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EMERGENCY EVACUATION AND SHELTERING DURING THE COVID-19 PANDEMIC

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SEAN is interested in your feedback. Was this rapid expert consultation useful? For further inquiries regarding this rapid expert consultation or to send comments, contact sean@nas.edu or (202) 334-3440.

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EXECUTIVE SUMMARY

Fundamental shifts in preparedness planning are needed to ensure health, safety, and smooth operations during emergencies in the context of the COVID-19 pandemic. This rapid expert consultation details what is known from research on evacuation behavior, social responses to disaster, and risk communication, as well as lessons learned from emergency managers, public health departments, local officials, and human service providers, as the second year of the pandemic unfolds. It includes strategies for (1) evacuation plans, (2) sheltering operations, and (3) risk communication best practices for public officials confronting hazards and disasters.

Evacuation planning that includes identifying logistical needs and understanding the processes that drive evacuation behavior is vital to preparing for extreme events that may require mass mobilization during the pandemic **(Box 1)**. To prepare for emergency events requiring evacuation, it is necessary to revise shelter planning and mass care operations, shelter staffing, and shelter design and operations with a focus on reducing virus transmission and ensuring safety **(Box 2)**. Developing effective public messaging is also critical during the pandemic and requires advance planning and familiarity with the needs and characteristics of the communities being served **(Box 3).**

BOX 1
Strategies for Evacuation Planning during the COVID-19 Pandemic

1. Assess Population Vulnerability
2. Address Access and Functional Needs
3. Reassess Existing Transportation Agreements
4. Incorporate Public Health Best Practices into Existing Transportation Plans
5. Address Private Vehicle Usage
6. Reduce Shadow Evacuation
7. Address Virus Transmission Concerns in Evacuation Guidance and Integrate Public Health Guidance into Evacuation Outreach
8. Account for Delayed Decision-Making and Evacuation Processes

BOX 2
Strategies for Sheltering and Mass Care Operations during the COVID-19 Pandemic

1. Enhance Shelter Capacity in Socially Vulnerable Communities
2. Reduce Reliance on Large Congregate Shelters and Update Shelter Designs
3. Incorporate Safety Measures in Shelter Design and Operations
4. Seek New Sources of Personnel and Modify Training Plans
5. Collaborate with Local Partners

BOX 3
Strategies for Evacuation and Sheltering Risk Communication during the COVID-19 Pandemic

1. Begin by Addressing Concerns Most Common in the Population
2. Tailor Message Framing to the Needs of Specific Audiences
3. Use Accessible Communication Formats
4. Provide Actionable Guidance with Implementation Steps
5. Use Trusted Messengers
6. Account for Information-Seeking Behavior
7. Maximize Advance Warning

INTRODUCTION

This rapid expert consultation aims to help emergency planners and other decision makers identify strategies for updating evacuation plans, sheltering operations, and risk communication practices to prepare for hazards and disasters that may occur during the COVID-19 pandemic and during future large-scale public health threats.[1] Most communities already have disaster preparedness plans and designated emergency planners; however, concerns about transmission of the SARS-CoV-2 virus have required significant modifications to traditional approaches for managing hazard threats. Even as vaccination programs unfold, the slow pace and limited scope of vaccination will continue to necessitate changes to emergency evacuation and sheltering operations throughout 2021 and potentially beyond.

With resources strained across government entities by the ongoing response to the pandemic, it is essential for local, state, and federal agencies typically responsible for conducting or supporting emergency evacuation, sheltering, and risk communication operations to coordinate so higher levels of government can provide assistance when the resources of lower levels of government are exceeded. For instance, county-level emergency managers may require greater support than usual from state governments to help mobilize and deploy resources, coordinate public messaging, or facilitate regional shelter planning based on internal virus transmission rates. Agencies also need to strengthen interjurisdictional coordination to ensure access to supplies and personnel under rapidly changing conditions (Chin et al., 2020). Interagency cooperation within jurisdictions is needed in addition to coordination across levels of government. Emergency management, public health, social service, and other government agencies as well as nongovernmental organizations need to work together to create unified strategies to prepare for and respond to hazard threats while protecting against COVID-19. Such collaborations are particularly important for addressing the current climate of mistrust in government, which threatens to undermine some people's confidence in the efficacy of life-saving protective actions (Long et al., 2020). Collaboration with credible, locally familiar entities (discussed further below) is essential in situations where some community segments mistrust authorities.

As is often true of disasters, the pandemic has also brought to light how existing social inequities are amplified during times of crisis. COVID-19 has exacerbated challenges related to evacuation and sheltering, which is particularly worrisome given the ways in which the pandemic has disproportionately affected groups that were already especially vulnerable to disasters, such as older adults and people with disabilities. In light of widespread concerns about racial justice and police abuse that gained visibility in 2020, emergency planners also need to consider how most effectively to reach minority communities that may face barriers to

[1]The full statement of task for this rapid expert consultation is as follows: "The National Academies of Sciences, Engineering, and Medicine will produce a rapid expert consultation on how government officials can approach emergency evacuation and sheltering operations in response to extreme weather, natural hazards and other disasters during the COVID-19 pandemic. Drawing on published literature on evacuation behavior, social responses to disaster, and risk communication, this document will outline considerations for planning emergency evacuation and setting up public shelters during the pandemic. It will also address how to communicate effectively with the public about concurrent risks. This rapid expert consultation will incorporate lessons from recent disaster response as well as input from experts. The document will be designed to be of practical use to decision makers but will not recommend specific actions or include other recommendations. It will be reviewed in accordance with institutional guidelines."

evacuation in addition to a heightened risk of exposure to the virus and complications from COVID-19. Nonprofit organizations, places of worship, community health clinics, and other social institutions that have close ties to historically marginalized populations may be well positioned to assist with emergency outreach, evacuation, and sheltering efforts

Research shows that negative experiences with law enforcement, such as instances of police violence, can suppress people's willingness to engage with authorities on matters of public safety, particularly in Black neighborhoods (Desmond et al., 2016). In particular, such experiences can adversely affect the degree to which minority communities consider authorities to be reliable sources of emergency warnings (Lindell and Perry, 1992). Similarly, reports emerged during Hurricane Harvey that concerns about immigration enforcement had discouraged households with undocumented immigrants from evacuating to shelters or otherwise seeking assistance in life-threatening situations, in part because of conflicting messages and actions from Border Patrol (Aguilar, 2017; Romero and Jordan, 2017). The intersection of vulnerabilities (e.g., increased caregiving responsibilities assumed by women, heightened risk of complications and death from COVID-19 in Black and Latinx communities, and excessive job losses among Black and Latina women) and the propagation of these vulnerabilities through institutionalized systems (e.g., leave policies that penalize caregivers, inaccessible assistance programs, inadequate legal protections for victims of domestic violence) are also important considerations for emergency planners that can be addressed through interagency partnerships.

Whereas the first year of the pandemic was marked by tremendous uncertainty among both emergency planners and the public regarding how to prioritize and manage safety measures under these compound hazards, 2021 offers the benefit of direct experience from the first year of the pandemic. The lessons learned from this experience have shaped fundamental shifts now underway to ensure smooth emergency operations during the pandemic. This document presents key lessons that can guide preparation for the potential impacts of an emergency requiring mass evacuation in the face of a continually evolving public health threat. Presented in turn are strategies for evacuation planning, for sheltering and mass care operations, and for effective risk communication.

STRATEGIES FOR EVACUATION PLANNING

The COVID-19 pandemic complicates evacuation planning—an essential process for reducing human losses from disasters such as floods, hurricanes, wildfires, and industrial accidents. In the context of the pandemic, it is necessary to modify existing emergency response plans and to plan for new, potentially resource-intensive public safety measures (e.g., physical distancing[2], testing) that may increase costs and decrease efficiency. Evacuation planning that includes identifying logistical needs and understanding the processes that drive evacuation behavior is vital to preparing for extreme events requiring mass mobilization during the pandemic.

[2]This report uses the term "physical distancing" rather than the widely used term "social distancing" because the latter implies the elimination of all social contact with others. However, social isolation is a potential source of adverse psychological consequences (Brooks et al., 2020) that can be reduced by effective coping strategies including maintenance of social contacts through electronic media (Jurblum et al., 2020).

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Key Takeaways: Evacuation Planning

Addressing Community Support Needs

- *Assess Population Vulnerability*. Use demographic data and local knowledge to identify populations that are most likely to experience disaster impacts and are at higher risk of becoming ill with COVID-19.
- *Address Access and Functional Needs*. Reevaluate special arrangements intended to support populations that face barriers to evacuation. Alternative measures, such as new agreements and plans for coordination among multiple agencies, need to be considered.

Transportation Planning

- *Reassess Existing Transportation Agreements*. Form new agreements with providers, train additional workers, or find additional voluntary organization partners to fill service gaps.
- *Incorporate Public Health Best Practices into Existing Transportation Plans*. Modify transportation services to follow public health best practices including mask wearing, distancing and sanitization; ensure access to PPE for drivers and riders
- *Address Private Vehicle Usage*. Provide guidance on how to reduce virus transmission in multihousehold carpools and how to avoid crowds at rest stops and destinations.
- *Reduce Shadow Evacuation*. Develop geographically specific messages about which areas are at the highest risk for disaster impacts and in which areas residents can safely shelter in place to limit evacuations to areas where they are most needed.

Issuing Evacuation Guidance

- *Address Virus Transmission Concerns in Evacuation Guidance* and *Integrate Public Health Guidance into Evacuation Outreach*. Help people resolve the apparent conflict between the avoidance of COVID-19 exposure and the need for evacuation by explicitly acknowledging these concerns and advising them how to prioritize and mitigate risks. Include detailed instructions on how to reduce the risk of virus transmission. Information about risk prioritization can be paired with advice on using masks and taking other precautions in shelter spaces whenever possible
- *Account for Delayed Decision-Making and Evacuation Processes*. Given that evacuation decision making is likely to take longer during a pandemic, carefully consider how much advance warning is feasible, and update plans accordingly.

1. Assess Population Vulnerability

Emergency plans are most effective when planners apply both local-level knowledge (including through consultation with community leaders, advocates, and representatives of community- and faith-based organizations) and demographic data to identify groups that are more likely to face challenges under various conditions, although additional resources are often necessary to execute such plans. A review of community demographic data[3] is a critical step in

[3]There are a number of tools available for evaluating these data. The Centers for Disease Control and Prevention's (CDC's) Social Vulnerability Index uses 15 variables related to social vulnerability and enables users to see the spatial distribution of these variables on scalable maps (Centers for Disease Control and Prevention [CDC] et al., 2020). The index is based on U.S. Census data and so does not capture new areas of vulnerability that may have emerged as a result of the pandemic because of the time lag since data collection. Nonetheless, it provides

identifying populations both at disproportionate risk for disaster impacts (e.g., those living below the poverty line, mobile home residents, people with limited English language proficiency) as well as from COVID-19 (e.g., African Americans, older adults, people with disabilities) and planning proactively for their emergency support needs.

