors: chemical; commercial facilities; communications; critical manufacturing; dams; defense industrial base; emergency services; energy; financial services; food and agriculture; government facilities; healthcare and public health; information technology; nuclear reactors, material, and waste; transportation systems; and water and wastewater systems.

**Emerging risks.** Emerging risks are either new risks or familiar risks that evolved due to new or unfamiliar conditions; and therefore, often lack the historic data traditionally used to assess risk. Emerging risks can appear suddenly and often arise from advancements in technology or changes in the threat environment.

**Fusion Center.** State-owned and operated centers that serve as focal points in states and major urban areas for the receipt, analysis, gathering and sharing of threat-related information between State, Local, Tribal and Territorial (SLTT), Federal, and private-sector partners.

**Hazard.** natural or man-made source or cause of harm or difficulty (a hazard differs from a threat in that a threat is directed at an entity, asset, system, network, or geographic area, while a hazard is not directed).

**Hazard Mitigation Grant Program (HMGP).** A Federal program that assists SLTT communities in implementing long-term hazard mitigation measures following a major disaster declaration to significantly reduce or permanently eliminate future risk to lives and property from natural hazards.

**Homeland Security Grant Program (HSGP).** A Federal program with three components—the State Homeland Security Program (SHSP), Urban Area Security Initiative (UASI), and Operation Stonegarden (OPSG)—that supports enhancing the ability of state, local, Tribal, and territorial governments, as well as nonprofits, to prevent, protect against, respond to, and recover from terrorist attacks.

**Impact.** The community-specific effects a threat or hazard scenario would have on a community if the threat or hazard occurred, written in the language of common emergency management metrics.

**Likelihood.** The chance of something happening, whether defined, measured, or estimated objectively or subjectively, or in terms of general descriptors (e.g., rare, unlikely, likely, almost certain), frequencies, or probabilities.

**Mission area.** Groups of Core Capabilities, including Prevention, Protection, Mitigation, Response, and Recovery.

**Mutual aid.** Agreements that establish the terms under which one party provides resources—personnel, teams, facilities, equipment, and supplies—to another party.

**National Critical Functions (NCF).** The functions of government and the private sector so vital to the United States that their disruption, corruption, or dysfunction would have a debilitating effect on security, national economic security, national public health or safety, or any combination thereof.
**National Flood Insurance Program (NFIP).** A Federal program that aims to reduce the impact of flooding on private and public structures by providing affordable insurance to property owners, renters, and businesses and by encouraging communities to adopt and enforce floodplain management regulations.

**National Mitigation Investment Strategy (NMIS).** A single national strategy for advancing mitigation investment to reduce risks posed by natural hazards and increasing the nation’s resilience to natural hazards.

**National Preparedness Goal.** Defines what it means for the whole community to be prepared for all types of disasters and emergencies. The goal itself is: ‘A secure and resilient Nation with the capabilities required across the whole community to prevent, protect against, mitigate, respond to, and recover from the threats and hazards that pose the greatest risk.’

**National Preparedness System (NPS).** The instrument the Nation employs to build, sustain, and deliver Core Capabilities in order to achieve the goal of a secure and resilient Nation.

**National Response Framework (NRF).** A guide to how the Nation responds to all types of disasters and emergencies. It describes specific authorities and best practices for managing incidents that range from the serious but purely local to large-scale terrorist attacks or catastrophic natural disasters.

**National Risk and Capability Assessment (NRCA).** A suite of assessment products that measures risk and capability across the nation in a standardized and coordinated process. When analyzed together, these products will better measure national risks, capabilities, and gaps. The NRCA includes the following components: THIRA, SPR, National THIRA, National SPR.

**Nationwide community capability.** Capability that has been reported by all states and territories within the contiguous United States, as well as states and territories outside of the contiguous United States that have been identified as directly impacted by nationally catastrophic scenarios.

**POETE areas.** A model that divides capabilities into meaningful, broad categories of activity—planning, organization, equipment, training, and exercises.

**Resilience.** The ability to adapt to changing conditions and withstand and rapidly recover from disruption due to emergencies.

