Health and Social Services in Puerto Rico Before and After Hurricane Maria

Predisaster Conditions, Hurricane Damage, and Themes for Recovery

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Preface

On September 19 and 20, 2017, Hurricane Maria severely damaged the island of Puerto Rico. Coming just two weeks after Hurricane Irma, the storm significantly damaged local infrastructure and interrupted the provision of services essential to the people of Puerto Rico. In the aftermath, the president signed a Major Disaster Declaration for Hurricane Maria on September 20, 2017 (DR-4339) under the *Robert T. Stafford Disaster Relief and Emergency Assistance Act* (Stafford Act). As attention turned from response to long-term recovery, Congress enacted a Supplemental Appropriation Bill authorizing funding for rebuilding efforts. The Act required the governor of Puerto Rico, in coordination with the Federal Emergency Management Agency (FEMA), the Department of Treasury, Department of Energy, and other federal agencies having responsibility under the National Disaster Recovery Framework, to submit within 180 days of enactment of the legislation a report to Congress that describes Puerto Rico’s 12- and 24-month economic and disaster recovery plan.

The plan was developed in coordination with the Federal Oversight and Management Board (FOMB) established under the Puerto Rico Oversight, Management, and Economic Stability Act (PROMESA), the federal interagency, and key partners from private and nongovernmental entities using an agile process to identify recovery solutions. Under contract with FEMA, the Homeland Security Operational Analysis Center (HSOAC) provided substantial support in developing the plan by soliciting and integrating inputs from a wide variety of stakeholders, contributing analysis where needed, and drafting the plan. The plan included an overview of damage and needs, courses of action (COAs) to meet those needs, costs of the courses of action, and potential funding mechanisms for those costs.

The governor’s team finalized the economic and disaster recovery plan for Puerto Rico, and the Governor submitted Puerto Rico’s final plan to the U.S. Congress on August 8, 2018. The plan defined priorities, goals, and expected outcomes that address both immediate needs and provide a foundation for longer-term sustainability.

The planning effort was organized into 12 sectors (reflecting the National Disaster Recovery Framework). The purpose of this report is to describe the development of plan elements for the health and social services sector via the Health and Social Services (HSS) Sector team, including analytical material that was not included in the recovery plan but informed the planning process. We also describe the methodology behind the damage and needs assessment and discuss themes for recovery. Long-form COAs that provide greater detail than found in the plan (e.g., cost estimations, implementation considerations) can be found at the end of this report. As described

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in greater detail later, the COAs comprise a collection of activities, policies, and actions developed to support the human capital investments identified in the recovery plan.

While the National Disaster Recovery Framework (NDRF) includes education in the health and social services sector, in April 2018 FEMA determined that, given the scope and centrality of the sector’s future development, education would be treated as a separate sector and is detailed in a comparable but separate volume. While there is considerable overlap between Education and HSS, this report summarizes key findings from a damage and needs assessment and COAs designed to address health and social services–specific needs.

The report may be of interest to individuals and organizations working on the implementation of the recovery plan or other aspects of the island’s recovery. It may also be of interest to those working on recovery in other regions affected by the 2017 hurricanes or others like it (e.g., islands, territories, small or remote communities) and those interested in broader recovery issues pertinent to health and social service topics.

This research was sponsored by FEMA and conducted within the Strategy, Policy, and Operations Program of the HSOAC federally funded research and development center (FFRDC). More information about HSOAC’s contribution to planning for recovery in Puerto Rico, along with links to other reports being published as part of this series, can be found at www.rand.org/hsoac/puerto-rico-recovery.

About the Homeland Security Operational Analysis Center

The Homeland Security Act of 2002 (Section 305 of Public Law 107-296, as codified at 6 U.S.C. § 185) authorizes the Secretary of Homeland Security, acting through the Under Secretary for Science and Technology, to establish one or more FFRDCs to provide independent analysis of homeland security issues. The RAND Corporation operates the HSOAC as an FFRDC for the Department of Homeland Security (DHS) under contract HSHQDC-16-D-00007.

The HSOAC FFRDC provides the government with independent and objective analyses and advice in core areas important to the department in support of policy development, decisionmaking, alternative approaches, and new ideas on issues of significance. The HSOAC FFRDC also works with and supports other federal, state, local, tribal, and public- and private-sector organizations that make up the homeland security enterprise. The HSOAC FFRDC’s research is undertaken by mutual consent with DHS and is organized as a set of discrete tasks. This report presents results of research and analysis conducted under task order 70FBR218F00000032, “Puerto Rico Economic and Disaster Recovery Plan: Integration and Analytic Support.”

The results presented in this report do not necessarily reflect official DHS opinion or policy.

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Summary

In September 2017, Puerto Rico was struck by two major hurricanes in quick succession. The first of these, Hurricane Irma—a Category 5 storm—skirted the northeastern coast of Puerto Rico on September 7, leading to widespread power outages and water service interruptions for several days. Less than two weeks later, on September 20, Hurricane Maria made landfall on Puerto Rico as a Category 4 hurricane with peak wind speeds of up to 155 miles per hour (mph). It was the most intense hurricane to make landfall in mainland Puerto Rico since 1928. The storm’s path moved directly across the main island, only 25 miles from San Juan, the area of Puerto Rico with the highest population density. The effects of the hurricanes were widespread and catastrophic, including the failure of Puerto Rico’s entire energy grid, cascading failures of transportation, communications, water supply, and wastewater treatment systems, and damage to other sectors including health care, social services, and education.

In response to the damage inflicted on Puerto Rico by Hurricanes Irma and Maria, Congress passed the Bipartisan Budget Act of 2018 on February 9, 2018 (U.S. Public Law 115-123, 2018), which required the governor of Puerto Rico, in coordination with the Federal Emergency Management Agency (FEMA), the Department of Treasury, Department of Energy, and other federal agencies, to submit a report to Congress that described Puerto Rico’s 12- and 24-month economic and disaster recovery plan within 180 days of enactment of the legislation. That plan, *Transformation and Innovation in the Wake of Devastation: An Economic and Disaster Recovery Plan for Puerto Rico*, was submitted to Congress on August 8, 2018.

Michael Byrne, the federal coordinating officer responsible for overseeing FEMA’s response and recovery efforts in Puerto Rico, asked the Homeland Security Operational Analysis Center (HSOAC), a federally funded research and development center (FFRDC) operated by the RAND Corporation, to assist with writing the congressionally mandated long-term recovery plan for Puerto Rico. To establish an evidence-based foundation for the recovery plan, HSOAC was also asked to conduct an assessment describing the damage from the hurricanes and remaining needs across Puerto Rico.¹

This report focuses on the damage and needs assessment and related courses of action (COAs), which are a collection of activities, policies, and actions that support the human capital investments and that were developed for Puerto Rico’s health and social services sector by the Health and Social Services (HSS) Sector team. The HSS Sector includes five subsectors: health

¹ More information about HSOAC’s contribution to planning for recovery in Puerto Rico, along with links to other reports being published as part of this series, can be found at RAND Corporation, “Supporting Puerto Rico’s Disaster Recovery Planning,” webpage, undated. As of March 12, 2019: www.rand.org/hsoac/puerto-rico-recovery.
care, public health and emergency preparedness, environmental health, mental and behavioral health, and social services.

Given that many of Puerto Rico’s current problems have roots that long predate the 2017 hurricanes, Puerto Rico’s recovery presents an opportunity to implement social, governmental, fiscal, and economic reforms that would lead to a 21st-century Puerto Rico. For the HSS Sector, this meant that recovery planning was envisioned as an opportunity to rebuild and enhance health and social service infrastructure and regional health care networks to ensure reliable and equitable access to health and social services and health-promoting communities, including an efficient and effective response to public health crises and other future disasters, as described in the recovery plan.

This damage and needs assessment and related actions for the Health and Social Services Sector were developed to support Puerto Rico’s recovery. The assessment and COAs draw on myriad data sources as well as stakeholder interviews and roundtables, literature reviews, and media reporting. Throughout the process, our team engaged with stakeholders and subject matter experts, including senior Puerto Rico Department of Health (PRDOH) and Puerto Rico Department of Family (PRDOF) staff, researchers at the University of Puerto Rico and the Inter-American University, local nonprofits in the education sector, health and social services researchers in Puerto Rico with expertise in the field, and island professionals with experience in disaster recovery and health system reform.

Key Challenges Facing the Health and Social Services Sector Before the 2017 Hurricanes

Prior to the hurricanes, Puerto Rico faced widespread and persistent challenges. Some of these challenges were specific to the health and social services sector, while others were more foundational (e.g., over a decade of economic decline) and exacerbated the challenges faced in other sectors.

Burden of chronic disease. Before Hurricanes Irma and Maria, overall rates of chronic disease in Puerto Rico (heart disease, diabetes, etc.) were higher than U.S. averages. For example, according to the 2017 Behavioral Risk Factor Surveillance System (BRFSS), 17.2 percent of individuals in Puerto Rico reported that they had been told by a doctor that they have diabetes, compared with 10.5 percent of individuals in all U.S. states and the District of Columbia. An estimated 9.9 percent reported heart disease or myocardial infarction compared with 6.6 percent in all U.S. states and the District of Columbia. Reports of stroke were similar for both populations. However, a greater percentage of those in Puerto Rico had been told they had high blood pressure (44.7 percent) than in US. states and the District of Columbia (32.3 percent) (Centers for Disease Control and Prevention, 2015). There are also significant age, gender, and economic differences in health risk among Puerto Rico’s population. Women who suffer a
myocardial infarction report more deaths (8.6 percent for women vs. 6 percent for men in hospitals) than men with the same conditions (Zevallos et al., 2012). Those at the lower end of the socioeconomic spectrum were at greater risk for diabetes, and diagnosed diabetes was more prevalent among women than men (age adjusted rates were 14 percent compared with 13.5 percent, respectively, on average) in 2016. Asthma was prevalent among young people, with a higher lifetime asthma prevalence in the younger age groups.

**Prevalence of mental health problems.** The overall rates of psychiatric, including alcohol disorders, in Puerto Rico prior to the storms were similar to those of the United States as a whole (23.7 percent and 26.2 percent, respectively, in 2015) (Canino et al., 2016), despite the level of poverty in Puerto Rico and the link between mental health and poverty. However, the prevalence of some psychiatric illness was not evenly distributed across demographic groups or geographic areas. For example, compared with those in other health regions, residents from the San Juan health region had the highest 12-month prevalence rate for alcohol use disorder (8.9 percent), alcohol abuse (8.2 percent), and alcohol dependence (2.5 percent) (Canino et al., 2016).

**Population changes creating new vulnerabilities.** Puerto Rico’s population has become increasingly aged over the past decade as a result of natural aging as well as outmigration. In 2010 the median age was 37 years, and persons 60 years or older accounted for 20.6 percent of the population (768,905 persons). As of 2017, the median age had increased to 41.4 years and persons over 60 years comprised 26 percent of the population (871,429 persons) (U.S. Census Bureau, 2017a). This increase is expected to continue, with 39.2 percent of the population projected to be age 60 or older by 2050 (Puerto Rico Office of the Ombudsman for Elderly, 2014). By comparison, persons age 65 or older are projected to account for 22 percent of the U.S. population by 2050. As of 2015, 39.9 percent of the population age 65 and over was estimated to be living at or below the federal poverty level (FPL) with Social Security (80.2 percent) and the Nutrition Assistance Program (NAP; 40.9 percent) as their main sources of income (Puerto Rico Office of the Ombudsman for Elderly, 2014). Because the risk for chronic health conditions increases with age, demand for health services and other support services will increase as the population ages. The continued economic decline and outmigration of working-age adults may in turn affect the government of Puerto Rico’s ability to provide these services.

**Environmental hazards.** Puerto Rico has had long-standing challenges with water and air pollution as well as waste management. Before the storms, the island violated drinking-water standards for volatile organic compounds, total coliform bacteria, and disinfection by-products. Puerto Rico struggled with limited landfill capacity and low recycling rates, which created a waste management crisis (U.S. Environmental Protection Agency, 2016). Moreover, Puerto Rico also had many toxic waste sites, including 18 Superfund (hazardous waste) sites on the National Priorities List, or about 3.4 per 1,000 square miles. This compares with an average of 1.4 per

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2 Current U.S. Census Bureau projections do not include a cutoff at 60 years of age.
1,000 square miles across the United States (U.S. Census Bureau, 2012; U.S. Environmental Protection Agency, undated). Exposure to environmental hazards in Puerto Rico has been correlated with a high prevalence of childhood asthma (Loyo-Berrios et al., 2007), adverse birth outcomes (Aker et al., 2019), and water- and vector-borne disease outbreaks (Hlavsa et al., 2015; Sheffield et al., 2014). Unenforced building codes, informal housing, and storm-related hazards (e.g., mold) also present environmental hazards to residents.

**Health care workforce and access to services.** Provider shortages and access issues pose functional challenges for the health care system in Puerto Rico. As of September 30, 2018, there were 105 health provider shortage areas (HPSAs): 39 of these were primary care, 24 dental care, and 42 mental health care, according to the Health Resources and Services Administration (HRSA, undated). Seventy-two of Puerto Rico’s 78 municipalities have been designated as medically underserved areas; in 32 primary care HPSAs, the ratio of the population to primary care providers is 3,500 to 1 or higher. The issue of provider outmigration is a challenge as well, with 2,132 health professionals outmigrating to the United States in 2014, of which 361 were physicians. At the same time, there has been an increase in the number of people using some services, such as mental health care. There has been limited access to preventive programs, including psychosocial supports, particularly for low-income Puerto Ricans.

**Health care finance challenges.** Puerto Rico’s financial challenges, combined with statutory limits on Medicaid reimbursements from the federal government, have constrained the government’s ability to provide health care services. Unlike in the 50 states and the District of Columbia, where the federal government matches all Medicaid expenditures at the appropriate federal matching assistance percentage (FMAP) for the state, FMAP in Puerto Rico is applied until the Medicaid ceiling funds and available Affordable Care Act (ACA) funds are exhausted. Somewhat lower Medicaid and Medicare reimbursement rates relative to U.S. states, combined with cost-of-living challenges, have put a downward pressure on payments for providers.

**Vital records challenges.** When Hurricanes Irma and Maria made landfall in September 2017, the Puerto Rico Demographic Registry reportedly was using a paper-based reporting system, which precludes the collection and sharing of real-time information on vital events after a disaster as well as the implementation of protocols for surveillance of disaster-related deaths. Attributing mortality following a disaster or other extreme weather events can also be hindered by under-identification and other challenges, such as limited surveillance periods (Uscher-Pines, 2007) or the type of methodology used to estimate mortality (Madrigano, McCormick, and Kinney, 2015; McCormick, Madrigano, and Zinsmeister, 2016).

**Lack of access to income and food assistance.** Despite continued need, the number of Temporary Assistance for Needy Families (TANF) recipients has been dropping consistently over time. Possible reasons given for this downward trend during a challenging economic

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3 The total is 93, if correctional facilities are removed.

4 Personal communication with HSS Recovery Support Function (RSF) contacts, June 2018.
environment included more cases reaching the 60-month limit, which increases attrition (i.e., exit rates are higher than entry rates), emigration from Puerto Rico, or other demographic changes that could affect the size of the eligible population (Cordero-Guzman, 2017). As of 2016, 45.1 percent of Puerto Ricans had incomes below the FPL (U.S. Census Bureau, SI703, 2016a), and 467,827 households received benefits from NAP (38.3 percent) (U.S. Census Bureau, DP03, 2017b). Because this program is funded via a capped block grant, $1.9 billion for 2017, it is not able to accommodate increased need (Wolkomier, 2017). As the economic decline progresses, families will continue to “time out” of some TANF benefits, which may exacerbate the situation for many already impoverished individuals across Puerto Rico.

**Economic decline.** Puerto Rico’s economy had been generally declining since 2006. A number of factors likely contributed to this decline, including expiration of pharmaceutical patents, outsourcing of some pharmaceutical products from Puerto Rico to India and China, and to a limited extent, the 1996 repeal by Congress of a tax credit for U.S. corporations that generated income in Puerto Rico (MacEwan, 2016). Puerto Rico also was negatively affected by the Great Recession of 2008. The economy has remained in near-continuous recession for the past decade. According to the Bureau of Labor Statistics (2018a), there is low labor force participation (just under 40 percent in August 2017) and high unemployment relative to the rest of the United States. Given the lack of economic opportunities, an increasing number of young people and working-age adults migrated away from Puerto Rico, with the resulting population downturn exacerbated by a declining birth rate (U.S. Census Bureau, SI703, 2016). This migration away from the island, in turn, further decreased Puerto Rico’s workforce and, consequently, its tax base.

With many working-age adults leaving Puerto Rico, an increasing share of the remaining population has been affected by poverty or other challenges. Some groups, including children, have been disproportionately affected by poverty. Many children in Puerto Rico live in impoverished conditions, with 56 percent living in poverty (less than 100 percent of the federal poverty level, or FPL) and 36 percent living in extreme poverty (less than 50 percent of the FPL) (Annie E. Casey Foundation, 2018). Over half of children live in families that rely in some way on public assistance. More than 80 percent of the 2016–2017 student population came from families with incomes below 150 percent of the FPL (Puerto Rico Department of Education, 2017). Rural residents have been especially hard hit by Puerto Rico’s economic decline (Morelock et al., 2000; Skibell, 2018).

**Fiscal transparency.** The government of Puerto Rico has been hampered in its ability to address the island’s economic and sociodemographic challenges because of a lack of fiscal transparency and accountability to stakeholders, and the government has faced fierce criticism as a result (Marazzi, 2018; Coto, 2018). As noted in a 2015 U.S. Treasury report, annual budgets have relied on unrealistic revenue estimates, resulting in the masking of structural deficiencies, and financial disclosure is lacking in clarity and deadlines have been missed, making it difficult to track progress on reforms (Government Development Bank for Puerto Rico, 2015). Similarly,
the April 2018 “New Fiscal Plan for Puerto Rico” acknowledges that “periods of fiscal irresponsibility and lack of economic planning and transparency also contributed to Puerto Rico’s financial crisis” (Governor of Puerto Rico, 2018a).

The Hurricanes’ Impacts on the Health and Social Services Sector

The hurricanes exacerbated existing challenges in Puerto Rico’s health and social services sector.

Health Care Infrastructure Damage

Many health care facilities incurred damage from the storms, although it was not evenly distributed. Most of the western part of Puerto Rico—the Mayaguez and a part of the Bayamon health care region—was classified as having low damage (on a scale of 0–14, with 1 being lowest). In contrast, parts of the northern, southern, and eastern regions were more significantly affected, including other parts of the Bayamon, Caguas, Fajardo, Metro, and Ponce regions.5 In some municipalities, federally qualified health centers (FQHCs)—those community-based care providers that receive funds from the HRSA Health Center Program to provide primary care services in underserved areas—were the only open and operational places where emergency and acute health care services were being provided around the clock in the first few months following the hurricanes. Clinical and diagnostic centers around Puerto Rico sustained considerable damage, with 28 of the 103 listed being severely damaged. The severity of damage was most acute for non-mountainous regions (five in mountainous regions and 23 in non-mountainous regions were severely damaged). FQHCs also sustained damage, which was split evenly between mountainous and non-mountainous regions. Of the 92 FQHCs in Puerto Rico, 20 reported being damaged with operational closure or at least significant limitations, and 10 of those 20 were located in the mountain region (Federal Emergency Management Agency, 2018a).

Health Impacts

Damage to buildings and to electrical, water, and communications infrastructure closed medical and social service facilities and affected health and social service agencies’ ability to operate. For some facilities, this disruption lasted for several months, but it varies. Even at facilities that remained open, services were compromised by intermittent access to power and water, lack of access to client records, and limited staff, many of whom were unable to come to work. With a high proportion of the population lacking access to potable water, residents sometimes resorted to unsafe sources, such as wells and/or faucets contaminated by waterborne pathogens or chemicals. Specific incidents reported in Puerto Rico included an outbreak of

5 FEMA briefing on health care infrastructure, October 2017.
leptospirosis, a bacterial infection spread when urine from infected animals gets into water or soil, which occurred in October 2017; gastrointestinal outbreaks at multiple schools; an increase in the numbers of sick students; and an increase in the incidence of conjunctivitis and influenza, increases that were later corroborated (Oda et al., 2018; Adams et al., 2019). The presence of mold and proximity to debris, pests, and vectors (mostly waterborne) also resulted in unsafe living conditions in highly impacted areas. During site visits to elder-care facilities (public and private), which FEMA conducted in December 2017 and January 2018, increases in conjunctivitis and respiratory problems were reported to the HSS RSF.

Increases in anxiety, depression, and post-traumatic stress disorder (PTSD) were widely reported following the hurricanes. Of the 2,500 people who have visited the emergency clinic since its opening after the storm, 90 percent were referred for mental health screenings (Dickerson, 2017). In addition, although the rate of suicide had fallen in the year right before Hurricane Maria, the rate had previously spiked during the height of the financial crisis (2008–2013), and initial reports indicate that it spiked again following Maria. At least 253 people committed suicide in 2017, a 29-percent increase from 2016. Eighty-five percent of these suicides were committed by men (Governor of Puerto Rico, 2017b).

The Human Cost

The official death count released by the Puerto Rico Department of Public Safety was initially 64. However, a range of estimates have been published using a variety of coding and counting methods, and the official count was increased to 2,975 based on a study by George Washington University, commissioned by the government of Puerto Rico (Milken Institute School of Public Health, 2018).

Disruption of Social Services

Impacts to this subsector include loss of and damage to physical structures and interruption of service to clients and beneficiaries. Anecdotal reports of data loss have been refuted by Puerto Rico government agencies, although limited access to existing data and/or the need to re-collect data appear to have been difficult during the process of ascertaining case status. Similarly, locating and identifying participants after the storm was hampered by data access difficulties. Like other subsectors, social services have been affected by migration away from the island: As younger generations have migrated to other parts of the United States, an increasing number of senior citizens are living alone and may therefore be more vulnerable to financial exploitation (Puerto Rico Office of the Ombudsman for Elderly, 2014).

Emerging Issues

In summary, several health care system issues emerged in the wake of the hurricanes. First, hospital and health clinic use increased as compared with the use of primary care as a result of the infrastructure disruptions. Second, changes in the population mix after the hurricanes may
have negatively affected certain vulnerable communities, but it is unclear what future service needs may be for that changing demographic. Third, full health care system restoration issues need to be addressed urgently, inclusive of addressing both physical damage and workforce retention.

**Themes for Recovery and Courses of Action**

The COAs discussed here are a collection of activities, policies, and actions developed to support the human capital investments identified in the recovery plan. The portfolio that was included in the plan addresses four themes that emerged during the damage and needs assessment.

**Building Health and Social Service Systems Capacity**

One of the critical challenges that was demonstrated through Hurricane Maria was the fragility of the health care system, including social, behavioral, and environmental health services. This component seeks to address ongoing resilience in the health care system to ensure flexibility and agility in response and long-term recovery. This includes the repair and rebuilding of hospitals and primary care centers. Health and social services require reliable electricity systems to function, so efforts to create a hardened electricity grid supported by alternative energy generators will be required to keep these services available in a future emergency. The portfolio also includes elements of routine function in the system, including stronger primary care options (e.g., community health centers/primary care clinics), better financing mechanisms (e.g., Medicaid/Medicare payment systems), and better data integration and digitization of health and related information.

**Strengthening the Workforce and Its Capacity to Address Health Issues**

Given the shortages in some health specialties and concerns about personnel moving away, the government of Puerto Rico intends to incentivize, retain, and train the health care and public health workforce through such initiatives as loan repayment programs and policies that allow nurse practitioners (NPs) and physician assistants (PAs) from other states to provide care in Puerto Rico. In addition, the government of Puerto Rico will focus on improving workforce capabilities in public health surveillance and vital records data use, which will be important during disaster response and under normal circumstances.

**Strengthening Social Systems for Populations Most in Need**

There are several populations with greater needs during and after disaster, such as those who are at home, seniors, those with chronic health conditions, and so forth. Thus, this component includes services and other supports that address these challenges, to ensure continuity during and after disaster and to limit disruptions to food, medication, technology, and other supplies
required by these populations. One initiative focuses on transitioning to the more financially flexible Supplemental Nutrition Assistance Program (SNAP), while another option would be to implement long-term waivers to existing NAP regulations. Other COAs focus on developing public education campaigns and training to help detect child and senior abuse, enhancing food stockpiles to support the older adult population, and hiring additional child welfare investigators to reduce the backlog of child maltreatment investigations.

Creating Healthy Communities

Healthy communities support healthy people. Transportation, municipal infrastructure, education, economic development, natural and cultural resources, and telecommunications are all required to improve and protect the health and well-being of communities. Toward that end, the government of Puerto Rico proposes a range of initiatives, including deploying Wi-Fi and broadband internet connectivity (increasing access to health information to support healthy lifestyles and chronic disease prevention and management); providing incentives to move from remote communities to urban centers (increasing access to key economic and educational services); and offering better access to transportation and community resources, such as museums, parks, artist workspaces, and community centers, as well as natural resources (promoting access to services, healthy activities, and exercise). The government of Puerto Rico also intends to reduce water- and vector-borne disease transmission through improved public health surveillance and innovative mosquito-control practices. Closing unpermitted and unregulated dumps will further remove environmental and public health threats to the people of Puerto Rico. This focus on addressing broad and interconnected social and economic determinants—particularly in education and financial sectors—can have significant impacts on the population’s health and well-being.

Implementation Considerations

Given the timeline and purpose of the recovery plan, creating detailed implementation plans was beyond the scope of our work. However, we conclude by describing a range of considerations that those involved in implementing the COAs should bear in mind.

- **Implementation will require additional analysis, detailed planning, and adjustments.** Each of the COAs will require at least some degree of additional analysis and the fleshing out of key details.
- **Cost estimates will need to be updated.** Similarly, cost estimates provided for the COAs were typically based on the best available information, but should be verified and updated, if necessary.
- **Key partners will need to be identified and engaged.** The COAs identify likely implementation partners. However, implementers will need to review and (as needed) revise the list of partners, contact them, secure commitments, and identify a more detailed division of labor, modes of communication, and options for coordination.
• **Ongoing monitoring and formative evaluation will be needed to inform midcourse corrections throughout the implementation process.** Monitoring and evaluation should focus on whether programs show signs of producing both relevant outputs (e.g., health services delivered) and outcomes (e.g., improved physical health).

• **Dependencies with COAs in other sectors should be considered.** The implementation of some of the HSS COAs depends on COAs in other sectors. For example, the Health and Social Services COA related to expanding telehealth assumes improvements in infrastructure, particularly stable and reliable telecommunication, that are addressed by the Comm/IT (CIT) Sector team.
Acknowledgments

We acknowledge the steadfast support and encouragement of our project sponsor Michael Byrne, the Acting Caribbean Area Division Director of the Federal Emergency Management Agency (FEMA) and the federal coordinating officer and federal disaster-recovery coordinator for Hurricane Irma and Maria response and recovery in Puerto Rico. We also appreciate the contributions of other key FEMA partners, including Gerilee Bennett, Kevin Snyder, Patrick Tuohy, and Jose Gil Montanez. From Puerto Rico, we are particularly grateful for the input of Omar Marrero Diaz and Laura Femenias Jove, the director and associate director, respectively, of the Central Office for Recovery, Reconstruction, and Resilience.

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Furthermore, we are thankful to the residents of Puerto Rico for their strength and vision after disaster.
# Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AAMC</td>
<td>Association of American Medical Colleges</td>
</tr>
<tr>
<td>ADFAN</td>
<td>Administration for Families and Children</td>
</tr>
<tr>
<td>ADS</td>
<td>Autoridad de Desperdicios Solidos (Solid Waste Management Authority)</td>
</tr>
<tr>
<td>ASEM</td>
<td>Medical Services Administration</td>
</tr>
<tr>
<td>ASES</td>
<td>Administración de Seguros Salud de Puerto Rico (Health Insurance Administration)</td>
</tr>
<tr>
<td>ASSMCA</td>
<td>Administration of Mental Health and Anti-Addiction Services</td>
</tr>
<tr>
<td>ATV</td>
<td>all-terrain vehicle</td>
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<tr>
<td>BRFSS</td>
<td>Behavioral Risk Factor Surveillance System</td>
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<tr>
<td>CAP</td>
<td>Consumer Assistance Program</td>
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<tr>
<td>CDC</td>
<td>Centers for Disease Control and Prevention</td>
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<tr>
<td>CFSR</td>
<td>Child and Family Services Review</td>
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<tr>
<td>CHC</td>
<td>community health center</td>
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<tr>
<td>CHIP</td>
<td>Children’s Health Insurance Program</td>
</tr>
<tr>
<td>CIRIO</td>
<td>Corporation for the Blind and Physically or Mentally Disabled</td>
</tr>
<tr>
<td>CMS</td>
<td>Centers for Medicare and Medicaid Services</td>
</tr>
<tr>
<td>COA</td>
<td>course of action</td>
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<tr>
<td>CONUS</td>
<td>continental United States</td>
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<tr>
<td>CPCB</td>
<td>Community Planning and Capacity Building</td>
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<tr>
<td>DHS</td>
<td>Department of Homeland Security</td>
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<tr>
<td>EBP</td>
<td>evidence-based practice</td>
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<tr>
<td>ECHO</td>
<td>Extension for Community Healthcare Outcomes</td>
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<tr>
<td>EMS</td>
<td>emergency medical services</td>
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<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
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<tr>
<td>FEMA</td>
<td>Federal Emergency Management Agency</td>
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<tr>
<td>FFRDC</td>
<td>federally funded research and development center</td>
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</table>
FMAP  federal matching assistance percentage
FNS  Food and Nutrition Service
FOMB  Federal Oversight and Management Board
FPL  federal poverty level
FQHC  federally qualified health center
FSP  Food Stamp Program
FTE  full-time equivalent
HPSA  health provider shortage area
HRSA  Health Resources and Services Administration
HSOAC  Homeland Security Operational Analysis Center
HSS  Health and Social Services (Federal Emergency Management Agency
  Sector)
ISC  Integrated Service Centers
MMC  multimedia campaign
NAP  Nutrition Assistance Program
NDRF  National Disaster Recovery Framework
NGO  nongovernmental organization
NHLBI  National Heart, Lung, and Blood Institute
NP  nurse practitioner
OPPEA  Oficina del Procurador de las Personas de Edad Avanzada
PA  physician assistant
PFA  psychological first aid
PR  Puerto Rico
PRASA  Puerto Rico Aqueduct and Sewer Authority
PRDOF  Puerto Rico Department of Family
PRDOH  Puerto Rico Department of Health
PRDR  Puerto Rico Department of Health Demographic Registry
PREMA  Puerto Rico State Agency for Emergency and Disaster Management
PR-EQB  Puerto Rico Environmental Quality Board
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
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<tr>
<td>PROMESA</td>
<td>Puerto Rico Oversight, Management, and Economic Stability Act</td>
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<td>PRVCU</td>
<td>Puerto Rico Vector Control Unit</td>
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<tr>
<td>PTSD</td>
<td>post-traumatic stress disorder</td>
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<tr>
<td>RSF</td>
<td>Recovery Support Function</td>
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<tr>
<td>SAMHSA</td>
<td>Substance Abuse and Mental Health Services Administration</td>
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<tr>
<td>SNAP</td>
<td>Supplemental Nutrition Assistance Program</td>
</tr>
<tr>
<td>SUD</td>
<td>substance use disorder</td>
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<tr>
<td>TANF</td>
<td>Temporary Assistance for Needy Families</td>
</tr>
<tr>
<td>TF-CBT</td>
<td>Trauma Focused Cognitive Behavioral Therapy</td>
</tr>
<tr>
<td>USDA</td>
<td>U.S. Department of Agriculture</td>
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<tr>
<td>WIC</td>
<td>Women, Infants, and Children</td>
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<tr>
<td>ZAPSS</td>
<td>Zika Active Pregnancy Surveillance System</td>
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1. Introduction

In September 2017, Puerto Rico was struck by two major hurricanes in quick succession. The first of these, Hurricane Irma—a Category 5 storm—skirted the northeastern coast of Puerto Rico on September 7, 2017, leading to widespread power outages and water service interruptions for several days. Less than two weeks later, on September 20, Hurricane Maria made landfall on Puerto Rico as a Category 4 hurricane with peak wind speeds of up to 155 miles per hour (mph), the most intense hurricane to make landfall in mainland Puerto Rico since 1928. The storm’s path moved directly across the main island, only 25 miles from San Juan, the area of Puerto Rico with the highest population density. This track also led to nearly all of Puerto Rico experiencing hurricane force winds (at least 74 mph). Puerto Rico’s mountainous terrain likely exacerbated the hurricane’s impacts, leading to wind intensification (wind tunnels), increased rainfall, and flash flooding in rivers, streams, and valleys (National Weather Service, undated).

The effects of the hurricanes were widespread and catastrophic, including the failure of Puerto Rico’s entire energy grid. Damage to critical infrastructure resulted in cascading failures of the lifeline systems of energy, transportation, communications, water supply, and wastewater treatment and impeded response operations. Furthermore, with these events occurring at the end of a very active hurricane season, federal resources for disaster response were stretched, and aid from other states was not easily available because of a lack of mutual aid compacts and geographical separation from the mainland United States. Once aid supplies did arrive in Puerto Rico, there were also challenges to moving goods around the island as a result of limited supplies of fuel, insufficient drivers, and impassable roads (Domonoske, 2017; Gillespie, Romo, and Santana, 2017).

Based on information gathered in a series of interviews with municipio government staff—interviews conducted by the Homeland Security Operational Analysis (HSOAC) Municipalities Sector team—Puerto Rico’s municipal governments, which are typically the first responders during an emergency, were unprepared for a disaster of this magnitude. For example, many municipalities (43 percent) reported that their emergency response plans did not address how to protect children, seniors, and individuals with disabilities, and some municipalities had not held regular emergency preparedness exercises. Furthermore, extensive housing and infrastructure damage led to a months-long interruption of essential services. Residents lacked electricity, food, and water for a prolonged period and, with roads impassable, many had limited access to medical care. The sequelae of the hurricanes continued to affect Puerto Rico for weeks and even months, as people lost jobs, schools were closed, government services and private enterprises could not operate effectively, landslides caused flooding hazards, and wastewater polluted marine environments. Older adults, female caregivers, children and youth, residents of informal
housing\(^1\) (e.g., housing built without approved architectural or engineering plans, housing built on lands without title), individuals with disabilities or chronic illnesses, and rural residents were all disproportionately affected (Milken Institute School of Public Health, 2018; Sou, 2018; Puerto Rico Department of Education, 2017; Viglucci, 2018; Stoneham, Hasty, and Sesin, 2018).

Catastrophic hurricanes and the resulting emergencies are not unique to Puerto Rico. However, since the 2017 hurricanes, Puerto Rico has entered into a much longer period of postdisaster failure and faces a lengthier recovery than other regions of the United States that have dealt with the aftermath of similar events. Recovery has been especially difficult for Puerto Rico because of a range of long-term, chronic challenges and critical stressors that were producing a slow-building, systemic crisis prior to the 2017 hurricane season. An economic downturn spanning more than a decade, coupled with structural demographic, social, and infrastructure stresses, all combined to lead to a broader—and longer-term—challenge that will necessitate transformative changes and investments in the years to come.

In response to the damage inflicted on Puerto Rico by Hurricanes Irma and Maria, Congress passed the Bipartisan Budget Act of 2018 on February 9, 2018 (U.S. Public Law 115-123, 2018), which required the governor of Puerto Rico, in coordination with the Federal Emergency Management Agency (FEMA), the Department of Treasury, Department of Energy, and other federal agencies with responsibilities under the National Disaster Recovery Framework (NDRF), to submit a report to Congress that describes, within 180 days of enactment of the legislation, Puerto Rico’s 12- and 24-month economic and disaster recovery plan. That plan, *Transformation and Innovation in the Wake of Devastation: An Economic and Disaster Recovery Plan for Puerto Rico* (Governor of Puerto Rico, 2018b), was submitted to Congress on August 8, 2018.

Michael Byrne, the federal coordinating officer responsible for overseeing FEMA’s response and recovery efforts in Puerto Rico, asked the HSOAC, a federally funded research and development center (FFRDC) operated by the RAND Corporation, to assist with writing the Congressionally mandated long-term recovery plan for Puerto Rico. To establish an evidence-based foundation for the recovery plan, HSOAC was also asked to conduct an assessment describing the damage from the hurricanes and remaining needs across Puerto Rico.

This report focuses on the damage and needs assessment and related courses of action (COAs)—that is, activities, policies, and other actions developed to rebuild and improve health and social services in Puerto Rico.\(^2\) When the contract supporting this work started, education and health and social services were addressed jointly as a single FEMA sector under one Health and Social Services (HSS) Recovery Support Function (RSF). In April 2018, FEMA created a

\(^1\) The “Build Back Better” plan describes homes built on government land without permission and without following building code requirements as “informal housing.”

\(^2\) More information about HSOAC’s contribution to planning for recovery in Puerto Rico, along with links to other reports being published as part of this series, can be found at RAND Corporation, “Supporting Puerto Rico’s Disaster Recovery Planning,” webpage, undated. As of March 12, 2019: www.rand.org/hsoac/puerto-rico-recovery.
separate Education Sector, though it remained under the purview of the Health and Social Services RSF. The HSOAC education team similarly was split out from the Health and Social Services team in order to remain aligned with the FEMA structure. However, we treated Health and Social Services and education as highly interconnected throughout the plan development process to ensure that overlap was addressed as appropriate (e.g., important child nutrition programs administered by the Puerto Rico Department of Family [PRDOF] operate in facilities owned and operated by the Puerto Rico Department of Education). Readers interested in learning more about the Education Sector may wish to review that separate volume.3

The Health and Social Services Sector, as defined by FEMA, is composed of multiple areas: public health, health care services, behavioral health, environmental health, food safety and regulated medical products, long-term responder health issues, social services, disaster case management/referral to social services, and children and youth in disasters. Taken together, these mission areas focus on human recovery—a key component of recovery along with economic development and the recovery of physical infrastructure. While each of the nine mission areas is important and in many ways distinctive, the HSOAC team aggregated these nine mission areas into five subsectors:4

- health care
- public health and emergency preparedness
- environmental health
- mental and behavioral health
- social services.

Table 1.1 provides a crosswalk between the HSOAC subsectors and the FEMA mission areas. Including the Health and Social Services Sector, FEMA arranged the recovery effort into 12 sectors: Community Planning and Capacity Building (CPCB), Comm/IT (CIT), Economics (ECN), Education (ED), Energy (ENR), Housing (HOU), Municipalities (MUN), Natural and Cultural Resources (NCR), Public Buildings (PBD), Transportation (TXN), and Water (WTR). While the FEMA sectors could all be understood to be connected in some way, we note overlap with and interdependencies between relevant FEMA sectors such as Education, Public Buildings, and CPCB that are particularly important to Health and Social Services.

3 The reader should note differing uses of the term “sector” in this report. The capitalized “Sector” refers to how FEMA organizes response and recovery. This means HSS or Education. Lower-case “sector” refers to common segments of the economy or policy structures, like aviation or tourism.

4 These subsectors are specific to HSOAC’s division of labor and were not used by FEMA.
Table 1.1. Crosswalk Between HSOAC’s Subsectors and Mission Areas

<table>
<thead>
<tr>
<th>Subsectors</th>
<th>FEMA Mission Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public health and emergency preparedness</td>
<td>Public health, long-term response health issues, food safety, children and youth</td>
</tr>
<tr>
<td>Environmental health</td>
<td>Environmental health</td>
</tr>
<tr>
<td>Social services</td>
<td>Disaster health case management/referral to social services, children and youth</td>
</tr>
<tr>
<td>Health care</td>
<td>Health care services, regulated medical products, children and youth</td>
</tr>
<tr>
<td>Mental and behavioral health</td>
<td>Behavioral health, children and youth</td>
</tr>
<tr>
<td>Educationa</td>
<td>Children and youth</td>
</tr>
</tbody>
</table>

NOTES: We expanded behavioral health to include both behavioral and mental health, which covers mental health disorders, physical or chemical factors that lead to illness, as well as aspects of emotional well-being and resilience. Behavioral health covers disorders related to behavioral health choices, including substance use and abuse. Also, note that children and youth and elder issues were addressed in multiple subsectors, though the latter is not one of the nine mission areas. Responder safety and health were included in public health and emergency preparedness, principally.

a Education is described in a separate volume.

In the remainder of this introduction, we provide an overview of some of the key overarching challenges facing Puerto Rico prior to the 2017 hurricanes and explain how this context shaped the development of the damage and needs assessments and COAs. We then describe the methods and sources used in this research.

Puerto Rico’s Challenge and Opportunity

The 2017 hurricanes focused a magnifying glass on a range of long-term challenges facing Puerto Rico. Before the hurricanes, Puerto Rico’s economy had been generally declining since 2006. A number of factors likely contributed to this decline, including expiration of pharmaceutical patents, outsourcing of some pharmaceutical products from Puerto Rico to India and China, and to a limited extent, the 1996 repeal by Congress of a tax credit for U.S. corporations that generated income in Puerto Rico (MacEwan, 2016). Puerto Rico also was negatively affected by the Great Recession of 2008. Between 1997 and 2017, about 83,000 manufacturing jobs were lost—more than 50 percent of the prior total (MacEwan, 2016; Feliciano and Green, 2017; Makoff and Setser, 2017; Bureau of Labor Statistics, 2018c). The economy has remained in near-continuous recession for the past decade, with low labor force participation (just under 40 percent in August 2017) (Bureau of Labor Statistics, 2018a) and high unemployment relative to the rest of the United States (Bureau of Labor Statistics, 2018b).

Given the lack of economic opportunities, an increasing number of young people and working-age adults have migrated away from Puerto Rico, with the resulting population downturn exacerbated by a declining birth rate (U.S. Census Bureau, 2016). According to a recent briefing to the Federal Oversight and Management Board (FOMB) for Puerto Rico, about one
million Puerto Ricans left the island between 2000 and 2015. This outmigration, in turn, has
further decreased Puerto Rico’s workforce and, consequently, its tax base. Disparities in
educational achievement between Puerto Rico and the continental United States (define as
CONUS for this report) pose an additional challenge to Puerto Rico’s economic development
(Federal Reserve Bank of New York, 2014; Krueger, Teja, and Wolfe, 2015), with negative
implications for individual earning capacity.