It is essential, then, for emergency planners[4] to consider the complex intersection of challenges that place certain groups in harm's way and hinder their capacity to take protective actions under various conditions. For instance, institutionalized systems of inequality create disproportionate challenges for racial and ethnic minorities—particularly Black, Latinx, and Indigenous populations—at each stage of the disaster life cycle. These challenges result in barriers to preparedness and evacuation; heightened rates of morbidity, mortality, and financial loss; and reduced access to recovery and mitigation assistance (Asfaw et al., 2019; Bolin and Kurtz, 2018; Eisenman et al., 2009; Hartman and Squires, 2006; Méndez et al., 2020; Phillips and Morrow, 2007; Sharkey, 2007).[3] Likewise, these groups have faced disproportionate impacts from the pandemic in ways that can be traced back to many of the same underlying causes (Centers for Disease Control and Prevention [CDC], 2020c; Garcia et al., 2020; Iaukea et al., 2020).

Emergency planners will benefit from actively seeking out and engaging local stakeholder organizations. For instance, community-based organizations that provide services to those struggling with homelessness may be able to shed light on rising rates of housing insecurity resulting from the eviction crisis caused by the pandemic and on the resulting spatial distribution of unsheltered populations.[5] Likewise, data on food insecurity can be useful in identifying vulnerable populations. The Feeding America food bank network, for example, developed estimates of food insecurity in 2020 mapped at the national, state, county, and congressional district levels (Hake et al., 2020). And domestic violence service providers may be able to address concerns related to physical abuse—which tends to increase during times of disaster and has already been exacerbated by the pandemic—in local emergency planning activities (Enarson, 1999; Kofman and Garfin, 2020). A preparedness toolkit for domestic

baseline information about community characteristics that is valuable for emergency planners given that communities with high social vulnerability are more likely to become COVID-19 hotspots (Dasgupta et al., 2020; Karaye and Horney, 2020; U.S. Census Bureau, 2020). Alternatively, a web application developed by Chin and colleagues (2020) to assist with community planning and response can be used to understand county-level intersections of individual, household, and community factors in the United States that influence the impact of COVID-19, as well as the capacity to respond. There are limitations on the power of any index to explain different outcomes. The Social Vulnerability Index, for example, performs best to explain property losses and fatalities (Bakkensen et al., 2017). Caution is needed to consider the purpose for which such an index is being used and whether it has been empirically validated for that purpose.

[4]This report uses the term "emergency planners" to refer to staff from any agencies involved in community emergency preparedness including emergency management, public health, law enforcement, fire/rescue, transportation, and social services.

[3]These issues intersect with social dynamics linked to other aspects of people's identities, such as age, socioeconomic status, gender, disability status, and citizenship status. For example, older adults who are undocumented may face an array of challenges during an emergency due to the risk of deportation and exclusion from many disaster assistance programs in addition to age-related vulnerabilities (Campbell, 2019), such as an increased risk of complications from COVID-19.

[5]Published research is lacking on the question of whether concerns about eviction might deter evacuation; however, it may benefit emergency managers to explore these issues with service providers.

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violence organizations developed by the California Partnership to End Domestic Violence is a useful resource for such discussions (California Partnership to End Domestic Violence, n.d.).[6]

2. Address Access and Functional Needs

COVID-19 has disrupted many paratransit and other mobility services. Service providers have experienced revenue losses; added costs for personal protective equipment; and, in the case of volunteer-based programs, the loss of drivers who are themselves often drawn from populations at high risk from the virus (e.g., retired older adults). These challenges may hamper evacuation efforts, especially as populations that are socially vulnerable to disasters often lack reliable access to transportation, emergency information, and other resources and are frequently overlooked in emergency planning (Eisenman et al., 2007; Renne et al., 2011). In this context, existing evacuation transportation plans need to be modified as part of emergency planning to accommodate the multiagency coordination necessary to estimate new transportation needs (e.g., through special-needs registries or consultation with human services organizations) and link those needs to available resources so community members without alternatives will not be left in dangerous conditions. Although many people who lack their own vehicles are able to evacuate with peers who do have them, there are social vulnerability "hotspots" in which few households have reliable transportation (Lindell et al., 2019b). Thus, special arrangements, such as contracts with service providers, inclusive planning activities (e.g., those that include representatives of communities with access and functional needs), and resources dedicated specifically to addressing these issues are needed to ensure universal access to emergency services (Godfrey et al., 2019).

The experiences of residents at the Golden Arms public housing complex for seniors in Lake Charles, Louisiana, during Hurricane Laura in August 2020 illustrate the importance of interagency coordination and inclusion of vulnerable populations in evacuation planning.[7] In this case, a group of low-income, minority, older adult residents, many of whom had disabilities, were stranded in the complex for 3 days in dangerous heat without power or running water as the result of a series of miscommunications and missteps regarding transportation and shelter arrangements (Childs, 2020; Crowdsource Rescue, 2020; Dudley, 2020). Valuable lessons can be learned from this example about considerations for future evacuation planning during the pandemic. These lessons include the need to involve public housing facilities and other social vulnerability "hotspots" in disaster planning (including in outreach by emergency managers); to identify points of contact for obtaining information about assistance with evacuation; to incorporate intra- and inter-organizational emergency response activities in disaster plans; to provide clear directives on how representatives of various organizations should respond when they encounter people who need help in ways that fall outside their mission or jurisdiction, with emphasis on life safety; and to ensure that systems are in place for assigning appropriate responders to dangerous but not immediately life-threatening situations.

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[6]Gender disparities have become particularly pronounced during the pandemic because, as noted earlier, women, particularly Black and Latina women, have experienced disproportionate job loss and increased responsibility for caregiving for children and other dependents (Saenz and Sparks, 2020). As these pressures have overlapped with rising rates of domestic violence, there may be increased pressure for emergency planners to address these needs as part of emergency evacuation and sheltering operations.

[7]Evidence for these recent events is documented only through organizational reports and media outlets and thus has not been peer reviewed.

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Emergency planners also need to address medical vulnerabilities in their populations (Kishore et al., 2018). Nursing homes and long-term care facilities, which have already been struggling to limit residents' exposure to the novel coronavirus, will face compound risks in the context of an emergency. For instance, the risk of relocation trauma—a severe form of psychological stress that can be brought on by rapid relocation, with potentially fatal consequences for older adults—is compounded by the risk of virus transmission that may occur in the process of transporting or sheltering residents.[8] As the vaccination effort advances nationwide, consideration of vaccination records, and perhaps documented antibody tests, can help guide strategies for identifying appropriate precautions for the most vulnerable evacuees. Explicit guidance is necessary to ensure that vaccinated evacuees continue to take appropriate precautions (e.g., use of masks, physical distancing).

These facilities will also require assistance with transportation arrangements, prioritization for power restoration, or other forms of support. For instance, during Hurricane Laura, some nursing homes and long-term care facilities were reluctant to evacuate, and those that did so struggled under the burden of new coronavirus protocols (Sedensky, 2020). In some instances, facilities failed to notify families where residents were relocated or to inform residents when they would return home (Beauvais, 2020). Local emergency planners can help avoid repeating these experiences by proactively reaching out to such facilities and facilitating their planning efforts by reviewing memoranda of understanding (MOUs) for relocation and discussing the timelines and resources required.[9]

3. Reassess Existing Transportation Agreements

Evaluating transportation resources in advance of an emergency is vital to ensuring that services will be available to all who need them, and is even more critical now given that many public transit agencies have reduced staff levels in response to sharp declines in demand since the onset of the pandemic (Liu et al., 2020). Emergency planners will need to coordinate with multiple transportation entities, including public transit agencies, private mobility companies, and nonprofit service providers, to ensure the timely availability of services to address this challenge should an emergency occur (Wong et al., 2020). As an example, following Hurricane Laura, the Acadiana Voluntary Organizations Active in Disaster (VOAD) group in Louisiana provided limited bus service to evacuees in need of temporary shelter who lacked transportation (KATC News, 2020). Recurrent transportation needs will also need to be considered, as individuals with certain medical conditions may require regular visits to dialysis centers, wound care clinics, and chemotherapy appointments, among others.[10]

4. Incorporate Public Health Best Practices into Existing Transportation Plans

To prepare for evacuation in the context of the pandemic, public health guidelines regarding consistent mask wearing, physical distancing, and sanitizing procedures to prevent the

[8]Rates of COVID-19 infection are likely to increase in both origin and destination locations, highlighting the potential for elevated risk throughout relocation and upon return (Pei et al., 2020).

[9]This level of outreach may be a challenge in communities where emergency managers are already under strain due to disaster recovery or pandemic response efforts.

[10]In some cases, local governments may not be in a position to provide transportation assistance. In such situations, emergency planners may be able to work with community- and faith-based organizations to arrange for alternatives when possible, prioritizing at-risk populations occupying unsafe structures. People will need detailed guidance to help them understand their risks and take appropriate protective actions.

spread of the virus, including through asymptomatic transmission, need to be incorporated into existing transportation plans. Service providers may need to increase the number of vehicles or trips or the amount of time specified in evacuation plans to allow for physical distancing (Dunn et al., 2020). Pandemic safety protocols compatible with Centers for Disease Control and Prevention (CDC) guidance for each transportation mode need to be clearly displayed, reiterated, and consistently followed (CDC, 2020b). Drivers will need access to personal protective equipment (PPE), as well as training to ensure that they use the PPE properly and are confident in other protective measures that have been implemented, such as proper ventilation of their vehicles.[10] In addition, riders can be protected by restricting seat occupancy to alternate rows, ensuring that they are appropriately masked using cloth masks if N95 masks or alternatives such as KN-95 masks are not available, and providing convenient access to hand sanitizer at vehicle doors for use at entry and exit.

Public messaging around these issues (as advised by public health authorities) may also be needed to instill confidence and encourage compliance with posted protocols (see the discussion of effective risk communication below).[11] Guidance on which protective measures are most effective is evolving as the pandemic continues; thus, emergency planners need to routinely incorporate public health authorities' current protocols when providing guidance on using various forms of PPE (e.g., regarding the quality of different mask materials and disinfectants accordingly).