**Risk assessment.** A product or process that collects information and assigns a value to risks for the purpose of informing priorities, developing or comparing courses of action, and informing decision making.

**Risk management.** An approach to manage (i.e., lessen the severity of) a risk. Risk management approaches include risk avoidance, risk control, risk transfer, risk acceptance.

**Scenario-based community capability.** The progress made by communities potentially impacted by nationally catastrophic scenarios in achieving the national goal, arranged by standardized impact.

**Social Determinants of Health (SDOH).** The conditions in the environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health and quality-of-life outcomes and risks.

**Space Weather.** Conditions in the region of space close to the earth, especially the presence of electromagnetic radiation and charged particles emitted by the sun, that can affect human activity and technology.

**Stakeholder Preparedness Review (SPR).** A self-assessment of a jurisdiction’s current capability levels against the targets identified in the Threat and Hazard Identification and Risk Assessment (THIRA).

**Standardized impact.** Metrics used by the emergency management community with quantifiable consequences associated with major threats and hazards.

**Systemic risks.** Systemic risks are distinguished by their interconnectedness. Systemic risk propagates or emerges in interconnected systems.
across boundaries of situational awareness or operational control, resulting in unwanted effects that cascade with amplifying harm. This type of risk begins as a distributed vulnerable state that increases with the complexity of our social, technological, and environmental systems. Once a triggering incident takes place, systemic risk can destabilize entire systems’ critical functions by affecting multiple sectors and producing cascading effects that may amplify the original incident’s impact. These risks are especially concerning when they appear in critical infrastructure sectors (e.g., electric, financial).

**Threat.** A natural or man-made occurrence, individual, entity, or action that has or indicates the potential to harm life, information, operations, the environment, and/or property (a hazard differs from a threat in that a threat is directed at an entity, asset, system, network, or geographic area, while a hazard is not directed).

**Threat and Hazard Identification and Risk Assessment (THIRA).** A three-step risk assessment process that allows a jurisdiction to understand its threats and hazards (risks) and how the impacts may vary according to time of occurrence, season, location, and other community factors; as well as determine the level of capability required to address those risks.

**Tribal Homeland Security Grant Program (THSGP).** A federal program that supports the ability of state, local, Tribal, and territorial government, as well as nonprofits, to prevent, protect against, respond to, and recover from terrorist attacks.

**Urban Area Security Initiative (UASI).** A Federal program that assists high-threat, high-density Urban Areas efforts to build, sustain, and deliver the capabilities necessary to prevent, prepare for, protect against, and respond to acts of terrorism.

**Vulnerability.** A physical feature or operational attribute that renders an entity, asset, system, network, or geographic area open to exploitation or susceptible to a given hazard.

**Vulnerable populations.** Populations that are less likely to be able to prepare for hazards; less likely to receive or be able to respond to warnings; more likely to die, suffer injuries, and have disproportionately higher material losses; have more psychological trauma; and face more obstacles during phases of response and recovery.

**Whole community.** Whole community is a means by which residents, emergency management practitioners, organizational and community leaders, and government officials can collectively understand and assess the needs of their respective communities and determine the best ways to organize and strengthen their assets, capacities, and interests.
COMMUNITY AND NATIONAL CAPABILITY TARGETS

Community and national capability targets facilitate capabilities-based planning, which emergency managers use to determine the Nation’s capability requirements to manage its risk. Since 2012, states, territories, urban areas, and Tribes have used the community Threat and Hazard Identification and Risk Assessment (THIRA) to set goals for how much capability they want to have. Communities then use the Stakeholder Preparedness Review (SPR) to report how prepared they currently are. In order to facilitate consistency and standardization across communities and the Nation, the Federal Emergency Management Agency (FEMA) developed a methodology by which communities report their goals and current capability using the same standardized capability targets.

Each standardized capability target has three components (Figure 12). Critical tasks apply to a wide range of threats and hazards—not only those identified in the THIRA—that emergency managers nationwide routinely plan for. The Nation’s ability to perform critical tasks indicates the Nation’s overall preparedness. Each standardized target also incorporates impacts and timeframe metrics. Standardized impacts are key metrics used by the emergency management community with quantifiable consequences associated with major threats and hazards. Timeframe metrics describe the amount of time or level of effort needed to successfully manage the impact and take into account how quickly communities and the Nation should be able to activate a given capability and how long it can be sustained. Capability targets define success for one or more aspects of a Core Capability.