With many working-age adults leaving Puerto Rico, an increasing share of the remaining
population has been affected by poverty or other challenges. In 2016, nearly 25 percent of Puerto
Ricans received monthly Social Security benefits, compared with fewer than 19 percent of the
U.S. population overall, while nearly 38 percent of households were receiving benefits from the
Federal Nutrition Assistance Program (NAP) for Puerto Rico (U.S. Census Bureau, 2017b). Also
according to the 2017 American Community Survey five-year estimates, 37 percent of Puerto
Ricans relied on Medicaid/means-tested insurance alone (an additional 8.1 percent and
0.2 percent relied on Medicare alone and Veterans Administration benefits alone, respectively).
By way of comparison, 14.5 percent of the U.S. population relied on Medicaid/means-tested
coverage alone for the same period (U.S. Census Bureau, 2017a).

Some groups, including children, have been disproportionately affected by poverty. More
than 80 percent of the 2016–2017 student population came from families with incomes below
150 percent of the federal poverty level (FPL; Puerto Rico Department of Education, 2017).
Rural residents have also been especially hard hit by Puerto Rico’s economic decline, with a
substantial percentage of Puerto Rican residents living in insecure housing, including homes
built in high-risk locations, such as near rivers, coastlines, or earthquake zones (Morelock et al.,
2000; Skibell, 2018). The aforementioned long-term economic decline, poverty, lack of
economic opportunities, and other economic hardships pose significant challenges to many in
Puerto Rico, and health and social services must be considered within this context. With that
context in mind, this report is focused on health and social services, and we refer readers
interested in a more detailed discussion of the economic circumstances in Puerto Rico to other
sector reports available at www.rand.org/pubs/research_reports/RR2600.html.

Puerto Rico has struggled to provide effective, efficient, and transparent governance for its
residents. In some key domains, including public safety, misaligned responsibilities between the
state and municipal governments have led to gaps in service provision or duplicative services.
The government of Puerto Rico and its public agencies also have faced fierce criticism regarding
a lack of fiscal transparency, inability to meet established performance goals, and a lack of
accountability to stakeholders (Marazzi, 2018). As noted in a 2015 U.S. Treasury report, annual
budgets have relied on unrealistic revenue estimates resulting in the masking of structural
deficiencies, and financial disclosure is lacking in clarity and deadlines have been missed,
making it difficult to track progress on reforms (Government Development Bank for Puerto
Rico, 2015). Similarly, the April 2018 “New Fiscal Plan for Puerto Rico” acknowledges that
“periods of fiscal irresponsibility and lack of economic planning and transparency also contributed to Puerto Rico’s financial crisis” (Governor of Puerto Rico, 2018a).

Although the 2017 hurricanes brought significant new challenges to Puerto Rico, they also presented an opportunity to accelerate reforms and initiatives already under way on the island. Given the combination of acute storm effects and longer-term challenges, HSOAC was asked to help the Governor develop a recovery plan that went beyond simply repairing the damage from the hurricanes to address the chronic issues and fundamental concerns that have impeded Puerto Rico’s ability to prosper and exacerbated the hurricanes’ impact. In short, HSOAC was asked to help figure out how to use the disaster as an opportunity to “build back better,” and in a way that made sure that resources invested today would lead to a stronger, more resilient Puerto Rico over the long term. For Health and Social Services, this means that the government of Puerto Rico has the opportunity to fundamentally transform these systems in a way that improves the health of all Puerto Ricans; supports the development of children, youth, and adults; and supports the government’s vision of economic and social development moving forward.

Methodology

Overview of Recovery Plan Development

Recovery plan development consisted of several distinct but overlapping phases, as well as the use of simultaneous top-down and bottom-up approaches. The governor of Puerto Rico actively developed strategic initiatives (top-down approach) while the damage and needs assessment was occurring (bottom-up approach). The top-down process started with the definition of the vision for Puerto Rico. From that vision, strategic initiatives were developed to provide themes to guide investments in recovery, which would be executed through portfolios and more detailed COAs. More detail about the strategic initiatives can be found in Appendix E. The bottom-up process started with the damage and needs assessment, which informed the development of COAs to address identified needs. COAs were then linked together in portfolios to address specific areas of need (e.g., building systems and supports for health-promoting communities). Groups of portfolios, covering all strategic initiatives set out by the Governor, were combined by decisionmakers and stakeholders into several plan alternatives for deliberation and discussion, with the preferred alternative becoming the recovery plan. This simultaneous top-down/bottom-up process necessarily required continuous feedback loops to adjust COAs and portfolios, based on, for example, decisionmakers’ preferences and emerging data. In the remainder of this chapter, we focus in more detail on the bottom-up processes that informed the overall plan development.
Developing the Damage and Needs Assessment

The damage and needs assessment provided the baseline to define, compare, and prioritize potential COAs. The assessment describes conditions before Hurricanes Irma and Maria, damage caused by the hurricanes, and posthurricane conditions.

To develop the damage and needs assessment, HSOAC examined not only what happened in the immediate wake of the 2017 hurricanes, but also how the impact of these hurricanes exacerbated—and in turn was exacerbated by—existing challenges and stressors in Puerto Rico.

We reviewed damage data for relevance to the Health and Social Services Sector and combined and summarized data from different sources as needed. Our team then reviewed and integrated information, identifying key issues and themes that emerged from more than one data source. We also sought additional input from local stakeholders to ensure that our findings matched their understanding of the key needs and damage in the health and social services sector.

Data Sources

Data sources used for the assessment were identified primarily from literature reviews and discussions with subject matter experts and stakeholders. In addition, we requested and received relevant data from the Health and Social Services RSF and the FEMA Education, Health and Social Services, CPCB, and Public Buildings Sector teams. Specific data sources are provided in footnotes in the text and include

- more than 120 data files in various formats shared by RSF staff, including maps, reports from site visits, facility lists, demographic data, and other files
- FEMA Situation Reports (SitReps)—daily reports used to provide updates on FEMA activities in disaster areas, among other topics, and updates from FEMA Education, HSS, and Public Buildings sectors
- reports and papers on health and social services in Puerto Rico, including academic literature, white papers and gray literature, and newsprint, with a focus on data that could be used to compare rates in Puerto Rico and elsewhere, where relevant, and local strategies to address health and social services sector needs
- input via focus groups, key-informant interviews, and solution-oriented sessions with stakeholders, including representatives from the Puerto Rico Department of Health (PRDOH), PRDOF, the University of Puerto Rico, the Inter-American University, FEMA Education Sector, and FEMA Health and Social Services Sector and RSF
- data from the U.S. Census Bureau, Centers for Disease Control and Prevention (CDC), the Bureau of Labor Statistics, U.S. Department of Agriculture (USDA) Food and Nutrition Service, and other federal sources to provide context or comparison data.

Developing COAs

Defining the COA Approach

We defined a COA as an approach to address a problem or issue associated with storm damage or a preexisting condition that inhibits economic recovery. The Health and Social Services COAs were designed to achieve the long-term strategic initiative of transforming the
health and social services systems to support community health, develop a sustainable health care workforce, and expand the reach of the health and social support systems to meet the needs of all Puerto Ricans. Each COA was developed to directly address specific pre- and poststorm damage and needs, emphasizing financial, structural, and governance needs within the health and social services sector. Dedicated expert teams were formed in alignment with the aforementioned 12 FEMA sectors to develop COAs responsive to the needs identified in each sector. The expert teams worked in partnership with the corresponding RSF, FEMA sector teams, and local partners and stakeholders to develop COAs.

Data Sources

The HSOAC HSS Sector drew from existing plans, proposals, and the literature to identify strategies, best practices, and possible innovations. Specifically, we reviewed materials and strategic plans from U.S. Health and Human Services (HHS) and the Puerto Rico Department of Health and related agencies, the Puerto Rico Governor’s Office, and Puerto Rico–based nonprofits and think tanks, among others. In addition to Health and Social Services–specific sources, some key sources that addressed numerous sectors and provided valuable information included the Build Back Better Puerto Rico plan (Governor of Puerto Rico, 2017a), the New Fiscal Plan (Governor of Puerto Rico, 2018a), and the ReImagina Puerto Rico Report (Resilient Puerto Rico Advisory Commission, 2018). The Build Back Better plan was written by the Governor’s office in direct response to Hurricanes Maria and Irma, and ReImagina Puerto Rico was the result of a series of stakeholder working groups sponsored by the Rockefeller Foundation’s 100 Resilient Cities Program.

Throughout the process, our team engaged with stakeholders and subject matter experts, including senior PRDOH and PRDOF staff as much as was possible, researchers at the University of Puerto Rico and the Inter-American University, local nonprofits in the education sector, health and social services researchers in Puerto Rico with expertise in the field, as well as Island professionals with experience in disaster recovery and health system reform. COAs also drew from discussions held in larger cross-sector working groups and task forces and were often formulated in partnership with the RSF team members, who brought practical knowledge, experience with relevant programs, and a deep understanding of the federal system. The COAs were reviewed and revised by both internal and external peer reviewers as well by PRDOH staff, FEMA sector staff, and RSF partners.

COA Elements

To aid in the decisionmaking process, each COA across all sectors contained a discussion of nine key elements:

- sector(s) impacted—brief listing of the primary and secondary sectors relevant to the action under consideration
- issue/problem being solved—summary of the problem being addressed
- short description—brief discussion of the proposed action, focusing on the who, what, and how of implementation
- potential benefits—summary of how the proposed action would address the identified problem
- potential spillover impacts to other sectors—discussion of anticipated spillover, positive or negative, into other sectors
- potential costs—order-of-magnitude estimate of the cost of the COA, including one-year upfront cost and annual cost over the subsequent 10 years
- potential funding mechanisms—possible sources of funding, with a primary focus on entities rather than specific grant opportunities
- potential pitfalls—description of any anticipated negative consequences of the proposed action
- likely precursors—description of steps, or other COAs, that would need to occur prior to the proposed action.

Complete descriptions of each COA that follow this outline can be found in Appendix A.

Assessment Criteria

The teams evaluated each COA’s responsiveness to identified needs and alignment with the evidence base (based on best or promising practices), as well as the extent to which they aligned with the Governor’s stated strategic goals. As part of the review process, some COAs were eliminated from consideration or adjusted in an effort to roughly align the costs and benefits. For each proposed COA, the relevant sector team also established rough order-of-magnitude cost estimates to support high-level planning and inform decisionmaking.

One of the priorities emphasized by the Governor’s team was innovation, which is embedded in the idea of building back better. While this concept seems fairly straightforward in some sectors (e.g., new technologies in Energy or Communications and IT), in Health and Social Services it sometimes involved newer technologies while in other cases the focus was on not repeating something that has proved to be unsuccessful in the past. For example, one COA aims to address vector-borne diseases through the use of innovative drone technology for mosquito eradication. Elsewhere, innovation could come in the form of expanding trauma and chronic stress care by empowering nontraditional providers, such as schools and faith-based and nongovernmental organizations, to work with professionals to provide care to their constituents.

Assessing COA Performance

Characterizing COA Sensitivity to Uncertainty

The project team also tested whether COAs were sensitive to several types of uncertainty, which helped guide COA comparisons at the macro level (though a more detailed investigation of risks and uncertainties should be conducted prior to implementation). Each COA was
qualitatively evaluated by the extent to which its effectiveness or cost was sensitive to future uncertainties related to

- **Governance.** The current institutions, laws, and policies that govern Puerto Rico may change in the future, and some changes may affect the outcomes of COAs.
- **Climate and extreme weather.** Puerto Rico is vulnerable to a number of climate-related stressors, such as rising temperatures, changing precipitation patterns, and sea-level rise, as well as extreme weather, including hurricanes and storm surge. Uncertainties in the future frequency and severity of these conditions could affect the outcomes of COAs.
- **Economic conditions.** Local economic conditions are related to outcomes of the recovery process itself. Nevertheless, Puerto Rico’s ability to recover also depends on external factors affecting local economic conditions (e.g., global economic conditions).
- **Population and demographics.** Puerto Rico has seen a significant outmigration since the 2017 hurricanes. The total population of Puerto Rico, and its makeup, may shape the need for and effectiveness of many COAs.
- **Technology and related infrastructure reliability.** Technological advancements in any field can create new COAs for addressing a need or can change the effectiveness of existing COAs.

**Cost Analysis**

Each of the nearly 31 COAs developed to address identified needs in Health and Social Services included a preliminary estimated cost for implementing that COA. Cost information could directly support analysis and prioritization of the COAs, and the cost estimates were well suited to higher-level analysis and comparisons. Decisionmakers and stakeholders could assess costs specific to each COA, rank the COAs by cost, and break down costs into upfront and recurring annual costs. Cost estimates were developed along orders of magnitude, and it is assumed that a more finely tuned estimate will be developed during the implementation phase.

Cost is only one dimension used to analyze courses of action, and it is often best used in conjunction with complementary outcomes measures, such as linkages with desired attributes determined by the government of Puerto Rico, sensitivity to uncertainty, and economic impact. Cost information can help stakeholders assess the resource requirements associated with COAs, but cost information alone is not necessarily informative for priority setting, since two COAs with an equal cost may meet different needs or provide different sets of benefits.

**Developing COA Portfolios**

A key part of the plan development process was the alignment of COAs with plan objectives. To this end, COAs were sorted according to broadly defined objectives that aligned with the overall plan vision. Seven of these objectives focused on precursors that would be needed to start the recovery with a strong foundation (e.g., government capacity, high-quality data), nine objectives focused on capital investments (e.g., water, health and social services infrastructure), and eight objectives focused on strategic initiatives (e.g., entrepreneurship, advanced manufacturing). Following this sorting process, the Health and Social Services Sector team
combined COAs into portfolios, with each portfolio representing an alternative way of addressing a strategic initiative that was feasible, internally consistent, and relevant. Each portfolio includes a combination of COAs consistent with a strategic theme (e.g., resilience focused) aligned to the selected strategic objective. Portfolios were developed by subject matter experts who best understood the needs and the technical solutions available. Subject matter experts might develop several different portfolios to support the same strategic initiative using different themes. Given the large number of ways in which stakeholders could combine COAs together to craft portfolios, stakeholder creativity and vision played an important role, alongside technical knowledge. See Appendix E for a description of the plan vision, goals, and objectives.

The project team developed analytical tools and a structured process to aid stakeholders in exploring the portfolios. Portfolios could be assessed by stakeholders according to their aggregate attributes, uncertainties, or the costs of the underlying COAs.

Organization of This Report

The remainder of this report is organized in five chapters:

- Chapter 2 provides an overview of Puerto Rico’s health and social services sector before the hurricanes. The chapter includes a discussion of the structure of health social services systems, governance, and assets, and then delineates key challenges facing the sector before the 2017 hurricanes.
- Chapter 3 summarizes the key findings of the damage and needs assessment conducted for the health and social services sector. This chapter describes the impact of Hurricanes Irma and Maria, including their effects on service delivery and infrastructure.
- Chapter 4 identifies key themes for recovery in the health and social services sector and discusses specific COAs to support those themes.
- Chapter 5 provides conclusions and next steps.

Appendix A supplies a more complete description of each of the COAs.
2. Puerto Rico’s Health and Social Services Sectors Before the Hurricanes

To understand the damage incurred by the health and social services sector in Puerto Rico as a result of Hurricanes Irma and Maria, it was necessary to examine what the system was like and what challenges it faced before the storms. In this chapter we focus first on the structure, governance, and assets of the health and social services sector. Next, we describe a number of challenges facing the system prior to the storms, including the burden of chronic disease, prevalence of mental health problems, population changes, exposure to environmental hazards, and workforce, finance, and vital records challenges.

Structure, Governance, and Assets

Puerto Rico’s health and social services sector includes a wide range of services aimed at supporting the health and well-being of the population through preventive measures, treatment for chronic and acute conditions, and safety net and support programs for vulnerable and at-risk populations. There are overlapping responsibilities across agencies such that responsibility for a given subsector is not uniquely held by a single agency, Table 2.1 presents 2017 budget amounts and briefly summarizes the function of some of the principal agencies involved.

In the following sections, we describe the systems that support health and social services in more detail.

Health System

There are several elements of the health system—public health, environmental health, and health care including mental and behavioral health.
<table>
<thead>
<tr>
<th>Item</th>
<th>Public Health and Emergency Preparedness</th>
<th>Environmental Health</th>
<th>Social Services</th>
<th>Health Care</th>
<th>Mental Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary agency</td>
<td>Puerto Rico Department of Health (PRDOH); Puerto Rico State Agency for Emergency and Disaster Management (PREMA)</td>
<td>Puerto Rico Environmental Quality Board</td>
<td>Puerto Rico Department of Family</td>
<td>Health Insurance Administration (ASES); Medical Services Administration (ASEM)</td>
<td>Administration for Mental Health and Addiction Services</td>
</tr>
<tr>
<td>Primary function</td>
<td>Ensure the health of the entire population, including improving access to resources to sustain healthy living, preventing diseases and accidents, and responding to outbreaks and other large-scale threats to human health.</td>
<td>Protect and conserve the environment and maintain a balance between economic development and the environment.</td>
<td>Administer nutrition assistance programs and a wide range of social support services.</td>
<td>Oversee all aspects of Medicaid, administer insurance via federally funded health care programs. Provide specialized medical and hospital services through the Medical Center and other facilities.</td>
<td>Oversee quality metrics for mental health and substance use care in Puerto Rico.</td>
</tr>
<tr>
<td>Annual budget (2017)</td>
<td>$902 million (PRDOH); $10.7 million (PREMA)</td>
<td>$60.4 million</td>
<td>$2.6 billion</td>
<td>$2.8 billion (ASES); $199.2 million (ASEM)</td>
<td>$124.8 million</td>
</tr>
</tbody>
</table>

**Table 2.1. Summary of Primary Agencies That Operate in the HSS Sector**

The purpose of **public health** is to ensure the health of the entire population, including improving access to resources to sustain healthy living, preventing diseases and accidents, and responding to outbreaks and other large-scale threats to human health. The PRDOH is a Cabinet-level agency set forth by Article 4, Section 6 of the 1952 Constitution of Puerto Rico. According to the agency’s 2011–2018 Strategic Plan, PRDOH is responsible for establishing food and nutritional surveillance systems, public policies related to mental health and suicide prevention, epidemiological services, health communication, and chronic disease management, among other things. In 2017, PRDOH had total costs of about $902 million. Other agencies that provide relevant services and support include the Medical Services Administration (ASEM) with total 2017 costs of $2.8 billion, the Administration of Mental Health and Anti-Addiction Services (ASSMCA) with total 2017 costs of $124.8 million, and the Health Insurance Administration (ASES) with total 2017 costs of $199.2 million. There is program overlap across some of these agencies (e.g., PRDOH operates environmental health and nutritional support programs), so agency budgets cited may not capture the total amount spent on a given subsector.

Health emergency preparedness, a key component of public health, is coordinated by the Puerto Rico State Agency for Emergency and Disaster Management (PREMA), which is tasked with protecting the population during disasters; providing assistance before, during, and after a
disaster to ensure the protection of life and property; and managing the recovery and establishment of government services to citizens and businesses. Under law 20-2017, this agency is one of seven within the Department of Public Security and had a 2017 budget of $10.7 million.

The goal of environmental health is to identify, monitor, and control threats to human health related to the natural and built environments. This includes air, water, soil, buildings, industrial facilities, and so on. PRDOH has some responsibilities here, including food service, animal control, dengue control, among others, that it addresses through its environmental health program, which was funded at $23.8 million in 2017. In addition to the PRDOH responsibilities, Puerto Rico established protection of the environment as a governmental function in 1970 with the passage of the Public Policy Environmental Act of 1970 (Act No. 9). Modeled after the National Environmental Policy Act of 1970, Act No. 9 established an executive-level Puerto Rico Environmental Quality Board (PR-EQB) and an environmental review requirement. PR-EQB’s main function is to protect and conserve the environment and maintain a balance between economic development and the environment. PR-EQB had total costs of $60.4 million in 2017.

Health care focuses on the delivery of health care services to prevent disease as well as to treat acute disease and manage chronic illness. Before the 1970s, Puerto Rico had a publicly funded health system. However, since that time, the system was weakened as a result of decentralization, with funding streams becoming increasingly fragmented and the public sector’s role growing. By the 1990s, as part of La Reforma de Salud, a plan initiated in 1993 that led to a shift to privatization, public hospitals had converted to for-profit and not-for-profit hospitals (similar to the rest of the United States). The municipal diagnostic centers were mostly dismantled and replaced with federally qualified health centers (FQHCs). Since 1994, Puerto Rico has mandated enrollment of most Medicaid beneficiaries, other income-eligible populations, and some government employees in a managed care plan. The formal government health care plan and Medicaid program, Mi Salud, which emerged from Reforma in 2010, provides acute, primary, and specialty benefits, while behavioral health is provided elsewhere (described in a subsequent section). Mi Salud does not cover home health services, hospice care, medical equipment and supplies, or nursing facility services; thus, these services are not available through managed care.

ASES, the state agency responsible for overseeing all aspects of Medicaid, has a cooperative agreement with PRDOH to administer insurance through each of the health care programs that receive federal funding: Mi Salud, the Children’s Health Insurance Program (CHIP), Medicare Platino (for those beneficiaries eligible for both Medicaid and Medicare), and programs for medically indigent persons who are not covered by other programs, funded by the government of Puerto Rico only. Public employees are covered by Mi Salud. The Health Department and ASES

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1 Managed care enrollment requirements for Medicaid beneficiaries differ by state, with no other states requiring it for all Medicaid beneficiaries and ten states requiring it only for Medicaid enrollees who also receive Temporary Assistance for Needy Families (TANF) benefits.
services are organized by geographic region (east, northeast, southeast/southwest, northwest, southwest, north/San Juan). ASES had total costs of $199.2 million in 2017.

Puerto Rico contracts with eight health plans to provide health care. As of this report, *Mi Salud* is offered through one local for-profit plan (Triple S) and is available throughout Puerto Rico. *Mi Salud* is currently transitioning to a new plan in early 2019, titled Vital, which may affect how it is offered and by whom.

Medicare Platino is offered through seven for-profit plans: First Medical/First Plus, MCS, MMM Healthcare, PMC Medicare Choice, Humana, and two Blue Cross/Blue Shield affiliates (American Health Medicare and Triple S). Puerto Rico also contracts with two pharmacy benefit management companies to provide prescription drugs to *Mi Salud* participants. Managed care organizations are reimbursed through a combination of capitated and fee-for-service payments, which cover primary and specialty care, respectively. Single capitation rates are developed for each contractor using actuarial methods that account for regional variation.

**Mental and behavioral health** focuses on individuals’ subjective happiness as well as their ability to participate fully in society and the economy. Since 1994, mental health and substance use disorder care have been part of the larger health care system in Puerto Rico (Alegria et al., 2001). *Mi Salud* (described previously) carves out behavioral health, which is provided through a separate behavioral health managed care organization that is widely available and administered by a for-profit plan, Adult Protective Services.

Mental health services are regulated throughout Puerto Rico by the ASSMCA (the Spanish acronym), which is a division of the Department of Health legally authorized in 1993. The legislation that provided a legal basis for the new administration created ASSMCA by combining the former Department of Addiction Services (DSCA, Spanish acronym) and the PRDOH Assistant Secretary of Mental Health. ASSMCA is responsible for overseeing quality metrics for mental health and substance use care in Puerto Rico, including access, acceptability, appropriateness, continuity of care, professional competence, cultural sensitivity, effectiveness, efficiency, and promptness. ASSMCA 2017 total costs were $124.8 million.

**Social Service System**

This system includes a range of activities designed to ensure the well-being of vulnerable populations, including children, the elderly, and those with disabilities. Puerto Rico Law No. 171 (June 30, 1968) created the Department of Social Services, which was reorganized under Puerto Rico Law No. 1 (July 28, 1995) as the PRDOF. Supported by a mix of federal and local funding, the PRDOF provides a wide range of human and social welfare services in Puerto Rico.

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2 Mental and behavioral health care was established with Act No. 67 and, in 2000, amended by Act No. 408. Known as the Puerto Rico Mental Health Law, the act contained a bill of rights of those receiving mental health services.

3 Also authorized by the Puerto Rico Mental Health Law.
The PRDOF houses many of the publicly provided services related to child welfare and social services. Four administrations and one corporation operate with fiscal and administrative autonomy within the umbrella agency under the Office of the Secretary, which sets policy for the department. Administrators at the operational and programmatic components are responsible for executing policies established by the Office of the Secretary in their respective areas of service, including developing and implementing standards and procedures for programs and providing operational supervision of Integrated Service Centers (ISC). Select administrations include the Administration for Families and Children (ADFAN), charged with operating programs to protect children and youth, social work, adoption, and abuse and domestic violence; Administration of the Socioeconomic Development of the Family, which administers federal programs such as Child and Adult Care Food Program, NAP for Puerto Rico, TANF, and the Low-Income Home Energy Assistance Program (LIHEAP); the Administration for Integral Development of Childhood, which operates Head Start and Early Head Start as well as child care programs; the Child Support Administration; and the Corporation for the Blind and Physically or Mentally Disabled (CIRIO), which provides services to individuals who are blind and those with mental/behavioral disabilities.

Nutritional assistance is of particular importance, as 37.9 percent of households received food stamps (i.e., NAP benefits) in 2017 (U.S. Census Bureau, 2017b). From 1974 to the early 1980s, Puerto Rico participated in the Food Stamp Program (FSP), which was the predecessor to the Supplemental Nutrition Assistance Program (SNAP) operating in the 50 states. As part of the Budget Reconciliation Act of 1981, Congress replaced Puerto Rico’s FSP with a capped block grant that became NAP.

As measured by the fiscal year (FY) 2017 budgets for the four PRDOF administrations, annual expenditures for social services in Puerto Rico are approximately $2.6 billion (Government of Puerto Rico, undated). Eight percent is earmarked for staffing and facilities. A report by the Child Welfare League of America (2017) states that, in 2014, Puerto Rico spent $150,558,280 for child welfare services, which includes all direct and administrative services provided to children and families by the state agency. Federal funds accounted for $26,582,396, and state and local funds accounted for $123,975,884.

In addition to the governmental agencies, a variety of nonprofit organizations are involved in providing social services (e.g., child care providers and food banks). As of 2014, 11,570 nonprofit organizations were active in Puerto Rico: Of those, 22 percent were community-based and focused on local issues (Estudios Tecnicos Inc., 2015). Organizations described as social service providers accounted for 776 of the total (6.7 percent), while economic, social, and community

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Note that this estimate includes only the PRDOF, which is the primary provider of social services. However, these services are distributed across numerous agencies and an exhaustive accounting would increase this amount (e.g., the PRDOF Secretariat and Oficina Del Procurador De Las Personas De Edad Avanzada (OPPEA) would add approximately $70 million).
development organizations accounted for 888, health services accounted for 373, and housing services accounted for 245.

Key Assets

Assets in the health and social services sector include facilities to house operations, operational capabilities (e.g., equipment, networks, and resources needed to perform services), and a trained workforce needed to carry out activities.

Facilities

Health Care

Table 2.2 summarizes the types of health care facilities currently in Puerto Rico, according to data that FEMA provided to HSOAC in 2018. Health facility typically means “any government facility currently operated by the Health Facilities Administration of Puerto Rico,” inclusive of mental health facilities, psychosocial rehabilitation centers, chronic disease hospitals, and long-term care facilities. (Table 2.2 also includes private facilities for completeness.) FQHCs refers to all health centers that receive federal funds as authorized by Section 330 of the Public Health Service Act. FQHCs provide a variety of integrated services, including primary care, mental health, oral health, and pharmacy.

<table>
<thead>
<tr>
<th>Type of Facility</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitals</td>
<td>65</td>
</tr>
<tr>
<td>Private clinics</td>
<td>8</td>
</tr>
<tr>
<td>Pediatric centers</td>
<td>7</td>
</tr>
<tr>
<td>Behavioral health clinics</td>
<td>13</td>
</tr>
<tr>
<td>Corporate for the Fund of State Insurance (supports workers compensation, governm</td>
<td>19</td>
</tr>
<tr>
<td>Transitional service centers</td>
<td>7</td>
</tr>
<tr>
<td>ASSMCA mental health</td>
<td>1</td>
</tr>
<tr>
<td>Centers for the prevention and treatment of sexually transmitted diseases</td>
<td>8</td>
</tr>
<tr>
<td>Centers for diagnostics and treatments</td>
<td>103</td>
</tr>
<tr>
<td>Federally qualified health centers (FQHC-330)</td>
<td>50</td>
</tr>
<tr>
<td>Stand-alone emergency rooms</td>
<td>3</td>
</tr>
<tr>
<td>Dialysis centers</td>
<td>70</td>
</tr>
<tr>
<td>Residential treatment facilities</td>
<td>1</td>
</tr>
</tbody>
</table>

a This is a federally funded facility; there are 449 behavioral health facilities overall.

Figure 2.1 shows the locations of the hospitals in Puerto Rico. Many hospitals are clustered near San Juan.
A 2011 report states that 449 licensed facilities provide mental health care in Puerto Rico, most of which are nonprofit organizations (Rodreguez, Greeman, and Pesante, 2012). HHS reports that the 50 “FQHC-330” clinics also provide mental health services (Rodreguez, Greeman, and Pesante, 2012), but it is difficult to determine whether those services are comprehensive across all facilities. It is unknown whether these 50 centers are included in the count of 449 facilities. Three mental health community care facilities of the 50 total were reported to have closed as of data collection in summer 2018. In addition to these facilities, many volunteer efforts to provide health services are reported to have started after Hurricane Maria, though capturing a full accounting of the magnitude is difficult given the variety of mechanisms and organizations supporting these efforts.

Laboratory Facilities

The public and environmental health subsector operates laboratories that are responsible for coordinating and evaluating environmental health activities. The PR-EQB operates the Environmental Investigation Laboratory of Puerto Rico, which supports the Department of Natural and Environmental Resources and is responsible for testing samples of environmental media, including water quality from beaches and lakes, as well as air and land resources.

The Assistant Secretary of Environmental Health and Public Health Laboratories, an operational unit within the Department of Health, is responsible for environmental health activities and public health laboratories.
Social Services

According to a status report provided to HSOAC in the spring of 2018, designated facilities that provide social services include the following:

- 1,024 registered Head Start centers promote school readiness among children from birth to five years of age in low-income families, by focusing on cognitive, social, and emotional development.
- 737 registered child care centers provide a range of child care and early child education services.
- 138 multiple activities and services centers for elderly people are available to senior citizens (as of the 2015–2018 State Plan on Aging).

In addition to the government-owned facilities and employed workforce (as discussed in a subsequent section), the government of Puerto Rico funds the provision of social services through a network of nongovernmental organizations and other entities.

Operational Capabilities

Public and environmental health includes a range of assets beyond workforce and facilities, which are provided primarily through the PRDOH operational units described previously. These assets include the following:

- **Surveillance systems.** The Office of Epidemiology and Research measures the impact of conditions and diseases in Puerto Rico and trains community health workers in conducting surveillance.
- **Public health education.** Public information about health and more comprehensive health education are offered through various operational units.
- **Surveillance networks.** PR-EQB monitors air quality; the PRDOH and Puerto Rico Aqueduct and Sewer Authority (PRASA) monitor drinking water quality.
- **Vector control.** In September 2016, the CDC awarded $13 million to the private nonprofit Puerto Rico Science, Technology, and Research Trust to establish the first Puerto Rico Vector Control Unit (PRVCU). The PRVCU is tasked with oversight and implementation of comprehensive mosquito-control activities to help prevent and manage diseases spread by mosquitoes. The PRVCU also engages in community participation, education, and mobilization.
- **Federal and local revolving funds.** The Environmental Protection Agency (EPA) operates a large revolving fund program, and Puerto Rico operates two state revolving funds: the Clean Water State Revolving Fund and the Drinking Water State Revolving Fund. Revolving funds function like “environmental infrastructure banks,” providing low-interest loans to eligible recipients for water and wastewater infrastructure projects.

Workforce

Health Care

Estimates of the number of health care providers in Puerto Rico vary. Some reports cite significant concerns about the emigration of physicians and other health care professionals, and
other analyses cite an adequate supply but note important concerns about the distribution of providers, including shortfalls and provider shortage areas across Puerto Rico. According to a 2016 Association of American Medical Colleges (AAMC) report, 9,874 active physicians were practicing in Puerto Rico, including 3,580 primary care doctors and 227 general surgeons (AAMC, 2016). On the mental health side, the Bureau of Labor Statistics (BLS) identified 40 substance abuse and behavioral disorder counselors; 270 mental health and substance abuse social workers; 350 clinical, counseling, and school psychologists; 60 psychiatric aides; 120 psychiatric technicians; and 100 psychologists in Puerto Rico.

Environmental Health, Public Health, and Emergency Preparedness

In addition to the clinical occupations described, a range of occupations contribute to maintaining public health and emergency preparedness. Among these categories, the BLS reports that there were 130 emergency management directors, 2,050 EMTs and paramedics, 50 epidemiologists, 430 environmental scientist and specialists, and 50 environmental science and protection technicians. The environmental health categories include health but may not be restricted to health-specific occupations. While these categories may not capture all of the occupations that contribute to this sector, this subset provides a picture of the relevant Puerto Rican workforce (Bureau of Labor Statistics, 2018a).

Social Services

Table 2.3 shows the social services workforce across BLS staffing categories. As of May 2017, the workforce included 35,340 employees across all categories.
Table 2.3. Social Services Workforce (May 2017 Estimates)

<table>
<thead>
<tr>
<th>Staffing Category</th>
<th>Number of Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child, family, and school social workers</td>
<td>3,600</td>
</tr>
<tr>
<td>Child care workers</td>
<td>1,590</td>
</tr>
<tr>
<td>Clinical, counseling, and school psychologists</td>
<td>350</td>
</tr>
<tr>
<td>Community and social service occupations</td>
<td>15,670</td>
</tr>
<tr>
<td>Community and social service specialists, all other</td>
<td>850</td>
</tr>
<tr>
<td>Community health workers</td>
<td>360</td>
</tr>
<tr>
<td>Counselors, all other</td>
<td>250</td>
</tr>
<tr>
<td>Education administrators, preschool and child care center/program</td>
<td>260</td>
</tr>
<tr>
<td>Educational, guidance, school, and vocational counselors</td>
<td>1,250</td>
</tr>
<tr>
<td>Health care social workers</td>
<td>750</td>
</tr>
<tr>
<td>Mental health and substance abuse social workers</td>
<td>270</td>
</tr>
<tr>
<td>Preschool teachers, except special education</td>
<td>2,990</td>
</tr>
<tr>
<td>Psychiatric aides</td>
<td>60</td>
</tr>
<tr>
<td>Psychiatric technicians</td>
<td>120</td>
</tr>
<tr>
<td>Psychologists, all other</td>
<td>100</td>
</tr>
<tr>
<td>Social and community service managers</td>
<td>290</td>
</tr>
<tr>
<td>Social and human service assistants</td>
<td>4,870</td>
</tr>
<tr>
<td>Social work teachers, postsecondary</td>
<td>50</td>
</tr>
<tr>
<td>Social workers, all other</td>
<td>1,380</td>
</tr>
<tr>
<td>Substance abuse, behavioral disorder, and mental health counselors</td>
<td>280</td>
</tr>
</tbody>
</table>


Key Challenges Facing the Health and Social Services Sector in Puerto Rico Before the Hurricanes

Puerto Rico’s health and social services sector faced numerous challenges before Hurricanes Irma and Maria. Key challenges that predated the storms, and some of which were exacerbated by the storms, are described in these next sections.

Burden of Chronic Disease

Before Hurricanes Irma and Maria, overall rates of chronic disease in Puerto Rico (heart disease, diabetes, etc.) were higher than U.S. averages. For example, according to the 2017 Behavioral Risk Factor Surveillance System (BRFSS), 17.2 percent of individuals in Puerto Rico reported that they had been told by a doctor that they have diabetes, compared with 10.5 percent of individuals in all U.S. states and the District of Columbia. An estimated 9.9 percent of Puerto Ricans reported coronary heart disease or myocardial infarction compared with 6.1 percent in all U.S. states and D.C. Reports of stroke were similar for both populations. However, a greater percentage of those in Puerto Rico had been told they had high blood pressure (44.7 percent) than in U.S. states and D.C. (32.3 percent) (Centers for Disease Control and Prevention, 2015).

As occurs in many parts of the world, significant age, gender, and economic differences in health risk exist among Puerto Rico’s population. As of 2016, women in Puerto Rico who
suffered a myocardial infarction were more likely to die than men with the same condition, although no significant gender difference has been seen in the prevalence of heart attack or Type 2 diabetes. In Puerto Rico, one out of every three adults age 65 or older had diabetes, and those at the lower end of the socioeconomic spectrum were at greater risk. Diagnosed diabetes was more prevalent among women than men (age-adjusted rates of 14 percent compared with 13.5 percent, respectively, on average) in 2016. Asthma was prevalent among young people. Lifetime asthma prevalence was also higher among women than among men (22 percent compared to 12 percent, on average) (Centers for Disease Control and Prevention, 2016).

According to data excerpted from the Puerto Rico Chronic Disease Action Plan 2014–2020, put forth by PRDOH (which uses data from the 2011 BRFSS, which estimates the prevalence of risk factors among adults 18 years or older), the main behavioral and environmental drivers of chronic disease in 2011 appear to have been physical inactivity (66 percent), overweight (40 percent, with 26 percent qualifying as obese), high cholesterol (38 percent), hypertension (37 percent), and smoking (15 percent). These rates are not dissimilar from those in some states, though rates of being physical inactive and overweight were somewhat higher in Puerto Rico. See Table 2.4 for additional detail on chronic conditions in Puerto Rico compared with elsewhere in the United States. Efforts to address chronic disease prevention and management have included improved surveillance, stronger clinical-community linkages, and strategies to support healthy behaviors particularly with respect to healthy eating and physical activity—all goals of the Department of Health and the Puerto Rico Chronic Disease Control Alliance’s Chronic Disease Action Plan 2014–2020. Progress toward these goals, however, is unknown (Puerto Rico Department of Health, undated).

### Table 2.4. Chronic Disease Burden, Puerto Rico Compared with United States

<table>
<thead>
<tr>
<th>BRFSS 2017 Item</th>
<th>Puerto Rico 2011</th>
<th>Puerto Rico 2017</th>
<th>All States and D.C. 2011</th>
<th>All States and D.C. 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ever been told you had angina or CHD</td>
<td>7.2</td>
<td>7.2</td>
<td>4.1</td>
<td>3.9</td>
</tr>
<tr>
<td>Ever been told you had a heart attack (myocardial infarction)</td>
<td>4.8</td>
<td>5.0</td>
<td>4.4</td>
<td>4.2</td>
</tr>
<tr>
<td>Ever been told you had a stroke</td>
<td>1.7</td>
<td>2.5</td>
<td>2.9</td>
<td>3.0</td>
</tr>
<tr>
<td>Ever been told you had COPD</td>
<td>3.1</td>
<td>4.0</td>
<td>6.1</td>
<td>6.2</td>
</tr>
<tr>
<td>Ever been told by a doctor you have diabetes</td>
<td>13.5</td>
<td>17.2</td>
<td>9.5</td>
<td>10.5</td>
</tr>
<tr>
<td>Adults who have been told they have high blood pressure</td>
<td>36.8</td>
<td>42.2</td>
<td>30.8</td>
<td>30.9</td>
</tr>
</tbody>
</table>


**Prevalence of Mental Health Problems**

The overall rates of psychiatric disorders in Puerto Rico before the storms were similar to those of the U.S. states (23.7 percent and 26.2 percent, respectively, in 2015) (Canino et al.,
2016), despite the level of poverty in Puerto Rico and the link between mental health and poverty. To explain the comparability of rates of psychiatric illness, researchers hypothesized that high levels of family and social support in Puerto Rico could help. Additionally, the recurrence of economic and social instability in Puerto Rico has also been posited to have led to long-term coping mechanisms (Canino et al., 2016). Prior to the storms, women ages 18–64 had a lower probability of being diagnosed with a substance use disorder than did men, and adults in the 26-to-45 age group had the highest 12-month prevalence rate for having a substance use disorder (5.1 percent) of any age group. However, the prevalence of psychiatric illness was not evenly distributed across demographic groups or geographic areas of Puerto Rico. Overall, 10.5 percent of women in Puerto Rico met diagnostic criteria for a past-year psychiatric disorder compared with 8.2 percent of men. Compared with those in other health regions, residents from the San Juan health region had the highest 12-month prevalence rate for alcohol use disorder (8.9 percent), alcohol abuse (8.2 percent), and alcohol dependence (2.5 percent) (Canino et al., 2016).

Because of concern about high rates of suicide and suicidal thought, the PRDOH established a commission in the late 1990s on the issue of suicide. Before Hurricane Maria, as late as 2016, the suicide rate had dropped appreciably. Gender differences in suicide were stark, with far more men than women committing suicide.5

Population Changes Creating New Vulnerabilities

Puerto Rico also faced some population-level challenges. While the overall population was declining for some time, by 2015 the elderly population was increasing at a higher rate than expected, with 39.2 percent of the population projected to be age 60 or older by 2050 (Puerto Rico Office of the Ombudsman for Elderly, 2014). As of 2015, 39.9 percent of the population age 65 and over was estimated to be living at or below the FPL, with Social Security (80.2 percent) and NAP (40.9 percent) benefits as their main sources of income (Puerto Rico Office of the Ombudsman for Elderly, 2014). Because the risk for chronic health conditions increases with aging, demand for health services and other support services will increase as the population ages. Furthermore, as described in more detail in later sections, emigration from Puerto Rico has posed additional challenges for the health, development, and future vibrancy of the island, including a decrease in the school-age population and in the health care workforce.

Exposure to Environmental Hazards

Puerto Rico has had long-standing challenges with water and air pollution, as well as waste management. Before the storms, the island violated drinking water standards for volatile organic

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compounds, total coliform bacteria, and disinfection by-products. Puerto Rico struggled with limited landfill capacity and low recycling rates, which created a waste management crisis (U.S. Environmental Protection Agency, 2016). Moreover, Puerto Rico also had many toxic waste sites on the National Priorities List, including 18 Superfund (hazardous waste) sites, or about 3.4 per 1,000 square miles. This compares with an average of 1.4 per 1,000 square miles across the United States (U.S. Census Bureau, 2012; U.S. Environmental Protection Agency, undated).