5. Address Private Vehicle Usage

Emergency managers need to promote adherence to coronavirus safety measures to help reduce evacuees' exposure to the virus, limit the extent to which evacuees expose other people at travel destinations, and advise about potential travel disruptions along evacuation routes (e.g., lodging and restaurant closures, shelter location changes, shelter capacity restrictions) (Federal Emergency Management Agency [FEMA], 2020a). Evacuees often carpool, which necessitates special precautions on the part of individuals who have been diagnosed with, are experiencing symptoms of, or have recently been exposed to COVID-19. It may be helpful to advise people to keep extra masks and hand sanitizer in their vehicles or to prepare emergency kits for use in case of rapid onset hazards, such as flash floods and some wildfires, that require evacuations to be carried out with relatively little advance notice. When occupying vehicles with people outside their household, evacuees can be advised that wearing masks and keeping windows rolled down to maximize airflow, even if none of the passengers is experiencing symptoms of infection, will reduce the risk of virus transmission, including asymptomatic transmission (Mathai et al., 2021). Emergency planners may also need to consider providing information about the rates of infection in likely destination communities to help evacuees make informed decisions about the risks associated with various locations.

[10]Drivers from both government and nongovernmental programs are likely to need PPE. Given the financial crises faced by many nonprofits as a result of the economic downturn occasioned by the pandemic, agreements with service providers may need to include the provision of PPE for both drivers and riders to ensure safe operations. Stockpiles of supplies need to be secured in advance of a disaster to ensure sufficient resources can be distributed (Schultz et al., 2020).

[11]See also https://www.nap.edu/catalog/25881/encouraging-adoption-of-protective-behaviors-to-mitigate-the-spread-of-covid-19.

6. Reduce Shadow Evacuation

Shadow evacuation occurs when people outside the officially declared evacuation zone decide to leave, a phenomenon that can increase evacuation route congestion that propagates back into the evacuation zone. This phenomenon may be even more problematic during the pandemic if evacuees transmit the virus into areas with low infection rates.

Shadow evacuations can potentially be reduced by creating and communicating geographically specific messages about risks in different areas within warning messages or evacuation orders (Cuite et al., 2017; Lamb et al., 2012; Morss et al., 2016). To this end, public awareness messaging, such as Florida's "Know Your Zone, Know Your Home" campaign, can help people understand their risks, advise them on how to shelter in place safely when appropriate, and familiarize them with their evacuation zones using clearly labeled maps and vulnerability information for each labeled area.[12] Despite such campaigns, there will still be some residents who are unable to identify whether or not they are in areas where evacuation is recommended, although the problem can be decreased if maps and other evacuation messaging identify evacuation zones by ZIP Codes, jurisdictional boundaries, or other readily recognizable geographical features (Lindell, 2020). Decision makers can also be more judicious when issuing evacuation orders by considering such factors as home type (e.g., single family, multi family, mobile home) and condition (e.g., year of construction) in addition to such factors as hazard zone to more accurately weigh the risks to different areas under different conditions (Bruggers and Green, 2020).

7. Address Virus Transmission Concerns in Evacuation Guidance and Integrate Public Health Guidance into Evacuation Outreach

The COVID-19 pandemic complicates people's risk assessment calculations during an emergency. Emergency planners can encourage appropriate responses by acknowledging people's concerns and helping them weigh the various risks they face, such as by advising them which concerns take precedence and what measures they should take to protect themselves from the threats they face (J-E. Yusuf et al., 2020). For example, the American Meteorological Society developed statements for use by emergency managers, weather forecasters, the news media, and the public in preparing for tornado and hurricane threats during the pandemic. These statements provide clear calls to action about the importance of understanding one's risk and vulnerability, being prepared for potential threats, and prioritizing immediate threats to safety. They also relay simple, explicit guidance regarding public shelters, use of trusted information sources, and basic preparedness measures (American Meteorological Society, 2020a, 2020b).[13]

Focused efforts are needed to synthesize information about the virus on an ongoing basis so people can readily access the most current guidance. In the context of emergencies that intersect with the pandemic, this need for updated guidance may translate into frequently revising emergency preparedness messaging. People who will be sheltering with people other than the members of their households, for example, will need explicit directives about how to

[12]The campaign offers template tools that counties can tailor to proactively encourage preparedness; see https://www.floridadisaster.org/planprepare/know-your-zone-know-your-home.

[13]Some people who are sheltering with people from other households during emergencies may underestimate the risk of virus transmission. Directives to follow public health precautions may help to emphasize virus-related risks and the need for protective measures.

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safely shelter together.[14] They are likely to need updated information about best practices for maintaining physical distance, wearing masks (including which types of masks are most appropriate), not sharing food or utensils, and other considerations that may arise as understanding of virus transmission improves and new threats (e.g., new variants) emerge (Shultz et al., 2020). Although the general public's beliefs about exposure paths for respiratory infectious diseases are generally consistent with those of experts, they tend to underestimate the likelihood of infection from brief physical contact (Wei et al., 2020).

Coordination among public health officials, emergency managers, weather forecasters, broadcast meteorologists, and other relevant information sources is necessary to ensure that people do not receive conflicting or confusing recommendations (World Health Organization, 2017). Thus whenever possible, when the risks posed by exposure to extreme weather events are more immediately life-threatening than the risk of being exposed to the virus while traveling or sheltering, emergency managers need to state this explicitly and to pair this prioritization message with tips on how to stay safe while responding to the weather event. In March 2020, for example, the Huntsville-Madison County Emergency Management Agency issued a news release advising the public to find safe shelter in the event of a tornado (Huntsville-Madison County Emergency Management Agency, 2020). The announcement explicitly stated that the Alabama Department of Public Health had recommended protection from a tornado as the first priority, coupled with precautions to reduce the risk of infection wherever people sought shelter.[15] Research on people's perceptions of protection responsibility indicates that message recipients will also want information about what authorities are doing to keep people safe from COVID-19 during evacuation (Wei et al., 2018).

In some instances, there may be significant uncertainty about the risks people face, and this may lead to disagreements among experts. Emergency planners need to consider in advance how to advise the public (including through the development of a communication plan with input from trusted messengers, discussed below) when the risks from emergencies are uncertain so that people are equipped to make appropriate decisions based on their circumstances (e.g., by considering the construction of their housing or their location in evacuation zones). People need to be directed to trustworthy sources that provide relevant, up-to-date information that can help them weigh various factors relevant to their protective action decisions.

8. Account for Delayed Decision-Making and Evacuation Processes

Timing is critical to evacuation, but several aspects of the evacuation process are likely to take longer than normal during the pandemic. Evaluation of competing risks is likely to cause people to delay evacuation until they are confident that the risk from environmental hazards (e.g., hurricanes, tornadoes) risk is greater than the risk of developing COVID-19. Such delay on the part of a large proportion of the population within the evacuation zone may result in overloading evacuation routes, thus preventing people from reaching safety before hazard impacts. This scenario is particularly dangerous during a rapid onset event (e.g., late intensification of a hurricane) requiring rapid mobilization (Kuligowski, 2020). To equip people to mobilize quickly and efficiently, local officials can encourage people to begin evacuation

[14]Members of high-risk populations such as older adults tend to rely heavily on friends and family for assistance during emergencies (Meyer, 2017); thus, tailored guidance is needed on how these populations and the people who assist them can maximize safety when sheltering together.

[15]No published studies have systematically examined the effectiveness of these communities or their effects; thus, this approach has not been empirically validated.

preparations well before they decide to leave. That is, they need to pack bags, secure the home, and arrange accommodations before leaving (e.g., by contacting friends and relatives or making advance reservations at commercial facilities) to ensure safe accommodations for both evacuees and their hosts.[16]

Compounding delays resulting from prolonged evacuation decision making are delays associated with the evacuation process itself. Transporting people to safety will likely take longer than normal during the pandemic because of physical distancing requirements, reduced capacity of public transportation facilities, prolonged shelter screening processes, and other public health measures. The shifting timelines for these activities require trade-offs among public safety, efficiency, resource availability, and uncertainty regarding the event. Rising social and financial constraints are likely to be reflected in increased demand for transportation assistance and other forms of evacuation support (J-E. Yusuf et al., 2020). Reassessing evacuation time estimates can help emergency planners strike a balance between moving people from at-risk locations, reducing the likelihood of resource depletion, and minimizing the risk of virus exposure. At the same time, however, it is equally important to recognize that increasing warning lead time entails greater uncertainty about the intensity, location, and timing of an emergency event.[17] Thus if lead time is increased, it will be important to convey this uncertainty, which in turn will increase information-seeking behavior and, potentially, delays in taking protective action. Even during extended periods of forewarning, research suggests that many people at risk monitor information about the impending threat frequently or even continuously (Dow and Cutter, 2000; Morss et al., 2017; Zhang et al., 2007).

STRATEGIES FOR SHELTERING AND MASS CARE OPERATIONS

Congregate care centers, commonly called public shelters, serve an essential function in community evacuation plans by providing safe structures to accommodate temporary relocation, particularly for socially vulnerable populations. Demand for these facilities has historically been low relative to the size of the evacuated population;[18] however, concerns about virus transmission in high-risk households may make it less feasible for friends and relatives to accommodate visitors. Moreover, commercial lodging may be inaccessible to some households because of business closures, increased demand due to government reservations for noncongregate shelters, or personal financial constraints. Although fear of virus exposure in public shelters is likely to drive many people to stay with family and friends, others—particularly those whose social connections are at higher risk or otherwise inaccessible (e.g., because of limited transportation options)—may increase the demand for accommodations in public shelters (Marshall et al., 2020). The pandemic poses an array of new logistical issues that shelter planners need to address. Advance planning and multiagency coordination are key to identifying and proactively addressing potential challenges.

[16]Note that COVID-induced delays among the population in the risk area might be offset by lower rates of shadow evacuation.

[17]While these challenges exist independently of the pandemic, concerns about COVID-19 exacerbate the condition of uncertainty, adding to the challenges for decision makers.

[18]People who have the means to do so generally seek shelter at the homes of friends or relatives, followed by hotels and other commercial facilities, rendering public shelters a refuge of last resort (Lindell et al., 2019b).

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Key Takeaways: Shelter and Mass Care Operations

Shelter Planning

- *Enhance Shelter Capacity in Socially Vulnerable Communities*. Address the potential need for greater public shelter capacity due to the pandemic. For hazards with localized impacts, such as most inland flooding, shelters located within communities characterized by high levels of social vulnerability tend to experience greater demand. For hazards with regional impacts, such as many hurricanes, the increased demand will occur in communities to which socially vulnerable households travel. The issue of increased demand may be exacerbated by the pandemic as physical distancing requirements and economic losses may make other options less feasible.
- *Reduce Reliance on Large Congregate Shelters and Update Shelter Designs*. Reduce shelter population size to support increased physical distance among occupants within shelters. When this is not feasible, emphasize mask wearing, strong enforcement policies, sanitization procedures, and frequent hand washing.