FEMA uses the THIRA/SPR to work with communities to understand their progress and gaps in preparedness. Through the THIRA, communities assess their risks and set targets for the capabilities needed to address those risks. Through the SPR, communities evaluate how close they are to meeting their targets, identify their gaps, and develop approaches for closing those gaps. FEMA uses these assessments to inform national-level capability and gap assessments and assess national preparedness.

Composition of a Capability Target

![Diagram](image)

**Figure 12:** Example of standardized target language, including timeframe and impact.
APPENDIX C: NATIONAL RISK AND CAPABILITY ASSESSMENT

NATIONAL RISK AND CAPABILITY ASSESSMENT

The Disaster Recovery Reform Act of 2018 (DRRA) sets the requirement that FEMA develop “tiered, capability-specific performance objectives” to assess national preparedness and identify gaps in national capability. To meet this requirement, FEMA developed the National Risk and Capability Assessment (NRCA), a suite of preparedness assessments that measure risk and capability across the Nation in a standardized and coordinated way (Figure 13).

The NRCA builds upon the annual capability assessments—the THIRA/SPR—submitted by states, territories, urban areas, and Tribal Nations. Through these assessments, all 56 states and territories (including the District of Columbia) and many major urban areas and Tribes measure catastrophic risks to their communities, the impacts of those risks, and their capability to manage those risks using standardized language as the basis for understanding capability. The Federal Government then uses the same common language to assess the Nation’s catastrophic risks and capabilities to support communities. The 2021 National Preparedness Report (NPR) uses the NRCA data as an indicator to better understand how prepared the Nation is and where significant capabilities remain to be built.

In 2020, for the first time, FEMA established national response and recovery capability targets. These targets represent estimates of the capabilities required to manage the Nation’s realistic worst-case scenarios, using standardized language. With the completion of the National THIRA, all levels of government, including the Federal Government, now use this same standardized target language to assess these requirements. In 2020, 56 states and territories (including the District of Columbia), 31 Tribes, and 33 urban areas completed SPRs.

Through the NRCA, FEMA compares the level of capability that communities collectively intend to build and sustain to the estimated level of capability that the Nation will need to manage a catastrophic threat or hazard. By identifying and understanding resulting gaps in capability, the Nation can strategize how best to close these gaps using data-driven decision-making.

Figure 13: The assessments identify the national-level capability needs and the gaps to meet catastrophic incidents.
THE FOUR PARTS OF THE NATIONAL RISK AND CAPABILITY ASSESSMENT (NRCA)

1. **Risks and Associated Impacts**: All levels of government use the THIRA process to identify and assess threats and hazards of concern.

2. **Capability Goals**: The Community THIRA process uses capability targets to convert the likely impacts of incidents into goals for how much capability that the communities want to have, while the National THIRA establishes capability targets for the Nation to collectively address.

3. **Current Capabilities**: The Community SPR enables communities to measure their current capabilities, while the National SPR will assess the Nation’s ability to provide support beyond current community capabilities (the National SPR is currently under development and not included in this report).

4. **Gaps**: The SPR process helps all levels of government to identify the current gaps that are preventing them from reaching their capability goals and develop strategies to close those gaps.

At a national level, disasters rarely occur in isolation. Because of this, the national targets also account for the likelihood that FEMA and other federal partners will be engaged in ongoing disaster operations at the same time as a catastrophic incident, thereby increasing the total impact that the Nation will have to address. For this reason, in its analysis, FEMA included plausible concurrent operations (PCO) based on historical impact data for hurricanes, floods, and wildfires. Using these PCOs alongside the National THIRA scenarios, FEMA worked with stakeholder agencies and SMEs to determine the estimated impacts and the timeframes within which those impacts should be addressed.

Building off of analysis included in the 2020 NPR, FEMA is taking the first steps to assess national capability gaps through analysis included in this report (focused on capabilities most stressed by COVID-19) and forthcoming analysis in the National SPR.