The energy system has contributed to the waste problem. Puerto Rico has relied largely on petroleum derivatives and coal for power. By-products from coal energy generation include coal ash, which contains toxic metals such as lead and arsenic. Coal ash waste sites tend to be concentrated near the power plants in communities along the southeastern coast of the main island—areas with high rates of poverty and unemployment—reinforcing concerns that those in the lowest socioeconomic groups are the most susceptible to these dangerous exposures. Additionally, some communities have been exposed to harmful sulfur dioxide from oil-based power generation (Federal Register, 2018).

A number of studies have shown environmental hazards to be associated with adverse health outcomes in Puerto Rico. One study reported a higher prevalence of childhood asthma and risk of asthma attacks in areas near air pollution sources, such as grain mills, petroleum refineries, asphalt plants, and power plants (Loyo-Berrios et al., 2007). Another analysis notes a higher prevalence of preterm births (11.39 percent) compared with the 50 U.S. states and the District of Columbia (9.63 percent) (Hamilton et al., 2017). Because of the high rates of preterm births and the extent of hazardous waste contamination in Puerto Rico, the National Institute of Environmental Health Sciences (NIEHS) Superfund Research Program funds the PROTECT Program. The multi-university PROTECT Center studies exposure to environmental contamination in Puerto Rico and its contribution to adverse birth outcomes (“Puerto Rico Testsite for Exploring Contamination Threats (PROTECT),” 2013).

Waterborne disease outbreaks may also have been a problem in Puerto Rico prior to the hurricanes (Hlavsa et al., 2015). While the number of reported outbreaks is low or nonexistent and PRDOH has reported a 5.6 percent rate of gastrointestinal disease, some have estimated that it is much higher (21 percent) due to underreporting, indicating the possibility of food or waterborne contamination as a possible cause. Vector-borne disease outbreaks have also affected the health of Puerto Ricans. In 2016, Zika virus disease became a nationally notifiable condition. In 2016, there were 5,168 symptomatic cases reported in U.S. states and 36,512 symptomatic cases reported in U.S. territories; Puerto Rico alone reported 35,395 symptomatic cases. The number of symptomatic cases reported dropped in 2017 and 2018, with 52 symptomatic cases reported in U.S. states and 104 in Puerto Rico as of November 5, 2018 (Centers for Disease Control and Prevention, 2018a). While the answer is not yet definitive, it has been suggested that the rapid decline in Zika cases could have resulted from the development of herd immunity (Siedner, Ryan, and Bogoch, 2018). Other mosquito-borne diseases are also of concern, including dengue, which is endemic in Puerto Rico. Between 2002 and 2010, more than
61,000 suspected dengue cases were reported in Puerto Rico, of which 22,648 were confirmed (Halasa, Shepard, and Zeng, 2012).

**Health Care Workforce and Access to Services**

Provider shortages and access issues pose functional challenges for the health care system. Historical workforce data are available from the Urban Institute (Perreira et al., 2017), Health Resources and Services Administration (HRSA), Kaiser Family Foundation (Artiga, Hall, and Rudowitz, 2018), AAMC, and the Puerto Rico Health Department (Alameda, 2013), though estimates can vary. The latter has one study that forecasts health workforce into 2019 based on pre-storm provider availability, medical school enrollment, and population trends. The issue of shortage and outmigration to U.S. states and D.C. are the two greatest concerns for provider retention.

As of September 30, 2018, there are 105 health provider shortage areas (HPSAs): 639 primary care, 24 dental care, and 42 mental health care, according to HRSA (undated). Seventy-two of Puerto Rico’s 78 municipalities have been designated as medically underserved areas, while 32 primary care HPSAs have a population-to-primary-care-provider ratio of 3,500 to 1 or higher. According to the Urban Institute analysis (Perreira et al., 2017), the number of general providers seems adequate, with 0.4 dentists, 7 nurses, 0.7 pharmacists, and 2.5 physicians per 1,000 people. A 2016 estimate from AAMC noted that there were 9,874 active physicians, 3,580 primary care doctors, and 227 general surgeons. The AAMC report notes that 23 percent of municipalities had a shortage of pediatricians, 68 percent had a shortage of OB-GYNs, and 64 percent had a shortage of psychiatrists.

The issue of provider outmigration is a challenge as well. AAMC estimates that 2,132 health professionals moved to the U.S. states or D.C. in 2014, of which 361 were physicians. This was one of the largest waves in outmigration of educated professionals at the time. If health care technicians are included, the total loss is estimated to be 51,740 that year alone. Since 2014, various estimates have indicated that there is a net outmigration of 138 physicians from Puerto Rico each year. A shortage of physicians in the U.S. states or D.C. has been cited as part of the motivation for migration. Some also note that the loss of health providers includes advanced clinical practitioners—including physician assistants (PAs) and nurse practitioners (NPs)—who face resistance from the medical community in Puerto Rico because physicians view NPs as competitors.

At the same time, the number of people who used ASSMCA mental health services jumped significantly. ASSMCA served 43,145 residents in 2012, up from 23,560 patients in 2011. Even in 2011, the penetration rate for mental health service providers was 5.99 per 1,000 residents (Rodriguez, Greeman, and Pesante, 2012), which is below the national average of 23.07

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6 The total is 93, if correctional facilities are removed.
Evidence suggests that the low penetration rate has decreased access to care. For instance, in 2015 approximately 36 percent of adults with serious mental illness had not received mental health services in the previous year (Substance Abuse and Mental Health Services Administration [SAMHSA], 2015b). There has also been limited access to preventive programs, including psychosocial supports, particularly for low-income Puerto Ricans.

In addition to the workforce and increased service need issues, there are challenges around access to medical supplies. Access to oxygen was one noted as a particularly acute need. There is one supplier of oxygen to hospitals and private companies that supply oxygen tanks for home care use in Puerto Rico. This creates a supply chain that is easily disrupted during a disaster, which can leave patients who rely on oxygen at increased risk.

**Health Care Finance Challenges**

Puerto Rico’s financial challenges, combined with statutory limits on Medicaid reimbursements from the federal government, have constrained the government of Puerto Rico’s ability to provide health care services. To pay for public services, including Medicaid, Puerto Rico borrowed money through municipal bonds. This action resulted in more financial problems in 2014 when ASES withheld Medicaid payments, creating even more uncertainty. Furthermore, because financing was mostly earmarked for Medicaid/Medicare managed care, virtually no health care providers employed a fee-for-service model, except in some specialty care areas (e.g., psychiatric care).

The majority of Puerto Ricans (60 percent in 2015, according to the American Community Survey) have been insured by public coverage alone or in combination, including Veterans Administration (VA) health care, Medicaid/CHIP (Mi Salud), or Medicare (U.S. Census Bureau, 2016). Overall, Mi Salud reimbursement rates are not high. In the 50 states and the District of Columbia, the federal government matches the federal matching assistance percentage (FMAP) for the state, which varies according to the state’s per capita income, with no ceiling. This FMAP rate ranges from 50 percent to 76 percent. However, in Puerto Rico and other territories, the FMAP is set at 55 percent irrespective of per capita income and is subject to a flat ceiling. In 2017, this ceiling was set at $347 million. The Affordable Care Act (ACA) authorized a further $5.4 billion total for Puerto Rico over the eight years from 2011 to 2019 (Merling and Johnston, 2017), but this additional funding was exhausted in 2018. The federal match rate is applied only until the Medicaid ceiling funds and ACA funds are exhausted, resulting in a significantly lower effective matching rate (Sebelius, 2013). If Puerto Rico’s FMAP were based on per capita income, some analysts have estimated that it would increase to nearly 83 percent (Mach, 2016). Given this low effective match rate, the Medicaid and CHIP Payment and Access Commission (2017) estimated a gap in funding of up to $877 million in 2018.

Medicaid reimbursement rates also put downward pressure on providers, which has contributed to salary issues and the provider shortage. To address this set of financing

**Vital Records Challenges**

When Hurricanes Irma and Maria made landfall in September 2017, the Puerto Rico Demographic Registry reportedly was using a paper-based reporting system. This type of system precludes the collection and sharing of real-time information on vital events after a disaster as well as the implementation of protocols for surveillance of disaster-related deaths. The challenges associated with a paper-based system have become apparent in the time following the hurricane as uncertainty around hurricane-related mortality persists. In addition, attributing mortality following a disaster or other extreme weather events can be hindered by under-identification and other challenges such as limited surveillance periods (Uscher-Pines, 2007) or the type of methodology used to estimate mortality related to extreme weather events or other disasters (Madrigano, McCormick, and Kinney, 2015; McCormick, Madrigano, and Zinsmeister, 2016).

**Risk Factors Among Children**

Many children in Puerto Rico live in impoverished conditions, with 56 percent living in poverty (less than 100 percent of the FPL) and 36 percent living in extreme poverty (less than 50 percent of the FPL) (Annie E. Casey Foundation, 2018). During the period from 2008 to 2012, 84 percent of children lived in census tracts with poverty rates of at least 30 percent, and this rate has remained fairly steady since 2012. Meanwhile, over half of children live in families that rely in some way on public assistance. Table 2.5 summarizes some of the key indicators that can affect child welfare.

In addition to the indicators in Table 2.5 that describe the living conditions of many children in Puerto Rico, findings from the 2010 Child and Family Services Review (CFSR) conducted by HHS provides information on how well ADFAN is able to achieve key goals. While somewhat dated, the CFSR provides the best known, available source of prestorm data on the health of the child social services system.

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7 Personal communication with HSS RSF contacts, June 2018.
Table 2.5. Selected Child Welfare Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Rate (%)</th>
<th>Number</th>
<th>Measurement Year(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children in poverty (&lt;100% FPL)</td>
<td>56</td>
<td>390,000</td>
<td>2016</td>
</tr>
<tr>
<td>Children in extreme poverty (&lt;50% FPL)</td>
<td>36</td>
<td>252,000</td>
<td>2016</td>
</tr>
<tr>
<td>Children whose parents lack secure employment</td>
<td>55</td>
<td>551,000</td>
<td>2007</td>
</tr>
<tr>
<td>Children living in high poverty areas</td>
<td>84</td>
<td>647,000</td>
<td>2012–2016</td>
</tr>
<tr>
<td>Children in families that receive public assistance</td>
<td>52</td>
<td>359,000</td>
<td>2016</td>
</tr>
<tr>
<td>Children living in households with a high cost burden</td>
<td>27</td>
<td>189,000</td>
<td>2016</td>
</tr>
<tr>
<td>Children without a vehicle at home</td>
<td>10</td>
<td>70,000</td>
<td>2016</td>
</tr>
<tr>
<td>Children who are subject to an investigated report</td>
<td>27/1,000</td>
<td>19,545</td>
<td>2015</td>
</tr>
<tr>
<td>Children who are confirmed by child protective services as victims of maltreatment</td>
<td>8/1,000</td>
<td>5,891</td>
<td>2015</td>
</tr>
<tr>
<td>Children in foster care</td>
<td>NA</td>
<td>4,189</td>
<td>2015</td>
</tr>
</tbody>
</table>

NOTE: Children are defined as individuals under age 18. These data indicators are somewhat dated but may serve as benchmarks for recovery progress.

Table 2.6 summarizes a number of key performance indicators included in the 2010 CFSR along with measured outcomes and comparisons to target values. As is evident in the table, Puerto Rico fell well short of the target on most indicators for the cases reviewed, especially the indicators *Children have permanency and stability in their living situation* (only 12.5 percent in conformity) and *Families have enhanced capacity to provide for their children’s needs* (23.1 percent in conformity). In the case of the enhanced capacity indicator, it was found that efforts to assess and address service needs of clients were insufficient, as were efforts to involve children and parents in case planning. Additionally, caseworker visit frequency and quality were insufficient to ensure child safety, and visits with parents were insufficient to ensure child safety monitoring. In addition, the 2010 CFSR found that, as of the time of the review, ADFAN did not have a statewide information system to capture status, demographic information, location, and placement goals for children in the foster care system.

The 2010 CFSR also found a number of deficiencies in multiple systemic factors, such as information systems and data accuracy, development of case plans, and processes for notifying caregivers about hearings. Specifically, it was noted that Puerto Rico did not have a statewide information system to capture status, demographic information, location, and placement goals for all children who were in the foster care system as of the time of the review. Plans to improve the data system and other systemic factors were included in the review document, though it is not known if those proposals were carried out or if performance on the relevant indicators has improved.
Table 2.6. Key Performance Indicators for the Child Welfare System

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Performance Target (Percentage of Cases in Substantial Conformity)</th>
<th>Actual Value (Percentage of Cases in Substantial Conformity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children are protected from abuse and neglect</td>
<td>95</td>
<td>39.1</td>
</tr>
<tr>
<td>Children are safely maintained in their homes when possible and appropriate</td>
<td>95</td>
<td>36.9</td>
</tr>
<tr>
<td>Children have permanency and stability in their living situations</td>
<td>95</td>
<td>12.5</td>
</tr>
<tr>
<td>Families have enhanced capacity to provide for their children's needs</td>
<td>95</td>
<td>23.1</td>
</tr>
<tr>
<td>Children receive appropriate services to meet their educational needs</td>
<td>95</td>
<td>74.5</td>
</tr>
<tr>
<td>Children receive adequate services to meet their physical and mental health needs</td>
<td>95</td>
<td>50.9</td>
</tr>
</tbody>
</table>


a Percentage of cases reviewed for the CFSR.

Lack of Access to Income and Food Assistance

The number of TANF recipients has been dropping consistently over time. The monthly average in FY 2000 was 92,299, dropping to 15,259 in FY 2017 (U.S. Department of Health and Human Services, Office of Family Assistance, 2018). A professor at Universidad Interamericana (Inter-American University) estimated that the number of current beneficiaries could be as low as 5,000. Possible reasons given for this downward trend during a challenging economic environment included more cases reaching the 60-month limit, which increases attrition (i.e., exit rates are higher than entry rates), outmigration from Puerto Rico, or other demographic changes that could affect the size of the eligible population (Cordero-Guzman, 2017). Another possibility suggested by the Interamericana staff, which to our knowledge has not been studied as of the date of this report, was that placing work requirements on benefits during an economic downturn, when there are fewer jobs, would decrease eligibility.

As of 2017, 45.3 percent of Puerto Rican households had incomes below the FPL, and 451,535 received benefits from NAP (37.9 percent) (U.S. Census Bureau, 2017b). Because this program is funded via a capped block grant of $1.9 billion for 2017, it is not able to accommodate increased need (Wolkomier, 2017). On March 1, 2018, an additional $1.27 billion was made available through the Additional Supplemental Appropriations for Disaster Relief Act of 2017 for nine months, as discussed in more detail in Chapter 3 (Caribbean Business Staff, 2018).
Chapter Recap

As we have illustrated in this chapter, Puerto Rico provides a wide range of HSS services aimed at supporting the health and well-being of the population through preventive measures, treatment for chronic and acute conditions, and safety net and support programs for vulnerable and at-risk populations. This sector includes public health, environmental health, health services, mental and behavioral health, and social services. Health and Social Services assets include facilities, a trained workforce, and equipment and supplies. As of 2016, there were 9,874 active physicians practicing in Puerto Rico, as well as more than 900 professionals in the mental and behavioral health field. As of May 2017, the social services workforce included 35,340 employees across all categories. Before the hurricanes, the health and social services sector faced a number of public health challenges, including the burden of chronic disease, prevalence of mental health disorders, population changes, and exposure to environmental hazards. The sector was also challenged by a declining workforce, insufficient funding, and outdated data systems. As will be discussed in Chapter 3, the challenges facing the health and social services sector were intensified by the hurricanes, particularly for certain populations and in certain parts of the island.
3. Damage and Needs Assessment

This chapter covers the impact of Hurricanes Irma and Maria on the health and social services sector. We begin with a discussion of damage to the health care infrastructure and then describe the impacts of the hurricanes on health and health care and social services. The chapter concludes with a discussion of posthurricane conditions as of March 2018.

Health Care Infrastructure Damage

In October 2017, FEMA’s initial assessment of health care infrastructure damage showed that the extent of damage was not evenly distributed. Most of the western part of Puerto Rico—the Mayaguez and part of the Bayamon health care region—was classified as having low damage (on a scale of 0–14, with 1 being lowest). In contrast, parts of the northern, southern, and eastern regions were more significantly affected; these are other parts of the Bayamon, Caguas, Fajardo, Metro, and Ponce regions.\(^1\)

As part of the recovery effort the Health and Social Services RSF team was asked in February 2018 to provide a clear picture of the status of health care facilities in Puerto Rico damaged during Hurricanes Irma and Maria to inform the development of short- and long-term strategies for the future of health care throughout the island. Facilities include Department of Health, public corporations, as well as not-for-profit and private for-profit owned/managed health care providers. In short, given the response and recovery operations, the Health and Social Services RSF was asked to identify health care service providers in Puerto Rico, including roles and responsibilities, geographic location, and resource limitations, which could help inform decisionmaking related to priority setting for restoration of services. This information would then be folded into facility assessments conducted by FEMA and HHS, proposed remediation plans, and estimated timelines for completion and return to service of any affected centers.

Clinical and diagnostic centers around Puerto Rico sustained considerable damage, with 28 of the 103 listed being severely damaged. The severity of damage was most acute for non-mountainous regions (five in mountainous regions and 23 in non-mountainous regions were severely damaged). FQHCs also sustained damage, which was split evenly between mountainous and non-mountainous regions. Of the 92 FQHCs in Puerto Rico, 20 reported being damaged with operational closure or at least significant limitations, and 10 of those 20 were located in the mountain region, according to a status report that FEMA provided to HSOAC in 2018.

In the aftermath of Hurricane Maria, the CDC used syndromic surveillance (early detection of disease outbreaks using existing health data in real time) to monitor for disease outbreaks,

\(^1\) FEMA briefing on health care infrastructure, October 2017.
including waterborne illness, and transported clinical specimens to Atlanta, Georgia, because much of Puerto Rico’s laboratory infrastructure was destroyed (Ravi, 2017). It took time to get back to functionality; as of January 25, 2018, 556 (55 percent) of the 1,003 public health laboratories in Puerto Rico remained closed, according to a report that FEMA shared with HSOAC in 2018.

Health Impacts

Environmental Health

In the immediate aftermath of the hurricanes, much of Puerto Rico’s power grid was off-line, and wastewater treatment plants and pumping stations operated by PRASA were out of service. Significant damage to trunk sewers caused major sewage overflows, particularly at intersections with surface water. Over 13.7 billion gallons of untreated wastewater was discharged into the San Juan metropolitan area because of energy failures at PRASA wastewater treatment plants and pumping stations (Governor of Puerto Rico, 2018b). The power grid failure also rendered inoperable many community well and surface pumps in areas not serviced by PRASA. Other concerns in these areas included damage to water distribution pipes and storage tanks, clogging, and site inaccessibility because of debris.

With a high proportion of the population lacking access to potable water, residents sometimes resorted to unsafe sources, such as wells and/or faucets contaminated by waterborne pathogens or chemicals. Specific incidents in Puerto Rico included an outbreak of leptospirosis, a bacterial infection spread when urine from infected animals gets into water or soil, which occurred in October 2017. In a preliminary analysis of site visits to schools, conducted in December 2017 and January and February 2018, the HSS RSF described reports of gastrointestinal outbreaks at multiple schools, an increase in the numbers of sick students, an increase in incidence of conjunctivitis (December) and influenza, and reports of deaths from leptospirosis at two schools. These conditions are commonly associated with poor water quality.

The incidence of skin-burrowing parasites that cause scabies or other skin infections was also reported to be on the rise in the month after Maria (Rodriguez-Diaz, 2018; Ramphal, 2018). The long-term risk of resurgence of Zika virus remains a concern, due to standing water, which is a breeding ground for mosquitoes.

The presence of mold and proximity to debris, pests, and vectors has also resulted in unsafe living conditions in highly impacted areas. During site visits to elder-care facilities (public and private) conducted in December 2017 and January 2018, increases in conjunctivitis and respiratory problems were reported, according to reports that FEMA provided to HSOAC. It was noted that some of the respiratory problems were exacerbated by the lack of power in residences, which prevented use of medical equipment (e.g., continuous positive airway pressure and nebulizers for treating sleep apnea and respiratory diseases, respectively). Similar increases in
gastrointestinal illness, skin infections, influenza, and conjunctivitis were reported in health care clinics that were visited in December and January.

The prevalent and persistent absence of a reliable source of power resulted in reliance on diesel-powered generators, heightening concern for air quality and the potential human health implications, particularly for those suffering from respiratory disease (Reardon, 2017). The International Agency for Research on Cancer (IARC) has classified diesel engine exhaust as a Group 1 carcinogen, based on sufficient evidence that exposure is associated with an increased risk for lung cancer. A study that deployed several air quality monitors around San Juan near the end of 2017 found that sulfur dioxide levels exceeded EPA daily thresholds on nearly 80 percent of the first 30 days in the field. The authors also concluded that generators were the likely cause of the increase, as the lone coal-fired plant was inoperable at the time and shipping had decreased following the hurricanes (Subramanian et al., 2018).

**Mental Health**

Increases in anxiety, depression, and post-traumatic stress disorder (PTSD) were widely reported following the hurricanes. Reports from Ponce Health Sciences University also indicated an increase in the proportion of mental health patients from rural areas, particularly Utuado and Cayey (Perez, 2018). The need for mental health services is especially great in Toa Baja, which incurred some of the worst storm damage. Of the 2,500 people who have visited the emergency clinic since its opening after the storm, 90 percent were referred for mental health screenings (Dickerson, 2017). In addition, although the rate of suicide had fallen in the year before Hurricane Maria, the rate had previously spiked during the height of the financial crisis (2008–2013), and initial reports indicate that it spiked again following Maria. At least 253 people committed suicide in 2017, a 29-percent increase from 2016. Eighty-five percent of these suicides involved men (Governor of Puerto Rico, 2017b). As of January 22, 2018, the suicide hotline had received 3,050 calls since the storms, a 246-percent increase compared with the same time the previous year (Governor of Puerto Rico, 2017b). Stakeholders also note that the official reported rate of suicide most likely underestimates the actual number of suicides.

The Health and Social Services RSF conducted site visits to schools and reported that mental health was a main concern within schools. The incidence of suicide and attempted suicide among minors has risen drastically since the hurricane, affecting children as young as eight years old. A December report on school visits explained that there was an increase in behavioral health needs among students, families, faculty, and staff. The report suggested that the lack of basic services such as internet and electricity was adding to these issues, and recommended that an in-school, formal behavioral health program was needed. These issues were reiterated in a report from January and February 2018 that FEMA made available to HSOAC.
Mortality

As described thus far, Hurricanes Irma and Maria led to significant health impacts. The damage to critical infrastructure left many people at increased risk for sickness or death. For example, there are 30,626 Medicare beneficiaries who are electricity-dependent (e.g., require a ventilator to live independently in their home) (U.S. Department of Health and Human Services, 2016) who may have been without power for prolonged periods. Meanwhile, damage to medical facilities and roads made accessing needed care more difficult for some residents, which can be particularly threatening in a population with a high prevalence of chronic conditions that require consistent treatment or medications for maintenance. Based on a *New York Times* analysis of data released by the Demographic Registry of Puerto Rico, the number of deaths caused by hypertension and hypertensive renal disease, diabetes, respiratory disease, as well as sepsis, Alzheimer’s and Parkinson’s diseases, and suicide increased in the period immediately following the hurricanes (September to October 2017) compared with the average for the same months in 2015 and 2016 (Robles et al., 2017).

The official death count released by the Puerto Rico Department of Public Safety was initially 64, based on cause of death recorded in death certificates. However, based on a study by George Washington University that was commissioned by the government of Puerto Rico (Milken Institute School of Public Health, 2018), the final count has since been revised to 2,975. To arrive at this estimate, both direct and indirect deaths were counted, and mortality data from July 2010 to August 2017 was compared with mortality data from September 2017 to February 2018 to estimate excess deaths. The authors note that their study does not account for increased morbidity or health care system impacts, but that there is a need to do so.

In addition to the official reporting, a range of estimates have been published using a variety of coding and counting methods. For example, on June 13, 2018, the government of Puerto Rico reported that there were 1,427 more deaths in the four months after the hurricanes than normal (based on the previous four years). Similarly, independent researchers analyzing vital statistics data found that about 1,000 more people died in September and October 2017 than normal, largely in the hurricane’s path or in mountainous rural areas. A Harvard study estimated that the mortality rate increased by 62 percent from September 20 to December 31, 2018, relative to the same period in 2016, with hurricane-related deaths likely ranging from about 800 to 8,500. About one-third of deaths were reported as being caused by the hurricane or resulting from an inability to access, or delays in accessing, medical care. Commonly reported problems included loss of power for home medical devices, inability to access medications, closed medical facilities, and absent doctors (Kishore et al., 2018). A Pennsylvania State University study used mortality rate data from 2010 to 2016 to establish the expected monthly mortality rates and ranges and then compared the monthly means to reported deaths in September, October, and November 2018 to arrive at an estimate of 1,139 hurricane-related deaths (Santos-Lozada and Howard, 2018).
Disruption of Social Services

Impacts to this subsector include loss of and damage to physical structures and interruption of service to clients and beneficiaries. Anecdotal reports of data loss have been refuted by various agencies. However, limited access to existing data and/or the need to re-collect data appear to have made it difficult to accurately locate and identify all participants after the storm. Like other subsectors, social services have been affected by migration away from the island: As younger generations have migrated to the U.S. states and D.C., an increasing number of senior citizens are living alone and are without employment and may be more vulnerable to abuse, negligence, abandonment, and financial exploitation (Puerto Rico Office of the Ombudsman for Elderly, 2014).

Additionally, FEMA and its supporting partner agencies identified some issues for HSOAC that are at risk of worsening following the hurricanes and thus warrant particular attention:

- the potential for an increase in child abuse and maltreatment
- limitations in the capacity of the social service and child protection workforce to manage an increased caseload
- an increase in the number of people living in vulnerable conditions owing to the diminished capacity of the health and social services sector to provide support
- the difficulty of expanding local community social services to the whole community, without a corresponding increase in resources.

Posthurricane Conditions as of March 2018

Health Care

According to the Kaiser Family Foundation, as of March 2018, six months after the hurricanes, almost all health centers in Puerto Rico had reopened (one mobile van remained closed for repairs) (Figure 3.1). However, a health center’s being “open” does not guarantee it is operating at full capacity. Approximately one in ten (11 percent) of the permanent health center sites in Puerto Rico still had limited or no grid power. Three health centers had intermittent grid power and needed to rely on generators as a backup source of power; five were without use of grid power and relied solely on generators, and another health center was using solar power (Kaiser Family Foundation, 2018).

Access to health care remained variable across health services as noted by municipal leaders in a survey conducted between April 24, 2018, and June 8, 2018. As shown in Table 3.1, significant numbers of municipalities reported that key health care services were still not accessible to residents eight months after the hurricanes. Seven municipalities reported that primary, general care was not accessible. Specialized care, emergency care, and dialysis were even less likely to be accessible, with large proportions of municipalities reporting their citizens did not have access.
Figure 3.1. Operational Status of Health Centers in Puerto Rico as of March 2018

Table 3.1. Municipal Leaders’ Perceptions of Availability of Health Care After the Hurricane

<table>
<thead>
<tr>
<th>Availability of Health Services After the Hurricane</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary care (general care clinic, doctor’s office, community health centers)</td>
<td>N</td>
<td>58</td>
<td>9</td>
</tr>
<tr>
<td>Secondary care (hospital and emergency care, specialist)</td>
<td>N</td>
<td>44</td>
<td>19</td>
</tr>
<tr>
<td>Therapy centers</td>
<td>N</td>
<td>36</td>
<td>27</td>
</tr>
<tr>
<td>Dialysis centers</td>
<td>N</td>
<td>22</td>
<td>40</td>
</tr>
</tbody>
</table>


Environmental Health

As of spring 2018, the EPA completed assessments at over 300 regulated facilities, EPA-led Superfund sites, oil sites, and chemical facilities and completed all hurricane-related response actions at these sites. The EPA did not identify any major spills or releases from these facilities associated with Hurricane Maria (U.S. Environmental Protection Agency, 2018). Infectious diseases such as influenza have been controlled to within comparable rates in the U.S. states and D.C., although concerns about water quality persist.
Social Services

On March 1, 2018, the Additional Supplemental Appropriations for Disaster Relief Act of 2017 made an additional $1.27 billion available for Puerto Rico’s NAP for nine months (Caribbean Business Staff, 2018). In addition to this funding extension, the federal Food and Nutrition Service (FNS) approved a request to extend a limited number of waivers to schools operating the National School Lunch Program and School Breakfast Program and to child care institutions that operate the Child and Adult Care Food Program through March 31, 2018, effectively extending the services they were able to provide (U.S. Department of Agriculture, 2017). There also were a series of waivers approved that extended the periods during which Women, Infants, and Children (WIC) food instruments could be redeemed, but the last waiver expired August 31, 2018. It is not known how many people were affected by the end of the waivers.

Emerging Issues

Key issues that remain for public and environmental health include lack of access to potable water, water safety and access concerns, and unsafe living conditions with respect to mold, proximity to debris, and pests. These concerns were echoed in a survey of local Puerto Rican government officials and staff from 73 of 78 municipalities conducted between April 24, 2018, and June 8, 2018. When asked to name their top public health threats at the time of the survey, the number-one concern was mosquito-borne disease (32 percent of municipalities), with water (19 percent) and solid waste/debris (14 percent) also falling within the top-five public health threats named (ICMA, 2018). For public health, there was concern regarding the interruption of essential services (e.g., cold chain for vaccines, storage of insulin), the operational status of some of the public health labs (with some samples being sent to CDC headquarters for testing), access to essential services such as immunizations, and concerns about damage to critical public health facilities.

Surveys of municipal leaders following the storm also identified ongoing mental health challenges for citizens as a result of conditions caused by the storms. One mayor noted that they would regularly see citizens shaking during heavy rainstorms in the months following the hurricanes—something they attributed to PTSD.2 In the early days of disaster response, many behavioral health services were up and running, as noted in a meeting held on October 16, 2017, with 20 behavioral health stakeholders, but access to these services was difficult because of a lack of transportation. To address this issue, providers conducted deliberate outreach to those hard-to-reach communities. ASSMCA trained 300 mental health facilitators to provide care within the most affected of the 78 municipalities. They were reported to have entered the field on November 3, 2017. As of November 28, ASSMCA leadership reported that all mental health

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2 Mentioned in an HSOAC roundtable of municipal leaders during the poststorm period.
hospitals and treatment clinics were operational. The U.S. Public Health Service and the Centers for Disease Control and Prevention fielded a two-question survey to assess distress and access. Of the 133 people surveyed, 18 percent reported distress and denied having access to people or resources to address this issue. These data can be used as a benchmark to evaluate recovery efforts in the coming months. To help improve access to care, some routine procedures were suspended, such as requiring a primary care doctor referral for behavioral health care.

Chapter Recap

As we have described in this chapter, the hurricanes damaged health care infrastructure, affected the physical and mental health of the population, and disrupted the provision of social services to people in need. There was also a significant human cost in terms of both increased mortality because of the storms as well as more than 2,900 excess deaths attributed to hurricane-related causes. In addition, the hurricanes revealed several systemic issues affecting Puerto Rico’s health and social services sector, including a need for more primary care, shifts in the demographics of the population in need of Health and Social Services services, difficulties with basic administrative issues including cash flow and billing, and the need to ensure the overall soundness of the health care system by addressing both infrastructure and workforce issues. The COAs developed by the Health and Social Services Sector team and discussed in Chapter 4 are intended to address both the damage caused by the hurricanes as well as longer-term challenges facing the health and social services sector.
4. Themes for Recovery and Courses of Action

The COAs described in this chapter are a collection of activities, policies, and actions designed to aid in the achievement of the government of Puerto Rico’s goal to transform the health and social services systems to promote community well-being, foster a healthy population, and provide support to those living in vulnerable conditions. More specifically, the plan highlights the need to invest not only in rebuilding Health and Social Services infrastructure but in building back better, as described in this capital investment from the recovery plan:

Rebuild and enhance health and social service infrastructure and regional health care networks to ensure reliable and equitable access to health and social services and health-promoting communities, including an efficient and effective response to public health crises and other future disasters (Governor of Puerto Rico, 2018b, p. 67).

Drawing on the priorities identified by the government of Puerto Rico in collaboration with the PRDOH and other stakeholders, our team developed COAs that would address a mix of short- and long-term needs; align with needs identified by Puerto Rican stakeholders; and balance innovation and aspiration with the need to address basic needs. In the following sections we provide a more detailed discussion of how this process unfolded in the Health and Social Services Sector.

Health and Social Services Portfolio Development

COAs were grouped into portfolios that targeted specific issues within the health and social services sector (e.g., data quality and availability, workforce gaps). These portfolios also pulled in COAs from other sectors that were either foundational (e.g., need reliable broadband capacity for telehealth) or supportive (e.g., aid municipalities in securing grant funding to support and expand the Health and Social Services workforce) and allowed COAs to be viewed outside of the Health and Social Services subsector boundaries (e.g., mental health, environmental health). There were four initial portfolios.

**Portfolio 1: Increase flexibility in services access for vulnerable populations**
Creates greater flexibility to ensure food, health, and other social supports are provided/continued for populations disproportionately affected by disaster.

**Portfolio 2: Strengthen and expand workforce for health and social services**
Focuses on provider licensure and incentives and expanding use of nontraditional health providers, as well as emergency preparedness to strengthen and expand access to health and social services.
Portfolio 3: Improve consistent data quality monitoring and data infrastructure
Links key elements of data systems and enables the integration of data systems that track factors that promote or detract from health and well-being.

Portfolio 4: Build system supports for health-promoting communities
Creates multisector conditions that support health and well-being through community attributes design changes and other aspects of environmental and community conditions.

The intent of the recovery approach described in the plan, which is encapsulated in the comprehensive portfolio of COAs as described in the following sections, is to address the Governor’s capital investment related to improving health and well-being while also bringing together elements of municipal, infrastructure, telecommunications, and economic sectors that contribute to better health outcomes. We developed 31 COAs across four themes. These themes cut across the initial set of portfolios described previously:

- **Building systems capacity to respond in disasters and during routine times.** One of the critical challenges that was demonstrated through the needs and damage assessment was the fragility of the health care system, including social, behavioral, and environmental health services. This component seeks to address ongoing resilience in the health care system and to ensure flexibility and agility in response and long-term recovery. But the portfolio also includes elements of routine function in the system, including stronger primary care options (e.g., community health centers/primary care clinics), better financing mechanisms (e.g., Medicaid/Medicare payment systems), and better data integration and digitization of health and related information.

- **Strengthening the workforce for health.** As identified in the damage and needs assessment, Puerto Rico has disproportionate numbers of health provider shortage areas and concerns regarding provider outmigration. As such, a key requirement of building healthy communities is to have adequate and high-quality health provider availability. COAs focused on the health workforce are designed to incentivize, retain, and train the health care provider and public health practitioner workforce.

- **Strengthening supportive services for populations most at need.** We found that there are several populations with greater needs during and after disaster, such as those who are at home, seniors, and those with chronic health conditions. Thus this component includes services and other supports that address these challenges, to ensure continuity during and after disaster and to limit disruptions to food, medication, technology, and other supplies required by these populations.

- **Creating healthy communities by augmenting and enhancing the built environment.** Healthy communities support healthy people. And as we learned through discussions with stakeholders across Puerto Rico, many communities lack critical resources that promote health and well-being (e.g., reliable, clean water and access to high-quality health services). Similarly, many communities may not have access to economic opportunities that allow residents to earn a sustainable livelihood, which may contribute to outmigration. Toward that end, this component encompasses a range of initiatives in areas such as transportation, municipal infrastructure, education, economic development, natural and cultural resources, and telecommunications, to improve and protect the health and well-being of communities.
After reviewing the four initial portfolios, the Governor’s team selected a fifth comprehensive portfolio that addressed themes that cut across the initial four portfolios and supported the Governor’s vision of building back better.

**Portfolio 5: Build robust and healthy communities.**
Integrates Health and Social Services systems and healthy environments, by combining key COAs from across portfolios, to address overarching themes while remaining streamlined.

Table 4.1 provides a quick reference listing of the Health and Social Services COAs and a brief description of each COA can be found in Appendix B. Appendix A presents longer justifications for each Health and Social Services COA that include problem statements, order-of-magnitude cost estimates, possible funding mechanisms, and implementation considerations.

In the following section we describe the Health and Social Services COAs included in the selected portfolio that were developed to address these themes. Note that while the portfolio selected for the plan included foundational and supportive COAs from other sectors, only Health and Social Services COAs are discussed in detail here. See Appendix C for a listing of COAs from other sectors that were included in the selected HSS portfolio and Appendix D for a listing of the five Health and Social Services portfolios and the HSS COAs they contained.
<table>
<thead>
<tr>
<th>COA ID</th>
<th>COA Name</th>
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<td>HSS 1</td>
<td>Increase Use of Solar-Powered Generators and Solar Backup Power Source</td>
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<td>HSS 2</td>
<td>Prevent Disease Through a Capacity-Building Healthy Housing Initiative: Targeting Mold, Lead, and Other Stressors</td>
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<tr>
<td>HSS 3</td>
<td>Implement Integrated Waste Management Program and Expand Programs to Increase Recycling Rates</td>
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<td>HSS 4</td>
<td>Improve Surveillance of Waterborne Disease</td>
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<td>HSS 5</td>
<td>Develop and Implement an Integrated Electronic Reporting System for Vital Records</td>
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<td>HSS 6</td>
<td>Reduce Opportunities for Vector-Borne Diseases</td>
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<td>HSS 7</td>
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<td>HSS 8</td>
<td>Increase Public Health Laboratory Capacity</td>
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<td>HSS 9</td>
<td>Increase Access to Telehealth Options as Telecommunication Supports Become More Robust</td>
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<td>HSS 10</td>
<td>Expand Care for Trauma and Chronic Stress</td>
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<td>HSS 11</td>
<td>Add Incentives and Other Supports to Increase and Retain Supply of Health Care Providers and Public Health Practitioners</td>
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<td>HSS 12</td>
<td>Augment Community Health Centers and Elements for Primary Care and Chronic Disease Prevention and Management</td>
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<td>HSS 13</td>
<td>Expand Practice Laws for Health Care Providers</td>
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<td>HSS 14</td>
<td>Develop a More Robust and Resilient Data System of Health Costs and Links to Health Outcomes</td>
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<td>HSS 15</td>
<td>Advance Uptake of Evidence-Based Practices/Quality of Care for Mental Health</td>
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<td>HSS 16</td>
<td>Address Food Insecurity by Ensuring Flexible Nutrition Assistance Programs</td>
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<td>HSS 17</td>
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<td>HSS 18</td>
<td>Improve Programs to Prevent and Address Abuse of Children and Seniors After a Disaster</td>
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<td>HSS 19</td>
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<td>HSS 20</td>
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<td>HSS 22</td>
<td>Move to a More Regionally Integrated Approach to Emergency Planning, Exercising, Response, and Recovery</td>
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<td>HSS 23</td>
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<td>HSS 24</td>
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<td>HSS 25</td>
<td>Establish a Collaborative Agreement Between PRDOF and WIC for Infant Formula Storage and Distribution</td>
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<td>HSS 26</td>
<td>Review and Improve Systems for Stockpiling and Distributing Supplies and Pharmaceuticals Post-Disaster</td>
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<td>HSS 27</td>
<td>Improve Current Epidemiological Surveillance to Better Respond to Natural and Man-Made Disasters</td>
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<td>HSS 28</td>
<td>Support the Development of a Suicide Prevention Campaign</td>
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<td>HSS 29</td>
<td>Revise Regulations on Food Stockpiling at Child- and Elder-Care Facilities</td>
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<tr>
<td>HSS 30</td>
<td>Review and Improve Plans, Systems, and Processes for Tracking and Responding to Physical and Mental Health Needs of First Responders</td>
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<tr>
<td>HSS 31</td>
<td>Review and Improve Systems for Administration and Finance of Response-Related Activities</td>
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Recovery Themes

Ensuring that residents can live healthy, productive lives in Puerto Rico is essential to a robust health, social, and economic recovery. To strengthen and expand access to health care and promote healthful living, the government of Puerto Rico will need tools designed to build robust and healthy communities. There are four key themes from the damage and needs assessment that guided COA development and the associated COAs. COAs are referenced by FEMA sector and number (e.g., HSS 9 refers to COA #9 under the Health and Social Services Sector). See Table 4.1 for a listing of the COAs and the appendixes for more detailed descriptions of each.

Building Systems Capacity to Respond in Disasters and During Routine Times

One critical challenge exposed by the hurricanes is the fragility of the health and social system, including medical, behavioral, and environmental services. The government of Puerto Rico plans to build resilience to ensure flexibility and agility in response and long-term recovery. This includes the repair and rebuilding of hospitals and primary care centers. Health and social services require reliable electricity systems to function, so efforts to create a hardened electricity grid supported by alternative energy generators will be required to keep these services available in a future emergency. The government also proposes robust, resilient communications initiatives that will connect community clinics across Puerto Rico using a broad range of technologies—including mobile and telehealth—to ensure real-time access to clinical data from any access point and improve clinical care delivery and adaptation to disaster impacts (HSS 9, CIT 29). The government of Puerto Rico intends to develop flex-funding for critical social service centers, such as domestic violence and homeless shelters and child- and elder-care facilities, in order for these centers to tap into additional financial resources during a long-term response and recovery period (HSS 19). Another COA calls for implementing temporary waivers for a range of emergency health and social service needs (e.g., prescription coverage, mortuary services) to ensure uninterrupted access to care in the postdisaster period and prevent potential delays in time-sensitive care and nutrition support (HSS 33). Finally, the government of Puerto Rico proposes to build resilience through upgrades and enhancements to the 911 service (CIT 3), a shift toward a regionally integrated approach for emergency preparedness (HSS 22), improved systems for emergency medical stockpiles and supplies (HSS 23, HSS 26), and other initiatives.