Shelter Design and Operations

- *Incorporate Safety Measures in Shelter Design and Operations*. Introduce new health screening and monitoring protocols, and designate isolation spaces for people who are sick or who may have been exposed to the virus, consistent with CDC and American Red Cross guidelines.
- *Seek New Sources of Personnel and Modify Training Plans*. Draw personnel from such sources as the Medical Reserve Corps, Community Emergency Response Teams (CERTs), concert and event staff, students seeking clinical hours and internship opportunities, and regional incident teams outside the evacuation zone. Provide training for both new and existing shelter staff to ensure that they conduct shelter operations safely and in compliance with public health best practices.
- *Collaborate with Local Partners*. Communicate and coordinate with schools, places of worship, voluntary organizations, and public–private partnerships that can provide alternative shelter facilities, coordinate feeding operations, and provide in-kind resources or services to reduce the burden on public resources and increase the likelihood of compliance with COVID-19 safety protocols.

1. Enhance Shelter Capacity in Socially Vulnerable Communities

Public shelters sometimes lack the capacity needed to support the population within their designated service area (Karaye et al., 2019). Such capacity constraints may be exacerbated during the COVID-19 pandemic because of the increased demand noted above. Socially vulnerable groups such as racial and ethnic minorities and persons with limited English proficiency also face an increased risk of COVID-19 infection (CDC, 2020c; Karaye and Horney, 2020), further underscoring the need for enhanced shelter capacity that complies with public health guidelines. Attention to these issues is particularly important for organizations tasked with operating shelters in remote communities, especially during events that receive little media coverage or external assistance because of the smaller or less advantaged populations affected.

2. Reduce Reliance on Large Congregate Shelters and Update Shelter Designs

Public shelter operations typically involve mass care services provided to many evacuees in a large facility. In the context of the pandemic, however, shelter designs of this nature are ill advised because these tightly packed, enclosed spaces are likely to foster transmission of the virus (Shultz et al., 2020). Guidance from the CDC on public shelters advises that evacuation

plans be modified to prioritize small shelters (those with fewer than 50 occupants) and to increase the use of noncongregate environments, such as private rooms (CDC, 2020a). In responding to this guidance, emergency planners need to identify alternative shelter sites and develop new protocols to ensure that operational needs and the needs of evacuees are met. For instance, California announced in July 2020 that as part of wildfire planning, it would utilize fairgrounds, campgrounds, hotel rooms, college dormitories, and Airbnb rentals as public shelters (Office of Governor Gavin Newsom, 2020).

Such arrangements may, however, introduce additional complexities by limiting the stock of available commercial facilities for individuals with the resources to pay for accommodations. For example, evacuations from Hurricane Laura filled New Orleans hotel rooms to capacity, leading authorities to redirect overflow evacuees to Alexandria, LA, approximately 200 miles inland (Mcauley et al., 2020). Additionally, authorities struggled to test evacuees for COVID-19 during this event, having tested only 200 out of nearly 12,000 evacuees a week after the storm (Westwood, 2020). Commercial facilities also may pose unique logistical challenges in conducting feeding operations, engaging in sanitization procedures, and providing basic supplies (e.g., toiletries), and other services. And facility policies may need to be examined to ensure that they do not impose restrictions that conflict with common evacuee needs (e.g., policies banning pets).[19] Special attention is necessary to ensure that the needs of evacuees with disabilities will be met.

Noncongregate sheltering arrangements may not be feasible in some communities, depending on capacity and available resources. In such cases, officials can consider implementing congregate shelters in combination with policies such as mandatory masking, sanitization protocols, hand washing, and frequent testing, recognizing the potential need for special attention to enforcement of protective behaviors may be necessary to ensure safety in these environments (National Academies of Sciences, Engineering, and Medicine [NASEM], 2020). Emergency planners may also consider establishing MOUs with other municipalities to provide mutual aid during emergencies; however, opening shelters in communities with high internal rates of virus transmission is ill advised because of the increased risks to evacuees, shelter workers, and origin and destination communities (Pei et al., 2020).

Public shelter providers are also required to provide functional needs support services (FNSS), such as durable medical equipment (DME), consumable medical supplies, and personal assistance services, as well as reasonable modifications to policies, practices, and procedures to accommodate such needs.[20] Caches of the types of supplies needed for FNSS are limited in many communities, and the shift to noncongregate sheltering may exacerbate pressure on resources and services. Shelter planners may need to coordinate agencies (particularly those that provide FNSS and advocate for the rights of individuals requiring those services) and pool resources to provide adequate support. For instance, hotel units or other shelter facilities could be reserved in strategic locations to accommodate groups with similar functional needs so that resources could be accessed more readily. The potential impacts of infrastructure disruption at such sites, such as loss of power and running water, will need to be assessed to prevent secondary emergencies (e.g., lack of power for electricity-dependent DME). Backup plans to redirect or relocate

[19]Shelter planners also need to consider whether changes to pet accommodations in congregate shelter settings are necessary.

[20]The California Office of Emergency Services maintains a library of access and functional needs resources that may be helpful to shelter and emergency planners; see https://www.caloes.ca.gov:443/AccessFunctionalNeedsSite/Pages/AFN%20Library.aspx.

evacuees, support personnel, and equipment are necessary if disruptions cannot be adequately mitigated.

3. Incorporate Safety Measures in Shelter Design and Operations

Nearly all aspects of shelter design and operations may require modification to reduce the likelihood of exposure to COVID-19 (American Red Cross, 2020). CDC guidelines specify a range of new protocols aimed at reducing the risk of coronavirus transmission, such as screening and monitoring for symptoms of illness, isolation of persons who display such symptoms, cleaning and disinfection procedures, food service procedures, and considerations for children (CDC, 2020a).[21] To implement this guidance, some localities have developed virtual (e.g., web- and telephone-based) and drive-up registration procedures to reduce person-to-person contact and alleviate the burden of registration and other procedures for on-site shelter staff (Dunn et al., 2020). However, alternate procedures will need to be provided to ensure access among evacuees without reliable Internet service or transportation. In some cases, the guidelines may be difficult for shelter planners to implement. In such instances, shelter planners may need to coordinate with public health agencies and partner organizations (see below) to determine how to maximize safe access to alternative options.

Another approach is the "holistic surveillance and response" model used in response to an influenza A (H3) outbreak at a Houston shelter following Hurricane Harvey. This approach emphasizes on-site monitoring, multiagency coordination, isolation protocols, and other infection control measures (Liu et al., 2019). The risks associated with these environments can be greatly reduced by integrating effective protective measures, surveillance (including laboratory surveillance, when possible), and response protocols as standard practice. Monitoring activities also need to be coordinated to address the potential for postevacuation surges in transmission within the community and to limit infections in temporary housing locations for displaced evacuees (Shultz et al., 2020). These arrangements require significant planning, as well as outreach and coordination well in advance of an emergency to assure sufficient supplies and personnel.

4. Seek New Sources of Personnel and Modify Training Plans

Increasing the number of shelter facilities and introducing new protocols may amplify the demands on personnel, resulting in shortages of normal staff and volunteers. Additionally, regular sources of personnel support may be less available than usual. For instance, individuals aged 65 and older—a population that is particularly vulnerable to complications from COVID-19—are substantial portion of the shelter volunteer workforce in many communities (Marshall et al., 2020). While opportunities may remain for older adults and other high-risk workers to provide support in other capacities during an emergency, such as serving in call centers, arrangements may need to be made to ensure sufficient on-site shelter personnel. Shelter operations during the pandemic may also require a greater number and range of specialized staff, such as medical professionals, than is typical in normal times to assist with health monitoring, isolation units, and testing; however, those staff are also likely to be less available than usual as they may already be activated as part of the pandemic response or may be members of high-risk

[21]Testing protocols may also need to be implemented to reduce the likelihood of asymptomatic transmission. Frequent messaging about the possibility of asymptomatic cases may help ensure that people in shelters understand the importance of continuing to take precautions to avoid transmitting the virus.

groups. Local emergency planners will need to coordinate with state and federal partners to access additional personnel support from outside the affected area.

To address staffing shortages, shelter planners may have to reallocate staff who are not typically responsible for shelter operations and seek other sources of support. Potential sources include the Community Organizations Active in Disasters (COAD) and VOAD groups, the Medical Reserve Corps, Community Emergency Response Teams (CERTs), concert and event staff, and students seeking clinical hours and internship opportunities in the medical field (W. Yusuf et al., 2020a). Traditional and teen CERT programs throughout the country began leveraging their volunteers in 2020 to assist with pandemic response efforts that could easily translate into shelter operations, such as performing intake screenings, conducting food distribution, and making supply deliveries (FEMA, 2020b). Regional incident teams from areas outside the disaster zone may be another source of personnel support; however, tapping this source will require coordination among government entities across jurisdictional and geographical scales.[22]

Regardless of the personnel arrangements, changes in routine shelter operations will require additional training for all shelter workers;[23] both experienced shelter staff and volunteers will need to learn new protocols and procedures, while newly assigned personnel may need more comprehensive training. Multimedia aids may be needed to help volunteers understand, adopt, and promote health and safety standards. As is the case with drivers (see above), it is essential that those providing training for shelter personnel be effective in explaining how to implement exposure control procedures—such as physical distancing, mask use, and hand washing—because this increases trainees' *ability* to perform those procedures. In addition, it is important to explain the reasons for exposure control procedures because that increases trainees' *motivation* to perform them on the job ("training transfer"—Noe, 2020). Shelter managers can foster the development of a safety culture (Sammer et al., 2010) in which, for example, managers emphasize their commitment to safety and work with shelter personnel to identify situations in which compliance may be so difficult that procedures or workplaces need to be modified. Shelter managers should also set explicit compliance goals, conduct periodic walkthroughs to verify compliance, and encourage workers and occupants to immediately report noncompliance or deficiencies in procedures so supervisors can take prompt corrective action (Lindell, 1994).

5. Collaborate with Local Partners

Community-based and faith-based organizations (both those with disaster-specific missions and those that lack an explicit disaster focus) play a critical role in community disaster response, helping to address unmet needs and supporting community resilience more broadly (Acosta et al., 2018). Such organizations, for example, helped fill critical gaps in the government response to Hurricanes Katrina and Sandy by providing temporary shelter, food, and other

[22]Law enforcement and military personnel are also frequently called upon to assist with evacuation, sheltering, and other disaster response operations; however, concerns about systemic racism in policing and past traumatic experiences with the militarization of disaster response may introduce additional challenges in some settings, particularly in minority communities (Tierney and Bevc, 2007).

[23]As an example, materials designed by the American Red Cross on sheltering during the COVID-19 pandemic provide a useful resource that addresses such topics as congregate and noncongregate sheltering, supply and staffing needs, shelter flow, establishment of isolation areas, dormitory layout, and a range of other issues to ensure that all aspects of shelter operation support pandemic safety (American Red Cross, 2020).

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essential services (De Vita et al., 2008; Lazrus et al., 2020; Schmeltz et al., 2013).[24] Local community responses are likely to occur regardless of whether such groups are officially integrated into emergency response planning; however, outreach to these groups can enhance coordination and ensure that they receive accurate information about how to operate safely in the context of a pandemic. Networks such as VOAD and COAD serve as a vital mechanism for coordinating local partners.[25] As local nonprofits whose mission lacks an explicit disaster focus tend to act spontaneously without the benefit of disaster plans (Meyer et al., 2019), it may be particularly important during the pandemic for emergency planners to proactively reach out and engage them in the broader planning effort. Voluntary agency liaisons, who are typically assigned through the incident command structure, may be best suited to engaging these partners.

STRATEGIES FOR EVACUATION AND SHELTERING RISK COMMUNICATION

The public's willingness to follow evacuation orders and public health guidance is critical to reducing disaster losses and limiting coronavirus transmission. Effective risk communication plays a key role in helping people evaluate risks and make decisions about protective actions. The development of effective messaging requires advance planning, beginning with a *strategic analysis* that includes such tasks as identifying the community's needs and setting goals for the risk communication program (Lindell and Perry, 2004). The planning process then proceeds to *operational analysis* that includes identifying suitable risk communication sources and channels, *resource mobilization* that enlists the support of relevant stakeholders, program development that includes staffing crisis communication teams and developing procedures for communication and rumor control, and *program implementation* that includes building source credibility by demonstrating their proficiency in minor incidents and gaining the support of sources that already have credibility with specific population segments in their communities. Message content needs to address issues specific to the pandemic, providing detailed guidance about both hazards and evacuation safety and emphasizing specific actions that need to be taken in response to risks (Wood et al., 2012). It is also important for risk communicators to avoid repeating misinformation, even to debunk it, as doing so can have the unintended consequence of reinforcing false information (Lewandowsky et al., 2020; NASEM, 2020). A prior rapid expert consultation provides detailed guidance on strategies for increasing adherence to protective behaviors that can mitigate the spread of COVID-19.[26] The basic principles of risk communication discussed in that document are also applicable in the context of hazards and disasters and are not reproduced here.

[24]Sheltering arrangements may be undertaken by formal organizations, such as nonprofit agencies that bring together volunteers and resources as part of a coordinated effort, or through informal channels, such as when individuals act independently and spontaneously (e.g., by offering up their own homes to displaced persons through their networks) (Whittaker et al., 2015).

[25]Formal organizations may be less prevalent in small and rural communities. Coordination with informal groups may be more necessary in these settings.

[26]See https://www.nap.edu/catalog/25881/encouraging-adoption-of-protective-behaviors-to-mitigate-the-spread-of-covid-19.

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Key Takeaways: Evacuation and Sheltering Risk Communication

Message Content and Delivery

- *Begin by Addressing Concerns Most Common in the Population*. Provide detailed guidance and address misconceptions about COVID-19 risks without repeating misinformation to avoid encouraging its spread.
- *Tailor Message Framing to the Needs of Specific Audiences*. Respond to specific concerns of different audiences, and develop mechanisms for identifying and combating misinformation.
- *Use Accessible Communication Formats*. Deliver a clear, consistent message in multiple formats. Visual tools, such as illustrations; multiple languages; audible messages; and large font size for text-based messages can all be helpful.
- *Provide Actionable Guidance with Implementation Steps*. Address barriers to action when relaying guidance, and provide actionable solutions.

Selecting Message Sources and Channels

- *Use Trusted Messengers*. Issue emergency guidance strategically through a variety of outlets (television and radio, social networks, social media) and through sources that are seen as trustworthy by diverse audiences. Partner with community- and faith-based organizations viewed as credible by target communities.

Message Timing

- *Account for Information-Seeking Behavior*. Anticipate and respond to people's tendency to confirm risk and warning information by providing resources in which the public can use trustworthy sources to find information relevant to their concerns, as well as tips to help reduce the amount of time spent on deliberation and decision making.
- *Maximize Advance Warning*. Communicate the importance of having a plan in advance of a disaster, and provide tips for reducing the amount of time dedicated to deliberation or decision making at the time of an emergency.

1. Begin by Addressing Concerns Most Common in the Population

Community members are likely to have questions about how to minimize the risk of coronavirus exposure if an evacuation is required. Anticipating and proactively responding to these concerns can help ensure that people understand the risks they face and respond in ways appropriate to their situation. Messages leading up to an emergency will be most effective if they pair information about the threat with guidance about actions people can take to protect themselves and their loved ones (Morss et al., 2016; Wood et al., 2012). This is because a hazard warning creates a risk perception that motivates the search for a protective action but does not necessarily identify the most appropriate protective action (Lindell and Perry, 2012). Developing a communication plan with templates that can be easily updated as needed can help ensure that important details are included (Lindell, 2018; Wood et al., 2018). Messages can be developed and pretested with input from members of target audiences to maximize their effectiveness and appropriateness (Fischhoff et al., 2011).

2. Tailor Message Framing to the Needs of Specific Audiences

Increasing hostility toward scientific expertise and public health recommendations that has emerged during the COVID-19 pandemic intersects with skepticism about the validity of evacuation guidance and may lead those who do evacuate to be less receptive to following safety

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protocols in shelters (Allcott et al., 2020; Latkin et al., 2021; Long et al., 2020). Relative to those with more egalitarian worldviews, those who hold strong individualist worldviews[27] tend to perceive such events as hurricanes as posing less risk, to be less likely to believe that evacuation is an effective protective action, and to be more likely to perceive official information and warnings as overblown or biased (Morss et al., 2020). Moreover, those with individualist worldviews may also be more likely to believe conspiracy theories and oppose actions to reduce the spread of COVID-19 (Biddlestone et al., 2020). As a result, these individuals may be less likely to participate in an evacuation, which can be particularly dangerous for those residing in high-risk areas, as well as for the emergency response personnel who may be called upon to assist them during life-threatening conditions. Similarly, recent research suggests that political identities may further shape evacuation behavior. One study found that, independently of whether an evacuation order had been issued in their county of residence, individuals residing in more conservative-leaning areas were less likely to evacuate relative to those living in more liberal-leaning areas (Long et al., 2020).

These findings suggest that shadow evacuation may be a greater challenge among populations that are more likely to perceive an event such as a hurricane as a threat, whereas failure to evacuate may be more common among populations that tend to be skeptical toward forecasts and government warnings about such events. To address the influence of cultural and political beliefs on people's behavior during emergency events, risk communicators need to tailor the framing of information for different audiences and develop mechanisms for identifying and combating misinformation. Efforts to combat misinformation have the greatest impact when officials lead with factual information and explain it, address myths while avoiding repetition of misinformation, describe the fallacies behind misinformation, and reinforce facts often.[28] Additionally, risk communications are more likely to be believed if they are received through trusted sources and channels (see below). As noted previously, special attention is needed on this issue when there is mistrust of authorities or specific risk communicators (e.g., in minority and immigrant communities that have experienced conflicts with law enforcement). The involvement of trusted social institutions is particularly important in such settings.

The likelihood of compliance with disaster-related and public health recommendations is more likely when risk communicators are sensitive to the contexts in which decisions about protective action are being made and frame messages in a way that resonates with recipients' concerns, experiences, capabilities, and resources. For instance, medically fragile people can be provided with information about where to find shelters that can accommodate their health care needs. Likewise, community members with limited English proficiency are more likely to receive important information when it is translated into their dominant language.[29] Local partner organizations that routinely work with target groups can often assist with identifying information needs as well as developing and pretesting messages.

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[27]Individualist worldviews emphasize individual autonomy over social control and are associated with more conservative political ideologies. In contrast, egalitarian worldviews tend to embrace collective action, stronger social bonds, and collectivist cultural norms and are associated with more liberal political ideologies.

[28]*The Debunking Handbook 2020* provides an extensive discussion of strategies for understanding and combating misinformation. See https://www.climatechangecommunication.org/wp-content/uploads/2020/10/DebunkingHandbook2020.pdf.

[29]King County, Washington, has developed a tip sheet with guidance for emergency managers and public information officers about how to translate and review materials to ensure that they will meet the needs of intended audiences. See https://www.kingcounty.gov/~/media/depts/emergency-management/documents/public-education/Translation_tips_for_EMs_and_PIOs_REV_02-07-19.ashx?la=en.

3. Use Accessible Communication Formats

Emergency planners need to be particularly attentive to the accessibility of communications regarding risks and environmental hazards during an evacuation and at shelter sites. For instance, shelters accommodating population segments that have limited English language proficiency can provide signage translated into as many locally spoken languages as possible to ensure that the information is accessible to all evacuees. Similarly, using a combination of visual and audio communications (e.g., telephone calls with prerecorded messages, open captioning on emergency broadcasts, inclusion of sign language interpreters) can help ensure that messages are accessible to blind, low-vision, deaf, and hard-of-hearing individuals. The National Governors Association (2020) has identified five broad actions that can be taken to implement function-based strategies for addressing communication needs.[30]

4. Provide Actionable Guidance with Implementation Steps

Resources on which many people rely during emergencies have become less reliable during the pandemic, with potential implications for their ability to comply with evacuation orders or other guidance. Personal contacts may be unavailable because they are at risk of complications from COVID-19; social service providers may have become overwhelmed by high demand and insufficient resources; and financial reserves that would otherwise go toward vehicles and supplies may have been depleted. Thus, capacity to respond is a particularly important consideration for risk communicators. Protective action recommendations will be insufficient to prompt action if message recipients do not know how to implement those actions or if they face implementation barriers that render the recommended action infeasible (Campbell et al., 2020; Eisenman et al., 2007; Wood et al., 2012). Thus, messages are more effective if the guidance they provide is actionable with clear, feasible steps that people can take to protect themselves. For example, warning messages that identify sources of additional information and assistance, including special transportation options, can help ensure that people who have limited mobility or need a means of transportation can reach shelters. Evaluating messages with people's functional capacities and needs in mind enables risk communicators to tap into the ways in which people make their protective action decision within a broader societal context—an approach that may be particularly valuable for supporting those groups identified as vulnerable (Lazrus et al., 2012)—as well as identify potential points of confusion, such as when local and state ordinances are in conflict.

5. Use Trusted Messengers

The perceived credibility of an information source plays an important role in determining how people perceive and respond to risks (Fischhoff et al., 2011; NASEM, 2020). Communication plans therefore need to include people who are trusted with respect to both infectious disease and other risks, recognizing that any single information source's credibility—their perceived expertise and trustworthiness—is likely to differ from one hazard to another (Wei et al., 2018). Conflicts that have emerged during the pandemic over what information is factual and trustworthy, as discussed above, highlight the need for subject matter experts (e.g., public health and public safety professionals) to collaborate with different population segments' trusted messengers to ensure that audiences believe the hazard information, and comply with protective action recommendations, that experts are providing (Allcott et al., 2020; Lewandowsky et al., 2020).