But the health and social services sectors in Puerto Rico also need to meet the day-to-day needs of the people of Puerto Rico’s at all stages of life. To do so, the government of Puerto Rico intends to strengthen the backbone of the system by improving the standard of care and increasing access to services. Improving provider retention and maintaining high-quality care means reconsidering the current Medicaid and Medicare reimbursement rates to address the financial viability of the health care system at large and to actively analyze the links between health expenditures and outcomes in ways that are transparent and usable by payers and providers (HSS 7). To support a full array of primary care services and chronic disease
prevention and management, primary care options are to be expanded by the government of Puerto Rico and PRDOH specifically; this will enhance the existing network of community health centers and augment relevant primary care supports, including mobile care clinic options, training, and supplies (HSS 12). To improve mental health services, the government of Puerto Rico intends to expand care for psychological trauma and chronic stress, increase promotion of and referral to existing services (HSS 10), and encourage greater uptake of evidence-based practices to promote health in other settings, such as community centers and schools (HSS 15). These efforts will be paired with a comprehensive suicide prevention campaign promoting wellness and self-care to ensure that those at risk are identified and referred to appropriate services (HSS 28). Another initiative aims to increase access to care through telehealth options (HSS 9) in conjunction with broader efforts to improve data integration and digitization of health and related information (HSS 14).

**Strengthening the Workforce for Health**

The expansion of services described in the preceding section is possible only if there are doctors and other health providers to support it. Given the shortages in some health specialties and concerns about personnel moving away, the government of Puerto Rico intends to incentivize, retain, and train the health care and public health workforce through such initiatives as loan repayment programs and policies that allow nurse practitioners and physician assistants from other states to provide care in Puerto Rico (HSS 11, HSS 13). In addition, the government of Puerto Rico will provide workforce training in order to increase public health surveillance capacity (HSS 8, HSS 27) and facilitate vital records data use (HSS 5), which will be important during disaster response and under normal circumstances.

**Strengthening Supportive Services for Those Populations Most at Need**

Residents living in vulnerable circumstances—for example, home-bound, older adults (especially those who live alone), people who depend on nutritional support, and those with chronic health conditions—have greater needs during and after a disaster. To address these challenges, the government of Puerto Rico proposes to enhance services and other supports that ensure continuity during and after a disaster and that limit disruptions to food, medication, technology, and other crucial supplies. Puerto Rico provided nutrition assistance through the FSP from 1974 to 1982, but it switched to a capped block grant NAP through the Budget Reconciliation Act of 1981. Transitioning to the more financially flexible SNAP—formerly known as the FSP—will allow greater surge capacity postdisaster and provide greater benefit to participants (HSS 16). In the event the transition to SNAP does not occur, long-term waivers to the existing NAP regulations (HSS 17), which would be implemented by the USDA Food and Nutrition Service, would enable greater flexibility in how program participants access food during a disaster.

To raise awareness of child and senior abuse and how to report it, public education campaigns and training of staff at integrated service centers and disaster shelters are needed to
detect and address abuse (HSS 18). The government of Puerto Rico intends to support the older adult population through both routine day-to-day efforts and targeted, community-led support post-disaster (HSS 20). These initiatives include enhancing food stockpiles through a policy change requiring a minimum 14-day, healthy, shelf-stable food supply at all licensed child- and elder-care facilities and providing guidance to them on stockpile contents (HSS 29). Another initiative calls for increasing funding to the PRDOF to hire additional child welfare investigators to reduce the backlog of child maltreatment investigations (HSS 24) so that the department is better positioned to quickly address a potentially increased incidence of abuse post-disaster.

The government of Puerto Rico plans larger efforts to build capacity that will make all residents more resilient to future disasters. These efforts include developing, updating, and implementing preparedness and response plans across the island—including plans for communities facing particularly high risk during disasters—so that communities can better sustain themselves immediately after a disaster. Other components include developing a public information and communication capability to continuously engage communities in the recovery process and increase residents’ visibility into recovery planning and implementation (CPCB 6) and hiring planners in each municipality and at the state level to support a more robust emergency shelter system for the longer term (CPCB 7). Finally, the government of Puerto Rico aims to strengthen the involvement of local nonprofit and nongovernmental organizations in disaster recovery by establishing a unit within the Office for the Socioeconomic and Community Development, or any other designated agency, to maximize the agency’s partnership with government agencies in the recovery process while helping build their capacity (CPCB 15).

Creating Healthy Communities by Augmenting and Enhancing the Social and Built Environment

Healthy communities support healthy people. Transportation, municipal infrastructure, education, economic development, natural and cultural resources, and telecommunications are all required to improve and protect the health and well-being of communities. This component encompasses a range of initiatives, including deploying Wi-Fi and broadband internet connectivity (increasing access to health information to support healthy lifestyles and chronic disease prevention and management); providing incentives to move from remote communities to urban centers (increasing access to key economic and educational services); and offering better access to transportation and community resources, such as museums, parks, artist workspaces, and community centers, as well as natural resources (promoting access to services, healthy activities, and exercise). For example, an integrated strategy to help artists and arts organizations resume practice and livelihoods posthurricane NCR would facilitate community recovery and improve a sense of collective well-being (NCR 2).

Another effort calls for summer and after-school learning programs (described in greater detail in the education section) that incorporate physical and mental health services to promote whole child health and well-being (ED 1). The government of Puerto Rico intends to conduct a
landscape analysis of early childhood opportunities to determine the current supply of interventions and care settings, demographics of children ages 0–5 years (and their families), and the cost of and possible funding streams for programs that provide high-quality care to all children in Puerto Rico and improve their long-term health and learning trajectories (ED 3).

Finally, plans to collect and map housing-sector data will directly benefit people’s health through increased accuracy in the routing of emergency vehicles (HOU 5); initiatives to implement healthy housing guidelines for mold mitigation, remediation, and public health will help prevent respiratory-related diseases (HSS 2). The government of Puerto Rico also intends to reduce water- and vector-borne disease transmission through improved public health surveillance (HSS 4) and innovative mosquito-control practices (HSS 6). Closing unpermitted and unregulated dumps will further remove environmental and public health threats to the people of Puerto Rico (NCR 10).

Chapter Recap

The recovery plan intends to address short-term recovery needs and long-standing challenges to the health and social services sector. Some of the issues are specific to health and social services (e.g., system fragmentation) while others are external but have the potential to be equally prohibitive to health and well-being (e.g., economic decline, widespread poverty). Given that many of these COAs are intended to address long-standing issues in Puerto Rico’s HSS system, we recognize that they will not be easy to implement. In Chapter 5, we will provide a few considerations to help support implementation of these COAs.
5. Implementation Considerations

Given the timeline and scope of the recovery plan, there were limitations to data availability. Creating detailed implementation plans was therefore beyond our scope. We conclude here by describing the data gaps we encountered and by offering a number of factors to be considered when implementing the Health and Social Services courses of action.

Key Data Gaps

Given the decentralized nature of many health and social services, many data gaps remain around poststorm status and functioning at the time of this writing. While data exist on which health facilities were open after the storm and approximately when they were open, less information was available on the extent to which facilities were operating at full capacity. Similarly, estimates were available on the total number of physicians who left the island, but less was known about regional variation in migration patterns and their possible impact on health professional shortages. Data were not available on poststorm water quality and the burden of waterborne illness (pre- and poststorm), or on the status of public health laboratories and the capacity for long-term monitoring and surveillance. Because air quality monitoring networks were inoperable after the storm, no data were available to understand the health ramifications of consistent and widespread use of diesel generators as a power source. In addition, because social services are offered by a patchwork of public and private nonprofit entities, and reporting requirements are not uniform, a comprehensive assessment of facility damage and current status of services around the island was not possible. We also lacked poststorm surveillance data on the burden of mental illness in Puerto Rico to assess change in poststorm incidence and prevalence of illness.

Implementation Will Require Additional Analysis, Detailed Planning, and Adjustments

The process of implementation is often seen as a matter of carrying out steps defined in a plan with high fidelity. In this case, the recovery plan was designed to be a strategic plan, not an implementation one. Therefore, each of the COAs will require at least some degree of additional analysis and the fleshing out of key details. For instance, the COA on reducing the gap in Medicare and Medicaid reimbursement rates will require analysis of the extent to which reimbursement rates can be raised within the existing authorities and capabilities of the law.

Cost Estimates Will Need to Be Updated

Cost estimates provided for the COAs were typically based on the best available information, but they should be verified and, if needed, updated. For instance, we made best-guess assumptions about the number of social services centers that might run a generator following a
disaster and the size of the generator needed. These assumptions are clearly stated in the
appendixes but should be verified and revised as needed.

**Key Partners Will Need to Be Identified and Engaged**

The COAs identified likely implementation partners. However, securing commitments to participate was beyond the scope of this strategic planning process. Thus, implementers will need to review and (as needed) revise the list of partners, contact them, work to secure commitments, and identify a more-detailed division of labor, modes of communication and coordination among them, and so on.

**Ongoing Monitoring and Formative Evaluation Will Be Needed**

Finally, ongoing monitoring and formative evaluation will be necessary to inform various midcourse corrections throughout the implementation process. One focus should be on whether programs show signs of producing relevant outcomes (e.g., decrease in suicidal ideation and suicides, improved disaster-related volunteer and donation management). In addition to this evaluation, ongoing monitoring may be needed, along with midcourse adjustments. It will be especially important to pay attention to assumptions; if some turn out not to be true, adjustments in the COAs might be needed.

Monitoring and evaluation will require good record keeping as well. Paper-based vital records systems precluded the collection and sharing of real-time information on vital events after the hurricanes, as well as the implementation of protocols for surveillance of disaster-related deaths. The challenges associated with a paper-based system have become apparent in the time following the hurricane as uncertainty around hurricane-related mortality persists. Modernizing the way vital records are collected and kept is a critical step in ensuring data accuracy moving forward.

**Dependencies with COAs in Other Sectors Should Be Considered**

The implementation of some of the Health and Social Services COAs depends on COAs in other sectors. For example, the Health and Social Services COA related to expanding telehealth assumes improvements in infrastructure, particularly stable and reliable telecommunication, that are addressed by the Comm/IT (CIT) Sector. We note likely precursors for each of our COAs in the appendix.

**Health and Well-Being Is Dependent on the Wider Social and Economic Contexts in Puerto Rico**

The COAs discussed here focus primarily on the health and social services sector. However, it will be important to remember that the health of a population depends on more than medical treatment and preventive services. As noted in Chapter 2, stakeholders expressed concern that work requirements being placed on social support programs could have detrimental impacts on recipients, given the economic downturn.
Appendix A. Courses of Action

The appendix presents the full descriptions of all 31 courses of action.
HSS 1
Increase Use of Solar-Powered Generators and Solar Backup Power Sources

Sector(s) Impacted
Health and Social Services, Natural and Cultural Resources, Energy

Issue/Problem Being Solved
Fossil fuel generators are frequently used during power outages following weather-related disasters. These fossil fuel generators can contribute to air and noise pollution and also may not have a long life span. The use of generators in Puerto Rico has been much longer term given the duration of inconsistent power following Hurricane Maria. According to *El Nuevo Dia*, the Hospital San Francisco has had two generators fail since the storm, resulting in the evacuation of patients, and the *New York Times* has reported shortages in the availability of generators for residents to purchase in the first few months following the hurricane, with one company selling 250 to 300 generator units a day.\(^1\) With the extensive use of generators by both businesses, hospitals, and residences, the noise from fossil fuel generators is prominent. Some generator manufacturers claim noise levels of 49–60 decibels, and while this level does not generally lead to hearing loss, health effects have been observed with prolonged exposure to lower levels of environmental noise (e.g., 40–55 decibels), from annoyance to sleep disturbances, impaired cognitive performance in children, and increased risk for cardiovascular disease.\(^2\) In addition to health effects of environmental noise, gasoline or diesel generators require fuel from stations that need electricity for pumps to function, which may not necessarily work in long-term power outages. Improper use can result in injury (electrocution, electric shock, carbon monoxide poisoning) and fossil fuel generators often have short life spans, lasting one season or a single disaster event, according to FEMA. Following Hurricanes Rita and Katrina, in 2005, CDC identified 27 incidents of carbon monoxide poisoning attributable to portable generator use, resulting in 78 nonfatal cases and 10 deaths in hurricane-affected counties in Alabama and Texas. In Florida, 167 nonfatal cases of poisoning cases occurred after four major hurricanes hit in 2004. Propane generators are another option since propane does not degrade over time and is safer to store than gasoline, and so propane is a more stable and reliable fuel supply. However,

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propane generators still rely on having a ready supply of propane tanks, and they too are loud and contribute to noise pollution.

**Description**

This COA would subsidize solar cell generators and backup battery systems to home residences to reduce air and noise pollution. In contrast to natural gasoline, diesel, or propane generators, solar (or PV, for photovoltaic) generators are virtually silent, safer to operate, do not contribute toxic exhaust, seldom present a fire hazard, and last longer since there are no moving parts in a solar cell generator. They also run longer. Once a portable solar generator with a battery is up to full speed, it can run day and night without any inputs, contrary to needing to have diesel or gas on-hand in the case of a fossil fuel generator.

Another option is to utilize a solar panel array as a backup power source in conjunction with a traditional residential energy storage system. This involves permanently installing a PV array (solar panels). In the event of a grid failure, the battery storage system would form an “island” while the PV array would continue to generate power, forming a perpetual backup power source. Battery storage backup systems can complement portable solar generators that are less powerful. More powerful generators require larger PV arrays, which means more storage space is needed. Thus, smaller portable solar generators can be useful for short-term power outages when power needs are low (e.g., phone and computer charges) whereas solar battery backup systems are more useful in long-term power outages that incur high power needs (e.g., daily refrigerator, stove, air conditioning, and fan operation).

To implement this COA, subsidies are needed to allow the public to purchase solar generators and/or install battery backup systems. Awareness and education campaigns are needed to increase the public’s knowledge of (1) the need to own generators (of any type, but particularly solar generators, given their longer life span and lower risk of injury, noise pollution, and air pollution) in case of power outages; (2) how to store and prepare solar generators for use; and (3) proper use to ensure effective use of appliances and electronics. In the case of backup batteries, education on use of solar power stored in batteries is needed.

**Potential Benefits**

Solar-powered generators would reduce noise and air pollution and subsequently reduce the risk for respiratory and hearing-related illnesses. Portable solar generators are a longer-term solution than fossil fuel generators since they may last longer. They also do not rely on continuous inputs other than sunlight. Widespread use of energy-efficient generators and battery backup systems could reduce the number of residents who need to be evacuated solely because of power needs, reduce morbidity among residents with technological dependence for health issues, and mortality and injuries associated with fossil fuel generators. The growth in the residential solar market is likely to continue because of decreasing costs of solar equipment, new financing models, and increasing cost of electricity. Moreover, most solar panels are
tested by manufacturers to ensure they can survive high winds (e.g., 140 mph) and hail of up to 25 millimeters (one inch) falling at 23 meters per second (approximately 50 mph) without being dislodged, shattered, or damaged by heavy rain. The time scale to demonstrate benefit could be a year or longer.

**Potential Spillover Impacts to Other Sectors**

- Energy: less reliance on municipal sources of energy
- Natural and Cultural Resources: reduced need for fossil fuels, better air and noise quality

**Potential Costs**

- Potential upfront costs: $4.2 billion to $6.2 billion in estimated upfront costs
- Potential recurring costs: $1.4 million in estimated recurring costs (11 years)
- Potential total costs: $4.2 billion to $6.2 billion in total estimated costs

The cost of portable solar generators can range between $85 (for 9 amp-hours, which can charge mobile phones and some LED lights or small fans) to more than $2,100 (for 396 amp-hours, which can run appliances like refrigerators, TVs, lights, or medical devices for short periods of time). For installed solar panels with a battery backup system, the National Renewable Energy Laboratory estimates approximately $3.66/W (watt) and another $1,500 per kWh (kilowatt-hour) for the battery backup system. The typical American household uses 30 kWh per day. If we assume that conservation of energy is in effect during power outages (e.g., a third of typical usage rates = 10 kWh) * 1.2 (80% depth of discharge) *1.05 (efficiency loss of 5%) = 12.6 kWh/day. This translates to $1,500 * 12.6 = 18,900 for the backup battery and $11,000 to install 3 kW of solar panels for a total of approximately $30,000 per household for installed solar panels and a battery backup system. The costs in Tables A.1 and A.2 reflect household-only estimates with 15% of households taking advantage of the installed solar panels and 50% taking advantage of the portable generator subsidies. We additionally include costs for management, including outreach program to residents (1 part-time staff member); subsidization of 1 unit per household; 2 full-time staff members to manage subsidies; and public education campaign (2 full-time staff members) on how to use portable solar generators and solar panels plus a battery backup.
Table A.1. Program Management Assumptions

<table>
<thead>
<tr>
<th></th>
<th>Upfront Costs</th>
<th>Recurring Costs (Annual)</th>
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<tr>
<td></td>
<td>Low</td>
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<tr>
<td>Management/</td>
<td>$31,150.00</td>
<td>$31,150.00</td>
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<tr>
<td>outreach program</td>
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<tr>
<td>Subsidization</td>
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<td>$1,169,135,100.00</td>
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<tr>
<td>portable generators</td>
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<tr>
<td>Subsidization</td>
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<td>$5,010,579,000.00</td>
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<tr>
<td>PV array + backup</td>
<td></td>
<td></td>
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<tr>
<td>battery</td>
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<td></td>
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<tr>
<td>Subsidization</td>
<td>$155,750.00</td>
<td>$155,750.00</td>
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<td>management</td>
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<tr>
<td>Public education</td>
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<td>$124,600.00</td>
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<td>campaign</td>
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<tr>
<td>Total</td>
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<td>$6,179,901,000.00</td>
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Table A.2. Utilization Assumptions

<table>
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<tr>
<th>Assumptions</th>
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<tr>
<td>1.0 FTE</td>
<td>$62,300</td>
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<tr>
<td>Portable solar generator cost range</td>
<td>$85</td>
<td>$2,100.00</td>
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<tr>
<td>Subsidy %</td>
<td>75%</td>
<td>90%</td>
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<tr>
<td>Households using portable generators (50%)</td>
<td>618,590</td>
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</tr>
<tr>
<td>Households using solar panel array + battery (15%)</td>
<td>185,577</td>
<td></td>
</tr>
<tr>
<td>Number of portable generators / number of households</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Solar panel array + backup battery cost for a typical household</td>
<td>$30,000</td>
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</tr>
<tr>
<td>Total number of households</td>
<td>1,237,180</td>
<td></td>
</tr>
</tbody>
</table>

Potential Funding Mechanisms

U.S. Environmental Protection Agency, U.S. Department of Agriculture, Environmental Quality Board, private sector

Note: This COA would supplement existing projects aimed at developing a surveillance system to identify cases of carbon monoxide poisoning, either of mortality or morbidity, caused by electricity generators. This would allow both projects to complement each other.
**Potential Implementer(s)**

Environmental Quality Board, U.S. Environmental Protection Agency’s Caribbean Division

**Potential Pitfalls**

Widespread distribution of solar-powered generators will be an expensive undertaking. Current gas-powered generators would need to be phased out over time. Households may not have a place to dispose their existing fuel generators and it is unclear whether Puerto Rico has appropriate collection sites. Individual households may not want permanent solar panels installed on their rooftops for the backup battery option. The widespread need for battery backup systems depends on how robust the future power grid will be. Additionally, while solar generators can continuously store energy before a storm hits, cloudy days can reduce the efficiency of solar panels. While solar panels are tested to withstand heavy rainfall, hail, and wind speeds, the longevity of the panels depends on the quality of rooftop on which they are installed.

**Likely Precursors**

None envisioned at this time.
Prevent Disease Through a Capacity-Building Healthy Housing Initiative: Targeting Mold, Lead, and Other Stressors

**Sector(s) Impacted**

Health and Social Services, Public Buildings, Education

**Issue/Problem Being Solved**

The prevalence of asthma in Puerto Rico is very high. According to the Puerto Rico Department of Health, approximately 10.6% of adults and 13.8% of children reported current asthma in 2014. According to data from the 2015 BRFSS from the CDC, there are 214,590 children in Puerto Rico with asthma, resulting in a child lifetime asthma prevalence of 26.5% (compared with 13.1% for the 31 participating BRFSS U.S. states). Exposure to fungi, including mold and mildew, and other environmental hazards can exacerbate asthma symptoms and result in an increase in missed school days, ER visits, and hospitalizations. Although complete data are not available at this time, there have been several reports of steep increases in the number and severity of asthma cases since the hurricanes. In addition, prior research in Puerto Rico indicates that National Heart, Lung, and Blood Institute (NHLBI) guidelines are not being implemented across the island, suggesting a need for improved patient and provider education. Establishing sustainable clinical and environmental in-home management for patients with uncontrolled asthma is key to achieving consistent improved patient and provider outcomes.

**Description**

This COA builds capacity for the identification and management of mold and other environmental stressors through an integrated healthy homes/housing and buildings initiative that focuses on guidance on mold removal and prevention; asthma trigger education and in-home asthma intervention; healthy home inspections; education and enforcement of building codes during repair and rebuild; and training of target audiences. This COA sets up the infrastructure for capacity building and coordination between federal and Puerto Rico government agencies, health care providers, universities, and nonprofits to address mold remediation and prevention and other stressors as key triggers for asthma exacerbations in the aftermath of disasters. This will be accomplished through capacity building within agencies for enforcement; training (including certification programs) of targeted audiences: workers involved in recovery/rebuild, health care providers, families and children, community health workers/asthma educators/healthy home inspectors, and other key individuals from government agencies who oversee the recovery/rebuild; and promotion of NHLBI Expert Panel Report 3 guidelines for asthma care.
This COA would be implemented through mold remediation.

- Ensure that workers are trained and certified as Renovation, Repair, Painting (RRP), in mold remediation and in lead hazard control.
- Distribute the large resource of mold guidelines for recovery, rebuild, and healthy homes, etc., that was developed in the aftermath of Superstorm Sandy.

Implementation of the guidelines involves the specific actions.

- Promote options for utilization of sustainable building materials and proper ventilation systems.
- Ensure NHLBI guidelines for clinical and in-home asthma management are followed to achieve continuous reductions in emergency department visits and hospitalizations for asthma.
- Utilize health care provider training developed by the New Jersey American Academy of Pediatrics, customized to Puerto Rico, if necessary.
- Utilize current Asthma Educator training called Proyecto Aire, developed by the University of Puerto Rico–Allied Health Sciences; develop modules for disaster recovery, healthy homes, mold, etc., for trainings for community health workers and healthy home specialists.
- Utilize the current Indoor Air Quality (IAQ) Champions program, developed for schools by Universidad del Turabo, for training key school staff.
- Engage and promote PRDOH’s current clinical and in-home asthma intervention pilot program for island-wide implementation.
- Engage the Puerto Rico insurance agency, also known as ASES, to include clinical and in-home asthma intervention as a paid service in its contracts with Medicare and Medicaid providers.
- Implement provider and patient educational campaigns and consider the use of comprehensive case management models.

Potential Benefits

This COA builds capacity at all levels of government agencies and addresses key health issues, while focusing on workforce development and the creation of sustainable new jobs. Measures to decrease exposure to mold can decrease the public health burden of asthma and other respiratory-related diseases. Glucan is a component of the fungal cell wall that is used as a marker of fungal exposure. In a study of children aged 6 to 14 in San Juan, exposure to the highest quartile of glucan was associated with nearly nine-fold greater odds of one or more visits to the ED/urgent care for asthma, compared with exposure in the lowest quartile. This suggests that decreasing exposure to asthma triggers may lead to a significant reduction in asthma morbidity and associated health care costs and may optimize the utilization of funds. Comprehensive healthy housing programs have been shown to produce impacts with positive public health significance.
In a review of 9 outpatient asthma self-management education and 17 home-based interventions in the United States, most programs were associated with a positive return on investment.

Full implementation is expected to reduce asthma hospitalizations and missed school days and decrease short-term and long-term health care costs. This COA also focuses on workforce development, creates sustainable new jobs, assists in optimal utilization of disaster recovery funds, and ensures that Puerto Rico is better prepared for future hurricane seasons. Benefits are expected to be realized in 1 to 2 years.

**Potential Spillover Impacts to Other Sectors**

Public Buildings and Education would be impacted by coordinated implementation measures.

**Potential Costs**

Potential upfront costs: $1.2 million to $5.3 million in estimated upfront costs
Potential recurring costs: $14 million to $18 million in estimated recurring costs (11 years)
Potential total costs: $16 million to $23 million in total estimated costs

**Upfront**

- 1 full-time equivalent (FTE) to design implementation of building codes for mold-resistant materials ($62,300).
- Reconstruction costs for mold remediation estimated at $3.40 to $4.10 per square foot, remediating 50 to 100 buildings, with 2,000 to 10,000 square footage per building. Total = $340,000 – $4,100,000.
- 3 FTEs to implement guidelines and technical assistance for personal protective equipment (PPE) and remediation procedures ($186,900).
- 10 to 15 FTEs to implement Healthy Housing training programs and target workforce development on mold diagnosis, risk, PPE, remediation, proper asthma management (target audiences: recovery workers, construction workers, physicians and other health care providers, patients; community health workers/asthma educators/healthy home inspectors; other key individuals from government agencies who oversee the recovery/rebuild) ($623,000 to $934,500).
- Total: $1.2 million to $5.3 million.

**Ongoing**

- 1 full-time staff for ongoing management ($62,300).
- 10 FTEs for enforcement ($623,300).
- 10 to 15 FTEs to manage educational programs (ongoing) ($623,000 to $934,500).
- Total: $1.3 million to $1.6 million.
Potential Funding Mechanisms

U.S. Department of Health and Human Services Health Resources and Services Administration

Potential Implementer(s)

U.S. Environmental Protection Agency, Centers for Disease Control and Prevention, and other federal agencies; Puerto Rico Department of Housing, Puerto Rico Department of Health, other government of Puerto Rico agencies.

Potential Pitfalls

In San Juan, precipitation, dew point, and relative humidity have been found to promote the presence of fungal spores. The increased likelihood of extreme precipitation events caused by climate change is expected to increase the presence of fungal spores and may exacerbate associated public health. There is a lack of sustained coordination and accountability between key government agencies, health care organizations, universities, and nonprofits.

Likely Precursors

This COA does not include the costs of remediation for individual private homes, which would need to be financed through separate efforts.
Sector(s) Impacted

Health and Social Services, Natural and Cultural Resources, Municipalities, Energy

Issue/Problem Being Solved

Solid waste accumulation on the island is an environmental health problem. The majority of the approximately 29 landfills on the island are at or beyond capacity and the EPA has legal agreements to close 12 of these landfills. Recycling rates on the island are estimated to be about 10%, compared with 35% on the mainland.¹ The hurricanes exacerbated this problem, with an estimated 6.2 million cubic yards of waste and debris generated.² Improper (formal and informal) waste management on the island is a hazard to public health. Waste sites can become breeding grounds for vectors. There also exists the potential for hazardous contaminant exposure because of leaching or runoff from improperly contained landfills or waste piles. While the PR-EQB has primary responsibility for regulating solid waste landfills, and only PR-EQB has permitting and solid waste enforcement authority over the landfills, the EPA has used its enforcement authority under the Resource Conservation and Recovery Act, as well as other federal statutes, to require that actions be taken to address serious environmental and health risks. The Solid Waste Management Authority (Autoridad de Desperdicios Solidos, ADS) resides under the Department of Natural Resources and is responsible for the enforcement of Law No. 70 of September 18, 1992, as amended, known as “Law for the Reduction and Recycling of Solid Wastes in Puerto Rico.”³ ADS serves as a liaison between PR-EQB and the municipalities. ADS prepares the plans carried out by municipalities to meet the mandates required by PR-EQB. Some landfills are operated by private companies (e.g., the firm Conwaste operates the landfill in Toa Baja), and some may also be owned and operated by municipalities. The Puerto Rico Department of Health only has specific roles and limited jurisdiction.

Description

This COA lays out the steps necessary to create an integrated materials recovery and waste management program and increase the proportion of waste that is diverted from landfills through reuse, recycling, and composting.

This COA would be implemented exercising the following activities:

- Undertake a comprehensive cost analysis study. (Currently, there exists little understanding of the municipal costs associated with waste management; this gap must be filled to evaluate the cost/benefits of different management options and incentivization schemes.)
  - This study should include an assessment of different incentives for household recycling (e.g., caps on how much waste people can dispose for free, charges for waste disposal, etc.).
- Conduct an investigation of the implementation of tax incentives for companies that will take back consumer electronics.
- Create and implement an enforceable mandate for household recycling and composting (inclusive of source separation laws and container laws).
- Ensure enforcement of existing laws on the management of scrap tires to minimize mosquito generation.
- Launch a public education campaign covering
  - financial trade-offs for municipios (e.g., funds used for waste management could be diverted to community resources)
  - public health implications of waste piles
  - practical considerations (where/how/when to deal with recyclables/compost).

Potential Benefits

A clear characterization of the costs associated with managing waste streams generated across the island will enable an efficient evaluation of cost-effective management options. Diverting waste from Puerto Rico’s landfills will free up space for waste that must be landfilled so that it can be managed properly. In addition, a full accounting of costs and benefits associated with waste management may prove that new strategies for materials and waste management are cost-effective. For example, a study of construction waste minimization and recycling in Malaysia demonstrated that such a program was economically feasible and resulted in positive externalities, such as saving landfill space, reducing liability for workplace safety, and decreasing the likelihood of soil and groundwater contamination.\(^4\) A reduction in waste streams will also lessen the likelihood that waste will be informally managed in dumps or waste piles. Elimination of such informal waste management will contribute to vector management. The research and analysis required to implement the COA would likely take 1 to 2 years. After this time frame, implementation could begin and benefits would begin to be realized.

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Potential Spillover Impacts to Other Sectors

Natural and Cultural Resources: Informal waste management is also an ecological hazard. Municipalities: A reduction in waste could result in a cost savings that could be applied to other municipio priorities.

Potential Costs

Potential upfront costs: $220,000 in estimated upfront costs
Potential recurring costs: $6.2 million in estimated recurring costs (11 years)
Potential total costs: $6.4 million in total estimated costs

- 1 to 2 staff members (academic, consulting) to conduct cost study (1 year): $124,600
- 1 staff member (annually) to manage consumer electronic takeback program: $62,300 per year
- 8 staff members (annually) for regulatory implementation and enforcement: $62,300 per year
- 2 staff members for development and implementation of public education campaign (first 2 years): $249,200
- See Table A.3 below for additional detail on costs assumptions.

<table>
<thead>
<tr>
<th></th>
<th>Upfront Costs</th>
<th>Recurring Costs (Annual)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
<td>High</td>
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<tr>
<td>Waste characterization</td>
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<td>Manage electronic waste</td>
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<tr>
<td>program</td>
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<td></td>
</tr>
<tr>
<td>Regulatory</td>
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<td></td>
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<tr>
<td>implementation/enforcement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public education campaign</td>
<td>$124,600</td>
<td>$124,600</td>
</tr>
<tr>
<td>Total</td>
<td>$186,900</td>
<td>$249,200</td>
</tr>
</tbody>
</table>

Potential Funding Mechanisms

U.S. Environmental Protection Agency Workforce Development and Job Training Grants (cooperative agreement), nongovernment sources

Potential Implementer(s)

U.S. Environmental Protection Agency, Puerto Rico Department of Natural and Environmental Resources (Environmental Quality Board), Puerto Rico Recycling Partnership, universities
Potential Pitfalls

Any type of fee structure directed toward households could create additional waste management/vector problems if households store waste within property or dispose of it through improper channels.

Note that the PRDOH does not have legal jurisdiction over the problem of solid waste. These aspects fall under the PR-EQB and the ADS. The PRDOH oversees the control methods for vectors, including 10 FTEs (Vector Control Inspectors) that are distributed in all regions.

Likely Precursors

Implementation of expanded recycling would depend on what existing equipment is functioning and available, or it would require additional capital investments.
Sector(s) Impacted

Health and Social Services, Water

Issue/Problem Being Solved

In 2015, community water systems that served 99.5% of the population of Puerto Rico were in violation of the Safe Drinking Water Act (e.g., failure to test water safety, failure to report issues as required, violations of health-based standards). Drinking water contamination can cause disruption in water service and have large impacts on public health. In the immediate aftermath of Hurricane Maria, much of the island’s power grid was off-line, and sewage wastewater treatment plants, including those upstream of drinking water supplies, were out of service, exacerbating problems with the quality of drinking water. An outbreak of leptospirosis, a bacterial infection spread when urine of infected animals gets into water or soil, occurred in Puerto Rico in October 2017. Reports of gastrointestinal illness, conjunctivitis, and respiratory problems suggest public health outbreaks from poor water quality occurred as a result of the storm. Rapid detection and response will reduce the transmission of infectious pathogens and harmful chemicals in drinking water. Public health departments in U.S. states and territories have primary responsibility for detecting and investigating outbreaks and cases of disease. Outbreaks associated with exposure to drinking, recreational, and other types of water are voluntarily reported to the CDC. Although Puerto Rico has previously reported outbreaks through the National Outbreak Reporting System, the island did not participate in the most recent reporting period. Furthermore, Hurricane Maria severely damaged the main PRDOH laboratory facility in San Juan and regional facilities located in Arecibo, Ponce, and Mayaguez, which provide laboratory testing and surveillance for diseases. During the response phases, CDC and partners established a system for temporary alternative testing for selected priority diseases in laboratories in CONUS. Restoration of laboratory services on the island, including demonstrating that equipment meets required quality assurance and quality control criteria, is critical to ensuring the robustness of waterborne disease outbreak surveillance.

**Description**

This COA ensures the robustness of the surveillance system for waterborne disease. It would be implemented through the following actions.

- Ensure PRDOH laboratories are fully operational through quality assurance/quality control (QA/QC) testing.
- Establish a partnership between PR DOH and PRASA for monitoring public health data and communicating and coordinating alerts and investigations with water utility.
- Establish an alert investigation and public notification procedure, in cooperation with PRASA.
- Investigate the added benefits/costs of a syndromic surveillance system for waterborne disease.
  - Identify existing data streams that may be used to detect possible water contamination (ED cases, 911 calls, over-the-counter medication sales).
  - Understand data privacy and sharing limitations.
  - Assess information system requirements needed and implement statistical algorithms for tracking and generating alerts.

**Potential Benefits**

A surveillance system that provides rapid detection, identification of the cause, and response to illness reports can reduce the transmission of infectious pathogens and harmful chemicals and toxins in the water system. The potential adoption of a syndromic surveillance system has many ancillary benefits, including that it can be used to track multiple other disease outbreaks (e.g., influenza, vector-borne disease, etc.). Benefits could be realized in 1 to 2 years.

**Potential Spillover Impacts to Other Sectors**

Water: Close coordination with water utility (PRASA) is needed; decreased burden on health care system is likely.

Public Buildings: Restoration of public health laboratories must be completed.

**Potential Costs**

Potential upfront costs: $90,000 in estimated upfront costs
Potential recurring costs: $2.8 million in estimated recurring costs (11 years)
Potential total costs: $2.9 million in total estimated costs

- 1.5 full-time staff from PRDOH and PRASA (1 FTE = $62,300) to perform QA/QC of equipment and investigate syndromic surveillance
- 2 full-time staff each from PRDOH and PRASA (1 FTE = $62,300) to establish and maintain interagency partnerships and programs, recurring annually
- Total = $90,000 upfront; $250,000 annually

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4 Katharine M. Benedict et al., “Surveillance for Waterborne Disease Outbreaks Associated with Drinking Water.”
**Potential Funding Mechanisms**

U.S. Environmental Protection Agency (Water Finance Clearinghouse)

**Potential Implementer(s)**

Puerto Rico Department of Health, Puerto Rico Aqueduct and Sewer Authority, Centers for Disease Control and Prevention

**Potential Pitfalls**

Laboratory operations are dependent on sustained power.

**Likely Precursors**

Fully functioning public health laboratories will be dependent on building and equipment repairs (public buildings) and a reliable source of electricity (energy sector). Note that the personnel assigned to the PRDOH must be located in the Drinking Water Program of the Department of Health; according to the Safe Drinking Water Act, this program has responsibility for these systems. It is necessary to clarify the functions of the personnel assigned to PRASA, since these systems are not within its jurisdiction.
HSS 5
Develop and Implement an Integrated Electronic Reporting System for Vital Records

Sector(s) Impacted
Health and Social Services

Issue/Problem Being Solved
Currently, the Puerto Rico Demographic Registry uses a paper-based reporting system that does not allow real-time information on vital events after a disaster nor the implementation of protocols for surveillance of disaster-related deaths. Not having access to timely and accurate data delays the government’s response after any emergency, and the lack of transparency in sharing death-related data is detrimental to planning for future natural disasters.

Description
This COA will transition the PRDOH Demographic Registry (PRDR) from a paper-based to a web-based reporting system for vital events. The National Center for Health Statistics and the National Association for Public Health Statistics and Information Systems can provide technical support during implementation. These two organizations, in conjunction with the Colegio de Médicos-Cirujanos de Puerto Rico and Schools of Public Health in Puerto Rico, will be key partners in training and other activities that will assist in the system’s implementation.

The first step of implementation will be to conduct an infrastructure assessment and a process evaluation of the current reporting of vital events to identify the essential elements, needs, viability, and needed actions to implement a web-based system. The Office of Informatics and Technological Affairs or an external partner will perform a vulnerability and risk assessment for applications and the assessment for systems and communications infrastructure. Based on these assessments, PRDR and OIAT will develop a web-based application that will allow funeral directors, forensics personnel, hospital personnel, physicians, and other relevant personnel to complete and register the U.S. standard certificate of death as well as birth-related events at any time and from any location where web access is available. During the system-design process, it could be beneficial to consider including a simple way to indicate if a death is disaster-related (e.g., a checkbox) to aid disaster mortality surveillance.

Training workshops would be provided to personnel from OIAT, local Demographic Registry offices, the Forensic Science Bureau, funerary agents, the Board of Medical Examiners, physicians, and hospitals, among other relevant health-related personnel. This training would go over definitions and guidance for proper reporting of disaster-related deaths to ensure death
Certificates include attribution to a disaster when applicable. Training of this type will assist with future surveillance efforts and will be critical for the project’s success. Web-based courses and instructor-led seminars would be developed to simplify training and increase accessibility and flexibility during the educational process, and in-person trainings would be provided at each PRDOH Health Region (8 in total). The PRDR Quality Office would establish and conduct a quality assurance program designed to strengthen methods and procedures used by local registrars, hospital personnel, funeral directors, and other source data providers. The quality assurance program would monitor the registration system to ensure a highly acceptable level of registration and item completeness as well as timeliness and compliance with established procedures.

This COA could be piloted in one PRDOH region to test training methodology, ensure system stability, and fine-tune protocols.

**Potential Benefits**

The implementation of an electronic reporting system has many potential benefits including timeliness of data, completeness of vital records data, reduction of manual data-entry errors, and the provision of more complete, timely, and accurate reports. As the CDC notes, complete and accurate information is needed to understand factors that contribute to disaster-related deaths, and this information can be used for emergency preparedness and mitigation measures during disaster response and recovery.¹

Timely and accurate estimates of death tolls are critical to understanding the severity of disasters and targeting recovery efforts. Electronic Death Registration Systems (EDRSs) have been shown to support timely surveillance during disasters,² and comparisons of EDSRs to paper-based collection efforts have noted an increase in accuracy and completeness of the electronic system over paper.³ Thus, this system would increase efficiency in the death-reporting process after a disaster by reducing the time it takes to finalize a death record and allowing for the collection of additional data; it would also support accurate and rapid surveillance activities. The likely time scale to see benefits is estimated between 2 and 3 years.

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Potential Costs

Potential upfront costs: $1.5 million in estimated upfront costs
Potential recurring costs: $13 million in estimated recurring costs (11 years)
Potential total costs: $14 million in total estimated costs

Upfront costs would total $1.49 million and would include $615,000 for labor, consisting of 5 to 7 specialized FTEs at $70,000 (IT administrator/program manager, data administrator, programmers, data analysts) and 2 trainers at $62,300; $15,000 for an evaluation of technological infrastructure; $300,000 for dedicated servers and workstations or cloud IT infrastructure, internet with sufficient bandwidth capacity, software, security certificates, routers, cables, and computers with sufficient memory and storage, equipment maintenance; $100,000 for the development of training videos and materials and the provision of training sessions (including revisions after pilot testing); $50,000 for a pilot test of the project and evaluation; $374,000 for 24/7 IT service desk (6 FTEs at $62,300 distributed among 3 shifts per day); $40,000 for an educational media campaign. Annual cost would be $1.16 million and would consist of ongoing equipment maintenance and labor.

Potential Funding Mechanisms

Centers for Disease Control and Prevention’s National Center for Health Statistics, National Association for Public Health Statistics and Information System, Pan American Health Organization, private donors

Potential Implementer(s)

Puerto Rico Department of Health (PRDR, Office of Informatics and Technological Affairs, Planning and Development Office)

Potential Pitfalls

Unavailability of power supply; lack of internet access in funeral homes; providers not willing to use the electronic system; untrained personnel; infrastructure deficiencies at PRDR central and local offices

Likely Precursors

Developing the data framework and ensuring buy-in by all relevant facilities; significant improvements in infrastructure, particularly stable and reliable telecommunications (which is one of the COAs for that sector)
Reduce Opportunities for Vector-Borne Diseases

Sector(s) Impacted

Health and Social Services

Issue/Problem Being Solved

Vector-borne diseases, including Zika, chikungunya, and dengue, are a public health burden in Puerto Rico. In 2016, there were 5,168 symptomatic cases of Zika reported in U.S. states and 36,512 symptomatic cases reported in U.S. territories. Puerto Rico accounted for 35,395 (97%) of the symptomatic cases that occurred in U.S. territories. Provisional data from 2017 (as of April 4, 2018) report 432 symptomatic cases in U.S. states and 653 symptomatic cases in territories; 607 cases were reported in Puerto Rico.1 According to CDC, 61,844 suspected dengue cases were reported in Puerto Rico between 2002 and 2010, of which 22,648 were confirmed.2 Puerto Rico has made some progress in mosquito control. The PRDOH and the CDC have developed a surveillance system called Zika Active Pregnancy Surveillance System (ZAPSS). The PRVCU is developing an integrated vector management strategy, combining vector surveillance and monitoring, vector control operations, and island-wide community engagement, education, and mobilization programs, all of which will be implemented in partnership with other agencies (government and nongovernment) and communities across the island of Puerto Rico. However, more needs to be done, particularly because large-scale storm events exacerbate the frequency of standing water, especially at abandoned properties, due to disaster displacement.

Description

This COA supports and expands the monitoring, engagement, and educational components of the PRVCU vector management strategy. It also establishes support for additional innovative practices for mosquito control. Abandoned properties have been identified by the PRVCU as a major breeding site for mosquitos. While Puerto Rico already had a significant abandonment problem, with a surge in home foreclosures over the last decade,3 the hurricanes caused more residents to leave their homes. The identification and implementation of practices that can be

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used to eliminate mosquitos and mosquito breeding areas from abandoned properties is critical to vector control on the island.