[30]See https://www.nga.org/memos/access-and-functional-needs-considerations-covid-19/.

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Partnering with trusted sources to relay hazard information, evacuation guidance, shelter information, and COVID-19 precautions may help ensure that target recipients receive, pay attention to, comprehend, and believe these messages. Local media outlets, faith leaders, community-based organizations, and others can serve as valuable communication partners that can reach various groups. They may be able to incorporate disaster-related information into their own planned activities (e.g., incorporating announcements about hazard preparedness into such planned events as virtual town halls); disseminate materials during routine service provision (e.g., handing out flyers at food distribution centers or in home health care settings); or assist in efforts to target specific populations (e.g., K-12 schools sending home information about family disaster planning) (W. Yusuf et al., 2020b).

Whenever possible, it may also be beneficial to include these local partners—and account for the communities they serve—in trainings, drills, exercises, and other preparedness activities to ensure that they are equipped to relay accurate information and incorporate public health best practices into their own emergency operations (e.g., running shelters, providing transportation). Trust is necessary for the success of partnerships between emergency planners and local organizations; however, potential partners may possess levels of skepticism similar to those of their constituencies. Building trust therefore requires risk communicators to invest in developing relationships and providing two-way lines of communication long before a disaster strikes.

6. Account for Information-Seeking Behavior

The ways in which people perceive and respond to risks are complex and multifaceted, and there is much uncertainty within the scientific community about how people perceive some risks, particularly concurrent ones and novel ones such as COVID-19. However, it is well established that, under conditions of uncertainty, people spend valuable time seeking additional information, weighing options and determining an appropriate course of action (Lindell et al., 2019a; Wood et al., 2018), and the complexity introduced by the combination of a pandemic with another emergency such as a hurricane may prolong the process through which people decide how to respond. Deliberations over the potential benefits and costs of evacuation are likely to increase the amount of time required to decide on a course of action, as is planning the logistics of evacuation—packing to leave, and choosing a transportation mode, evacuation route and destination, and accommodations at the destination (Lindell et al., 2019b). It is thus advisable for emergency planners to recognize that milling—the process by which individuals seek confirmation of impending hazard threats, observe how others are responding, and weigh potential protective actions—will occur and to plan for it by providing channels and sources through which people can find additional information. Emergency planners can also design message content that provides the kinds of information often sought through information-seeking behavior. As summarized by Wood and colleagues (2018), warning messages are most effective when they

- describe the hazard event, its potential impact, the threat it poses, and how the recommended protective actions can reduce its consequences;
- provide protective action guidance that explains how to take the recommended actions to maximize health and safety (e.g., by identifying public health measures);
- specify a location for the event that helps recipients understand who will and will not be affected, and define geographic boundaries within which protective actions are recommended;

- detail a time by which people should begin taking protective actions, when such actions should be completed, and how long they should continue;
- identify what entity is the source of the message, ensuring that a credible source or, ideally, set of sources, is featured; and
- are clear, specific, accurate, and consistent across different channels and formats.

To this list, emergency planners may also add sources of additional information and sources of assistance. Although some warning messages elicit appropriate protective actions even if some—or even many—of these elements are omitted, the proportion of the risk area population that takes appropriate protective action is likely to increase with the number of elements that are included (Lindell, 2018).

7. Maximize Advance Warning

It is important for household evacuation plans to be designed specifically to facilitate *quick* action, particularly in areas that are at risk of rapid onset events. To encourage this type of preparedness, guidance can emphasize the following (Lindell et al., 2019a):

- being able to promptly recognize environmental cues;
- ensuring that all household members can access comprehensive, timely warnings;
- avoiding spending excessive amounts of time in information-seeking activities;
- preparing "grab and go" kits with changes of clothes, toiletries, essential medications, and important personal documents; and;
- designating a safe location away from the home for separated household members to reunite so they do not endanger themselves traveling home before evacuating.

Additionally, as discussed above, directly addressing pandemic-related needs (e.g., COVID-protective measures for sheltering with friends and family, knowledge of evacuation zones to avoid shadow evacuation) can help communicate the importance of preparedness messaging and enable recipients to evaluate it in the context of other concerns. Existing emergency planning checklists, guides, and other tools can be updated to incorporate COVID-19 safety measures. As an example, Cal Fire's updated wildfire preparedness guidance advises households to communicate with friends and relatives outside the evacuation area and ask about staying with them should the need arise, and if those potential sources of accommodations are at risk of serious illness, to make alternative arrangements (California Department of Forestry and Fire Protection, 2020).

It may also be helpful to encourage community members—particularly those who need external assistance during an emergency—to review their current household preparedness plans; contact local agencies on which they rely to affirm that those entities have emergency plans; and if necessary, identify alternatives to ensure that their needs will be met in the event of a service disruption. For example, people on dialysis need to consider where they will receive treatment if they need to evacuate to a given location and whether services will remain available if they choose not to evacuate.

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CONCLUSION

The many challenges posed by the COVID-19 pandemic exacerbate the difficulty of evacuating populations from the path of extreme events, providing them with shelter and other required services until the danger has passed, and communicating with them about the need for protective action. Implementing documented best practices through advance planning and interorganizational collaboration can reduce the burden on community resources and produce more equitable outcomes than might otherwise be achieved.

SEAN is interested in your feedback. Was this rapid expert consultation useful? Send comments to sean@nas.edu *or (202) 334-3440.*

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Examples and Resources

Strategies for Evacuation Planning during the COVID-19 Pandemic

- *CDC Social Vulnerability Index* https://www.atsdr.cdc.gov/placeandhealth/svi/index.html
- *U.S. County-Level Characteristics to Inform Equitable COVID-19 Response Interactive Online Tool* https://ccdd-hsph-harvard.shinyapps.io/county-risk
- *Feeding America Impact of Coronavirus on Food Insecurity Interactive Map* https://www.feedingamerica.org/research/coronavirus-hunger-research
- *Emergency Preparedness Toolkit for Domestic Violence Organizations:* https://www.cpedv.org/resource-tool/emergency-preparedness-toolkit
- *National Academies of Sciences, Engineering, and Medicine Societal Experts Action Network Report: Encouraging Adoption of Protective Behaviors to Mitigate the Spread of COVID-19* https://www.nap.edu/catalog/25881/encouraging-adoption-of-protective-behaviors-to-mitigate-the-spread-of-covid-19.
- *Florida Division of Emergency Management Know Your Zone, Know Your Home Guidance* https://www.floridadisaster.org/planprepare/know-your-zone-know-your-home
- *American Meteorological Society Tornado Sheltering Guidelines during the COVID-19 Pandemic* https://www.ametsoc.org/index.cfm/ams/about-ams/ams-statements/statements-of-the-ams-in-force/tornado-sheltering-guidelines-during-the-covid-19-pandemic
- *American Meteorological Society Hurricane Preparedness during the COVID-19 Pandemic* https://www.ametsoc.org/index.cfm/ams/about-ams/ams-statements/statements-of-the-ams-in-force/hurricane-preparedness-during-the-covid-19-pandemic

Strategies for Sheltering and Mass Care Operations during the COVID-19 Pandemic

- *California Office of Emergency Services Office of Access and Functional Needs Library* https://www.caloes.ca.gov:443/AccessFunctionalNeedsSite/Pages/AFN%20Library.aspx
- *CDC's Interim Guidance for General Population Disaster Shelters During the COVID-19 Pandemic* https://www.cdc.gov/coronavirus/2019-ncov/php/eh-practitioners/general-population-disaster-shelters.html
- *American Red Cross COVID-19 Shelter Training for American Red Cross Partners* https://nationalmasscarestrategy.org/covid-19-shelter-training-for-american-red-cross-partners/

Strategies for Evacuation and Sheltering Risk Communication during the COVID-19 Pandemic

- *Center for Climate Change Communication Debunking Handbook 2020* https://www.climatechangecommunication.org/debunking-handbook-2020
- *King County, Washington, Translation Tips Guide for Emergency Managers and Public Information Officers* https://www.kingcounty.gov/~/media/depts/emergency-management/documents/public-education/Translation_tips_for_EMs_and_PIOs_REV_02-07-19.ashx?la=en
- *National Governors Association Access and Functional Needs Considerations for COVID-19 Response and Recovery Planning Policy Memo* https://www.nga.org/memos/access-and-functional-needs-considerations-covid-19
- *California Department of Forestry and Fire Protection Wildfire Action Plan* https://www.readyforwildfire.org/prepare-for-wildfire/get-set/wildfire-action-plan

REFERENCES

Acosta, J. D., Burgette, L., Chandra, A., Eisenman, D. P., Gonzalez, I., Varda, D., and Xenakis, L. (2018). How community and public health partnerships contribute to disaster recovery and resilience. *Disaster Medicine and Public Health Preparedness*, *12*(5), 635–643. doi: https://doi.org/10.1017/dmp.2017.130.

Aguilar, J. (2017, August 31). Immigration authorities seek to soothe fears about Hurricane Harvey rescues. *The Texas Tribune.* Available: https://www.texastribune.org/2017/08/31/feds-seek-soothe-fears-within-immigrant-community-during-rescue-operat.

Allcott, H., Boxell, L., Conway, J., Gentzkow, M., Thaler, M., and Yang, D. (2020). Polarization and public health: Partisan differences in social distancing during the coronavirus pandemic. *Journal of Public Economics*, *191*, 104254. https://doi.org/10.1016/j.jpubeco.2020.104254.

American Meteorological Society. (2020a, April 9). *Tornado Sheltering Guidelines during the COVID-19 Pandemic*. Available: https://www.ametsoc.org/index.cfm/ams/about-ams/ams-statements/statements-of-the-ams-in-force/tornado-sheltering-guidelines-during-the-covid-19-pandemic.

American Meteorological Society. (2020b, July 30). *Hurricane Preparedness during the COVID-19 Pandemic*. Available: https://www.ametsoc.org/index.cfm/ams/about-ams/ams-statements/statements-of-the-ams-in-force/hurricane-preparedness-during-the-covid-19-pandemic.

American Red Cross. (2020). *COVID-19 Shelter Training for American Red Cross Partners*. Available: https://nationalmasscarestrategy.org/wp-content/uploads/2020/08/2020-08-15-COVID-19-Shelter-Training-for-Partners.pdf.

Asfaw, H. W., Sandy Lake First Nation, McGee, T. K., and Christianson, A. C. (2019). Evacuation preparedness and the challenges of emergency evacuation in Indigenous communities in Canada: The case of Sandy Lake First Nation, Northern Ontario. *International Journal of Disaster Risk Reduction*, *34*, 55–63. doi: https://doi.org/10.1016/j.ijdrr.2018.11.005.