The implementation of this COA supports expansion of ongoing education and engagement strategies through personnel support. In addition, drones are increasingly being used to scout out breeding sites for mosquitos and apply larvicide in hard-to-reach places and could be investigated for their effectiveness in Puerto Rico. Because of the dispersed nature of abandoned properties, targeted application is necessary. Pilots may be initiated in areas of high abandonment and then ultimately scaled island-wide.

- Investigate legal and practical implications of using drones to identify breeding sites and apply larvicide at abandoned private properties.
- Establish pilot program in one municipio to use drones to detect breeding grounds and apply larvicide at abandoned properties.
- Evaluate costs and benefits of pilot program.
- Implement large-scale program, as determined by pilot results.

**Potential Benefits**

Efforts to bolster ongoing vector management programs could reduce the transmission of disease on the island. Drone technology has the potential to dramatically improve mosquito control in areas that have been difficult to reach. Proof-of-concept studies have demonstrated that low-cost drones can be used effectively to map mosquito aquatic habitats for larval source management. Benefits are likely to be evident in 1 to 2 years.

**Potential Spillover Impacts to Other Sectors**

Natural and Cultural Resources

**Potential Costs**

Potential upfront costs: $370,000 to $3.4 million in estimated upfront costs
Potential recurring costs: $140,000 to $156,000 in estimated annually recurring costs (11 years)
Potential total costs: $530,000 to $3.8 million in total estimated costs

- 2 full-time staff for expansion of monitoring/engagement/education
- legal consultation (likely higher than standard salary)
- 1 full-time staff person at PRVCU dedicated to overseeing pilot, start-up, and implementation ($62,300 for first 2 years; may be reduced to 0.25–0.5 FTE for ongoing maintenance)

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- purchase of drones, $1,000 to $8,000/drone (identification drones are in the lower end of the range; drones that can perform application are $5,000 to $8,000)
- larvicide purchase, annual
- See Table A.4 for additional detail on costs assumptions.

### Table A.4. Costs and Assumptions

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<thead>
<tr>
<th>Upfront Costs</th>
<th>Recurring Costs (Annual)</th>
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<td>Legal consultation</td>
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<td>Management of pilot program</td>
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<td>Drone purchase for pilot</td>
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<td>Drone purchase for full program</td>
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<td><strong>Total</strong></td>
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<tr>
<td>Number of municipios</td>
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**Potential Funding Mechanisms**

U.S. Department of Health and Human Services

**Potential Implementer(s)**

Puerto Rico Vector Control Unit, Puerto Rico Department of Health, municipal governments

**Potential Pitfalls**

Larvicide application must be highly targeted and avoid contaminating areas that are potential drinking water sources. In addition, privacy concerns must be considered to avoid ancillary uses and “overreach” of drone technology.

**Likely Precursors**

None envisioned at this time.
Hide Full Document

Reduce Gap in Medicaid/Medicare Reimbursement Rate

Sector(s) Impacted

Health and Social Services

Issue/Problem Being Solved

The majority of Puerto Ricans (60% in 2015)\(^1\) are insured by Medicaid/CHIP or Medicare, but the cost of that is having an economic toll. There have been temporary solutions to improve access to health care, but these cash infusions to offset the Medicaid shortfall are temporary, and the future robustness of the system is uncertain. The Medicaid and CHIP Payment and Access Commission in 2017 estimated a shortfall in funding of up to $877 million in 2018.\(^2\)

In the 50 states and the District of Columbia, the federal government matches the FMAP for the state, which varies according to the state’s per capita income, with no ceiling. This FMAP rate ranges from 50% to 76%. However, in Puerto Rico and other territories, the FMAP is set at 55% irrespective of per capita income and subject to a flat ceiling. The annual ceiling on federal Medicaid match dollars is pegged to the medical component of the Consumer Price Index for All Urban Consumers (CPI-U); in 2017, this ceiling was set at $347 million. The ACA authorized a further $5.4 billion total over the 8 years from 2011 to 2019. The additional ACA funding was exhausted in 2018. The federal match rate is applied until the Medicaid ceiling funds and ACA funds are exhausted, at which point Puerto Rico must make up the difference itself.

Furthermore, as in the U.S. states, Puerto Rico’s population overall is aging. Puerto Rico’s elderly population rose to 19% in 2017. This is the only age demographic that experienced population growth over the past 10 years, and it is a vulnerable population with a higher demand for health services. While Medicare reimbursement rates are not subject to the same ceiling as Medicaid, they are still somewhat suppressed compared with the 50 states and D.C. Medicare uses the Geographic Practice Cost Index to account for regional variation in the cost of providing care. The practice expense component of the GPCI is intended to encompass the costs of running a medical practice in a given area, and it is based on medical practice employee wages and median residential rents (as a proxy for office rents). This component estimates the effective median gross rent of a 2-bedroom housing unit as a measure of the local cost of living, but it does not take into account the actual market rate of such a unit. In areas with a large proportion

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of nonmarket (e.g., public) housing, the median residential rent systematically underestimates market-rate rents and becomes a less-accurate proxy for physician office rents. Thus, the Medicare reimbursement rate in such areas does not account for the true costs of operating a practice.

Given the high cost of living and high percentage of medically indigent population, these reimbursement rates are not sufficient. Setting the Medicaid FMAP relative to per capita income and correcting the bias in the GPCIs will allow Puerto Rico to receive an increase in Medicaid and Medicare reimbursement.

Description

To begin to address this gap issue, it is important to first analyze the extent to which reimbursement rates can be raised within the existing authorities and capabilities of the law to help address the financial viability of the health care system. In the course of the analysis, we applied research methods used in the U.S. states and D.C. for improving patient outcomes, reducing Medicaid costs, and increasing payments to providers. This analysis should specifically examine opportunities in the context of disaster recovery needs over the long-term and future system robustness. Financial loss as well as provider retention issues are affected by reimbursement rates that are unable to keep up with the cost of care, cost of living, and related economic conditions.

The COA would entail reviewing the impact of varying reimbursement rates on service provision, access to care, and provider retention. The COA could extend to reviewing and modeling alternative payment options as well. This COA must also address what impact the Medicaid Consumer Assistance Program (CAP) has on federal matching rates and the Medicaid health care system.

The COA starts with a study and could be implemented by an independent research body or institution that does not have a vested interest in the outcome of the rate analysis (namely, not payers or the government). The COA is principally focused on analysis of reimbursement rates. The findings on how to address the gap ultimately would have to be applied by the Centers for Medicare and Medicaid Services (CMS), pending Congressional approval of changes to the Medicaid matching rate or ceiling or changes to the Medicare reimbursement calculation.

Potential Benefits

Without analysis of the impacts of reimbursement rates on access to care and provider retention, it is difficult to determine the extent of health care system fragility. Robust analysis is needed to capture where positive health care outcomes could be achieved by changes in payment.
structure. If the rates are stabilized after this temporary period or increased, the impact on access to care, use of services, and provider retention should be improved in 1–3 years.

**Potential Spillover Impacts to Other Sectors**

A study that results in reimbursement rate change could have a positive impact on provider retention. The resulting decrease in provider outmigration could have a beneficial effect on community building and increase access to quality care. Health care access in turn is key to resident livelihood and good health.

**Potential Costs**

- Potential upfront costs: N/A
- Potential recurring costs: N/A
- Potential total costs: N/A

If the rate analysis requires additional study, that would cost approximately $250,000 to $500,000 in study (1 time, over 1 year, upfront). This cost could skew up or down depending on the extent of the reimbursement and payment options modeled.

**Potential Funding Mechanisms**

- Government of Puerto Rico, nongovernment sources, U.S. Department of Health and Human Services

**Potential Implementer(s)**

- Independent research organizations, U.S. Congress

**Potential Pitfalls**

The most critical element of this COA is a willingness to review current rate schedules, but they should be reviewed in the broader context of payment reform. There is unlikely to be pushback to rate review on the part of health care providers. However, there is no guarantee that Congress would increase funding levels, if indicated by the analysis.

**Likely Precursors**

Reviewing rate history and effect on access to care, provider retention, etc.

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HSS 8
Increase Public Health Laboratory Capacity

Sector(s) Impacted
Health and Social Services, Water, Energy, Comm/IT Team, Public Buildings

Issue/Problem Being Solved
Already fragile PRDOH laboratory infrastructure was severely damaged by Hurricanes Maria and Irma, endangering the public’s health and diminishing diagnostic and surveillance response capacity.

Description
This COA will help boost PRDOH laboratory infrastructure with the latest diagnostic technologies and electronic data reporting capacity. It will also build and maintain a competent workforce for rapid response to emerging and public health threats as well as monitor disease conditions affecting the health of all Puerto Ricans. PRDOH would be responsible for implementing this COA in collaboration with the CDC, the HRSA, U.S. Department of Health and Human Services, and Association of Public Health Laboratories (APHL). Implementation would be done by rebuilding and/or developing up-to-date and well-equipped laboratories and putting in place the appropriate trained staff while engaging advanced systems and integrating laboratory and epidemiological activities. This COA also would provide a laboratory network infrastructure (a laboratory and patient information management system) whereby data can be communicated and shared between health care facilities to access data in a timely manner for rapid response. The likely time scale to see benefits is estimated at 2 years or longer.

Potential Benefits
This COA would allow the implementation of early-detection methodologies that would facilitate timely implementation of needed control measures to minimize disease transmission and additional health-related costs.

Potential Spillover Impacts to Other Sectors
This COA would require full and immediate support from the Public Buildings Administration for the evaluation of facilities.
**Potential Costs**

Potential upfront costs: $9 million in estimated upfront costs  
Potential recurring costs: $62 million in estimated recurring costs (11 years)  
Potential total costs: $71 million in total estimated costs

- Estimate for upfront costs is $9 million, for building repairs (based on the cost of rebuilding one small lab that is 25% damaged)
- Estimate for annual costs is $5.6 million, for 37 FTEs at $150,000

**Potential Funding Mechanisms**

Government of Puerto Rico, Centers for Disease Control and Prevention, Association of Public Health Laboratories, U.S. Department of Labor, nongovernmental organizations

**Potential Implementer(s)**

Puerto Rico Department of Health, U.S. Department of Health and Human Services (Centers for Disease Control and Prevention, Health Resources and Services Administration, Association of Public Health Laboratories)

**Potential Pitfalls**

Laboratory operations depend on sustained power and water supply.

**Likely Precursors**

Fully functioning public health laboratories will depend on building and equipment repairs (Public Buildings) and a reliable source of electricity (Energy).
Increase Access to Telehealth Options as Telecommunication Supports Become More Robust

**Sector(s) Impacted**

Health and Social Services, Comm/IT, Community Planning and Capacity Building

**Issue/Problem Being Solved**

There are health professional shortage areas, including mental health workforce shortage, and it is difficult to provide care to people who currently have less access to health care. There are 78 health provider shortage areas, and one-third of posthurricane deaths in a recent study were attributed by family members to delayed or prevented access to medical care.¹

**Description**

This COA expands the use of telehealth across the island and trains the health care workforce in its use. This would be implemented by health care facilities and associations, private industry (e.g., telecommunications providers, telehealth systems), and could leverage existing technology such as WhatsApp and Skype. Benefits could be seen within 1 to 2 years, particularly in terms of improved access to care.²

- Social media has the potential to be a way to reach more geographically isolated populations in need of mental health care.
  - For example, Facebook has been used to enroll individuals in an intervention for family members of individuals with substance use disorder (SUD).³
  - Existing tools can also be leveraged. Interviews suggest WhatsApp (mobile messaging platform) was used to transfer medical files between professionals during and immediately following the hurricane. WhatsApp provides end-to-end encryption and can function on both cellular and Wi-Fi networks. In other resource-poor settings, Skype has been successfully used as a vehicle for telepsychiatry, enabling physically

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remote or otherwise access-challenged patients to access needed mental health care. The multiplatform nature of Skype (computer, cellular phone, smartphone app) could ensure that such an intervention is accessible to the greatest number of people. Again, larger medical centers would need to be involved as partners.

- Telehealth can be housed within schools or clinics to provide access to providers at a distance.
  - This makes it possible to leverage resources from urban centers in rural areas and allows for the prescribing of medications while also having psychotherapy or trained clinicians doing the mental health evaluations.
  - This was done successfully in Haiti following the earthquake and has been done in schools.
  - Using Project ECHO (Extension for Community Healthcare Outcomes) as a base model, wider implementation of telehealth would increase access to specialist care for rural populations. A large academic medical center (such as in San Juan) serves as the hub and the Project ECHO platform is used to train primary care providers in rural areas (spokes) to address a wider range of problems, essentially through telementoring and consultation with specialists at the hub. Dependent on telecommunications infrastructure capabilities, this model could be further expanded to link the hub with community health workers or directly with patients who are currently unable to access specialty or primary care. The Project ECHO model also provides a platform for geographically separated providers to quickly gather and share best practices in an emergency or epidemic situation.

- Phone and online applications have also been used to target those with trauma-related mental illness.
  - For example, the Trauma Support Network is a program that incorporates self-management, peer support, timely access to information, and online social networking to manage mental health impacts of trauma.
  - Online/phone applications such as 7 cups, Prevail, PTSD Coach, and Mindstrong are available to manage mental illness typically using a hybrid of didactic exercises and limited person-to-person intervention.
    - This is an emerging field.

Potential Benefits

This COA would provide greater access to specialty care for nonurban populations and quicker networking and best-practice sharing among health care professionals in an emergency (depending on the nature of the emergency and the state of the power/telecommunications system).

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Furthermore, in the mental and behavioral health space, expanding telehealth would

- increase access to evidence based treatment for trauma
- mitigate some behavioral issues, both short term and long term, associated with trauma
- mitigate long-term health impacts associated with mental illness, such as chronic disease
- address the workforce shortage in Puerto Rico.

**Potential Spillover Impacts to Other Sectors**

The hub-and-spoke model could create jobs for nonphysician practitioners (NPs, PAs, etc.) in nonurban areas to serve as the spokes. The telecommunications sector is already trying to augment broadband service to support remote access options for education and economic development; the same supports could be leveraged for health services.

**Potential Costs**

- Potential upfront costs: $1.8 million in estimated upfront costs
- Potential recurring costs: $19 million in estimated recurring costs (11 years)
- Potential total costs: $21 million in total estimated costs

The cost to implement a telehealth program is approximately $250,000/year, per program. These programs can vary by mode and type, but $250,000 is a good average. This may be executed by universities or health care centers depending on regional assets and health district divisions. Given 7 health districts in Puerto Rico, it is estimated that fully implementing one program per district would be $1.75 million annually.

As one example program, Project ECHO can run $250,000/year.\(^6\) Robert Wood Johnson Foundation (RWJF) funded the University of New Mexico to build capacity to scale the model nationally via grants totaling $10 million.\(^7\)

Previous research that uses social media to recruit participants cost $43 per participant. That intervention was specifically to screen for SUD and enroll individuals in treatment.\(^8\)

There are approximately 57,000 individuals in Puerto Rico who meet the criteria for drug or

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alcohol dependence$^9$ and approximately 75% of these individuals are not currently in care.$^{10}$ It would cost $367,650 per year for 5 years to screen all of these individuals currently not in care and enroll them in care for a total of $1.8 million.

Many of the online applications to manage depression, anxiety, and PTSD are free—such as PTSD Coach—but there would be a cost associated with dissemination of the application.

**Potential Funding Mechanisms**

U.S. Department of Health and Human Services$^{11}$

**Potential Implementer(s)**

Health care providers, mental health care providers, private industry

**Potential Pitfalls**

Lack of sustained funding would be a challenge. Several studies have shown that the likelihood of failure of telemedicine efforts is higher when local ownership is lacking or implementation is imposed from above (e.g., local participation is required by federal health agency without allowing the local health ministry to consult on implementation).$^{12}$ Easily accessible, light-touch care may also keep people from getting more intensive care when needed. This must also consider what are the mechanisms around Medicaid reimbursement, noted in HSS 7.

**Likely Precursors**

Significant improvements in infrastructure, particularly stable and reliable telecommunications, which is one of the COAs for that sector. If clinics in rural areas could be prioritized for building bandwidth, then they could enable providers there to access the knowledge base of specialists in academic medical centers (e.g., UPR in San Juan).

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Expand Care for Trauma and Chronic Stress

Sector(s) Impacted

Health and Social Services

Issue/Problem Being Solved

There is a need to expand appropriate care for trauma and chronic stress, including services provided by nontraditional mental health providers.

Individuals on the island have just experienced a major trauma and now, as they rebuild, this can result in constant stress. There are wide reports of increased anxiety, depression, PTSD, suicidal ideation, and suicidality among all age groups. At least 253 people committed suicide in 2017, a 29% increase from 2016. As of January 22, 2018, the suicide hotline had a 246% increase in calls compared with the same time the previous year.\(^1\) Research shows that suicides go up months after a major disaster when there is slow recovery,\(^2\) so this issue has the potential to grow if unaddressed.

Description

This COA would expand the available networks to provide relief for trauma, stress, and anxiety-related behavioral health issues. Building on the mental health (clinical) care network, the COA would empower faith-based organizations, schools, and nongovernmental organizations to better understand and support their constituents in managing postdisaster stressors in a culturally compatible way. These nontraditional providers would work with professionals for training and guidance and would be located in nontraditional medical settings. Benefits could be seen within a year.

This COA would expand the number of people and the places where individuals could get both long-term and immediate assistance for acute trauma and chronic stress. Herein, we will discuss the expansion of evidence-based practice (EBP) among nontraditional mental health care providers, such as teachers and school officials, first responders, clergy, and other community members (both for acute disaster periods and in the long-term). An increase in EBP for traditional providers in practices such as Trauma Focused Cognitive Behavioral Therapy (TF-CBT) is included in HSS 15 on EBP and mental health.

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These nontraditional providers would receive broad training in interventions such as psychological first aid (PFA) and a targeted group of individuals would receive training in skills for psychological recovery (SPR), or similar interventions.

PFA is a set of systematic “helping actions” to reduce post-traumatic stress both in short-term and long-term recovery. PFA is structured around 8 core components for disaster/trauma response: contact and engagement, safety and comfort, stabilization, gathering information, providing practical assistance, connecting individuals with social support, providing information on coping, and finally, linkage with collaborative services.3,4

SPR is meant to follow PFA and, while not a formal mental health treatment, consists of skills building components that have been found helpful in post-traumatic settings. These include problem solving, positive activity scheduling, management of reactions, helpful thinking, and building healthy social connections.5

By utilizing interventions like PFA and SPR, nontraditional providers would be able to bolster the efforts of professionals—a model that has been used successfully in other communities, particularly those affected by disaster. The community members would not be asked to provide mental health therapy; rather, the training would teach community members to—in the course of their daily job—manage an individual who is struggling because of trauma or chronic stress and refer that individual to appropriate care.

The COA would be implemented by a set of mental health providers who can train nonprofessionals in EBP. There are already academic efforts in Puerto Rico to accomplish these trainings within the school system, but they need to be augmented and expanded so that they reach individuals and families without school-age children. It will be important to work out any legal issues required in ensuring that treatment processes are standardized, particularly for nontraditional providers.

These nontraditional providers would work with professionals to receive training and also guidance when they are using these EBPs. This would require training sessions either at a training center or classes within the community. Smart phone applications, such as the SAMHSA disaster application,6 can also be disseminated among the trainee population to help bolster their efforts once in the field. This application supports disaster mental health assistance.

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Knowledge transfer happens immediately following training. There is already ongoing training on Puerto Rico in PFA and, given this experience, additional training could be organized and implemented within 2 months and within the first year for 2,000 people. However, to train at least one-quarter of Puerto Rico’s teachers, clergy, and first responders it would take approximately 5 years at this pace.

Work would also need to be done to identify who the best community members are to deliver these EBPs. Feasibility research is required to correctly identify a range of nontraditional providers.

These nontraditional providers should be placed in nontraditional medical settings, such as schools and other centers of community life. Within schools this would bolster the work that is being done with school counselors to increase EBP. This issue is addressed in the HSS 15.

**Potential Benefits**

If done effectively in concert with the COA related to evidence-based care in mental health, improving trauma-based services would improve quality of care outcomes for traumatic stress. Trauma and chronic stress are acute and chronic issues in Puerto Rico, and this COA must address disaster response but also concerns about community violence and related loss. Expanding services and who can provide them would also address mental health provider shortage and distribution issues across Puerto Rico. Finally, engaging nontraditional providers, via community centers, faith-based organizations, and other trusted community institutions may also address issues around mental health stigma.\(^7\)

**Potential Spillover Impacts to Other Sectors**

Trauma affects the ability to attend to work and can have lasting psychological and cognitive consequences. In addition, trauma can exacerbate healing from more physical health problems. As such, improving and expanding trauma services has benefits for social, economic, and other health recovery.

Literature demonstrates that if appropriate interventions are implemented, they can mitigate unemployment due to mental health disability,\(^8\) substance use,\(^9\) disciplinary actions for school-

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age children,\textsuperscript{10} and difficulties learning in school.\textsuperscript{11} All of these are essential to the long-term recovery of Puerto Rico. This recovery will be hamstrung without proper mental health intervention.

**Potential Costs**

Potential upfront costs: N/A
Potential recurring costs: $3 million in estimated recurring costs (5 years)
Potential total costs: $3 million in total estimated costs

To implement an intervention like PFA with one-quarter of the teachers, clergy, and first responders in Puerto Rico would cost $600,000 over 5 years for a total of $3 million.

As noted in the HSS 15 on EBP, the costs associated with this trauma service expansion come primarily from labor and training. These include costs to

- train current and future providers in relevant EBP (noted in the COA about expanding evidence-based mental health practices)
- expand training to nontraditional providers (40,000 teachers, first responders, and clergy on the island well positioned to provide this type of care)
- ensure the workforce (providers and associated clinical and administrative staff) has the tools to monitor the quality of implementation
- provide “booster sessions” or continuing education for a range of providers over time.

Based on previous disaster responses,\textsuperscript{12} training and implementing an intervention like PFA with one-quarter of all well-positioned community members (10,000 people) would cost $600,000 over 5 years for a total of $3 million.

**Potential Funding Mechanisms**

U.S. Department of Health and Human Services Substance Abuse and Mental Health Services Administration grants, nongovernment sources

The SAMHSA has innovative practice grants, and Puerto Rico could be a site that would be benefit from a training center to support use of EPB. This could include training nontraditional providers in supports like psychological first aid.\textsuperscript{13}


\textsuperscript{13} See Substance Abuse and Mental Health Services Administration, “Grants,” undated.
Supports for nontraditional providers to offer mental health services could be folded into applications for broader social services, perhaps pursued by nonprofits and faith-based organizations.

**Potential Implementer(s)**

Mental health providers, faith-based schools, nongovernmental organizations

**Potential Pitfalls**

Blending professional cultures can be challenging. Full implementation across provider types will be a lengthy process. To be effective, training materials need to be culturally and linguistically appropriate. Ensuring the deployment and full implementation across provider types does not happen quickly. Providers and nontraditional groups need to work in concert, meaning there may be a need to blend cultures around supporting people (clinical vs. nonclinical approaches). It requires developing new training materials specific to Puerto Rico when these materials do not exist.

**Likely Precursors**

Feasibility research may be required to identify the best groups of community members, willing providers, and appropriate interventions. Before implementation of this COA it would be important to understand what the best groups of community members may be. They may include more tested choices, such as teachers and school staff, but also potentially other members of the community that will not be identified without feasibility research. It is also important to identify providers who are willing to train others in EBP. The most appropriate and implementable interventions would also have to be identified. Conducting formative evaluation research within the community before the selection and implementation of an intervention would help to identify who to train and what intervention to choose.\(^\text{14}\)

There were several organizations and universities in Puerto Rico offering mental health first aid interventions after Hurricane Maria hit the island. Nevertheless, an organizing entity is needed in order to implement a coordinated plan of intervention. Some entities that have mental health expertise in disaster situations are the Puerto Rico Psychology Association, the coalitions that work with domestic violence and child maltreatment shelters (Coordinadora Paz y RAICEM), as well as ASES.

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HSS 11
Add Incentives and Other Supports to Increase and Retain Supply of Health Care Providers and Public Health Practitioners

Sector(s) Impacted
Health and Social Services

Issue/Problem Being Solved
There is a concern about provider outmigration to U.S. states. Puerto Rico has disproportionate numbers of health provider shortage areas and concerns regarding provider outmigration and other locations. There are also significant concerns with the number of health provider shortage areas.

Description
This course of action is focused on ensuring Puerto Rico has a robust and stable health care provider and public health practitioner workforce, not only to attend to disaster-related health issues but also over the long term. Incentives and loan repayment programs can be powerful tools to retain and improve the quality of the health care provider supply. In particular, incentive programs can increase the appeal for health care and public health providers to relocate and practice in underserved areas. Given prior efforts to use incentives and other programs, continuous analysis of what works structurally and culturally would need to be considered.

This would be principally implemented by Puerto Rican universities (medical schools, nursing schools, etc.) and associated hospitals and health care facilities. There may also be a role for collaboration with institutions enrolling Spanish-speaking students in the 50 states and the District of Columbia from which providers could be recruited.

There are many possible incentive structures that would encourage implementation. A few options include scholarships, service option loans, loan repayments, direct financial incentives, resident support, or incentives to enroll in medical training in particular regions (e.g., rural Puerto Rico). Other incentives may include higher salaries (i.e., merit-based system), salary supplementation (i.e., workload-related payments), benefits (i.e., malpractice insurance), and allowances (i.e., rural locations/hardship allowance).

The time scale in which incentives could result in provider retention and reduction in health care provider shortage areas depends on the form of incentive. For loan repayment, benefits can be seen in 1 to 2 years. For other incentives at the start of medical or other health-related training, benefits may not yield for 4 to 6 years. For incentives to incorporate and retain public health practitioners, benefits can be seen in 2 to 3 years of implementation.
This can be applied across Puerto Rico, but with a focus on areas with poorer access to health care providers, and in Puerto Rico as a whole for public health practitioners.

**Potential Benefits**

Incentive programs have shown great benefit in retaining high-quality talent in health care, as well as creating communities of practitioners which can better serve their populations because of greater work satisfaction. The likely impacts are first on reductions in provider outmigration, followed by better distribution of providers, and ultimately improvements in access to health care services, including mental health. In addition to encouraging Puerto Rican practitioners to remain on the island, incentive programs such as loan repayment, specialized fellowships in rural medicine or disaster response, and other allowances may draw motivated health care workers and medical students from other areas to practice in Puerto Rico, thereby further reducing the number of health professional shortage areas.

Public health practitioners are responsible for performing day-to-day activities that influence population health through data collection and interventions with individuals, families, or local communities. Having a sufficient and capable public health workforce will promote preventive health care, improve the health of the population, and consequently reduce overall costs related to health. Furthermore, increasing the number of public health workers embedded in communities (who are “known” to the community) can increase community resilience in the face of disaster.

**Potential Spillover Impacts to Other Sectors**

This strategy, along with other approaches that improve health care access and health promotion, are key to social and economic stability in Puerto Rico. First, retention of health care providers ensures an industry/sector is not negatively affected by attrition, and thus preempts potential negative effects on the overall economy. Second, good health care access improves the quality of life and work productivity of Puerto Rico residents. Finally, ensuring a sufficient supply of public health practitioners to implement and sustain health promotion and prevention strategies will help improve the health of the population. A healthy population is an economically active one.

Furthermore, prioritizing health care and public health workforce retention would have positive effects on disaster response. Increasing the number of providers capable of addressing psychosocial needs in particular could reduce reliance on nongovernmental organizations (NGOs) in the aftermath of a disaster. Additionally, paramedic/EMT-level providers preferentially located in more rural areas could serve as field triage officers in a disaster.

**Potential Costs**

Potential upfront costs: $39 million in estimated upfront costs (3 years, as incentives aimed at provider retention would not occur until the third year)
Potential recurring costs: N/A
Potential total costs: $39 million in total estimated costs
Various loan and incentive programs have generally ranged from $15,000 per year/student to upwards of $200,000, depending on the program. If estimated on the high end of loan repayment for 100 medical students, this will be about $20 million. But incentives to stay as physicians could be anywhere from $20,000 to $50,000 lump sum payments. For about 100 providers, that is $5 million.

Incentives and benefits for other health care professionals and public health practitioners might range between $7,000 per student to nearly $70,000, depending on the program, degree, and university. A loan repayment for at least 200 professionals, on the upper end, would total about $14 million.

Potential Funding Mechanisms

U.S. Department of Health and Human Services Health Resources and Services Administration, government of Puerto Rico, nongovernment sources

HRSA has existing programs to support loan repayment in exchange for practicing in rural areas of the United States; the focus on Puerto Rico could be increased, and other loan forgiveness programs could be modeled on these and administered by HRSA. Other incentives could be provided by the government of Puerto Rico or private donors.

Potential Implementer(s)

Universities in Puerto Rico, associated hospitals and health care facilities

Potential Pitfalls

It would be necessary to calibrate expectations about incentives to stay in Puerto Rico, put time minimums or dollar limits on forgiveness eligibility, and work on other aspects of provider quality of life to ensure that providers and practitioners stay for the long term. A regrettable outcome would be a medical student practicing in a rural community for 2 years then leaving, with no replacement. It is also important to conduct continuous analysis on these programs to determine what is working and to make course corrections quickly. Finally, this action must consider the implications of not addressing Medicaid payment issues as noted in HSS 7 and HSS 13; that is, without any action to reduce or eliminate the Medicaid CAP, costs could increase to local government.

Likely Precursors

Determine specific provider shortage trends by specialty and geographic area to know how many providers would need to be recruited or retained. Determine the capacity of public health practitioners needed to implement the public health agenda.
Augment Community Health Centers and Elements for Primary Care and Chronic Disease Prevention and Management

Sector(s) Impacted

Health and Social Services

Issue/Problem Being Solved

The disaster raised questions about the timely, accessible care that can be provided during disaster response and over the long term, particularly with respect to chronic disease prevention and management. Stakeholders reported some difficulties in obtaining health services, particularly in rural and remote locations and those areas most severely affected by Hurricane Maria.

Description

This COA is focused on strengthening the network of community health centers (CHC) such as clinical and diagnostic centers and Centros 330 in Puerto Rico and augmenting supporting elements such as all-terrain vehicles (ATVs) and the CHC mobile care clinics, particularly in places with sustained damage or in remote access locations. There is a need to ensure that CHCs have adequately trained staff and supplies to support a full array of primary services through their mobile clinics. CHC could have ATVs in case of an emergency to reach isolated communities and patients.

This COA also focuses on how these centers could be supported to better advance chronic disease prevention. A critical challenge for public health after disasters is the difficulty of maintaining effective management of chronic diseases such as diabetes, asthma, cardiovascular disease, and the continuity of care for patients on dialysis. Widespread and prolonged loss of water, power and transportation, along with other factors, results in barriers for access to providers and prescription medications, or an inability to use medical equipment, all of which exacerbated issues for many patients. This might include developing tools and strategies to enhance capacity for the management of chronic diseases targeting two audiences; health care facilities that provide care, and patients themselves for individual care management. This will be implemented across Puerto Rico, with attention to remote or inaccessible locations.

CHCs would provide services supported by the Departamento de Salud, HRSA funding, and charitable contributions that support health care services for vulnerable populations with limited access to care as well as chronic disease prevention and management.

CHCs will be expanding their services by means of mobile care clinics to strengthen, support, and provide integrated primary care services to the population.
Setting up a mobile care clinic can be relatively quick and see benefits within 6 months to a year. This CHC component can improve health care access and ultimately client outcomes. Augmenting community health centers may take 1 to 2 years, given needs for training and to allocate supplies according to population needs.

**Potential Benefits**

The benefits are relatively efficient alternatives to building new hospitals or larger health care facilities. For example, CHCs can repurpose trailers as mobile care clinics. Also, this COA would improve access to services, particularly in places that are current health provider shortage areas and that have experienced greater hurricane-related damage.

Community health centers have demonstrated effectiveness in providing high-quality, affordable care.\(^1\) Community health centers also have the added value of being situated in high need areas, providing services regardless of ability to pay, and providing comprehensive health services often with enabling social supports to augment health outcomes.\(^2\)

In addition, this effort would improve patient outcomes and patient care with more efficient and proactive management of chronic diseases and reduce the strain on an already-strained health care system by preventing further complications of chronic disease.

**Potential Spillover Impacts to Other Sectors**

As noted in other health care access COAs, the benefits of improved access to care is that Puerto Ricans are healthier, have the services they need for primary care and chronic care management, and thus can work and take care of their families. We know that a more productive health sector has benefits for community economic development.\(^3\)

**Potential Costs**

Potential upfront costs: $500,000 in estimated upfront costs
Potential recurring costs: $250 million in estimated recurring costs (11 years)
Potential total costs: $250 million in total estimated costs

According to the literature, the cost of operating a mobile clinic, including vehicle and labor, averages $400,000 to $500,000 per year each. If 5 CHC operate at least 1 mobile clinic per

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region, for 35 total, means the cost for mobile clinics are $17.5 million annually. For augmentation of community health clinics, consider grant supports of up to $200,000 per year for 25 clinics across Puerto Rico ($5 million approximately). Tools to support chronic disease management for health care providers and individual care management could be $500,000 upfront and require $200,000 each year to maintain. Total annual costs = $22.7 million annually.

Costs could vary based on several factors: local supply of providers vs. the cost of having traveling providers; the quality of the mobile clinic or the community health center and the level of augmentation required (outfitting for certain kinds of medical equipment, technology for electronic health records, physical characteristics of the center and the location, supporting chronic disease prevention and management activities, etc.).

**Potential Funding Mechanisms**

U.S. Department of Health and Human Services Health Resources and Services Administration, government of Puerto Rico, Puerto Rico Department of Health, nongovernment sources

**Potential Implementer(s)**

Community health centers, Puerto Rico Department of Health

**Potential Pitfalls**

It will be important to ensure these mobile clinics are networked into emergency plans and hospitals (e.g., with information exchange, ability to move patients, access to roads and spaces to geographically vulnerable areas). The community health centers need to have steady support in order to ensure any upfront investments are maximized to maintain medical homes for patients over the long term. Finally, as noted in HSS 7, HSS 11, and HSS 13, the costs for adding services such as mobile supports could be a burden to Medicaid payment if the Medicaid CAP issues are not addressed.

**Likely Precursors**

Determine the location of new mobile care clinics to maximize benefit. It will also be key to outline what elements of the clinic augmentation would be most beneficial—transport supports and type of medical equipment, for example—to map to local patient/client needs.
Sector(s) Impacted

Health and Social Services, Economics, Education

Issue/Problem Being Solved

Primary care workforce shortages in Puerto Rico were exacerbated by hurricane stress and providers leaving Puerto Rico.

The issue of health care workforce is a functional challenge facing the system. Historical workforce data are available from the Urban Institute report,\textsuperscript{1} Kaiser, and the Puerto Rico Health Department, though estimates can vary.

Currently, there are 88 HPSAs. As of a 2016 AAMC report, there were 9,874 active physicians, 3,580 primary care doctors, and 227 general surgeons. The report notes that 23\% of municipalities had a shortage of pediatricians. AAMC estimates that 2,132 health professionals emigrated to CONUS in 2014, which was a 4\% reduction from a total of 51,740. The AAMC estimates that 361 physicians moved from Puerto Rico in 2014.

Another source reported that Puerto Rico had lost more than 3,000 physicians in 5 years and that it continues to lose almost 400 physicians each year (Michelson, 2015). Physician shortage in some U.S. states has been cited as part of the motivation for migration from Puerto Rico. Furthermore, some reports cite a lack of PAs (Perreira et al., 2017). PAs and NPs report some resistance from the medical community because physicians view NPs as competitors. The current law prohibits PAs from practicing medicine, though a law was recently passed to allow NPs to practice.

Description

This COA would increase the supply of licensed health care providers. Allowing NPs and PAs from other states to provide care on the island would increase the supply in the short term; incentives to attract licensed NPs and PAs from other locations would bolster the supply in the medium term; and the establishment and growth of NP and PA degree programs on the island would help to develop the workforce for the long term. This COA would involve the government of Puerto Rico and the Board of Nursing and local universities. This effort should include Sexual Assault Nurse Examiners who could deploy to the community using mobile care clinics (see HSS 12, Augment Community Health Centers and Elements for Primary Care and Chronic

\textsuperscript{1} K. Perreira et al., “Puerto Rico Health Care Infrastructure Assessment: Site Visit Report,” Urban Institute, 2017.
Disease Prevention and Management). This staff would recollect forensic evidence and offer trauma-centered intervention to victims.

**Potential Benefits**

Allowing NPs and PAs to practice at the top of their licenses would increase access to quality care island-wide. Furthermore, health care financing could be beneficially affected if Medicaid claims are reduced through greater use of lower-cost providers such as NPs and PAs.

Expanding access to extenders such as NPs and PAs would help alleviate some of the medical provider shortages currently being experienced in Puerto Rico, particularly in primary care and pediatrics.

Broadening the scope of practice for these health care providers would also positively affect Puerto Rico’s Medicaid budget. A recent study found that allowing physician assistants to prescribe drugs (practicing at the top of their licenses) resulted in an 11% reduction in outpatient expenditures among Medicaid recipients.2

**Potential Spillover Impacts to Other Sectors**

Having more NPs and PAs on hand could positively affect emergency preparedness in Puerto Rico by increasing the number of people available to act as frontline providers in a potential future disaster event.

A larger supply of medical professionals would be useful in emergency response. The Los Angeles Fire Department has trained NPs as first responders, particularly for mental health–related 911 calls.3 NPs and PAs in Puerto Rico could be similarly trained as an emergency preparedness asset.

Additionally, ameliorating a physician shortage with a new category of provider could spur economic development on the island. In the shorter term, before NP and PA training programs are established in Puerto Rico, recruitment of these providers from elsewhere will necessarily increase the population of workers.

**Potential Costs**

- Potential upfront costs: $500,000 in estimated upfront costs
- Potential recurring costs: $8 million in estimated recurring costs (5 years)
- Potential total costs: $8 million in total estimated costs

Short-term costs are minimal and include marketing to new graduates of NP and PA programs within and outside of Puerto Rico ($250,000 to $500,000 upfront, with lesser annual costs as the policy shift becomes common knowledge). Incentives like loan repayment are on the

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order of $100,000 per student (for up to 50 providers or $5 million annually). Supports for NP and PA programs in Puerto Rico, to ensure new practice guidelines are part of training, would be $500,000 per year for 5 programs ($2.5 million). Costs to expand the laws would be limited (e.g., creating licensure language), as this would be based on successful laws used in other parts of the United States. Cost = $500,000 + $5 million + $2.5 million = $8 million, over a 5-year period. The upfront costs are $500,000.

**Potential Funding Mechanisms**

Will need to address Medicaid/Mi Salud reimbursement for these providers.

**Potential Implementer(s)**

Local universities, government of Puerto Rico, Board of Nursing, independent health care licensure body, Puerto Rico Department of Health

**Potential Pitfalls**

If reimbursement rates remain low for NPs/PAs, this COA could end up bolstering a system that trains providers who then migrate to CONUS. PAs do not have a history of providing care in Puerto Rico, so trust in their abilities may be lacking.

Reimbursement rates for NPs and PAs under Medicaid/Mi Salud must be competitive to encourage NPs and PAs to stay or relocate to Puerto Rico in order for Puerto Rico to retain talent. These provider types should work with, rather than apart from, established medical groups and increase access to care for island residents. A potential pitfall would be the development of a “second-tier” system for lower-income Puerto Ricans who can only access NPs/PAs.

There will likely be resistance from physicians to expanding NP/PA scope of practice. There is no history of PAs practicing in Puerto Rico, apart from in the Veterans Administration hospital, so there is no existing trust of this provider type. Furthermore, generalistas, or physicians educated abroad and licensed to practice in Puerto Rico but not eligible to practice in the U.S. states, are typically resistant to competition from mid-level primary care providers.4

**Likely Precursors**

There needs to be discussions about the role and value of advanced clinical practice providers, including complementary responsibilities to physicians, and a review of expanded practice law implementation practices that are best matched to Puerto Rico’s demographics and provider composition.

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4 American Academy of PAs, “Puerto Rico Final Frontier in PA Licensure,” AAPA.org, undated.
**Sector(s) Impacted**

Health and Social Services

**Issue/Problem Being Solved**

There are limited systematic and digitized data on costs of health care across Puerto Rico health facilities. The impacts on improvements in health outcomes can influence resource allocation decisions after disaster and over the long term, particularly when data are affected or lost because of disaster.

**Description**

This COA creates supports for measuring health costs systematically, including merging data from insurance claims, hospital and other health center discharge data, and disease and health outcome information. This would also include solidifying the robustness of data systems for health outcomes information, inclusive of related social and human service data, and ensuring greater data digitization to facilitate analysis. There are difficult decisions about where and how to allocate resources, whether EBP is being used, and whether positive health outcomes are being achieved post-disaster and over the long term. This COA would ensure that systematic data are collected, through robust and resilient data systems, and that there is a mechanism to integrate and report on findings for overall health quality improvement. This should be implemented across Puerto Rico.

The COA could be implemented by an independent body that can merge data effectively (e.g., a university center, Institute for Statistics) and report transparently. Data feeds would have to come from established agreements to share information across health providers and actively engage Departamento de Salud. Ensuring data redundancy or systems that are robust to data loss is a key part of this COA as well.

There are three elements of implementing this COA: (1) strengthening the quality and robustness of existing data systems, particularly to ensure redundancy in case of disaster-related loss and better data digitization in the case of paper record loss; (2) creating a robust and standardized data framework for merging and analyzing health data on cost and outcomes; and (3) creating a reporting system for use in decisionmaking.

If data are used to inform policies and resource allocation, benefits of implementation could be seen in the government of Puerto Rico’s and related budgets on yearly or biannual budget cycles, which would likely accrue benefit in 2 years.
Potential Benefits

Without clear and robust data, it is difficult to make choices about provider retention supports and location and supports for a range of health care facilities, or to assess progress along health outcomes accounting for cost and service outcomes together. We also know that digitization of health information is disaster-resilient and has further benefits for ongoing analysis and patient coordination.\(^1\) Standardization also has benefits in terms of equity and resource allocation since common data can be compared, particularly if developing learning health systems.\(^2\) Transparency and accountability regarding health system performance would also be enhanced.\(^3\)

Potential Costs

Potential upfront costs: N/A
Potential recurring costs: $3.3 million in estimated recurring costs (11 years)
Potential total costs: $3.3 million in total estimated costs

The cost of setting up such as system would be mostly labor time, on the order of 4 FTEs/year. Assuming a higher employment rate of $75,000 for health data system specialists, annual cost is estimated at $300,000. There may be a cost for training and monitoring. In addition, money on programs or equipment could be needed to support storage or data sharing.

Potential Funding Mechanisms

U.S. Department of Health and Human Services, government of Puerto Rico

This focus on data is likely best supported by the government of Puerto Rico but can be augmented by training or capacity grants that come through the U.S. Department of Health and Human Services (Centers for Medicare & Medicaid Services, Agency for Health Care Research and Quality, etc.).

Potential Implementer(s)

Institute for Statistics, health care payers, health care providers, Puerto Rico Department of Health

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**Potential Pitfalls**

The most critical element is to ensure systematic data delivery by all health providers as well as PRDOH in order to provide an accurate and consistent picture of costs and outcomes, over time. It is also key to have systems that are robust in case parts of the system are lost and systems that can connect with each other for data sharing and integration. Without these features, the conclusions will be less robust. Considerations of current funding mechanisms, such as the Medicaid CAP noted in HSS 7, would also need to be considered in any data analysis.

**Likely Precursors**

Develop the data framework and ensure buy-in by all providers and payers. It is also key to obtain commitment from Puerto Rico government agencies on the importance of having an independent body to analyze and report data on a routine basis.
Sector(s) Impacted
Health and Social Services

Issue/Problem Being Solved

There is a lack of access to appropriate and evidence-based mental health care, which is exacerbated in Puerto Rico given higher stress in disaster recovery. Stakeholders reported that a large portion of mental health care is being provided by primary care physicians and/or individuals who lack training in EBP, such as BA-level psychology graduates.

FQHC clinics also lacked adequate staff to provide evidence-based care before Hurricane Maria, but following the storm the need is even greater. Individuals will need care to manage trauma and chronic stress.\textsuperscript{1,2} There are widely reported stories of increased anxiety, depression, and PTSD following the hurricanes.

Suicide also appears to be an issue. At least 253 people committed suicide in 2017, a 29\% increase from 2016. And, as of January 22, 2018, the suicide hotline had received 3,050 calls since the storm, a 246\% increase when compared against the same time the previous year.\textsuperscript{3}

Primary care also presents an opportunity to screen patients for mental and behavioral health problems, such as PTSD and SUD. Patients can then be enrolled in an evidence-based program, like collaborative care, that has been successful in a community clinic setting.

Description

Advance uptake of EBP/quality of care for mental health.

This COA will ensure greater uptake of evidence-based mental health practice by primary care providers in health care settings and in schools with school counselors.

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There are concerns that quality of services is uneven at best, and the use of EBP is not optimal in Puerto Rico. This is a particularly acute issue in the context of disaster recovery, where evidence-based mental health services (e.g., substance use treatment, trauma-based care) is needed to achieve quality outcomes. While there are many EBPs that might be appropriate, two that are likely effective key given Puerto Rico needs for stronger EBPs to address trauma are

- collaborative care
- Trauma Focused Cognitive Behavioral Therapy.

Collaborative care is based on the chronic care model, which is a proactive approach to primary care that supports evidence-based interactions between an informed patient and an integrated health care team. With collaborative care, behavioral health is integrated into that system of care. The collaborative care model requires behavioral health specialists and other staff to manage tracking and follow-up of patients, as well as to use electronic patient tracking tools.

- These additional staff can potentially manage more than one clinic, from a central location, through telehealth. It has been demonstrated that therapists can provide care successfully from a remote location to a brick-and-mortar clinic.

Trauma Focused Cognitive Behavioral Treatment (TF-CBT) is a short-term structured treatment model that is delivered in 8 to 25 sessions for children and includes the caregiver. The intervention incorporates standard CBT skills to combat PTSD symptoms, anxiety, and depression associated with traumatic events.

- TF-CBT should be available at FQHCs and within schools.
- It can be provided both individually and in a group setting; group therapy can also be provided through the FQHC clinics.

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The COA would be implemented by a set of mental health providers who can train others in EBP. EBPs in mental health should be applied wherever mental health services are provided—namely, in community health centers, primary care settings in hospitals, and schools.

The main components of implementation are to identify gaps in EBP based on mental health needs among populations in Puerto Rico, to train other providers in the use of relevant EBP, and to monitor how those practices are being applied and their benefits.

Those implementing the selected EBPs should consider an implementation model such as *Getting to Outcomes* or *Facilitation*, as these have demonstrated improved uptake of mental and behavioral health interventions.\(^{11}\)

Both *Facilitation* and *Getting to Outcomes* are collaborative implementation models specifically designed to bolster the use of EBP for mental and behavioral health within clinical care. *Getting to Outcomes* is a tool kit that uses a ten-step process that helps communities plan, implement, and evaluate a community-based EBP intervention. *Facilitation* is a comprehensive approach whereby implementation experts partner with local staff within the FQHC to support implementation planning and to adapt implementation strategies to local settings.

Use of EBP does not result in change quickly, as it takes time for providers to learn new methods and to then apply those new insights for meaningful change with clients. However, with correct implementation support it is possible to see early change in practice in 1 year and meaningful change in client outcomes in 2 to 3 years.\(^{12}\)

**Potential Benefits**

This would increase the standards of care and access to quality care for those with mental and behavioral problems in Puerto Rico. It would also identify individuals in need of mental health care who are currently not receiving that care. Both of the suggested interventions have been shown to increase engagement in care by the patient as well as reduce symptomology of depression and PTSD.

**Potential Spillover Impacts to Other Sectors**

Improvements in the quality of mental health means that people are getting care they need, hopefully in ways that are more timely, appropriate, and effective. Poor mental health is associated with poor educational outcomes, work outcomes, and overall poorer quality of life. As such, improving mental health is key to Puerto Rico’s social and economic future.


Literature demonstrates that if appropriate interventions are implemented, they can mitigate unemployment resulting from mental health disability,\textsuperscript{13} substance use,\textsuperscript{14} disciplinary actions for school-age children\textsuperscript{15} and difficulties learning in school.\textsuperscript{16} All of these are essential to the long-term recovery of Puerto Rico. This recovery will be hamstrung without proper mental health intervention.

**Potential Costs**

- Potential upfront costs: $2.5 million to $5.5 million in estimated upfront costs (5 years)
- Potential recurring costs: N/A
- Potential total costs: $2.5 million to $5.5 million in total estimated costs

The costs associated with better use of EBP are primarily training, labor, and implementation, and costs for monitoring uptake of EBP. These include costs to

- train current and future providers in relevant EBP, such as evidence-based trauma therapies
- ensure the workforce (providers and associated clinical and administrative staff) has the tools to monitor the quality of implementation
- provide “booster sessions” or continuing education for providers over time.

There are two options for support of this COA. The first is to fund continuing medical education classes on the use of EBP.

The costs associated with improvements in use of EBP are primarily training, labor and implementation activities related to uptake of EBP. We envision a set of continuing education classes or a training center. For continuing education, based on the experience in Mississippi following Katrina,\textsuperscript{17} it would cost $500,000 per year to train and implement an intervention like TF-CBT with 200 clinicians. Over 5 years that would cost a total of $2.5 million. This is the assumption for the lower bound on the cost.

The second option is to set up a training center, which could be funded through grant mechanisms or by the government, and hire mental health providers who can train others in the EBP. To be most useful, we need 5 trainers per EBP (in this case, 2 priority practices of collaborative care and TF-CBT). They could teach the classes, which would be comparable in

\textsuperscript{13} A. Nandi et al., “Job Loss, Unemployment, Work Stress, Job Satisfaction, and the Persistence of Posttraumatic Stress Disorder One Year After the September 11 Attacks,” 2004.


\textsuperscript{15} G. Sugai et al., “Preventing School Violence: The Use of Office Discipline Referrals to Assess and Monitor School Wide Discipline Interventions,” 2000.

\textsuperscript{16} B. D. Stein et al., “A Mental Health Intervention for Schoolchildren Exposed to Violence: A Randomized Controlled Trial,” 2003.

\textsuperscript{17} B. A. Sigel et al., “Characteristics of 17 Statewide Initiatives to Disseminate Trauma-Focused Cognitive-Behavioral Therapy (TF-CBT),” 2013.
cost. The trainer would also support health centers in implementing collaborative care and other practices, visiting clinics across Puerto Rico. The trainers would likely have average salaries of $100,000. The training center would have 2 administrative staff at $50,000 salaries each. For a total staff size of 12, then, we estimate about $1.1 million for a training center for 1 year. Over 5 years that would cost a total of $5.5 million. This is the assumption for the upper bound on the cost. If appropriate, this center could be based within the University of Puerto Rico.

**Potential Funding Mechanisms**

U.S. Department of Health and Human Services Substance Abuse and Mental Health Services Administration grants, Medicaid, nongovernment sources

Medicaid reimbursement has incentives around quality care services, aligned with the Healthcare Effectiveness Data and Information Set or other quality-of-care indicators. SAMHSA has innovative practice grants, and Puerto Rico could be a site that would be benefit from a training center to support use of EBP. Researchers in Puerto Rico could apply for mental health service research grants to support the monitoring and evaluation components.

**Potential Implementer(s)**

Mental health care providers

**Potential Pitfalls**

Ensuring the deployment and full implementation of EBP can take time and does not happen quickly. It requires having training materials that are culturally and linguistically appropriate for Puerto Rico. While we have included estimates to train staff to provide EBPs, the price of proving this care would be borne by Medicaid or other insurance payers.

**Likely Precursors**

Identify providers who are willing to train others in EBP. It is also key to know what the 2 or 3 priority EBPs are that would be most useful given Puerto Rican needs, related to disaster response and recovery as well as general mental health needs.

Research shows that interventions are more effective when proper feasibility research has been conducted first.\(^\text{18}\) As such, it is essential that formative evaluation be considered before the implementation of any interventions as well as during the implementation process. This will ensure that the best intervention is chosen, it is properly targeted to the most appropriate subsectors of the population, and it has the biggest benefit to Puerto Rico as a whole.

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Address Food Insecurity by Ensuring Flexible Nutrition Assistance Programs

Sector(s) Impacted

Health and Social Services

Issue/Problem Being Solved

A large portion of Puerto Ricans experience food insecurity\(^1\) and depend on nutrition assistance programs for income and food during regular circumstances: 37.9% of households in Puerto Rico received NAP benefits in 2017 (compared with 12.6% in the United States as a whole receiving SNAP benefits); in 2016, 52% of children lived in families that received some form of income assistance (including nutrition assistance); and in 2012, 40.9% of individuals 60 years or older reported NAP as a main source of income. NAP is funded by a capped block grant, so income limits and benefit levels are set well below those of SNAP in order to manage limited funding. As a result of the funding cap the program cannot expand to accommodate sudden change in need.

Description

This proposal would transition Puerto Rico back to SNAP to allow greater flexibility postdisaster and provide greater benefit to participants. The transition to SNAP would be implemented by Congress and the government of Puerto Rico. Program participants would see benefits within the first month of the transition to SNAP in the form of higher monthly benefit levels. Greater flexibility in program spending would be felt following a disaster.

Potential Benefits

Switching to SNAP would allow for a more efficient disaster response. In 2010 the U.S. Department of Agriculture conducted an impact analysis of transitioning from NAP to SNAP, and found that

- the number of households that receive nutrition assistance would increase 15.3% (85,000 additional households with 220,000 persons)
- the average monthly benefit would increase 9.6% ($23)
- nutrition assistance coverage would increase from 30% to approximately 43%\(^2\)

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It is important to consider the varied effects that SNAP has on food insecurity and nutrition. Considerable research has been conducted on SNAP’s impact on nutritional intake, and much of it suggests that it does not improve dietary quality. However, it has been a useful tool in the battle against hunger. While increasing dietary quality is key to improving health, addressing food insecurity is important in its own right. Food security has been shown to be associated with cardiovascular disease risk factors, depression, and diet and bone mass disparities.

While simply providing access to resources for food may not solve nutritional deficiencies, other components of SNAP would become available to Puerto Rico upon transition. The nutrition education component of NAP is funded through administrative funds, which constrains those funds and activities. Puerto Rico would become eligible for SNAP-Ed, which would open a dedicated funding stream for the educational activities. The availability of SNAP-Ed would be important as those programs have been reported to be associated with eating more fruits and vegetables and eating fast food less frequently, both of which can be an important part of battling obesity. Additionally, Puerto Rico would become eligible for SNAP Outreach, which can cover 50% of outreach activities aimed at enrolling nonparticipating, eligible people.

Another benefit of transitioning to SNAP would be the availability of a ready-to-use evaluation framework. The BRFSS also could be used as a surveillance tool as part of efforts to combat food insecurity.

**Potential Spillover Impacts to Other Sectors**

Moving to SNAP as it is implemented in the U.S. states could increase the nutrition assistance that is provided to the eligible Puerto Rican population. Expanding the eligible population could lead to a healthier population generally as well as an improved workforce.

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Potential Costs

Potential upfront costs: $3 million in estimated upfront costs
Potential recurring costs: $200 million in estimated recurring costs
Potential total costs: $200 million in total estimated costs

NAP was moved to a capped block grant in 1982 to reduce costs. Table A.5 shows the costs that would be incurred in this transition, as estimated in a 2010 report from the U.S. Department of Agriculture (2009 dollars have been adjusted to 2018 dollars).

- Total annual costs would increase by 22.7%. The federal share would be $536.5 million and Puerto Rico’s share would be $21.3 million.
- Annual benefit costs would increase by an estimated $493 million, all of which would be paid by the U.S. government since it is responsible for all SNAP benefits.
- Puerto Rico’s annual administrative costs would increase by $18.28 million.
- Both the U.S. and Puerto Rico governments would incur a one-time startup cost of $2.9 million.
- Retailer management would shift from Puerto Rico to the FNS. Puerto Rico and FNS would acquire and share the costs of providing stores with point-of-sale terminals when used solely for SNAP purchases.¹⁰

Potential Funding Mechanisms

U.S. Department of Agriculture, Puerto Rico Department of the Family

Potential Implementer(s)

U.S. Congress

Potential Pitfalls

Transitioning back to SNAP could be a politically sensitive issue, and negotiations with the FOMB will influence the availability of funds.

Likely Precursors


Table A.5. Costs of Changing from NAP to SNAP in Puerto Rico

<table>
<thead>
<tr>
<th>Cost Categories</th>
<th>Changes in Cost (in thousands)</th>
<th>A. Total</th>
<th>B. Federal</th>
<th>C. Puerto Rico</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Costs</td>
<td>$457,328</td>
<td>$439,187</td>
<td>$18,141</td>
<td></td>
</tr>
<tr>
<td>1. Benefits</td>
<td>$420,000</td>
<td>$420,000</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td>2. Administrative Costs</td>
<td>$37,326</td>
<td>$19,186</td>
<td>$18,140</td>
<td></td>
</tr>
<tr>
<td>a. Retailer Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) NAP Cost Adjustment*</td>
<td>-$424</td>
<td>-$212</td>
<td>-$212</td>
<td></td>
</tr>
<tr>
<td>(2) SNAP for Retailer Management Costs**</td>
<td>$1,000</td>
<td>$1,000</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td>(3) Point of Service/EBT Issuance Costs</td>
<td>$4,072</td>
<td>$2,036</td>
<td>$2,036</td>
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</tr>
<tr>
<td>b. Other Administrative Functions</td>
<td>$32,680</td>
<td>$16,363</td>
<td>$16,317</td>
<td></td>
</tr>
<tr>
<td>(1) One-Time Startup***</td>
<td>$5,130</td>
<td>$2,565</td>
<td>$2,565</td>
<td></td>
</tr>
<tr>
<td>(a) IT Hardware</td>
<td>$3,892</td>
<td>$1,946</td>
<td>$1,946</td>
<td></td>
</tr>
<tr>
<td>(b) IT Professional Services</td>
<td>$1,060</td>
<td>$530</td>
<td>$530</td>
<td></td>
</tr>
<tr>
<td>(c) Initial Training</td>
<td>$158</td>
<td>$79</td>
<td>$79</td>
<td></td>
</tr>
<tr>
<td>(d) Update Accounting System</td>
<td>$20</td>
<td>$10</td>
<td>$10</td>
<td></td>
</tr>
<tr>
<td>(2) Case-Management-Driven****</td>
<td>$1394</td>
<td>$720</td>
<td>$674</td>
<td></td>
</tr>
<tr>
<td>(a) MIS Staff</td>
<td>$410</td>
<td>$205</td>
<td>$205</td>
<td></td>
</tr>
<tr>
<td>(b) Software Licenses</td>
<td>$80</td>
<td>$40</td>
<td>$40</td>
<td></td>
</tr>
<tr>
<td>(c) Central Office Staff</td>
<td>$858</td>
<td>$429</td>
<td>$429</td>
<td></td>
</tr>
<tr>
<td>(d) Federal Quality Control</td>
<td>$46</td>
<td>$46</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td>(3) Caseload-Driven (Dependent)*****</td>
<td>$26,154</td>
<td>$13,077</td>
<td>$13,077</td>
<td></td>
</tr>
<tr>
<td>(a) Staff Costs</td>
<td>$24,560</td>
<td>$12,280</td>
<td>$12,280</td>
<td></td>
</tr>
<tr>
<td>(b) Other Direct Costs</td>
<td>$1,594</td>
<td>$797</td>
<td>$797</td>
<td></td>
</tr>
</tbody>
</table>

Note: Numbers may not add up due to rounding.

*NAP Cost Adjustment refers to the decline in costs if neither Puerto Rico nor the FNS were to perform retailer management.

**SNAP for Retailer Management costs refers to those costs that Puerto Rico and FNS would incur for retailer management under SNAP.

***One-Time Startup costs refer to expenses that occur at the beginning of the transition and are not repeated.

****Case-Management-Driven costs refer to costs that occur repeatedly but are not a function of the SNAP caseload.

*****Caseload-Dependent costs refer to those costs that vary as a function of the SNAP caseload.


NOTE: Costs have been adjusted for consumer prices index (CPI) inflation so will not equal what is displayed in the table. The cost adjustments do not include possible changes to the number of beneficiaries or other program changes.
Ensure That There Are Nutrition Supports for Populations Disproportionally Affected by the Disaster

Sector(s) Impacted

Health and Social Services

Issue/Problem Being Solved

Puerto Rico is home to sizable populations that rely on public assistance programs and may be more heavily impacted during a disaster. In 2016, nearly 39% of persons 65 years or older rely on nutrition assistance (compared with 11.8% of persons 60 years or more receiving SNAP benefits in the United States as a whole), and 52% of children lived in families that receive some form of public assistance (i.e., Supplemental Security Income, cash public assistance income, nutrition assistance) compared with 27% for the United States as a whole. NAP regulations stipulate how benefits can be used limit and how and where recipients can purchase food, which can exacerbate already-limited access to food following a disaster.

Seniors and children are considered to be particularly vulnerable following a disaster, so providing access to adequate nutrition is key to health maintenance. Under normal circumstances, benefits are intended for purchasing food at a grocery store for preparation at home and hot foods ready for immediate consumption are ineligible. This limits the type of foods that participants can purchase, which can be problematic following a disaster that cuts power for extended periods to large portions of the population and results in fewer food choices generally. Additionally, NAP cannot be used outside of Puerto Rico, so participants who migrate to CONUS must switch to the SNAP, which can be used in any U.S. state. Since SNAP is operated differently in each state and may already be operating at or near capacity, individuals wishing to transition to SNAP may face administrative hurdles in switching. This can result in lengthy periods without benefits and a change in eligibility.

Following Hurricane Maria, waivers put in place to address these challenges were 1-month in length, resulting in the need for repeated extensions.

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1 U.S. Department of Agriculture, Economic Research Service, “SNAP Participants by Age,” webpage, undated. Breakdowns are prepared by using the data from the annual reports in the Series “Characteristics of Supplemental Nutrition Association Program Households.”


4 Administración de Desarrollo Socioeconómico de la Familia, “Programa de Asistencia Nutricional (PAN),” webpage, undated.
Description

There are multiple policy actions that can be taken to promote postdisaster access to adequate nutrition among the elderly population.

1. The USDA FNS provides waivers to food/nutrition assistance programs following a disaster to provide greater flexibility in the food provided to beneficiaries and decreases the paperwork burden related to receiving aid, as well as time to receiving aid. Upon the declaration of a disaster, the same waivers that FNS granted after Maria could be immediately triggered in order to increase access to and the flexibility of nutrition assistance and could last for 3 to 6 months before an extension is required. FNS waivers granted after Hurricane Maria could be applied on a longer-term basis.
   a. Allow schools greater flexibility in what they can serve students in the Federal school meal programs so that they can continue to serve the food available even if it does not meet the menu planning or meal pattern requirements.
   b. Allow institutions to serve all school meals (lunch and breakfast) and Child and Adult Care Food Program meals and snacks to children at no charge.
   c. Allow NAP participants to purchase hot meals at NAP-authorized retailers using the Electronic Benefit Transfer card and the cash portion.
   d. States that receive displaced NAP participants would serve them using regular SNAP benefits, even if the individuals have been unable to close their NAP case. Additionally, states would use regular SNAP eligibility rules, including expedited procedures that allow households to receive an eligibility decision within 7 days rather than the typical 30 days. NAP participant households would be required to terminate their NAP case as soon as is practicable to ensure that there is not duplication of benefit.

Potential Benefits

These waivers promote consistent access to nutrition program benefits and would be implemented by FNS in conjunction with the NAP administrator. Time scale to see benefits would be immediate upon a disaster declaration. Children are particularly susceptible to stunted growth and developmental delays, resulting in inadequate nutrition, especially during the first 2 years. Elderly individuals are at increased risk of nutritional deficiencies resulting from the aging process, and the consequences of inadequate nutrition increase with age. As a result, gaps in nutritional assistance benefits may be particularly risky for these vulnerable populations. Rapidly activating waivers to nutrition assistance programs will avoid unnecessary gaps in benefits and avert negative health outcomes that could result from inadequate nutrition or disruption of medication.

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**Potential Spillover Impacts to Other Sectors**

Increasing consistent access to nutrition assistance could reduce acute health issues or complications, thereby reducing demand for health care services and/or burden on family and friends.

Stress induced by concern over how one will acquire food can add to storm-related trauma and mental health concerns (e.g., depression, suicide), both for food-insecure individuals as well as their family and friends.

**Potential Costs**

- Potential upfront costs: N/A
- Potential recurring costs: N/A
- Potential total costs: N/A

The waivers do not increase benefit levels or the number of program participants, but rather focus on allowing greater flexibility in how benefits are used. As such, there are no anticipated costs to NAP. The basic waiver structures already exist; however, they may need to be restructured to allow for immediate triggering following a future disaster. Since the waivers are put in place by USDA FNS, they would bear the burden of making the waivers longer term.

States that receive migrants from Puerto Rico will incur increased SNAP costs, which could include increased benefit disbursements and administrative costs such as labor for processing claims, preventing fraud, and educating new participants about how to use SNAP benefits. The U.S. government pays benefit costs, and recipient states would bear the increased administrative cost burden.

**Potential Funding Mechanisms**

- U.S. Department of Agriculture

**Potential Implementer(s)**

- U.S. Department of Agriculture Food and Nutrition Service

**Potential Pitfalls**

Rapidly transitioning migrated NAP cases from Puerto Rico to SNAP cases in CONUS could result in duplication of benefits and possibly fraud. This potential would persist even if Puerto Rico transitioned to SNAP (HSS 16) as SNAP eligibility and benefits are state-specific.

Costs to states will depend on how many migrants are received, which will not be known until after a disaster occurs. The approximately 200,000 individuals who left Puerto Rico post-Maria can provide a general guideline, as can the fact that many have moved to Florida or New York.
Allowing flexibility in the meal pattern and menu planning requirements (e.g., nutrition standards) could result in lower-quality food being served through school or other meal programs. Similarly, allowing NAP benefits to be used to purchase prepared/ready-to-consume foods could result in increased purchase of foods with lower nutritional value.

Long-term waivers could extend past the period of urgent need, which could unnecessarily increase program costs.

**Likely Precursors**

It is necessary to review the waivers applied post-Maria and the length of extensions to determine appropriate length.

This COA should be considered in conjunction with a transition to SNAP (HSS 16, Address Food Insecurity by Ensuring Flexible Nutrition Assistance Programs), since SNAP is more flexible and transitioning to it could preclude the need for waivers of this sort.
Sector(s) Impacted

Health and Social Services

Issue/Problem Being Solved

The Puerto Rico population is increasingly aged, and many of these individuals are living in vulnerable circumstances (e.g., 46.7% have some type of disability, 39.4% live below the FPL).\(^1\) Children in Puerto Rico may also face greater vulnerabilities than do children in the United States as a whole (e.g., in 2017, 58% of children lived in poverty in Puerto Rico compared with 19% for the United States). Children and seniors often experience increased risk of abuse following a disaster. The CDC states that hundreds of thousands of adults 60 years or older are abused, neglected, or financially exploited each year in the United States.\(^2\) Meanwhile, the Children’s Bureau reported that 7.2 million children in the United States were involved in child abuse reports.\(^3\) There is evidence to suggest that rates of child abuse increase following a disaster,\(^4\) and the CDC reports that seniors are often targets of financial exploitation and are susceptible to abuse resulting from increased family stresses.\(^5\)

Description

This COA would involve public education campaigns to raise awareness of child and senior abuse and how to report it, and it would provide training to staff at Integrated Service Centers and Disaster Shelters to detect and address abuse. This would be a collaborative effort by OPPEA, the PRDOF, and PREMA. OPPEA and the PRDOF can provide the expertise to


\(^{2}\) Centers for Disease Control and Prevention, “Elder Abuse Prevention,” webpage, undated.


\(^{5}\) CDC Healthy Aging Program, “CDC’s Disaster Planning Goal: Protect Vulnerable Older Adults,” media background paper, undated.
develop and conduct the training for shelters operated or managed by PREMA during an incident. The media campaign either could be newly developed or build on existing public education efforts already underway. If a new campaign is needed, it could take 1 to 2 years to see a benefit from the public education component to allow time for research on how to target the campaign, how to convey information, and how/where to publicize.

Given that OPPEA and the PRDOF already are active in supporting and protecting seniors and have staff with relevant expertise, it should take less time to provide benefit via the training component, as the training could begin as soon as it was developed and provided to shelter managers. Another model of providing training would use local officials or other professionals with expertise in elder care and child care as trainers and liaisons to shelters and ISC to ensure consistency across shelters and across the island. This model would train two individuals to provide training and coordinate this effort in each of the 7 PRDOH regions. Costs would be higher, but this would provide a degree of program consistency and help to ensure that this is a key component of preparedness. Since shelter staff training will take some time and public education could take longer to have a lasting impact, detection and reporting of abuse could be incorporated into a comprehensive disaster case management system as a short-term solution.

**Potential Benefits**

The educational component of this COA would be aimed at preventing physical, mental, and emotional abuse, and the training component would increase the availability of services for victims of abuse.

**Potential Spillover Impacts to Other Sectors**

Decreasing the occurrence of abuse could lower burden on the health care system because of a decreased need for services related to or exacerbated by trauma.

**Potential Costs**

- Potential upfront costs: $370,000 to $630,000 in estimated upfront costs
- Potential recurring costs: $6.9 million to $15 million in estimated recurring costs
- Potential total costs: $7.3 million to $16 million in total estimated costs

Upfront: $624,600. It would cost $250,00 to $500,000/year for marketing (public service announcements, brochures, etc.); 2 FTEs at the PRDOF or OPPEA, or local officials with expertise in elder care and child care, would be needed to develop new training or improve existing training programs and oversee ongoing training for ISC and shelter staff ($124,600).

Annual: $624,600 to $1.37 million. This would include the same marketing cost as year 1, and 2 to 14 FTEs. The ongoing marketing cost could be revised down if the campaign developed in the first year can be repeated rather than redeveloped anew each year. This assumes no TV advertising, which could drive up costs unless airtime is donated.
Potential Funding Mechanisms

U.S. Department of Health and Human Services Administration for Children and Families
ACL, Oficina del Inspector General de Permisos (Office of Inspector General of Permits), Puerto Rico Department of the Family

Potential Implementer(s)

Oficina del Inspector General de Permisos (Office of Inspector General of Permits), Puerto Rico Department of the Family

Potential Pitfalls

Funding variations from year to year could limit the potential impact.

Likely Precursors

Review existing training available to relevant staff. Review relevant training provided in other regions.
Sector(s) Impacted

Health and Social Services

Issue/Problem Being Solved

Fossil fuel generators are frequently used during power outages following weather-related disasters, and the fuel costs associated with constant generator use can rapidly deplete social service center budgets, which can result in facility closures because of lack of funding. Following Hurricanes Irma and Maria, the use of generators in Puerto Rico has been much longer term given the duration of inconsistent power and the fragility of the power grid.

Description

The first step would be to review the social service sector to identify facilities that are licensed to operate on the island and provide critical services. This could include public and private facilities such as senior living facilities, child foster homes, domestic violence and homeless shelters, and centers that provide nutrition assistance programs. The determination of critical facilities should consider the capacity of facilities to accommodate resident transfers from those determined not to be critical during a disaster. The PRDOF is the likely lead on this inventory and assessment effort. However, it should be done collaboratively by all agencies that are involved in the provision of social services and should include private and public facilities.

Next, create a flexible funding mechanism to assist critical facilities, such as domestic violence and homeless shelters and child- and elder-care facilities, in bearing the costs of long periods of generator use post-storm. The fund could also be accessible to technology-dependent children and elders who are being cared for at home. This fund could be managed at PREMA or the PRDOF and would allow critical centers to tap into additional financial resources for fuel expenses during a long-term response and recovery period. This COA would begin to produce benefits in 1 to 2 years, assuming that the critical facility inventory could be completed and the fund established in that time period.

Potential Benefits

Assisting centers with fuel costs would avoid facility closures because of loss of fuel, allowing for continuance of service provision to populations disproportionately affected by disasters and reducing the need to relocate shelters.
Potential Spillover Impacts to Other Sectors

Providing fuel supports to social service facilities will enable their continuity of operation and consistent provision of services, which could reduce emergency room visits and other avoidable burdens on the health care system resulting from avoidable morbidity.

Potential Costs

Potential upfront costs: $180,000 to $310,000 in estimated upfront costs
Potential recurring costs: $11 million to $980 million in estimated recurring cost
Potential total costs: $11 million to $980 million in total estimated costs

There will be an upfront cost of $186,900 to $311,500 for 3 to 5 FTEs to coordinate the critical facility inventory development effort during year 1.

Estimates for annual costs range from $11 million to $980 million. Based on the 2017 FEMA equipment rates, generators would cost $3.35/hour for a 5.5 kilowatt (kW) generator to $533.75/hour for a 2,500 kW generator for the duration of the subsidy distribution period. Annual labor after year 1 would amount to 3 to 5 FTEs for processing claims and fraud monitoring ($186,900 to $311,500).

Power needs will vary depending on a variety of factors, including facility type, size, equipment being powered, and the amount of time the generator is in use. For example, elderly care facilities that house individuals dependent on electric-powered medical devices around the clock may require more resources than a center that houses children or elderly with relatively less power-dependent care. Assuming a 7-day, 24-hour-a-day supply would result in a cost of $56,280/week for every 100 centers running a 5.5 kW generator, $1 million/week for every 100 centers running a 210 kW generator, and $8.9 million/week for every 100 centers running a 2,500 kW generator. See Table A.6 for additional cost information.

However, there are reportedly over 1,000 senior centers alone, which would drive up these costs considerably, as noted in the annual cost estimate. The number and type of facilities determined to be critical and eligible for this financial aid will be key to an accurate cost estimation during the implementation planning phase. Also note that these are per-week costs.
### Table A.6. Selected Generator Reimbursement Rates

<table>
<thead>
<tr>
<th>Capacity or Size</th>
<th>Unit</th>
<th>2017 Rate</th>
<th>Daily Rate</th>
<th>Weekly Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.5 kW</td>
<td>hour</td>
<td>$3.35</td>
<td>$80.40</td>
<td>$562.80</td>
</tr>
<tr>
<td>16 kW</td>
<td>hour</td>
<td>$7.45</td>
<td>$178.80</td>
<td>$1,251.60</td>
</tr>
<tr>
<td>20 kW</td>
<td>hour</td>
<td>$13.32</td>
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<td>$2,237.76</td>
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<tr>
<td>40 kW</td>
<td>hour</td>
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<tr>
<td>43 kW</td>
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<td>$15.00</td>
<td>$360.00</td>
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</tr>
<tr>
<td>100 kW</td>
<td>hour</td>
<td>$34.95</td>
<td>$838.80</td>
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<td>hour</td>
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<td>210 kW</td>
<td>hour</td>
<td>$62.45</td>
<td>$1,498.80</td>
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<td>280 kW</td>
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<td>$1,929.60</td>
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<tr>
<td>350 kW</td>
<td>hour</td>
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<td>$2,172.00</td>
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<tr>
<td>530 kW</td>
<td>hour</td>
<td>$153.30</td>
<td>$3,679.20</td>
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<tr>
<td>710 kW</td>
<td>hour</td>
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<td>$5,328.00</td>
<td>$37,296.00</td>
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<td>1,000 kW</td>
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<td>$11,899.20</td>
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<td>1,500 kW</td>
<td>hour</td>
<td>$511.22</td>
<td>$12,269.28</td>
<td>$85,884.96</td>
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<tr>
<td>2,500 kW</td>
<td>hour</td>
<td>$533.75</td>
<td>$12,810.00</td>
<td>$89,670.00</td>
</tr>
</tbody>
</table>

Labor cost for program staff could vary depending on the intensity and length of need. An incident that disrupts the power grid across the island for weeks will, of course, require more resources than a localized incident that lasts days.

**Potential Funding Mechanisms**


**Potential Implementer(s)**

Puerto Rico Department of the Family, Puerto Rico Emergency Management Agency

**Potential Pitfalls**

This should be viewed as a stop-gap measure and not as a long-term alternative to strengthening the power grid. There is the possibility of fraudulent claims and abuse, particularly if fuel is potentially subsidized by insurance or other disaster aid funding. If generators were required for longer periods of time or by more facilities than included in the estimate here, costs would increase considerably.
**Likely Precursors**

The need for generators depends on the robustness and resiliency of the power grid. Ensure that all relevant facilities have a generator and know how to access the funds. For this COA to have an impact, there must be adequate fuel supply available. The assessment of the critical facility landscape should include power needs at individual facilities to estimate costs more accurately.
Improve Supports for Seniors, Particularly Those Living Alone

Sector(s) Impacted
Health and Social Services

Issue/Problem Being Solved
Seniors may experience increased vulnerability because of fewer economic opportunities and decreasing health status, and those who live alone may be at even greater risk following a disaster. This is of great importance as Puerto Rico’s population has become increasingly older over the past decade because of natural aging as well as outmigration. In 2010 the median age was 37 years, and persons 60 years or older accounted for 20.6% of the population. As of 2017, the median age had increased to 41.4 years, and persons over 60 years comprised 26% of the population. This increase is projected to continue, with 39.2% of the population projected to be age 60 or older by 2050. By comparison, persons 65 or older are projected to account for 22% of the U.S. population by 2050. These challenges and increased vulnerability during a disaster could result in avoidable morbidity or mortality because of difficulties in accessing aid, emergency supplies, health care services, and power supply for electric-dependent home medical equipment. Moreover, seniors who live alone may also experience social isolation that prevents them from hearing about pending disasters, asking for help after one arrives, and being unknown to rescue and response efforts.

Description
This COA is aimed at increasing the resilience of the elderly population by providing broad supports during normal circumstances, and also providing targeted support post-disaster. Build on existing support systems for seniors (e.g., meals on wheels, home care visits, small elder-care facilities) to design predisaster response and recovery support plans to ensure that seniors and their families have clear contingency plans for major disruptions to key lifelines. Meanwhile, aiding seniors in securing employment would help to decrease their reliance on assistance programs and could be done through Centros de Apoyo y Rehabilitación de Adultos Mayores.

3 Current U.S. Census Bureau projections do not include a cutoff at 60 years of age.
Recent legislation that provides support for seniors (e.g., Proyecto de la Cámara 503 that creates a public registry of senior-care facilities, Proyecto del Senado 110 that creates a registry of volunteers who can provide care to Alzheimer’s patients, and Proyecto del Senado 646 that supports senior-care centers offering services such as transportation, nutrition, caregiver support) can be continued in order to realize the intended benefits. OPPEA and the PRDOF would be key to implementation of these efforts.

The post-disaster component consists of empowering communities to provide direct aid to seniors and would be supported by PREMA. This component is part of emergency planning at the local level and would help neighborhoods to identify their neighbors who might be particularly vulnerable following a disaster. Tools used elsewhere provide communities the capacity to create maps of resources and identify areas of need. This type of planning would provide support to seniors who live alone, building on the neighbor-to-neighbor model of aid. Local social service providers in the area would work collaboratively to coordinate visits to the homes of seniors living alone as soon as possible following a disaster to assist with aid access and acquiring emergency supplies. Training and community mapping efforts are estimated to take 1 to 2 years for many parts of the island; however, full implementation in all communities may take longer and will depend on local buy-in. Once established, this network would provide benefit to service recipients immediately following a disaster. The teams who conduct the check-ins could consist of volunteers and paid employees, depending on the capacity and structure of local service providers. This effort is intended to be locally driven, with a light touch from the regional level to help provide coordination.

**Potential Benefits**

Providing support prestorm can increase the resiliency of the elderly population. Ensuring that seniors living alone are able to access services could avoid the worsening of chronic conditions caused by insufficient medicines or nutrition and thus could promote overall well-being.

**Potential Spillover Impacts to Other Sectors**

Connecting seniors to economic opportunities could decrease their reliance on assistance programs and increase their participation in the labor market. Assisting seniors in obtaining aid and conducting wellness check-ins could decrease avoidable emergency care, thereby lowering the burden on the health care system. This type of formal network could lead to a greater sense of community cohesion and overall resilience.

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6 An example is Washington State Emergency Management Division’s “Map Your Neighborhood.”
Potential Costs

Potential upfront costs: $5.2 million in estimated upfront costs
Potential recurring costs: $57 million in estimated recurring costs
Potential total costs: $62 million in total estimated costs

The existing programs that promote economic opportunity would not incur additional cost. The estimate for upfront costs is $5.2 million. This would include investigating home-care visit reimbursement policies at a cost of 0.5 FTE (assuming 1 FTE = $62,300) over the course of 1 year.

The primary cost for the neighborhood mapping and wellness checks would be labor to coordinate efforts regionally and locally, which would amount to $5.17 million annually. At each of the 10 regional PRDF offices, we allow for 0.5 FTE for program coordination ($311,500 annually, assuming 1 FTE = $62,300) and 1 FTE at each municipality to coordinate efforts among local service providers ($4.86 million annually, assuming 1 FTE = $62,300).

Potential Funding Mechanisms

U.S. Department of Health and Human Services, Oficina del Inspector General de Permisos (Office of Inspector General of Permits), Puerto Rico Department of Family, Community Development Block Grant—Disaster Recovery

Potential Implementer(s)

Oficina del Inspector General de Permisos (Office of Inspector General of Permits), Puerto Rico Emergency Management Agency, Puerto Rico Department of Family

Potential Pitfalls

Reimbursement of home-care visits and similar services could increase the number of seniors living alone. While enabling seniors to live independently is generally a positive outcome, it is important that the other supports discussed here are implemented in order that they are not at risk during a disaster. For example, if communities do not buy-in to the mapping project and complete the exercise, seniors living alone will not receive the potential benefits.

Likely Precursors

The investigation of home-care visit reimbursement could be done as part of efforts to reduce the gap in Medicaid/Medicare reimbursement (HSS 7). A reliable local volunteer base will be needed to conduct mapping predisaster and wellness visits post-disaster.
Improve Public Awareness of Proper Storage of Insulin Post-Disaster

Sector(s) Impacted

Health and Social Services

Issue/Problem Being Solved

According to the Behavioral Risk Factor Surveillance System, Puerto Rico has consistently had a high prevalence of diabetes compared with the rest of the United States and its territories. Individuals dependent on insulin may not be aware that in case of a power outage, insulin can be kept at room temperature for up to a month. While this concept may be relevant to numerous health conditions, diabetes care is a high priority given its relatively high prevalence.

Description

This proposal includes four primary modes of delivering accurate and complete information about insulin storage: (1) health care providers at the point of delivery, 2) media campaigns, 3) disaster shelter managers, and 4) text messages sent to patients. Modes 1 and 2 would occur primarily predisaster (though they could continue postdisaster), while modes 3 and 4 would reinforce the message postdisaster.

Health care providers (e.g., primary care physicians and pharmacies) can provide additional information about medication storage to patients at the time of delivery. This would occur during the initial consultation, meaning that no additional resources would be used.

Mass media and social media campaigns can disseminate information to the public at-large. This could take the form of newspaper, radio, and TV ads and social media, all of which could be used to target patients affiliated with associations that address chronic disease (e.g., American Diabetes Association).

Disaster shelter managers can be trained on basic knowledge of medication storage, which could be done as part of existing training. If cold-storage is unavailable at shelters, the managers can inform survivors housed at the shelter about safe storage options. This could be supplemented by posting flyers at shelters that provide information directly to survivors.


Text messages reminding patients about how to store their medications could reinforce the prestorm outreach and education activities. Messages about medication storage could be stated generally, without being condition- or product-specific, to help protect privacy.

This COA could build on current projects in the recovery mission to identify appropriate messaging for the public education component. PRDOH would be key to implementation to ensure that accurate information is provided across all health regions.

**Potential Benefits**

Following a disaster, insulin may be more difficult to obtain, and the stockpile can be stretched to or beyond its limits. The insulin stockpile can be used more efficiently by educating patients, and the public more broadly, about how to properly store it and for how long it is effective without cold-storage.

Multiple studies\(^3\) have shown that there can be a disruption of medication adherence following a disaster, and there were reports of insulin-dependent patients disposing of their existing in-home stock after the power went out and they were no longer able to keep it cold post-Maria. Properly informing patients about the shelf life of their insulin medication will help maintain the health of these individuals and help avoid unnecessary depletion of the insulin stock because of wastage at the individual level. This might also reduce emergency room visits because of lacking medication.