Bakkensen, L. A., Fox-Lent, C., Read, L. K., and Linkov, I. (2017). Validating resilience and vulnerability indices in the context of natural disasters. *Risk Analysis*, *37*(5), 982–1004. doi: https://doi.org/10.1111/risa.12677.

Beauvais, S. (2020, September 4). A week after hurricane evacuation, nursing home residents with COVID-19 are still waiting to return to East Texas. *The Texas Tribune*. Available: https://www.texastribune.org/2020/09/04/texas-nursing-homes-evacuated-coronavirus-hurricane-laura.

Biddlestone, M., Green, R., and Douglas, K. M. (2020). Cultural orientation, power, belief in conspiracy theories, and intentions to reduce the spread of COVID-19. *British Journal of Social Psychology*, *59*(3), 663–673. doi: https://doi.org/10.1111/bjso.12397.

Bolin, B., and Kurtz, L. C. (2018). Race, class, ethnicity, and disaster vulnerability. In *Handbook of Disaster Research* (pp. 181–203). Cham: Springer. doi: https://doi.org/10.1007/978-3-319-63254-4_10.

Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., and Greenberg, N. (2020). The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *The Lancet,* 395 (10227), 912–920. doi: 10.1016/ S0140-6736(20)30460-8.

Bruggers, J., and Green, A. (2020, June 1). Hurricane season collides with pandemic as communities plan for dual emergencies. *NPR, Morning Edition*. Available: https://www.npr.org/sections/health-shots/2020/06/01/865483743/hurricane-season-collides-with-coronavirus-as-communities-plan-for-dual-emergenc.

California Department of Forestry and Fire Protection. (2020). *Wildfire Action Plan—Ready for Wildfire*. Available: https://www.readyforwildfire.org/prepare-for-wildfire/get-set/wildfire-action-plan.

California Partnership to End Domestic Violence. (n.d.). *Emergency Preparedness Toolkit: A Guide for Domestic Violence Organizations*. Available: https://www.cpedv.org/sites/main/files/file-attachments/emergency_preparedness_toolkit_revised_07.2018_cjedits.pdf?1582909879.

Campbell, N. (2019). Disaster recovery among older adults: Exploring the intersection of vulnerability and resilience. In F. I. Rivera (Ed.), *Emerging Voices in Natural Hazards Research*. Butterworth-Heinemann.

Campbell, N., Roper-Fetter, K., and Yoder, M. (2020). *Principles of Risk Communication: A Guide to Communicating with Socially Vulnerable Populations Across the Disaster Lifecycle*. Natural Hazards Center, University of Colorado Boulder. Available: https://hazards.colorado.edu/news/research-projects/risk-communication-and-social-vulnerability.

CDC (Centers for Disease Control and Prevention). (2020a). *CDC Interim Guidance for General Population Disaster Shelters During the COVID-19 Pandemic*. Available: https://www.cdc.gov/coronavirus/2019-ncov/php/eh-practitioners/general-population-disaster-shelters.html.

CDC. (2020b, October 21). *Protect Yourself When Using Transportation: Public Transit, Rideshares and Taxis, Micro-Mobility Devices, and Personal Vehicles*. Available: https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/using-transportation.html.

CDC. (2020c, December 10). *COVID-19 Racial and Ethnic Health Disparities*. Available: https://www.cdc.gov/coronavirus/2019-ncov/community/health-equity/racial-ethnic-disparities/what-we-do.html.

CDC; Agency for Toxic Substances and Disease Registry; and Geospatial Research, Analysis, and Services Program. (2020, September 15). *Social Vulnerability Index 2018 Database*. Agency for Toxic Substances and Disease Registry. Available: https://www.atsdr.cdc.gov/placeandhealth/svi/index.html.

Childs, J. W. (2020, September 30). Elderly, low-income Louisiana residents left to fend for themselves after Hurricane Laura, rescue group says. *The Weather Channel News*. Available: https://weather.com/news/news/2020-09-24-hurricane-laura-elderly-low-income-residents-stranded-lake-charles.

Chin, T., Kahn, R., Li, R., Chen, J. T., Krieger, N., Buckee, C. O., Balsari, S., and Kiang, M. V. (2020). US-county level variation in intersecting individual, household and community characteristics relevant to COVID-19 and planning an equitable response: A cross-sectional analysis. *BMJ Open*, *10*(9), e039886. Available: https://doi.org/10.1136/bmjopen-2020-039886.

Crowdsource Rescue. (2020). *Joint After-Action Report of Golden Arms Rescue*. Available. https://docs.google.com/document/d/1wId_qn7R8dFDhwK25DST5NowQSS8lFNoxwXXf6aI-mQ/edit.

Cuite, C. L., Shwom, R. L., Hallman, W. K., Morss, R. E., and Demuth, J. L. (2017). Improving coastal storm evacuation messages. *Weather, Climate, and Society*, *9*(2), 155–170. Available: https://doi.org/10.1175/WCAS-D-16-0076.1.

Dasgupta, S., Bowen, V. B., Leidner, A., Fletcher, K., Musial, T., Rose, C., Cha, A., Kang, G., Dirlikov, E., Pevzner, E., Rose, D., Ritchey, M. D., Villanueva, J., Philip, C., Liburd, L., and Oster, A. M. (2020). Association Between social vulnerability and a county's risk for becoming a COVID-19 Hotspot—United States, June 1–July 25, 2020. *Morbidity and Mortality Weekly Report*, *69*(42), 1535–1541. Available: https://doi.org/10.15585/mmwr.mm6942a3.

De Vita, C. J., Kramer, F. D., Eyster, L., Hall, S., Kehayova, P., and Triplett, T. (2008). *The Role of Faith-Based and Community Organizations in Post-Hurricane Human Service Relief Efforts*. The Urban Institute. Available: https://www.urban.org/sites/default/files/publication/29751/1001245-The-Role-of-Faith-Based-and-Community-Organizations-in-Post-Hurricane-Human-Services-Relief-Efforts.PDF.

Desmond, M., Papachristos, A. V., and Kirk, D. S. (2016). Police violence and citizen crime reporting in the Black community. *American Sociological Review*, *81*(5), 857–876. doi: https://doi.org/10.1177/0003122416663494.

Dow, K. and Cutter, S. L. (2000). Public orders and personal opinions: Household strategies for hurricane risk assessment. *Global Environmental Change Part B: Environmental Hazards, 2*(4), 143–155. https://doi.org/10572.1016/S1464-2867(01)00014-6.

Dudley, P. (2020, August 31). Seniors left at Lake Charles housing complex with no food, water or electricity after Hurricane Laura. *Eyewitness News*. Available: https://www.wwltv.com/article/weather/severe-weather/seniors-left-at-housing-complex-no-food-water-electricity/289-73c3a4bb-9664-4bbf-af9a-d6d055c67c9c.

Dunn, E., Behr, J., Yusuf, W., and Marshall, J. (2020). *Workshop #3: Transportation and Sheltering Logistics During the 2020 Hurricane Season: After-Action Report (AAR)*. Available: https://digitalcommons.odu.edu/odurc-presentations/24.

Eisenman, D. P., Cordasco, K. M., Asch, S., Golden, J. F., and Glik, D. (2007). Disaster planning and risk communication with vulnerable communities: Lessons From Hurricane Katrina. *American Journal of Public Health*, *97*(Supplement_1), S109–S115. doi: https://doi.org/10.2105/AJPH.2005.084335.

Eisenman, D. P., Glik, D., Gonzalez, L., Maranon, R., Zhou, Q., Tseng, C.-H., and Asch, S. M. (2009). Improving Latino disaster preparedness using social networks. *American Journal of Preventive Medicine*, *37*(6), 512–517. doi: https://doi.org/10.1016/j.amepre.2009.07.022.

Enarson, E. (1999). Violence against women in disasters: A study of domestic violence programs in the United States and Canada. *Violence Against Women*, *5*(7), 742–768. doi: https://doi.org/10.1177/10778019922181464.

FEMA (Federal Emergency Management Agency). (2020a). *COVID-19 Pandemic Operational Guidance for the 2020 Hurricane Season.* Available: https://www.fema.gov/media-collection/covid-19-pandemic-operational-guidance-2020-hurricane-season.

FEMA. (2020b, July). CERT volunteers of all ages assist during the pandemic. *Ready.Gov*. Available: https://community.fema.gov/story/CERT-Volunteers-of-All-Ages-Assist-During-the-Pandemic?lang=en_US.

Fischhoff, B., Brewer, N., and Downs, J. (2011). *Communicating Risks and Benefits: An Evidence Based User's Guide*. Food and Drug Administration (FDA), US Department of Health and Human Services Government Printing Office. https://www.fda.gov/media/81597/download.

Garcia, M. A., Homan, P. A., García, C., and Brown, T. H. (2020). The color of COVID-19: Structural racism and the disproportionate impact of the pandemic on older Black and Latinx adults. *The Journals of Gerontology: Series B*, *gbaa114*. doi: https://doi.org/10.1093/geronb/gbaa114

Godfrey, J., Saliceto, G., and Yegidis, R. (2019). Role of public transportation in a natural disaster state of emergency declaration. *Transportation Research Record*, *2673*(5), 230–239. doi: https://doi.org/10.1177/0361198119835814.

Hake, M., Dewey, A., Engelhard, E., Strayer, M., Harper, T., Summerfelt, T., Malone-Smolla, C., Maebry, T., and Gunderson, C. (2020). *The Impact of Coronavirus on Food Insecurity in 2020*. Available: https://www.feedingamerica.org/research/coronavirus-hunger-research.

Hartman, C. W., and Squires, G. D. (2006). *There is no such thing as a natural disaster: Race, class, and Hurricane Katrina*. Routledge.

Huntsville-Madison County Emergency Management Agency. (2020). *EMA Recommends Residents Make Severe Weather Shelter Plans*. Available: http://madisoncountyema.com/ShelterC19.pdf.

Iaukea, L., Lazrus, H., Maldonado, J., Blanchard, P., Dardar, T., Doyle, J., Eningowuk, F., Longknife, D., Montano, M., Montgomery, M., Neosh, J., Nogueras-Vidal, M., James Rattling Leaf, S., and Souza, M. K. (2020). Bringing Indigenous and earth sciences, knowledges, and practices together to understand and respond to COVID-19. *Journal of Indigenous Social Development*, *9*(3), 214–223.

Jurblum, M., Ng, C. H., and Castle, D. J. (2020). Psychological consequences of social isolation and quarantine: Issues related to COVID-19 restrictions. *Australian Journal of General Practice*, *49* (12), 778-783.