There is no research readily available on the effectiveness of multimedia campaigns (MMCs) to produce knowledge increase of behavior change around medicine storage. However, these types of campaigns have been shown to produce positive change to health-related behaviors.\(^4\)

A review of 14 MMCs\(^5\) targeting obesity suggests that outcomes varied considerably on campaign recall (21% to 55%) and recognition (16% to 88%). It should be noted that recall and recognition may be a result of individual MMC design and implementation rather than the potential of the concept to affect health-related behavior. Only one of the reviewed MMCs reported a behavior change outcome, with 29% of respondents indicating a desired change. Again, MMC design and implementation may affect this outcome. Also, the ability of MMCs to

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produce positive changes to diet and physical activity may not equate to their ability to affect changes to medicine storage behaviors.

Anti-tobacco campaigns also can provide useful information, specifically in terms of dose response. One campaign assessment\(^6\) reported a significant association between the odds of intending to smoke cigarettes in the next year and both low and high ad awareness. Those who reported higher levels of ad awareness also had lower intentions to smoke compared with those who reported lower levels of ad awareness (low ad awareness: Odds ratio = 0.70, \(p < .05\); high ad awareness: Odds ratio = 0.30, \(p < .01\)).

**Potential Spillover Impacts to Other Sectors**

This activity specifically targets diabetes medication; however, it could be expanded to other medications for chronic conditions, which could result in economic impacts through more efficient use of the relevant pharmaceutical stockpile.

**Potential Costs**

- Potential upfront costs: $640,000 in estimated upfront costs
- Potential recurring costs: $1.9 million in estimated recurring costs
- Potential total costs: $2.6 million in total estimated cost

Costs associated with health care providers educating their own patients would be minimal. For the medium and long term, this could be added to continuing medical education curricula and medical school so that it becomes part of current health care providers’ consultations with their patients and is taught to future generations of the health care workforce. For short-term needs, health care provider associations can disseminate this information and encourage providers to discuss with their patients during normal patient-provider interactions.

Training disaster shelter managers to educate survivors could be done at minimal cost by revising current training curricula and materials. Flyers posted at shelters would incur printing cost and minimal labor to post them in the shelters, though the latter might be tasked to shelter volunteers.

If an in-house text messaging system were used, there would be labor, infrastructure, and maintenance costs associated with the development of the system, as well as a secure environment in which the underlying patient data could be stored. These systems also would require cybersecurity measures to ensure compliance with sensitive data storage protocols. Costs for a text messaging service range considerably depending on the level of service required. One service requires no monthly fee, allows unlimited contacts, and charges $0.02 per message. With 15.3% of the population having been told by a doctor they had diabetes as of 2016, there

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may be approximately 500,000 people taking insulin resulting in a cost of $12,750 per alert sent out ($51,000 for 4 alerts in a year). Alternatively, enterprise systems are available with unlimited contacts, 250,000 messages included, and $0.012/additional message and other features (e.g., dedicated account rep, customer relationship management integration) for $2,499/month ($29,988/year). Since only 250,000 messages are included, an additional 1,750,000 messages would need to be purchased at $0.012/messages (500,000 people receiving messages 4 times/year), resulting in a charge of $21,000 for a yearly total of $50,988. Given the near-equal cost, the enterprise option would seem preferable given the additional functionality that it includes.

The upfront costs would amount to $640,175 and would consist of $15,575 (0.25 FTE, assuming 1 FTE = $62,300) to develop the shelter staff training; $124,600 (2 FTEs at $62,300 each) to develop and implement the public education campaign; and $500,000 to develop the mass media campaign.

Total annual cost would be $175,600 and consist of 2 FTEs to coordinate the training and public education campaign ($124,600/year, assuming 1 FTE = $62,300) and $51,000/year for a text messaging system.

It is possible that pharmaceutical benefit management companies could be tasked with sending texts to their patients. This would remove the need for an additional system to house patient data, as well as the lower cost to PRDOH, and should be explored as an option.

**Potential Funding Mechanisms**

U.S. Department of Health and Human Services, Puerto Rico Department of Health, private sector, nongovernment sources

**Potential Implementer(s)**

Health care providers, Puerto Rico Department of Health, private sector

**Potential Pitfalls**

Public education messaging that suggests that insulin can be stored at room temperature could cause confusion with regard to preferred cold-storage procedures, or it could be misunderstood as being more broadly applicable to other pharmaceutical products. This could lead to improper storage and subsequent use of expired medicines.

Text messages/alerts sent to patients after a disaster would depend on there being a centralized roster of patients. While such a roster has been proposed by numerous stakeholders, the idea poses risks to patient confidentiality, and development of it would likely face legal hurdles. A system such as this would require a secure data storage environment. While the patient information exists, it is not contained within a single system that could handle this type of messaging, though moving to an island-wide electronic medical record system might facilitate it.
This COA specifically addresses an acute need identified in the response to Hurricane Maria but does not address the broader issue of chronic disease prevention or management.

**Likely Precursors**

A patient roster would need to be created or compiled from extant patient records and securely stored. This would be an ongoing effort to maintain security, accuracy, and completeness.

There is a current Health and Social Services project within the recovery mission to address the identification of messaging on this issue that could be used as a starting place for this COA. That project should be reviewed to ensure that efforts are not duplicated.

This COA would not be functional without reliable telecommunications infrastructure.
Move to a More Regionally Integrated Approach to Emergency Planning, Exercising, Response, and Recovery

Sector(s) Impacted
Health and Social Services

Issue/Problem Being Solved
In the aftermath of Hurricane Maria, Puerto Rico’s unstable economic and health care infrastructures\(^1\) were diminished further and led to significant challenges associated with care delivery.\(^2\) Ensuring adequate health system resources can address emergent issues in medical services that are affected by a disaster. Based on Puerto Rico’s posthurricane experience, investments need to be made in health care systems development, including care regionalization, leveraging health care coalitions, and ensuring adequate surge capacity for medical assets, materials, and supplies in Puerto Rico.

Description
The PRDOH should collaborate with public and private, for-profit and nonprofit hospitals and health care organizations, including community health centers, to develop resilient, regionalized health care systems and infrastructure that effectively and efficiently respond to disasters.

- Create a disaster preparedness, response, and recovery network building on existing health care coalitions and emergency management networks.\(^3\)
- Regularly use existing tools to practice, measure, and improve health care coalition disaster surge capacity to help inform regional preparedness and response plans (e.g., The Healthcare Coalition Surge Test).\(^4\)
- Leverage health care coalitions to facilitate hospitals with disaster surge planning and resource sharing among hospitals and health care systems post-incident.
- Conduct exercises on hospital evacuation and include identified alternative facilities to transfer patients to as part of disaster planning.

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\(^3\) The networks could build on momentum created by the newly implemented CMS rule requiring health care organizations to have emergency preparedness plans. Specifically, the networks could assist members in developing and sustaining emergency preparedness infrastructure among all participating organizations.

• Equip emergency departments with needed resources in order to surge in response to disasters and mass casualty incidents as needed.
• Use existing tools to measure hospital disaster surge capacity to help inform facility preparedness and response plans. An example is the Hospital Surge Test.\(^5\)
• Implement processes for real-time needs assessment and syndromic surveillance in order to optimally utilize existing resources and assess additional needs.\(^6\)

**Potential Benefits**

Developing resilient health care system infrastructure, using existing networks and incorporating surge planning into this network, will likely help protect patients and communities from poor outcomes, reduce morbidity and mortality, ensure more efficient use of resources, and save costs.

**Potential Spillover Impact on Other Sectors**

This COA would actively engage critical infrastructure sectors (e.g., telecommunications, transportation, housing) in emergency preparedness initiatives, as well as tie in efforts around community planning and capacity building.

**Potential Costs**

Potential upfront costs: N/A  
Potential recurring costs: $10 million in estimated recurring costs  
Potential total costs: $10 million in total estimated costs

This COA focuses on planning and integration. Significant investments in materiel, systems, and infrastructure are not included here.  
Estimate for annual costs is $872,000 per year for 2 FTEs in each of the 7 health regions.


\(^6\) Such a system could be embedded in the health department or in the aforementioned networks. The former option might afford the system the benefits of island-wide coverage. However, this is a decision implementers should consider as they move forward with this recommendation.
Potential Funding Mechanisms

U.S. Federal Emergency Management Agency,7 Community Development Block Grant—Disaster Recovery, U.S. Department of Health and Human Services,8 Puerto Rico Department of Public Health,9 Puerto Rico Health Insurance Administration also known as ASES.10

Potential Implementer(s)

Puerto Rico Department of Health, hospital systems, other health care organizations

Potential Pitfalls

Not all health care organizations have the immediate financial capabilities or motivation to prioritize and/or participate in investing in making their systems more resilient through the suggested mechanisms. Health care coalitions and emergency management networks may not have the resources to increase collaboration and cooperation among various entities in order to increase health care system resilience.

Likely Precursors

Success of this COA might be influenced by the quality and spread of existing partnerships and organizational affiliations, degree of integration among primary/second/tertiary providers, prior market incentives to compete or collaborate across business units, and preexisting expertise in emergency preparedness.

9 Departamento de Salud de Puerto Rico, “Home,” webpage, undated.
HSS 23
Review and Improve Systems and Processes for Managing Volunteers and Donated Supplies

Sector(s) Impacted

Health and Social Services

Issue/Problem Being Solved

Management of volunteers and related donations was an impediment in the Maria response, and systems need to be better organized for future disasters. For instance, there was a lack of a place where all donations received through the PRDOH could be sorted for easy access for the employers/volunteers working in the 7 regions of the PRDOH. During Hurricane Maria, the donations received were difficult to access, resulting in delays in the time of distribution.

Description

This COA is focused on strengthening systems for volunteer management and coordination as well as implementing systems to better track donations and inventorying of supplies and other assets. This has a particular focus on health and social service volunteers and health care supplies. Also, this COA will establish a place where all the donations will be redirected and received by volunteers who will help in the process of sorting and classification. In addition, the management of donated equipment and supplies for technology-dependent children would need to be more efficient. This should be applied across Puerto Rico but could support the regionalized approach.

This COA should be implemented and lead by a government of Puerto Rico agency focused on emergency response, but for Health and Social Services, this should be done in close coordination with the PRDOH to ensure optimal use of health volunteers and other assets to address health and social service needs.

This COA would include multiple implementation elements: (1) volunteer tracking built on the principles of ESAR VHP (Emergency System for Advance Registration of Volunteer Health Professionals); (2) volunteer credentialing to ensure training and other competencies are up-to-date for deployment as needed; (3) supports for volunteer capacity development, including building on existing emergency medical services and supporting communication skills (e.g., volunteer ham radio networks); (4) warehouse rental space for receiving and managing donated supplies for the PRDOH; (5) contracting for specialized storage for receiving, managing, and dispatching donated medication within the PRDOH; and (6) strengthening registries for inventorying donations.
If done well, a robust system for volunteer and donations tracking should have immediate benefits in disaster response. Systems like these can also have benefits in nonemergent times as a means for organizing assets to support routine health promotion activities.

**Potential Benefits**

Volunteer management is key to disaster response and recovery. Well-organized volunteer systems facilitate quicker deployment of assets, minimize confusion and duplication of services, and can help match assets to areas of greatest need. Donations management has similar benefits, by ensuring that supplies are deployed to regions or populations of greatest damage and/or vulnerability.

**Potential Spillover Impacts to Other Sectors**

Effective volunteer and donations management can streamline and improve disaster management, and if done well, may improve efficiencies in how quickly sectors can get back online and/or transition to routine services.

**Potential Costs**

Potential upfront costs: $210,000 in estimated upfront costs
Potential recurring costs: $3.9 million in estimated recurring costs
Potential total costs: $4.1 million in total estimated costs

The cost for a robust volunteer management system consists of 2 primary components: database setup and management and training.

Estimated upfront cost is $210,000: 3 FTEs (at $70,000/year each) for initial database setup.
Estimate for annual costs is $350,000: 2 FTEs (at $70,000/year each) for database maintenance, and 3 FTEs (at $70,000/year each) for ongoing volunteer training, with particular focus on maintaining competencies among those addressing health and social service needs.

**Potential Funding Mechanisms**

Government of Puerto Rico, nongovernment sources

This program could be funded via a collaboration of health care systems preparedness grants and supports from the Puerto Rican Government as part of emergency services.

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3 National Voluntary Organizations Active in Disaster, “Donations Management,” website, undated.
**Potential Implementer(s)**

Puerto Rico Department of Health

**Potential Pitfalls**

It is important to be clear about the criteria for the volunteer registry (e.g., basic information needed, key criteria for volunteers) to ensure that the parameters are well understood by those interested in offering their services. It is also important to have clear guidelines about what supplies can and cannot be donated, to facilitate aid organizations and individuals in their support of future disaster response.

**Likely Precursors**

It is important to build on/merge any existing volunteer registries for this effort and to be clear about volunteers monitored in databases by the government of Puerto Rico vs. those that are part of NGOs (but could be integrated). Managing volunteers and donated supplies could be done in coordination of distribution centers under the COA HSS 26 and with the collaboration of regional planner staff hired under COA HSS 22. Licensure of volunteer providers could also be considered.
Increase the Child Welfare Investigative Workforce

Sector(s) Impacted

Health and Social Services

Issue/Problem Being Solved

In 2016, PRDOF employed 148 child welfare investigators and received 17,643 reports requiring investigation. As of June 2016, PRDOF reported a backlog of 6,787 cases requiring investigation. This deficit means that children remain in potentially unsafe living situations for much longer and may be at increased risk of further abuse in the post-disaster period, increasing the chance that the child may receive lasting harm.

The literature is mixed, but there are indications that following a disaster the incidence of child abuse increases. In light of the current investigative backlog, the potential for disaster-related incidence escalation places Puerto Rico’s child population at increased risk.

It is important to note that while the social worker workforce in Puerto Rico also has been dropping in recent years (see Table A.7), this COA focuses specifically on child welfare investigators. The reason for the narrow focus is the need to hire staff that are dedicated to investigating reports. In the broader social worker context, workers spend approximately 20% to 35% of their time on direct client contact or contact with other relevant professionals in the field (e.g., referrals for services). Given the backlog, it is important that this staff be able to spend the bulk of their time on investigative activities.

Table A.7. Child Welfare Social Worker Employment Trends

<table>
<thead>
<tr>
<th>Occupation Title</th>
<th>2010</th>
<th>2015</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child, family, and school social workers</td>
<td>4,450</td>
<td>3,600</td>
<td>3,600</td>
</tr>
<tr>
<td>Social workers, all other</td>
<td>1,400</td>
<td>1,240</td>
<td>1,380</td>
</tr>
</tbody>
</table>

Description

This COA would increase funding to PRDOF to hire additional child welfare investigators to manage existing caseloads of child maltreatment. The benefits will begin immediately after the

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first group of new investigators are hired and trained and the backlog of child maltreatment cases begins to be reduced, which is estimated at 6 months to 1 year. This would be implemented throughout Puerto Rico.

**Potential Benefits**

This COA would lead to a decreased backlog of child maltreatment cases. A decreased backlog and the expansion and training of a more robust child welfare investigative workforce will increase the capacity of PRDOF to be responsive to the long-term recovery needs of families and their children.

**Potential Spillover Impacts to Other Sectors**

Promoting the long-term safety of children will have far-reaching effects throughout Puerto Rican society as a whole. Early intervention also could lead to reduced health care and other social costs by warding off physical and mental health impacts later in life or tendencies toward criminal or other nondesirable behaviors.

**Potential Costs**

Potential upfront costs: $19 million in estimated upfront costs (2 years)
Potential recurring costs: $49 million in estimated recurring costs (11 years)
Potential total costs: $68 million in total estimated costs

This COA proposes a workforce surge in the first 2 years to address the investigative backlog and establish a steady ratio of investigator to reports, followed by a reduction in the overall number of investigators beginning in about the third year. The 2-year surge would cost $18.6 million for a doubling of the child investigator workforce (150 FTEs at $62,300) to work through the backlog, after which a smaller but still increased workforce would be maintained at $4.67 million in labor (75 FTEs at $62,300). If this workforce surge is coupled with successful abuse prevention efforts (HSS 18) it is anticipated that a further workforce reduction would be possible once the backlog is addressed.

**Potential Funding Mechanisms**

Government of Puerto Rico, Puerto Rico Department of the Family

**Potential Implementer(s)**

Puerto Rico Department of the Family
Potential Pitfalls

Because this COA is wholly dependent on the Puerto Rico budget, it will be susceptible to FOMB actions. Turnover rate for social workers generally is high,\(^3\) so there may be additional hiring and training costs required to maintain the workforce.

Likely Precursors

This should be combined with efforts to prevent child abuse and should be considered in conjunction with HSS 18 (Improve Programs to Prevent and Address Abuse of Children and Seniors After a Disaster).

\(^3\) U.S. Department of Health and Human Services, Children’s Bureau, “Worker Turnover,” webpage, undated.
Sector(s) Impacted

Health and Social Services

Issue/Problem Being Solved

Because of inadequate storage and distribution arrangements, following Hurricanes Irma and Maria there was limited accessibility to powdered milk formula and “ready to feed” formula for WIC program participants in Puerto Rico.

Description

This COA will establish a collaborative agreement between WIC and PRDOF to arrange appropriate climate-controlled storage, handling, and distribution of milk formulas for WIC participants who are also NAP beneficiaries. This agreement will ensure that supplies are properly stored and strategically located around Puerto Rico so that there is adequate availability for all communities.

Potential Benefits

Ensuring an adequate supply of formula would provide a key support for infants, a population that is particularly vulnerable during a disaster.

Potential Spillover Impacts to Other Sectors

Ensuring nutrition support could avoid negative health and development outcomes because of hunger. Additionally, it could reduce emergency room visits and other avoidable burdens on the health care system resulting from avoidable morbidity.

Potential Costs

Potential upfront costs: N/A
Potential recurring costs: N/A
Potential total costs: N/A

This collaborative agreement would incur no cost, though it could result in increased warehousing costs if implemented.
**Potential Funding Mechanisms**
Not applicable

**Potential Implementer(s)**
Puerto Rico Department of the Family, U.S. Department of Agriculture, Special Supplemental Nutrition Program for Women, Infants, and Children

**Potential Pitfalls**
None anticipated

**Likely Precursors**
This agreement should be part of a larger effort to integrate social and health services.
HSS 26
Review and Improve Systems for Stockpiling and Distributing Supplies and Pharmaceuticals Post-Disaster

Sector(s) Impacted
Health and Social Services

Issue/Problem Being Solved
Following the hurricanes in Puerto Rico there were concerns among service providers about the adequacy of systems to source emergency supplies.

Description
This COA will designate approximately 10 key health care facilities as Health Care Disaster Resource Centers that would be equipped with extra supplies needed during a disaster. The choice of 10 is informed by analysis of programs in Los Angeles County, which has 14 Disaster Resource Centers (DRCs) that support over 100 hospitals, so about 1 DRC for every 7 hospitals. According to the Puerto Rico Department of Health website, there are 69 hospitals. By that ratio we estimate Puerto Rico should have 10 caches.

Implementation of the COA would begin with a needs assessment to determine the precise content and primary users (e.g., hospitals, physician practices, pharmacists) and size of the stockpiles, which may vary somewhat from region to region, depending on the results of the needs assessment. However, examples of supplies would include tents and equipment to expand surge capacity, pharmaceuticals, medical and surgical supplies, and ventilators.

This will be a collaborative effort between PRDOH and PREMA. Benefits could be seen within approximately 2 years.

Potential Benefits
Ensuring that basic services are available postdisaster can avoid increased morbidity and mortality among electricity-dependent individuals. Ensuring that emergency response supplies are stored as efficiently as possible would make them more readily available after a disaster, while setting clear emergency plans would improve interagency coordination during and after a disaster.¹

¹ Department of Health Services, County of Los Angeles, “Disaster Resource Center (DRC) Designation and Mobilization,” Memorandum Reference No. 1102, undated.
**Potential Spillover Impacts to Other Sectors**

Stockpiling could affect public buildings. Water and energy might be affected by the review of plans to ensure services and any subsequent actions.

**Potential Costs**

Potential upfront costs: $20 million in estimated upfront costs  
Potential recurring costs: $2.8 million in estimated recurring costs (11 years)  
Potential total costs: $23 million in total estimated costs

- **Upfront costs**
  - *Material:* $20 million. $2 million per cache (based on Los Angeles County EMS Agency’s Disaster Resource Center program) multiplied by 10 caches.

- **Annual costs**
  - Maintenance of cache (replacement of expired supplies that cannot be rotated) estimated at $250,000/year.

Note: We assume security costs would be borne by local law enforcement.

Cache costs are based on Los Angeles County EMS Agency “Disaster Resource Center” program. Maintenance costs for cache could be higher depending on perishability of material, especially pharmaceuticals, and the ability to rotate those stocks with those in the regular supply chain.

**Potential Funding Mechanisms**


**Potential Implementer(s)**

Puerto Rico Department of Health, Puerto Rico Emergency Management Agency

**Potential Pitfalls**

Cache supplies, particularly pharmaceuticals, are subject to expiration. If rotating cache supplies with everyday supplies is not done to minimize the cost of replenishing older materiel, this could be an issue. While caches are designed to supplement a health care facility’s normal supplies during a disaster, they will become exhausted if supply lines are disrupted for an extended period.
Likely Precursors

Caches require secure storage locations at the designated Health Care Disaster Resource Center facilities. Coordination of the regional cache program would be one of the duties performed by regional planning staff hired under HSS 22 (Move to a More Regionally Integrated Approach to Emergency Planning, Exercising, Response, and Recovery).
HSS 27
Improve Current Epidemiological Surveillance to Better Respond to Natural and Man-Made Disasters

Sector(s) Impacted
Health and Social Services, Water, Housing, Economic, Comm/IT

Issue/Problem Being Solved
Natural or man-made disasters can exacerbate current health risks, threats, or disease outbreaks. They can also present new health issues (e.g., new diseases) for the health care system, requiring the system to respond in a timely and appropriate manner to decrease excess morbidity and mortality. Hurricanes Irma and Maria demonstrated a need to improve epidemiological surveillance system capacity in Puerto Rico and opportunities to link together different emergency response components.

Description
By developing a comprehensive epidemiological surveillance system, this COA will help improve Puerto Rico’s capacity to monitor short- and long-term adverse health effects, and thereby allow lessening of disease burden. The improved epidemiological surveillance capacity also will strengthen emergency response capacity for any future disasters. Innovative solutions to health problems will be implemented throughout the different PRDOH surveillance components: infectious diseases, chronic diseases, maternal and child health, environmental health, injury, occupational health and behavioral health.

PRDOH will be responsible for implementing this COA in collaboration with FEMA, the EPA, U.S. Department of Agriculture, Department of Defense, and U.S. Department of Health and Human Services. Implementation will be done by training the workforce capacity and increasing access of technological advancements to support surveillance activities. The likely time scale to see benefits is estimated at 2 years or longer.

Potential Benefits
A comprehensive surveillance capacity that draws together assets from existing systems such as infectious diseases, chronic diseases, maternal and child health, environmental health, injury, occupational health, and behavioral health could help improve the state’s response capacity for monitoring exposures and short- and long-term adverse health effects as a result from any disaster. It will also help better target interventions to decrease any resulting disease burden, while strengthening Puerto Rico’s emergency response capacity for any future disasters. Measures taken to develop and implement cutting-edge epidemiological capacity will allow
prompt public health action by conducting diagnostic and investigative activities in response to possible health problems and health hazards in the community, therefore reducing disease burden as well as health-related costs.

**Potential Spillover Impacts to Other Sectors**

This COA involves establishing collaborative agreements with numerous local, state, and federal agencies, cross-training on surveillance, and establishing data reporting and monitoring protocols.

**Potential Costs**

Potential upfront costs: $9 million in estimated upfront costs, for labor and equipment.
Potential recurring costs: $90 million in estimated recurring costs (11 years)
Potential total costs: $100 million in total estimated costs

- Upfront: $8.5M (labor and equipment)
- Annual: $8.5M (labor and equipment)

The type of labor needed to carry out this COA will include an epidemiological surveillance project manager and multiple coordinators for environmental health surveillance, injury/forensic surveillance, occupational health surveillance, and behavioral health. The technological infrastructure investment will include items such as electronic records, an electronic surveillance reporting system for the Obligatory Notifiable Diseases OA # 302, and surveillance tools.

**Potential Funding Mechanism**

Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, nongovernment sources

**Potential Implementer(s)**


**Potential Pitfalls**

PRDOH technological infrastructure does not support current programmatic IT needs.

**Likely Precursors**

Fully functional epidemiological surveillance systems will depend on continuous capacity building of the current PRDOH workforce. Identifying specific surveillance needs and determining current capacity will drive the design, and cost, of this COA.
Sector(s) Impacted

Health and Social Services

Issue/Problem Being Solved

Puerto Rico has seen a significant increase in suicide attempts since Hurricane Maria hit the island in September 2017. At least 253 people committed suicide in 2017, a 29% increase from 2016. As of January 22, 2018, the suicide hotline had received 3,050 calls since the storm, a 246% increase compared with the same time the previous year.

Description

This will be an island-wide, 6-part suicide prevention campaign that is evidence-based and includes:

1. promoting wellness and self-care through a public awareness campaign (making use of both earned media and paid media and deployed with a focused message on safety and well-being, with positive narratives in the form of actions, solutions, successes, and resources and without any references in pictures or words to modes of suicide)
2. identifying people who are at risk of suicide
3. identifying and addressing barriers to appropriate care for suicidality
4. providing appropriate care (both acutely on the suicide hotline and in emergency rooms and long-term care)
5. procedures for responding to suicide
6. procedures for addressing environmental factors associated with suicide (building off the previous work from the Commission for the Implementation of Public Policy in the Prevention of Suicide—La Comisión para la Implantación en Política Pública en Prevención del Suicidio—with a public awareness campaign, increased coordination and planning between agencies, surveillance research, and training workshops).

The components of a comprehensive approach to suicide. The National Registry of Evidence-Based Programs and Practices is a database of mental health and substance abuse interventions that have met a minimal set of review requirements and have been rated for quality and readiness of dissemination. It currently lists 20 interventions that may be effective at reducing suicide. It should be noted that there are 120 interventions that may be effective at preventing or treating drug use. The comparatively small evidence-base for suicide prevention is in large part the result of the low base rate of suicide, which makes evaluating interventions.

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1 Substance Abuse and Mental Health Services Administration, “National Registry of Evidence-Based Programs and Practices,” 2015a.
challenging. But we do know that, based on evidence, a comprehensive organizational approach to preventing suicide has six components. Yet the specific interventions within those components may vary.

1. **Raise awareness and promote self-care.** Aside from prior history of a suicide attempt, the epidemiologic evidence suggests that mental illness and substance misuse are among the strongest risk factors for suicide. Emerging evidence is also beginning to shed light on the salience of sleep disturbances and chronic pain on suicide risk, even possibly in the absence of a mental health or substance use disorder. Thus, programs that raise awareness about mental health and substance misuse, promote healthy behaviors, and inform employees about the resources that exist for them that can help prevent suicides. These can be delivered in a public awareness campaign that includes both earned media and paid media, deployed with a focused message on safety and well-being and including positive narratives in the form of actions, solutions, successes, and resources and without any references in pictures or words to modes of suicide. As part of this, the campaign will include training and media resources to help communities and families identify risk factors for suicide and ensure timely referral to mental health and other resources.

2. **Identify those at high risk of suicide.** Persons exhibiting symptoms of distress or having thoughts of suicide may turn to resources for help on their own accord. However, in many cases those in distress will not seek help proactively, in which case institutional processes and practices may identify such individuals. Besides teaching peers or other key personnel to identify and refer those in distress, other strategies for identifying high risk groups may include various routine screening programs or those that screen individuals after distressing events, though not necessarily specifically for suicide risk. HSS 15 recommends PFA, an intervention that could assist with this identification. Training primary care physicians and emergency room doctors and nurses to screen for suicide is also key.

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3 Cavanagh et al., pp. 395–405.


3. **Facilitate access to quality care.** If individuals themselves feel that they are at risk of suicide, or others believe that an individual is at risk, a comprehensive approach to preventing suicide ensures that individuals have access to quality care when they need it. Barriers to access may include both attitudinal barriers (e.g., a desire to handle the situation on one’s own, inaccurate perceptions about the severity of one’s own condition or of the effectiveness of behavioral health care) or structural barriers (e.g., cost, transportation), though in general attitudinal barriers are more prevalent among those not seeking care than structural barriers. The public awareness campaign will have to address some of these attitudinal barriers.

4. **Provide quality care.** Though a minority of those with mental disorders are at risk of dying from suicide, the majority of those who die by suicide have some sort of mental health problem. Providing high-quality mental health care can reduce suicides. Randomized control trials of specific mental health interventions have reduced suicidal behaviors and evidence-based approaches to care for individuals with common mental health disorders like depression, PTSD, or substance use disorders—including within Employee Assistance Programs—can reduce symptoms that, if left untreated, may result in increased risk of suicide.

5. **Alter the environment to restrict access to lethal means.** Perhaps the most controversial of the components of a comprehensive approach to preventing suicides is restricting access to the means by which people will choose to take their lives. There is evidence that detoxifying gas led to reduced inhalation deaths in England, fences or other barriers led to reduced suicides by fall/jumping, and that the way potentially lethal medications like Paracetamol are packaged led...

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to reduced suicides by overdose in the United Kingdom.\textsuperscript{15} Ecological studies suggest that varying rates of firearm ownership over time is correlated with suicide deaths.\textsuperscript{16}

6. Respond appropriately to suicides and suicide attempts. The response to suicide can help facilitate the grieving process for the decedent’s family, friends, and colleagues. It also serves as an opportunity for prevention. Although the mechanisms underlying why it occurs are unclear,\textsuperscript{17} suicides can occur in clusters through a process termed suicide contagion.

This will build on the work of the Commission for the Implementation of Public Policy in the Prevention of Suicide (La Comisión para la Implantación en Política Pública en Prevención del Suicidio) and will include the same structure and roles. This means that several agencies will be involved in implementing this COA, including representatives from each of the following agencies:

- Administrator of the Administration of Mental Health and Addiction Services
- Executive Director of the Administration of Health Services
- Secretary of the Department of Sports and Recreation
- Secretary of the Housing Authority
- Secretary of the Department of Families
- Secretary of the Department of Education
- Secretary of the Department of Justice
- Secretary of the Department of Corrections and Rehabilitation
- Superintendent of the Police of Puerto Rico
- Secretary of the Department of Work and Human Resources
- The Federation of Mayors
- The Association of Mayors
- 4 individuals from the private sector, 2 of which are from nonpecuniary organizations that provide services to people at risk of suicide in Puerto Rico.

This is a multifaceted intervention and as a result it will involve a multifaceted implementation strategy. The public awareness campaign is intended to make people aware of resources and reduce stigma surrounding mental illness and focus on addressing wellness issues. Training will also be required to ensure that primary care physicians, emergency room doctors, and emergency room nurses learn to identify those at high risk of suicide. Access issues are also


addressed through HSS 12 and HSS 22, and this COA will be best implemented in concert with these efforts to increase access. Training will also be required for mental health providers to ensure they are using the best methods when working with a person experiencing suicidal ideation or recovering from a suicide attempt. Finally, surveillance research is needed to identify and address any environmental factors, such as high, unprotected bridges, that are nexuses of suicide.

It takes time to see health outcomes associated with an intervention of this scale. However, with correct implementation support of EBPs, it is possible to see early change in practice in 1 year, and meaningful change in client outcomes in 2 to 3 years. And a media campaign can be rolled out in a matter of months.

**Potential Benefits**

This suicide prevention campaign for natural disaster victims will have the primary benefit of increasing awareness of suicide risk factors and improved health outcomes. This will improve overall health outcomes and timely referral to behavioral health services and other resources.

**Potential Spillover Impacts to Other Sectors**

This COA has the potential to spill over into the education sector, especially if screening is expanded to schools. Mental illness and suicidal ideation affect all aspects of an individual’s life, including the ability to attend to work or school and engage with their family and friends.

**Potential Costs**

Potential upfront costs: $250,000 in estimated upfront costs, for a media campaign
Potential recurring costs: $73 million in estimated recurring costs
Potential total costs: $73 million in total estimated costs

The upfront cost estimate of $250,000 is based upon developing a media campaign. The recurring cost is estimated to be $6.6 million annually. This annual estimate includes $500,000 for a suicide awareness campaign, $3.1 million (25 FTE at $124,000/year) to support suicide hotlines, $500,000 for provider training for approximately 200 clinicians, and $2.5 million (20 FTE at $124,000) to provide family support services.

**Potential Funding Mechanisms**

U.S. Department of Health and Human Services Substance Abuse and Mental Health Services Administration grants, Medicaid, nongovernment sources

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**Potential Implementer(s)**

Puerto Rico Department of Health, Puerto Rico Commission for the Implementation of Public Policy in the Prevention of Suicide

**Potential Pitfalls**

Ensuring the deployment and full implementation of EBP can take time. This will require having training materials that are culturally and linguistically appropriate for Puerto Rico. Additionally, increased screening has the potential to increase the number of people who are identified as needing care. There is a shortage of providers in Puerto Rico, so even if screening is effective for identifying individuals, access to care may still be an issue. For this reason, this COA would be most effective if executed with HSS 11, which is designed to address provider outmigration and health provider shortage areas.

**Likely Precursors**

Cooperation with media outlets to use appropriate language around discussions of suicide, providers who are ready and willing to train in appropriate care to address suicidality, and the hiring and training of additional staff for the suicide hotline are all necessary.
Sector(s) Impacted

Health and Social Services

Issue/Problem Being Solved

Elderly and child care homes across Puerto Rico were not adequately stocked with food supplies after Hurricane Maria. Facilities that maintained the required 7-day food supply but were not able to provide food after that point had to close, forcing residents and their families to find other lodging. This is particularly problematic as residents who have chronic or other health conditions living in these care homes are particularly vulnerable to complications that could arise from inadequate nutrition and external stressors. According to 2016 BRFSS data, the prevalence of diabetes in Puerto Rico is 15.3% and cardiovascular disease is 7.3%, which are considerably higher than the national medians of 10.5% and 4.1%, respectively.

Description

This COA requires a minimum 14-day food supply, ensures that food meets USDA/FNS nutritional requirement (e.g., reduces salty and sugary foods), and explores options for the provision of shelf-stable milk to include infant formula at child care homes (and also considers nonanimal milk alternatives such as soy, almond, rice, cashew, and coconut milk). In the event that the Department of the Family, WIC, or any other entity is in need of federal support to supplement commodities to support infants and young children, the federal government may consider acquiring post-disaster commodities from on-island vendors who regularly support WIC indirectly through the USDA. As part of the effort to establish the new stockpiling guidelines, the PRDOF also could investigate if/how retail emergency food supplies could be used. For example, some large wholesale retailers sell emergency food pallets that claim a shelf life of 25 years for the nonperishable items. A result of this investigation should be standards on what should be included in the local stockpile.

Policies that determine how social services are offered by the PRDOF are set by the Department Secretariat, thus, the initial action will take place there. Regional branches will be tasked with ensuring compliance at the local level. This will be carried out via the reporting protocol developed via the emergency operations and continuity of operations plans.

Revisions to the food stockpile would affect food availability immediately in the case of a disaster. Improved health outcomes resulting from more nutritious foods that are lower in salt and sugar will be longer term. Planning would occur at the central level, oversight and monitoring at the regional level, and implementation will occur at local facilities.
**Potential Benefits**

Residents of care facilities will benefit directly through increased availability of food postdisaster, as well as decreased salty and sugary foods.

**Potential Spillover Impacts to Other Sectors**

Improved health of the population living in residential care homes could lessen reliance on emergency room visits, in both disaster and nondisaster times. The burden of maintaining an expanded on-site food stockpile falls largely on facilities, which may already be resource constrained.

**Potential Costs**

- Potential upfront costs: N/A
- Potential recurring costs: N/A
- Potential total costs: N/A

No costs to the government of Puerto Rico unless it purchases the food supplies.

Facilities will need to have adequate storage space for a larger food stockpile, which could require new construction or reconfiguration of existing space.

Reconfiguration of the food supply chain will incur some upfront costs to facilities, as facility personnel determine how best to source different types of foods (if required to meet USDA/FNS nutrition standards).

**Potential Funding Mechanisms**

U.S. Department of Agriculture Commodity Assistance Program, Puerto Rico Department of Family

**Potential Implementer(s)**

Puerto Rico Department of Family, child- and elder-care facilities

**Potential Pitfalls**

A 14-day supply of food will be inherently reliant on shelf-stable foods, which are highly processed. Increasing dependence on these products could result in reliance on less nutritious foods that are higher in sugar and salt. This reliance could lead to different product sourcing arrangements that expand this practice outside of times of disaster. It is, therefore, imperative that policy revisions address both quantity and quality of the food stockpile and routine supply.

**Likely Precursors**

This COA should be considered in conjunction with HSS 25 (Establish a Collaborative Agreement between PRDOF and WIC for Infant Formula Storage and Distribution). Adequate onsite storage space, funds to purchase larger food stockpile, and a Memorandum of Understanding for backup suppliers are required.
HSS 30
Review and Improve Plans, Systems, and Processes for Tracking and Responding to Physical and Mental Health Needs of First Responders

Sector(s) Impacted

Health and Social Services

Issue/Problem Being Solved

First responders may not have access to adequate supports that attend to their own health and well-being during disaster response and recovery. Given the widespread damage caused by Hurricanes Irma and Maria, first responders were expected to perform emergency response activities, while also attending to losses that they might also have suffered.

Description

This COA focuses on ensuring that first responders, who are key in disaster response and recovery, have the appropriate supports to attend to health needs during disaster management activities, including the physical and emotional needs of the PRDOH employees during the recovery.¹

PRDOH, inclusive of counselors and supports to monitor health needs, should implement this in collaboration with FEMA to ensure accurate tracking of responder cohorts. This should be implemented across Puerto Rico, wherever first responders are working.

Implementation includes two components: (1) deployment of counselors and volunteers to provide monthly support services to first responders, and (2) a periodic (every 4 months for year 1; annually after) survey to assess responder health needs and management of health symptoms. Emergency Responder Health Monitoring and Surveillance can be used. There are several program models for addressing responder stress; as such, a review of the most culturally appropriate program for Puerto Rico, which is also evidence-based, is key element of this COA.

Benefits of implementing this COA should be seen relatively immediately, because monthly supports should mitigate immediate anxiety and stress symptoms associated with disaster response. But for those responders with more serious issues of trauma exposure, benefits will need to be evaluated over at least one year.

Potential Benefits

Programs to support the physical and mental health of first responders have lessened negative health impacts of the highly stressful circumstances of disaster response and recovery.\(^2\) By attending to responder needs early and often, supports will improve responder well-being and keep responders prepared to attend to the needs of others.\(^3\)

Potential Spillover Impacts to Other Sectors

This strategy has benefits to long-term disaster recovery because it ensures new health issues among responders are not added to the concerns of those immediately affected by disaster, thus effectively lessening the costs associated with long-term health services. Responders who are better able to manage the stress of disaster response personally should be able to serve the needs of residents across all service sectors (e.g., Infrastructure, Education, Economics) more effectively.

Potential Costs

- Potential upfront costs: $140,000 in estimated upfront costs
- Potential recurring costs: $18 million in estimated recurring costs (11 years)
- Potential total costs: $18 million in total estimated costs

The costs for responder health support programs include two elements: (1) counselor time (approximately 20 counselors, with average salary of $80,000, providing monthly support for responders, annually) or about $1.6 million total per year, and (2) setup of a survey that can be administered periodically with responders to track health symptoms over time (2 FTEs, with average salary of $70,000, to set up the survey upfront, or $140,000).

Potential Funding Mechanisms

- Community Development Block Grant—Disaster Recovery, U.S. Department of Health and Human Services, government of Puerto Rico, Puerto Rico Department of Health, nongovernment sources

Potential Implementer(s)

- Puerto Rico Department of Health, FEMA

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**Potential Pitfalls**

It is important to make services available, but in ways that reduce stigma for first responders who may feel uncomfortable seeking services for self-care.

**Likely Precursors**

Identify an accurate count of responders and/or the responder cohort who may be eligible; ensure that counseling is using EBP and is contextually and culturally appropriate.
HSS 31
Review and Improve Systems for Administration and Finance of Response-Related Activities

Sector(s) Impacted

Health and Social Services

Issue/Problem Being Solved

Hurricanes Irma and Maria forced a majority of the hospitals and clinics in Puerto Rico to close or offer reduced medical services. A complicating factor was that some clinics that were already experiencing financial distress were delayed (because of power or system failures and other challenges) in billing for services. This, in turn, delayed reimbursements, which affected their ability to provide patient care. There were also stakeholder reports of confusion about other regulations, including whether ambulances are permitted to transfer patients from facility to facility.

Description

The aftermath of the hurricanes provides an opportunity to review and address gaps and barriers in a range of regulations that affect medical and health responses to large-scale emergencies. This COA will review existing regulations related to medical response and, where indicated, will provide for temporary, disaster-related waivers, including but not limited to waivers to make patient transport easier, payment for health services to manage acute and chronic medical care needs, mortuary services (also in HSS 22), and agreements to share data among health care providers.\(^1\) It also will improve the capacity of the PRDOH and health care facilities, providers, and specialists to understand and implement the existing emergency health services. In doing so, the COA should build health care facility planning for financing emergency care services and maintaining cash flow over the long term.

This COA requires a review of the existing administrative and financial structures that can be implemented during and after a disaster to evaluate the extent to which they are responsive to the needs of impacted communities and health care systems as identified in experiences like Hurricane Maria. Ultimately this should be implemented across Puerto Rico by the health care system, but principally by ASES in collaboration with the Department of Health and Human Services and the CMS, specifically. These waivers would need to be implemented with attention

\(^1\) There were instances where the Puerto Rico Medicaid Managed Care plans had limited coverage, particularly for individuals who had relocated to CONUS. It is perhaps worth noting that such plans could consider an emergency expansion to match CONUS Medicaid Managed Care benefits.
to the applicable rules and restrictions, as well as include provider and payer training to the extent relevant. Processes need to be put into place to circumvent bureaucracy that can delay effective implementations of waivers so that patients and communities can receive the care they need in a timely manner. Evaluation of effective processes to implement waivers should be informed by a review of existing approaches across the United States (and in response to other disasters) and challenges faced by communities in implementing emergency waivers. The COA also provides for an awareness campaign to increase understanding of relevant regulations.

**Potential Benefits**

This COA ensures uninterrupted access to care postdisaster and protects patients and communities from adverse outcomes, which potentially saves costs in the long-term. If effectively implemented, likely benefits could be seen in 1 year and ideally in response to the next disaster or emergency.

**Potential Spillover Impacts to Other Sectors**

Revisions to regulations directly affecting health care could also have an impact on how other sectors (e.g., Transportation, Housing) are regulated.

**Potential Costs**

- Potential upfront costs: $250,000 in estimated upfront costs (2 years)
- Potential recurring costs: $7.9 million in estimated recurring costs (11 years)
- Potential total costs: $8.1 million in total estimated costs

Total upfront costs are estimated at $249,200 (over 2 years) and includes 2 FTEs at $124,600 (assuming 1 FTE = $62,300) to conduct negotiations with CMS and to coordinate the development and implementation of information campaigns for patients and providers to ensure awareness.

Annual costs are estimated at $750,000 and include $250,000 for marketing materials (e.g., brochures) and $500,000/year for TV/radio public service announcements.

**Potential Funding Mechanisms**

U.S. Department of Health and Human Services, government of Puerto Rico, nongovernment sources

**Potential Implementer(s)**

Administración de Seguros Salud de Puerto Rico (Puerto Rico Health Insurance Administration), U.S. Department of Health and Human Services, Centers for Medicare and Medicaid Services
**Potential Pitfalls**

Funding for existing federal and state programs may be exhausted earlier because of expedited spending or funds allocation. Safeguard measures need to be in place to ensure accurate and/or appropriate billing to prevent health care waste and fraud.

**Likely Precursors**

None
## Appendix B. Health and Social Services Sector COAs

<table>
<thead>
<tr>
<th>COA ID</th>
<th>COA Name</th>
<th>COA Short Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSS 1</td>
<td>Increase Use of Solar-Powered Generators and Solar Backup Power Source</td>
<td>This COA will create a program to promote solar-powered generators for residential properties to reduce air and noise pollution. Island-wide implementation will be done via subsidies for equipment purchases, as well as public education campaigns. To supplement portable solar generators, this COA also recommends that a portion of households have a backup system involving both a permanently installed solar panel array and a backup battery system.</td>
</tr>
<tr>
<td>HSS 2</td>
<td>Prevent Disease Through a Capacity-Building Healthy Housing Initiative: Targeting Mold, Lead, and Other Stressors</td>
<td>To prevent respiratory-related and other health exacerbations, this COA will build capacity for the identification and management of mold and other environmental stressors through an integrated healthy homes/housing and buildings initiative. This COA will focus on training (including certification) of different targeted actors for implementation, capacity-building mechanisms within agencies for enforcement across Puerto Rico, and promotion of NHLBI Expert Panel Report 3 guidelines for asthma management.</td>
</tr>
<tr>
<td>HSS 3</td>
<td>Implement Integrated Waste Management Program and Expand Programs to Increase Recycling Rates</td>
<td>This COA will create an integrated materials recovery and solid waste management program and increase recycling practices, and thus increase the proportion of waste that is diverted from landfills. This COA will produce a comprehensive cost analysis and create enforceable recycling and composting mandates and include public education.</td>
</tr>
<tr>
<td>HSS 4</td>
<td>Improve Surveillance of Waterborne Disease</td>
<td>This COA will strengthen the robustness of the surveillance system for waterborne disease by ensuring equipment is operational through QA/QC, developing communication tools, and establishing interagency partnerships.</td>
</tr>
<tr>
<td>HSS 5</td>
<td>Develop and Implement an Integrated Electronic Reporting System for Vital Records</td>
<td>This COA will develop and implement an electronic reporting system for vital events at the PRDR. An assessment of the current infrastructure and reporting process will inform the development and implementation. Training will be provided to staff across relevant agencies and facilities, including training on the proper reporting of disaster-related deaths to assist with future surveillance efforts. The PRDR Quality Office will establish and conduct a quality assurance program to strengthen methods and procedures and monitor the system for appropriate use across Puerto Rico.</td>
</tr>
<tr>
<td>HSS 6</td>
<td>Reduce Opportunities for Vector-Borne Diseases</td>
<td>This COA will support ongoing monitoring and engagement for mosquito control. It will establish additional innovative practices for mosquito control—for example, a pilot program using drones to detect breeding grounds and apply larvicide at abandoned properties. This pilot could be conducted in one municipality (though evaluation should be done to determine if aerial larvicide is effective before broader implementation) to determine if it could be implemented on an island-wide scale.</td>
</tr>
<tr>
<td>HSS 7</td>
<td>Reduce Gap in Medicaid/Medicare Reimbursement Rate</td>
<td>This COA will analyze the extent to which reimbursement rates can be raised within the existing authorities and the capabilities of the law to help address the financial viability of the health care system. This analysis will research methods currently used in CONUS for improving patient outcomes, reducing Medicaid costs, and increasing payments to providers. This analysis will specifically examine opportunities in the context of disaster recovery needs over the long term and future system robustness. Financial loss as well as provider retention issues are affected by reimbursement rates that are unable to keep up with cost of living and related economic conditions. This COA will review the impact of varying reimbursement rates on service provision, access to care, and provider retention.</td>
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<tr>
<td>COA ID</td>
<td>COA Name</td>
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<tr>
<td>HSS 8</td>
<td>Increase Public Health Laboratory Capacity</td>
<td>This COA will help boost PRDOH laboratory infrastructure with the latest diagnostic technologies and electronic data reporting capacity. It will also build and maintain a competent workforce for rapid response to emerging and public health threats, as well as for monitoring disease conditions that affect the health of all Puerto Ricans. This COA also will provide a laboratory network infrastructure (a laboratory and patient information management system) whereby data can be communicated and shared between health care facilities to access data in a timely manner for rapid response.</td>
</tr>
<tr>
<td>HSS 9</td>
<td>Increase Access to Telehealth Options as Telecommunication Supports Become More Robust</td>
<td>This COA will expand the use of telehealth across Puerto Rico and train the health care workforce in the use of telehealth technologies. This effort would use social media to screen and enroll more geographically isolated populations in mental health care services and use phone and online applications to target those with trauma-related mental illness.</td>
</tr>
<tr>
<td>HSS 10</td>
<td>Expand Care for Trauma and Chronic Stress</td>
<td>This COA will expand the networks available to provide relief for trauma, stress, and anxiety-related behavioral health issues. Building on the mental health (clinical) care network, this COA will empower faith-based organizations, schools, and nongovernmental organizations to better understand and support their constituents in managing postdisaster stressors in a culturally compatible way. These nontraditional providers will work with professionals for both training and guidance and will be located in nontraditional medical settings.</td>
</tr>
<tr>
<td>HSS 11</td>
<td>Add Incentives and Other Supports to Increase and Retain Supply of Health Care Providers and Public Health Practitioners</td>
<td>This COA will ensure that Puerto Rico has a robust and stable health care provider and public health practitioner workforce, not only to attend to disaster-related health issues but also over the long term. Given previous efforts to use incentives and other programs, continuous analysis of what works structurally and culturally would need to be considered.</td>
</tr>
<tr>
<td>HSS 12</td>
<td>Augment Community Health Centers and Elements for Primary Care and Chronic Disease Prevention and Management</td>
<td>This COA will strengthen Puerto Rico’s network of CHCs, such as clinical and diagnostic centers and Centros 330, and will augment supporting elements, such as ATVs and CHC mobile care clinics, particularly in places with sustained damage or in isolated areas. This COA will also explore how these centers could be supported to better advance chronic disease prevention and management.</td>
</tr>
<tr>
<td>HSS 13</td>
<td>Expand Practice Laws for Health Care Providers</td>
<td>This COA will increase the supply of licensed health care providers in Puerto Rico by (1) allowing NPs and PAs from other U.S. states and territories to provide care in Puerto Rico, which would increase the supply in the short term; (2) providing incentives to attract licensed NPs and PAs from other U.S. states and territories, which would bolster the supply in the medium term; and (3) establishing and expanding NP and PA degree programs in Puerto Rico, which would help to develop the workforce for the long term. This effort should include Sexual Assault Nurse Examiners who could deploy to the community with mobile care clinics. This staff would recollect forensic evidence and offer trauma-centered intervention to victims.</td>
</tr>
<tr>
<td>HSS 14</td>
<td>Develop a More Robust and Resilient Data System of Health Costs and Links to Health Outcomes</td>
<td>This COA will create supports for measuring health costs systematically, including merging claims data, hospital and other health center discharge data, and disease and health outcome information. This COA will solidify the robustness of data systems for health outcomes information, including related social and human service data, and ensure greater data digitization to facilitate analysis.</td>
</tr>
<tr>
<td>HSS 15</td>
<td>Advance Uptake of Evidence-Based Practices/Quality of Care for Mental Health</td>
<td>This COA will ensure greater uptake of evidence-based mental health practice in health care settings by (1) identifying gaps in EBP in Puerto Rico; (2) training providers in the use of relevant EBPs; and (3) monitoring how those practices are being applied.</td>
</tr>
<tr>
<td>HSS 16</td>
<td>Address Food Insecurity by Ensuring Flexible Nutrition Assistance Programs</td>
<td>This COA will transition Puerto Rico back to the SNAP to allow greater flexibility postdisaster and to provide greater benefit to participants.</td>
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<tr>
<td>COA ID</td>
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<tr>
<td>HSS 17</td>
<td>Ensure That There Are Nutrition Supports for Populations Disproportionally Affected by the Disaster</td>
<td>This COA will create long-term (e.g., three months or longer) waivers to NAP regulations that would be implemented by the U.S. Department of Agriculture FNS to allow greater flexibility in how program participants access food during a disaster. Waivers would be triggered on the declaration of a disaster.</td>
</tr>
<tr>
<td>HSS 18</td>
<td>Improve Programs to Prevent and Address Abuse of Children and Seniors After a Disaster</td>
<td>This COA will mount public education campaigns to raise awareness of child and senior abuse, and how to report it, and it would provide training to staff at integrated service centers and disaster shelters to detect and address abuse. This COA will also train local officials or other professionals with expertise in elder care and child care to provide this training to others and serve as liaisons with centers and shelters. In the short term, detection and reporting efforts could be included in a disaster case management system.</td>
</tr>
<tr>
<td>HSS 19</td>
<td>Create Flex-Funding for Social Service Centers</td>
<td>This COA will assess the social service center facility landscape to develop an inventory of critical facilities, and it will create a flexible funding mechanism to help critical facilities and technology-dependent children and elders who are being cared for at home bear the costs of long periods of generator use poststorm.</td>
</tr>
<tr>
<td>HSS 20</td>
<td>Improve Supports for Seniors, Particularly Those Living Alone</td>
<td>This COA will increase the resilience of seniors by providing supports during normal circumstances and targeted support post-disaster. Predisaster components include building on existing support systems for seniors to design predisaster response and recovery support plans to ensure that seniors, their families, and their communities have clear contingency plans for major disruptions to key lifelines. This will enable families, communities, and neighborhoods to provide direct aid to seniors who live alone and may face challenges in a disaster.</td>
</tr>
<tr>
<td>HSS 21</td>
<td>Improve Public Awareness of Proper Storage of Insulin Postdisaster</td>
<td>This COA will increase public knowledge about guidelines for storing insulin by training disaster shelter managers and health care providers to provide relevant information, conducting media campaigns, and sending text messages to patients. This COA will build on a current project in the recovery mission to identify appropriate messaging for the public education component.</td>
</tr>
<tr>
<td>HSS 22</td>
<td>Move to a More Regionally-Integrated Approach to Emergency Planning, Exercising, Response, and Recovery</td>
<td>This COA will develop resilient, regionalized, exercised health care systems and infrastructure to respond to disasters. This COA will create a disaster preparedness, response, and recovery network that will prepare hospitals and health care facilities to assist each other to surge during disasters. This COA includes hiring two people in each of the seven health regions to facilitate the regional planning and preparedness approach, including reviewing and improving plans for ensuring power, water, oxygen, and other critical supplies post-incident.</td>
</tr>
<tr>
<td>HSS 23</td>
<td>Review and Improve Systems and Processes for Managing Volunteers and Donated Supplies</td>
<td>This COA will strengthen systems for volunteer management and coordination, and it will implement systems to better track donations, including inventorying of supplies and other assets. This COA has a particular focus on health and social service volunteers and health care supplies.</td>
</tr>
<tr>
<td>HSS 24</td>
<td>Increase the Child Welfare Investigative Workforce</td>
<td>This COA will increase funding to PRDOF to hire additional child welfare investigators to manage existing caseloads of child maltreatment.</td>
</tr>
<tr>
<td>HSS 25</td>
<td>Establish a Collaborative Agreement Between PRDOF and WIC for Infant Formula Storage and Distribution</td>
<td>This COA will establish a collaborative agreement between WIC and PRDOF to arrange appropriate climate-controlled storage, handling, and distribution of milk formulas for WIC participants who are also NAP beneficiaries. This agreement will ensure that supplies are properly stored and strategically located around Puerto Rico to ensure adequate availability for all communities.</td>
</tr>
<tr>
<td>HSS 26</td>
<td>Review and Improve Systems for Stockpiling and Distributing Supplies and Pharmaceuticals Postdisaster</td>
<td>This COA will designate approximately ten key health care facilities as Health Care Disaster Resource Centers that would be equipped with extra supplies needed during a disaster.</td>
</tr>
<tr>
<td>HSS 27</td>
<td>Improve Current</td>
<td>This COA will improve the current epidemiological surveillance system, which</td>
</tr>
<tr>
<td>COA ID</td>
<td>COA Name</td>
<td>COA Short Description</td>
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<tr>
<td></td>
<td>Epidemiological Surveillance to Better Respond to Natural and Man-Made Disasters</td>
<td>will increase Puerto Rico’s capacity to monitor short- and long-term adverse health effects. The improved surveillance capacity also will strengthen emergency response capacity for any future disasters.</td>
</tr>
<tr>
<td>HSS 28</td>
<td>Support the Development of a Suicide Prevention Campaign</td>
<td>This COA will initiate a six-part suicide prevention campaign that includes (1) promoting wellness and self-care through a public awareness campaign (this campaign will include both earned media and paid media and will be deployed with a focused message on safety and well-being, with positive narratives in the form of actions, solutions, successes and resources, and does not include any references in pictures or words to modes of suicide); (2) identifying people who are at risk of suicide; (3) identifying and addressing barriers to appropriate care for suicidality; (4) providing appropriate care procedures (both acutely on the suicide hotline and in emergency rooms and long-term care) for responding to suicide; and (5) addressing environmental factors associated with suicide. This will build off the previous work from Puerto Rico’s Commission for the Implementation of Public Policy in the Prevention of Suicide, which included a public awareness campaign, increased coordination and planning between agencies, and conducted surveillance research and training workshops.</td>
</tr>
<tr>
<td>HSS 29</td>
<td>Revise Regulations on Food Stockpiling at Child- and Elder-Care Facilities</td>
<td>This COA will change current policy to require a minimum fourteen-day, healthy, shelf-stable food supply at all licensed facilities, and it will provide guidance on stockpile content.</td>
</tr>
<tr>
<td>HSS 30</td>
<td>Review and Improve Plans, Systems, and Processes for Tracking and Responding to Physical and Mental Health Needs of First Responders</td>
<td>This COA will ensure that first responders, who are key in disaster response and recovery, have the appropriate supports to attend to health needs during disaster management activities. This includes the physical and emotional needs of PRDOH employees during the recovery.</td>
</tr>
<tr>
<td>HSS 31</td>
<td>Review and Improve Systems for Administration and Finance of Response-Related Activities</td>
<td>The aftermath of the storm provides an opportunity to review and address gaps and barriers in a range of regulations that affect medical and health responses to large-scale emergencies. This COA will review existing regulations related to medical response and, where indicated, implement temporary waivers for a range of emergency health service needs, including, but not limited to, authorization, payment deadlines, prescription coverage, enrollment, and mortuary services. This COA will also initiate awareness campaigns to increase understanding of relevant regulations, and it will improve the capacity of the PRDOH and health care facilities, providers, and specialists to understand and implement the existing emergency health services.</td>
</tr>
</tbody>
</table>
Appendix C. COAs from Other Sectors Included in the Health and Social Services Portfolio
<table>
<thead>
<tr>
<th>COA ID</th>
<th>COA Name</th>
<th>COA Short Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIT 16</td>
<td>Government Digital Reform Planning and Capacity Building</td>
<td>Create a roadmap for digital transformation and determine priorities, assess needs, costs, and feasibility for a government-wide digital transformation strategy.</td>
</tr>
<tr>
<td>CIT 17</td>
<td>Puerto Rico Data Center</td>
<td>Establish a robust, disaster-proof, scalable, and cloud-enabled data center for governmental information systems that expands the capacity to perform essential governmental functions and deliver essential services.</td>
</tr>
<tr>
<td>CIT 18</td>
<td>Data Store and Data Exchange Standards for Critical Infrastructure</td>
<td>Create an online data store and data exchange standards for up-to-date, cross-sector data about critical infrastructure (government and private sector) using an open, modular, and standards-based approach for information exchange, interoperability, and storage.</td>
</tr>
<tr>
<td>CIT 19</td>
<td>Municipal Hotspots</td>
<td>Provide government-sponsored Wi-Fi in town centers and public buildings to address the digital disparity and provide a priority connection point after a disaster for reaching a large number of residents in one place. Maximize public access to government-sponsored Wi-Fi from the main centers of public life, including municipal buildings, parks, and town squares across Puerto Rico.</td>
</tr>
<tr>
<td>CIT 22</td>
<td>Use Federal Programs to Spur Deployment of Broadband Internet Island-Wide</td>
<td>Work with the Federal Communications Commission (FCC), U.S. Department of Housing and Urban Development, other federal agencies, and government of Puerto Rico agencies to streamline and expedite applications and approvals for schools, libraries, and clinics to receive funding for broadband services through FCC’s E-rate program, supplemented by other federal programs. Work with the FCC, federal agencies, and government of Puerto Rico agencies to leverage these programs.</td>
</tr>
<tr>
<td>CIT 23</td>
<td>Data Collection and Standardization for Disaster Preparedness and Emergency Response</td>
<td>Support expansion and ongoing development of status.pr website, with data-sharing protocol and in partnership with private sector, to enable ongoing situational awareness.</td>
</tr>
<tr>
<td>CIT 25</td>
<td>Evaluate and Implement Alternative Methods to Deploy Broadband Internet Service Throughout Puerto Rico</td>
<td>Create a comprehensive plan for deploying broadband internet throughout Puerto Rico by leveraging existing fiber rings and assessing the availability of existing federal programs, in particular those of the FCC.</td>
</tr>
<tr>
<td>CIT 29</td>
<td>Health Care Connectivity to Strengthen Resilience and Disaster Preparedness</td>
<td>Provide robust, resilient, multimodal connectivity to the 86 community clinics across Puerto Rico using satellite, low-power radio, and line-of-site technologies to complement fiber and cell systems and allow clinics to share bandwidth to support other recovery activities.</td>
</tr>
<tr>
<td>CIT 3</td>
<td>Upgrade and Enhance 911 Service</td>
<td>Upgrade the current 911 network to an Emergency Services IP Network, implement Next Gen 911, consolidate dispatch at the public safety answering points, and coordinate with government of Puerto Rico agencies in the housing sector for the adoption of E911 address conversion of rural route addresses.</td>
</tr>
<tr>
<td>CIT 30</td>
<td>Resiliency Innovation Network Leading to Development of a Resiliency Industry</td>
<td>Create a Resiliency Innovation Network to build on existing Puerto Rico Science, Technology, &amp; Research Trust and university facilities to develop, teach, test, and refine resiliency products and services.</td>
</tr>
<tr>
<td>CIT 32</td>
<td>Digital Citizen Services</td>
<td>Expand the scope of Puerto Rico Innovation and Technology Service to include a focus on citizen-centered services and prioritizing a “one-stop shop” experience for accessing government services and information in an easy-to-use fashion.</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>Details</td>
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</tr>
<tr>
<td>CIT 33</td>
<td>Government Digital Process Reform</td>
<td>Establish people-centered digital design and data science teams within the government of Puerto Rico to tackle cross-cutting policy and operational challenges and coordinate government agencies.</td>
</tr>
<tr>
<td>CIT 4</td>
<td>Rural Area Network Task Force</td>
<td>Establish a task force to develop communications networks and information systems in rural or disconnected areas, particularly for seniors, individuals with mobility disabilities, and caregivers, for use in emergencies.</td>
</tr>
<tr>
<td>CPCB 10</td>
<td>Incentivize Resilient, Creative Design Solutions for Addressing Hazards</td>
<td>Fund a design competition that fosters innovative solutions for risk reduction—specifically aimed at mitigating hazards, including (but not limited to) hurricanes and flooding—while also offering added social or economic benefits to the community.</td>
</tr>
<tr>
<td>CPCB 15</td>
<td>Strengthen Local Nonprofit and NGO Involvement in Disaster Recovery</td>
<td>Establish a unit within Puerto Rico’s Office for the Socioeconomic and Community Development to strengthen the engagement of local nonprofits and NGOs with government agencies and maximize their contributions as partners in the recovery process.</td>
</tr>
<tr>
<td>CPCB 2</td>
<td>Capacity Building for Community-Level Preparedness and Response</td>
<td>Develop and implement community-level response and recovery preparedness activities for priority communities that face particularly high risks during disasters. Recruit, train, and equip Community Emergency Response Teams so that these communities can better sustain themselves during the disaster-response period when emergency responders and access to the communities will be limited. Work with community leaders and community-based organizations to establish community-specific approaches for checking on people with access and functional needs.</td>
</tr>
<tr>
<td>CPCB 3</td>
<td>Capacity Building to Incorporate Hazard Risk Reduction into Planning and Design</td>
<td>Strengthen hazard mitigation assessment, monitoring, and evaluation capabilities within the Puerto Rico Planning Board so that the board can promote the incorporation of risk reduction in all planning and design decisions. This action includes (1) enhancing geographic information system capabilities to generate hazard maps for each municipality to inform zoning decisions and improve municipal hazard mitigation planning capacity, and (2) hiring a risk officer for each of the 27 state-level agencies.</td>
</tr>
<tr>
<td>CPCB 4</td>
<td>Resilience Building in Collaboration with High-Risk Communities</td>
<td>Develop and implement disaster resilience plans in collaboration with 50–100 selected communities. This action includes (1) investments into programs (e.g., workforce development, microfinance, education) that address long-term stressors as well as the improvement of essential services; and (2) resilience-building events for community residents and local businesses, including fostering connections among governmental agencies, community groups, and NGOs.</td>
</tr>
<tr>
<td>CPCB 6</td>
<td>Public Information and Communication Capability for Coordinated Recovery</td>
<td>Build a Public Information and Communication capability to maintain engagement with communities that are recovering and to support local engagement with recovery planning. Establish and maintain methods of two-way communication with residents about recovery planning and implementation. Establish effective communication with Puerto Rican communities in CONUS to better understand whether and when people decide to return to Puerto Rico for recovery planning purposes.</td>
</tr>
<tr>
<td>CPCB 7</td>
<td>Capacity Building for Emergency Shelter Planning</td>
<td>Conduct an assessment and develop a shelter plan that includes a comprehensive and strategic approach to sheltering island-wide. Hire planners in each municipality and at the state-level to build a robust emergency shelter system. Develop parameters, standards, and design guidelines for shelters to support residents over the longer term. Establish a protocol in coordination with the National Guard to support the efforts of local and state-level agencies for management of response commodities for shelters.</td>
</tr>
<tr>
<td>ED 1</td>
<td>Create New—and Enhance Existing—After-School and Summer Learning Opportunities</td>
<td>Expand existing and implement new summer and after-school learning programs—including academic, vocational education, health, nutrition, and mental health services—to address posthurricane learning loss, ensure access to the full range of educational opportunities, and provide consistency to meal programs.</td>
</tr>
<tr>
<td>ED 3</td>
<td>Landscape Analysis of Early Childhood Interventions and Care Opportunities</td>
<td>Determine the demographics of children 0–5 years of age (and their families), the current supply of interventions and care settings, and the cost of—and possible funding streams for—providing high-quality care to all children in Puerto Rico.</td>
</tr>
<tr>
<td>ED 7</td>
<td>Augment Tele-Education/Online Education</td>
<td>Provide “emergency instruction” in the event of a school closure of more than two weeks. This action includes building an online repository of free and open educational resources, available in English and Spanish and appropriate for various subject areas, grade levels (K–12), and technology platforms.</td>
</tr>
<tr>
<td>ENR 11</td>
<td>Design and Deploy Technologies to Improve Real-Time Information and Grid Control</td>
<td>Install a distributed energy resource management system and advanced metering infrastructure. Improve grid control and communication systems to stay online during major disturbances and support rapid recovery. Improve the monitoring and analytic capabilities of the energy management system and the supervisory control and data acquisition system for real-time operations and security assessments. Develop control system strategies to maintain adequate operational security margins and system stability under major events and significant system perturbations.</td>
</tr>
<tr>
<td>ENR 14</td>
<td>Design and Build Grid Assets to Meet Current and Future Demand</td>
<td>Design and build generation, transmission, and distribution assets to meet current and future demand projections, including right-sizing and relocation as required. This action complements current efforts by the Puerto Rico Electric Power Authority that include updating and strengthening analytical tools, especially for dynamic system monitoring.</td>
</tr>
<tr>
<td>ENR 2</td>
<td>Design, Build, and Maintain “Islandable” Portions of the Electrical Grid</td>
<td>Design and create an “islandable” or sectionalized grid that can balance generation and load to continue delivering locally generated electricity if sections of the transmission grid fail. Determine an optimal design of the system architecture through modeling and analysis. Strategically install, test, and maintain microgrids with an adequate inventory of replacement assets.</td>
</tr>
<tr>
<td>ENR 5</td>
<td>Harden Grid Assets to Support Critical Infrastructure</td>
<td>Prioritize the hardening of electricity and distribution assets. Design assets that enable rapid response time for electricity to support other critical infrastructure.</td>
</tr>
<tr>
<td>HOU 4</td>
<td>Make Owner-Occupied Homes More Resilient (Less Vulnerable to Natural Hazards)</td>
<td>Provide funding to perform mitigation work on homes not directly damaged by Hurricanes Maria or Irma but at increased risk of future damage from weather, climate, or other natural disasters.</td>
</tr>
<tr>
<td>HOU 5</td>
<td>Collect, Integrate, and Map Housing Sector Data</td>
<td>Conduct research, data analysis, planning, and integrated mapping of housing data through creation of an integrated database.</td>
</tr>
<tr>
<td>NCR 10</td>
<td>Clean Up and Eliminate Use of Unpermitted, Unregistered Dumps</td>
<td>Identify, sort, and recycle or dispose of waste at approximately 1,600–2,000 unpermitted, unregistered dumps throughout Puerto Rico and identify steps to prevent future use of such dumps.</td>
</tr>
<tr>
<td>NCR 15</td>
<td>Coral Reef and Seagrass Protection and Restoration</td>
<td>Restore damaged coral reef and seagrass sites in priority areas to protect coastal communities, human health and safety, biodiversity, ecological function, and economic activity.</td>
</tr>
<tr>
<td>NCR 16</td>
<td>Wetlands Restoration</td>
<td>Restore the capacity, resiliency, and ecological function of ten priority coastal wetlands through site-specific actions. Coordinate with other land-use activities such as stormwater management and port construction.</td>
</tr>
<tr>
<td>NCR 17</td>
<td>Reduce Coastal Erosion and Provide Disaster Protection Through Beaches and Dunes</td>
<td>Restore, monitor, and maintain beaches and sand dunes to make them stable and resilient to both seasonal- and disaster-related coastal flooding as well as long-term sea-level rise.</td>
</tr>
<tr>
<td>NCR 18</td>
<td>Establish the San Juan Barrier Reef System as a Marine Protected Area</td>
<td>Declare the San Juan Barrier Reef a Commonwealth of Puerto Rico Marine Protected Area, restrict fishing to support sustainable commercial and recreational fisheries, and invest in the reef’s restoration and long-term health.</td>
</tr>
<tr>
<td>NCR 2</td>
<td>Arts Recovery</td>
<td>Implement an integrated strategy to help artists and arts organizations recover while supporting Puerto Rico’s economic and emotional recovery. Options include recovery grants, workspaces, global arts exchange programs, preparedness and recovery training, an arts tourism service sector, and arts outreach to facilitate community recovery.</td>
</tr>
<tr>
<td>NCR 20</td>
<td>Redesign, Reorganize, and Rebuild Puerto Rican Parks</td>
<td>Conduct assessments to help the Puerto Rican parks system improve governance/operations efficiency, align park amenities to community needs, and reengineer parks to serve as stormwater infrastructure. Rebuild parks in compliance with building codes for hurricane-prone areas to be consistent with assessment findings.</td>
</tr>
<tr>
<td>NCR 26</td>
<td>Resource Management Capacity Building</td>
<td>Apply an updated framework for resource management and future disaster response that includes training support, data sharing, and educational outreach to enhance resilience in future disasters.</td>
</tr>
<tr>
<td>NCR 29</td>
<td>Enhance Public Participation and Education Through Museum Exhibits</td>
<td>Design and install in-depth, participatory exhibits at museums, such as the Parque de las Ciencias, that describe how different aspects of the natural and cultural resource recovery plans work and their benefits and drawbacks.</td>
</tr>
<tr>
<td>NCR 5</td>
<td>Forest Recovery in Rural Protected Areas, Private Forests, Critical Watersheds, and Urban Areas</td>
<td>Develop and implement strategic forest recovery and conservation strategies throughout Puerto Rico through public and private collaborations. Strategies should be developed with a focus on rural protected forests, ecological corridors, private forested lands, agroforestry, and urban forests. Restore tree nurseries and seed banks to aid in the recovery process.</td>
</tr>
<tr>
<td>NCR 7</td>
<td>Develop Partner Networks for Recovering Plant and Animal Species</td>
<td>Develop a comprehensive network of partners to work together to help fund actions for plant and animal species preservation, develop human capital and capacity in species management, educate the public, and cultivate experiential/tourism opportunities.</td>
</tr>
<tr>
<td>PBD 7</td>
<td>Refurbish Community Centers and Community Technology Centers</td>
<td>Rebuild or refurbish 300 community centers in low-income communities and 172 community technology centers and provide them with generators for backup power; rebuild all centers to withstand hurricanes and earthquakes.</td>
</tr>
<tr>
<td>TXN 1</td>
<td>Refine and Enforce Design Standards for Roads and Bridges</td>
<td>Collect and refine guidance on road design (e.g., “Complete Streets” policies that address needs of all road users, including pedestrians and bicyclists), develop a set of engineering standards that promote innovative and resilient features, and ensure that roads meet these standards.</td>
</tr>
<tr>
<td>TXN 8</td>
<td>Improve Bus Service</td>
<td>Improve existing bus service by giving priority to buses at intersections, providing real-time arrival information, upgrading bus stops, updating the payment system to use smart cards, adding dedicated bus lanes to some roads, and expanding the bus fleet.</td>
</tr>
<tr>
<td>WTR 23</td>
<td>Evaluate, Repair, and Improve Flood Control Infrastructure</td>
<td>Evaluate, repair, and improve the performance and resilience of flood control infrastructure, including dams, levees, channels, and water control structures, to safely manage 100-year floods events.</td>
</tr>
</tbody>
</table>
## Appendix D. Health and Social Services Portfolios

### Portfolio 1: Increase Flexibility in Service Access for Vulnerable Populations

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>HSS 16</td>
<td>Address Food Insecurity by Ensuring Flexible Nutrition Assistance Programs</td>
</tr>
<tr>
<td>HSS 17</td>
<td>Ensure That There Are Nutrition Supports for Populations Disproportionally Affected by the Disaster</td>
</tr>
<tr>
<td>HSS 18</td>
<td>Improve Programs to Prevent and Address Abuse of Children and Seniors After a Disaster</td>
</tr>
<tr>
<td>HSS 19</td>
<td>Create Flex-Funding for Social Service Centers</td>
</tr>
<tr>
<td>HSS 21</td>
<td>Improve Public Awareness of Proper Storage of Insulin Post-Disaster</td>
</tr>
<tr>
<td>HSS 24</td>
<td>Increase the Child Welfare Investigative Workforce</td>
</tr>
<tr>
<td>HSS 25</td>
<td>Establish a Collaborative Agreement between PRDOF and WIC for Infant Formula Storage and Distribution</td>
</tr>
<tr>
<td>HSS 26</td>
<td>Review and Improve Systems for Stockpiling and Distributing Supplies and Pharmaceuticals Post-Disaster</td>
</tr>
<tr>
<td>HSS 29</td>
<td>Revise Regulations on Food Stockpiling at Child- and Elder-Care Facilities</td>
</tr>
<tr>
<td>CPCB 4</td>
<td>Resilience Building in Collaboration with High-Risk Communities</td>
</tr>
<tr>
<td>CPCB 7</td>
<td>Capacity Building for Emergency Shelter Planning</td>
</tr>
<tr>
<td>CPCB 15</td>
<td>Strengthen Local Nonprofit and NGO Involvement in Disaster Recovery</td>
</tr>
<tr>
<td>CIT 3</td>
<td>Upgrade and Enhance 911 Service</td>
</tr>
<tr>
<td>CIT 26</td>
<td>Wi-Fi Hotspots in Public Housing and “Digital Stewards” Program</td>
</tr>
</tbody>
</table>

### Portfolio 2: Strengthen and Expand Workforce for Health and Social Services

<table>
<thead>
<tr>
<th>Portfolio</th>
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</thead>
<tbody>
<tr>
<td>HSS 7</td>
<td>Reduce Gap in Medicaid/Medicare Reimbursement Rate</td>
</tr>
<tr>
<td>HSS 9</td>
<td>Increase Access to Telehealth Options as Telecommunication Supports Become More Robust</td>
</tr>
<tr>
<td>HSS 10</td>
<td>Expand Care for Trauma and Chronic Stress</td>
</tr>
<tr>
<td>HSS 11</td>
<td>Add Incentives and Other Supports to Increase and Retain Supply of Health Care Providers and Public Health Practitioners</td>
</tr>
<tr>
<td>HSS 12</td>
<td>Augment Community Health Centers and Elements for Primary Care and Chronic Disease Prevention and Management</td>
</tr>
<tr>
<td>HSS 13</td>
<td>Expand Practice Laws for Health Care Providers</td>
</tr>
<tr>
<td>HSS 15</td>
<td>Advance Uptake of Evidence-Based Practices/Quality of Care for Mental Health</td>
</tr>
<tr>
<td>HSS 22</td>
<td>Move to a More Regionally Integrated Approach to Emergency Planning, Exercising, Response, and Recovery</td>
</tr>
<tr>
<td>HSS 23</td>
<td>Review and Improve Systems and Processes for Managing Volunteers and Donated Supplies</td>
</tr>
<tr>
<td>HSS 30</td>
<td>Review and Improve Plans, Systems, and Processes for Tracking and Responding to Physical and Mental Health Needs of First Responders</td>
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<td>HSS 31</td>
<td>Review and Improve Systems for Administration and Finance of Response-Related Activities</td>
</tr>
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<td>CIT 4</td>
<td>Rural Area Network Task Force</td>
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<td>CIT 22</td>
<td>Use Federal Programs to Spur Deployment of Broadband Internet Island-Wide</td>
</tr>
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<td>CIT 25</td>
<td>Evaluate and Implement Alternative Methods to Deploy Broadband Internet Service Throughout Puerto Rico</td>
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<td>CIT 29</td>
<td>Health Care Connectivity to Strengthen Resilience and Disaster Preparedness</td>
</tr>
<tr>
<td>ED 7</td>
<td>Augment Tele-Education/Online Education</td>
</tr>
<tr>
<td>MUN 14</td>
<td>Provide Technical Assistance to Repopulate Urban Centers</td>
</tr>
</tbody>
</table>
### Portfolio 3: Improve Consistent Data Quality Monitoring and Data Infrastructure

<table>
<thead>
<tr>
<th>Project Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>HSS 14</td>
<td>Develop a More Robust and Resilient Data System of Health Costs and Links to Health Outcomes</td>
</tr>
<tr>
<td>HSS 23</td>
<td>Review and Improve Systems and Processes for Managing Volunteers and Donated Supplies</td>
</tr>
<tr>
<td>CIT 27</td>
<td>Study Feasibility of Digital Identity</td>
</tr>
<tr>
<td>CIT 35</td>
<td>Government Digital Process Reform</td>
</tr>
<tr>
<td>CIT 36</td>
<td>Data Collection and Standardization for Disaster Preparedness and Emergency Response</td>
</tr>
<tr>
<td>CIT 19</td>
<td>Municipal Hotspots</td>
</tr>
<tr>
<td>CIT 37</td>
<td>Consolidated Government Information Systems</td>
</tr>
<tr>
<td>CIT 17</td>
<td>Puerto Rico Data Center</td>
</tr>
<tr>
<td>CIT 18</td>
<td>Data Store and Data Exchange Standards for Critical Infrastructure</td>
</tr>
<tr>
<td>CPCB 16</td>
<td>Establishing a University-Based Center of Excellence for Disaster Preparedness and Recovery</td>
</tr>
<tr>
<td>CPCB 1</td>
<td>Disaster Preparedness Data Analysis and Decision Support Capability</td>
</tr>
<tr>
<td>ED 2</td>
<td>Improve Longitudinal Data System to Support Evidence-Based Policy</td>
</tr>
<tr>
<td>HOU 5</td>
<td>Collect, Integrate, and Map Housing Sector Data</td>
</tr>
<tr>
<td>MUN 10</td>
<td>Provide Technical Assistance to Improve Municipal Finances by Generating Additional Revenues, Reducing Costs, and Balancing Budgets</td>
</tr>
</tbody>
</table>

### Portfolio 4: Build System Supports for Health-Promoting Communities

<table>
<thead>
<tr>
<th>Project Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>HSS 1</td>
<td>Increase Use of Solar-Powered Generators and Solar Backup Power Source</td>
</tr>
<tr>
<td>HSS 2</td>
<td>Prevent Disease Through a Capacity-Building Healthy Housing Initiative: Targeting Mold, Lead, and Other Stressors</td>
</tr>
<tr>
<td>HSS 4</td>
<td>Improve Surveillance of Waterborne Disease</td>
</tr>
<tr>
<td>HSS 6</td>
<td>Reduce Opportunities for Vector-Borne Diseases</td>
</tr>
</tbody>
</table>

### Portfolio 5: Build Robust and Healthy Communities

<table>
<thead>
<tr>
<th>Project Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>HSS 1</td>
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<td>HSS 7</td>
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</tr>
<tr>
<td>HSS 11</td>
<td>Add Incentives and Other Supports to Increase and Retain Supply of Health Care Providers and Public Health Practitioners</td>
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<tr>
<td>HSS 12</td>
<td>Augment Community Health Centers and Elements for Primary Care and Chronic Disease Prevention and Management</td>
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<td>HSS 13</td>
<td>Expand Practice Laws for Health Care Providers</td>
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<td>HSS 14</td>
<td>Develop a More Robust and Resilient Data System of Health Costs and Links to Health Outcomes</td>
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<tr>
<td>HSS 15</td>
<td>Advance Uptake of Evidence-Based Practices/Quality of Care for Mental Health</td>
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<tr>
<td>HSS 16</td>
<td>Address Food Insecurity by Ensuring Flexible Nutrition Assistance Programs</td>
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<tr>
<td>HSS 17</td>
<td>Ensure That There Are Nutrition Supports for Populations Disproportionally Affected by the Disaster</td>
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<tr>
<td>HSS 18</td>
<td>Improve Programs to Prevent and Address Abuse of Children and Seniors After a Disaster</td>
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<tr>
<td>HSS 19</td>
<td>Create Flex-Funding for Social Service Centers</td>
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<tr>
<td>HSS 20</td>
<td>Improve Supports for Seniors, Particularly Those Living Alone</td>
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<tr>
<td>HSS 21</td>
<td>Improve Public Awareness of Proper Storage of Insulin Post-Disaster</td>
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<tr>
<td>HSS 22</td>
<td>Move to a More Regionally Integrated Approach to Emergency Planning, Exercising, Response, and Recovery</td>
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<tr>
<td>HSS 23</td>
<td>Review and Improve Systems and Processes for Managing Volunteers and Donated Supplies</td>
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<td>HSS 26</td>
<td>Review and Improve Systems for Stockpiling and Distributing Supplies and Pharmaceuticals Post-Disaster</td>
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<tr>
<td>HSS 29</td>
<td>Revise Regulations on Food Stockpiling at Child- and Elder-Care Facilities</td>
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<tr>
<td>HSS 30</td>
<td>Review and Improve Plans, Systems, and Processes for Tracking and Responding to Physical and Mental Health Needs of First Responders</td>
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<td>HSS 31</td>
<td>Review and Improve Systems for Administration and Finance of Response-Related Activities</td>
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<tr>
<th><strong>COAs Developed After Review of Initial Portfolios</strong></th>
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<tr>
<td>HSS 5</td>
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<td>HSS 8</td>
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<td>HSS 27</td>
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<td>HSS 28</td>
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Appendix E. Plan Development

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n September 2017, Puerto Rico was struck by two major hurricanes—Irma and Maria—that intensified existing challenges in Puerto Rico’s Health and Social Services (HSS) infrastructure. In the aftermath, the government of Puerto Rico created a long-term recovery plan built on an evidence-based assessment of the damage from the hurricanes and the on-going needs across Puerto Rico. Development of the recovery plan was supported by the Federal Emergency Management Agency, other federal agencies, local stakeholders, and analysis from the Homeland Security Operational Analysis Center (HSOAC), operated by RAND Corporation under contract with the U.S. Department of Homeland Security.

HSOAC research provided the foundation for the 31 courses of action in the recovery plan addressing the health and social services sector. These actions are a mix of social, governmental, fiscal, and economic policies and reforms. This collection of actions presents an opportunity to build a more resilient health and social services infrastructure and regional health care networks to ensure reliable access to services, promote health and well-being, and more efficiently and effectively respond to public health crises and future disasters. The actions span the areas of health care, public health and emergency preparedness, environmental health, mental and behavioral health, and social services.

The damage and needs assessment and courses of actions cover four major themes: building systems capacity to respond both during disasters and routine times; strengthening the Health and Social Services workforce; strengthening support services for at-need populations; and creating health-promoting communities.