Karaye, I. M., and Horney, J. A. (2020). The impact of social vulnerability on COVID-19 in the U.S.: An analysis of spatially varying relationships. *American Journal of Preventive Medicine*, *59*(3), 317–325. doi: https://doi.org/10.1016/j.amepre.2020.06.006.

Karaye, I. M., Thompson, C., and Horney, J. A. (2019). Evacuation shelter deficits for socially vulnerable Texas residents during Hurricane Harvey. *Health Services Research and Managerial Epidemiology*, *6*, 2333392819848885. doi: https://doi.org/10.1177/2333392819848885.

KATC News. (2020, September 19). *Transportation Assistance Available for Laura Evacuees in Acadiana*. Available: https://www.katc.com/news/lafayette-parish/transportation-assistance-available-for-laura-evacuees-in-acadiana.

Kishore, N., Marqués, D., Mahmud, A., Kiang, M. V., Rodriguez, I., Fuller, A., Ebner, P., Sorensen, C., Racy, F., Lemery, J., Maas, L., Leaning, J., Irizarry, R. A., Balsari, S., and Buckee, C. O. (2018). Mortality in Puerto Rico after Hurricane Maria. *New England Journal of Medicine*, *379*(2), 162–170. doi: https://doi.org/10.1056/NEJMsa1803972.

Kofman, Y. B., and Garfin, D. R. (2020). Home is not always a haven: The domestic violence crisis amid the COVID-19 pandemic. *Psychological Trauma: Theory, Research, Practice, and Policy*, *12*(S1), S199–S201.

Kuligowski, E. (2020). Evacuation decision-making and behavior in wildfires: Past research, current challenges and a future research agenda. *Fire Safety Journal*, 103129. doi: https://doi.org/10.1016/j.firesaf.2020.103129.

Lamb, S., Walton, D., Mora, K., and Thomas, J. (2012). Effect of authoritative information and message characteristics on evacuation and shadow evacuation in a simulated flood event. *Natural Hazards Review*, *13*(4), 272–282. doi: https://doi.org/10.1061/(ASCE)NH.1527-6996.0000070.

Latkin, C. A., Dayton, L., Moran, M., Strickland, J. C., and Collins, K. (2021). Behavioral and psychosocial factors associated with COVID-19 skepticism in the United States. *Current Psychology*. doi: https://doi.org/10.1007/s12144-020-01211-3.

Lazrus, H., Morrow, B. H., Morss, R. E., and Lazo, J. K. (2012). Vulnerability beyond stereotypes: Context and agency in hurricane risk communication. *Weather, Climate, and Society*, *4*(2), 103–109. doi: https://doi.org/10.1175/WCAS-D-12-00015.1.

Lazrus, H., Wilhelmi, O., Morss, R., Henderson, J., and Dietrich, A. S. (2020). Information as intervention: How hurricane risk communication interacted with vulnerability and capacities in Superstorm Sandy. *International Journal of Mass Emergencies and Disasters*, 38(1), 89–120.

Lewandowsky, S., Cook, J., Lombardi, D., Albarracín, D., Amazeen, M., Kendeou, P., Lombardi, D., Newman, E., Pennycook, G., Porter, E., Rand, D., Rapp, D., Reifler, J., Roozenbeek, J., Schmid, P., Seifert, C., Sinatra, G., Swire-Thompson, B., van der Linden, S., … Zaragoza, M. (2020). *Debunking Handbook 2020* [Data set]. Databrary. https://doi.org/10.17910/B7.1182.

Lindell, M.K. (1994). Motivational and organizational factors affecting implementation of worker safety training. In M.J. Colligan (Ed.) *Occupational Medicine State of the Art Reviews: Occupational Safety and Health Training* (pp. 211-240). Philadelphia: Hanley & Belfus.

Lindell, M.K. (2018). Communicating imminent risk. In H. Rodríguez, J. Trainor, and W. Donner (eds.) *Handbook of Disaster Research, 2nd ed.* (pp. 449-477). New York: Springer.

Lindell, M.K. (2020). Improving hazard map comprehension for protective action decision making. *Frontiers in Computer Science*. doi: 10.3389/fcomp.2020.00027.

Lindell, M. K., Arlikatti, S., and Huang, S.-K. (2019a). Immediate behavioral response to the June 17, 2013 flash floods in Uttarakhand, North India. *International Journal of Disaster Risk Reduction*, *34*, 129–146. doi: https://doi.org/10.1016/j.ijdrr.2018.11.011.

Lindell, M. K., Kang, J., and Prater, C. (2011). The logistics of household hurricane evacuation. *Natural Hazards*, *58*(3), 1093–1109. doi: https://doi.org/10.1007/s11069-011-9715-x.

Lindell, M.K., Murray-Tuite, P., Wolshon, B. and Baker, E.J. (2019b). *Large-Scale Evacuation: The Analysis, Modeling, and Management of Emergency Relocation from Hazardous Areas.* New York: Routledge.

Emergency Evacuation and Sheltering During the COVID-19 Pandemic

Lindell, M.K. and Perry, R.W. (1992). *Behavioral Foundations of Community Emergency Planning.* Washington DC: Hemisphere Press.

Lindell, M.K. and Perry, R.W. (2004). *Communicating Environmental Risk in Multiethnic Communities.* Thousand Oaks CA: Sage.

Lindell, M.K. and Perry, R.W. (2012). The Protective Action Decision Model: Theoretical modifications and additional evidence. *Risk Analysis, 32,* 616-632. DOI: 10.1111/j.1539-6924.2011.01647.x.

Liu, L., Haynie, A., Jin, S., Zangeneh, A., Bakota, E., Hornstein, B. D., Beckham, D., Reed, B. C., Kiger, J., McClendon, M., Perez, E., Schaffer, M., Becker, L., and Shah, U. A. (2019). Influenza A (H3) outbreak at a Hurricane Harvey megashelter in Harris County, Texas: Successes and challenges in disease identification and control measure implementation. *Disaster Medicine and Public Health Preparedness*, *13*(1), 97–101. doi: https://doi.org/10.1017/dmp.2018.159.

Liu, L., Miller, H. J., and Scheff, J. (2020). The impacts of COVID-19 pandemic on public transit demand in the United States. *PLOS ONE*, *15*(11), e0242476. doi: https://doi.org/10.1371/journal.pone.0242476.

Long, E. F., Chen, M. K., and Rohla, R. (2020). Political storms: Emergent partisan skepticism of hurricane risks. *Science Advances*, *6*(37), eabb7906. doi: https://doi.org/10.1126/sciadv.abb7906.

Marshall, J., Behr, J., Yusuf, W., and Dunn, E. (2020). *Workshop #1: Vulnerable Populations & Planning Considerations for the 2020 Hurricane Season: After Action Report (AAR)*. Available: https://digitalcommons.odu.edu/odurc-presentations/20.

Mathai, V., Das, A., Bailey, J. A., and Breuer, K. (2021). Airflows inside passenger cars and implications for airborne disease transmission. *Science Advances*, *7*(1), eabe0166. doi: https://doi.org/10.1126/sciadv.abe0166.

Mcauley, A., Williams, J., and Wells, C. K. (2020, August 31). As New Orleans hotels reach their limit, state diverts Laura evacuees to Alexandria. *The Times-Picayune*.

Méndez, M., Flores-Haro, G., and Zucker, L. (2020). The (in)visible victims of disaster: Understanding the vulnerability of undocumented Latino/a and indigenous immigrants. *Geoforum*, *116*, 50–62. doi: https://doi.org/10.1016/j.geoforum.2020.07.007.

Meyer, M. A. (2017). Elderly perceptions of social capital and age-related disaster vulnerability. *Disaster Medicine and Public Health Preparedness*, *11*(1), 48–55. doi: https://doi.org/10.1017/dmp.2016.139.

Meyer, M. A., Purdum, J. C., Kyle Breen, M. A., John, B. A., Aggrey, K. Forrest, M. D., Cristian Nunez, B. A., and Peacock, W. G. P. (2019). Perspectives from nongovernmental organizations on education and training needs for community disaster recovery. *Journal of Emergency Management*, *17*(3), 225–238. doi: https://doi.org/10.5055/jem.2019.0422.

Morss, R. E., Demuth, J. L., Lazo, J. K., Dickinson, K., Lazrus, H., and Morrow, B. H. (2016). Understanding public hurricane evacuation decisions and responses to forecast and warning messages. *Weather and Forecasting*, *31*(2), 395–417. doi: https://doi.org/10.1175/WAF-D-15-0066.1.

Morss, R. E., Demuth, J. L., Lazrus, H., Palen, L., Barton, C. M., Davis, C. A., Snyder, C., Wilhelmi, O. V., Anderson, K. M., Ahijevych, D. A., Anderson, J., Bica, M., Fossell, K. R., Henderson, J., Kogan, M., Stowe, K., and Watts, J. (2017). Hazardous weather prediction and communication in the modern information environment. *Bulletin of the American Meteorological Society*, 98, 2653–2674.

Morss, R. E., Lazrus, H., Bostrom, A., and Demuth, J. L. (2020). The influence of cultural worldviews on people's responses to hurricane risks and threat information. *Journal of Risk Research*, *23*(12), 1620–1649. doi: https://doi.org/10.1080/13669877.2020.1750456.

NASEM (National Academies of Sciences, Engineering, and Medicine). (2020). Encouraging Adoption of Protective Behaviors to Mitigate the Spread of COVID-19: Strategies for Behavior Change. The National Academies Press. https://doi.org/10.17226/25881

Noe, R. A. (2020). Employee Training and Development, 8th ed. New York: McGraw-Hill.

Emergency Evacuation and Sheltering During the COVID-19 Pandemic

National Governors Association. (2020). *Access and Functional Needs Considerations for COVID-19 Response and Recovery Planning*. Available: https://www.nga.org/memos/access-and-functional-needs-considerations-covid-19.

Office of Governor Gavin Newsom. (2020, July 9). *Ahead of Peak Fire Season, Governor Newsom Announces More Firefighting Support Amid COVID-19 Pandemic*. Available: https://www.gov.ca.gov/2020/07/09/ahead-of-peak-fire-season-governor-newsom-announces-more-firefighting-support-amid-covid-19-pandemic.

Pei, S., Dahl, K. A., Yamana, T. K., Licker, R., and Shaman, J. (2020). Compound risks of hurricane evacuation amid the COVID-19 pandemic in the United States. *GeoHealth*, *4*(12), e2020GH000319. doi: https://doi.org/10.1029/2020GH000319.

Phillips, B. D. and B. H. Morrow. (2007). Social science research needs: Focus on vulnerable populations, forecasting, and warnings. *Natural Hazards Review 4*(61–68).

Renne, J. L., Sanchez, T. W., and Litman, T. (2011). Carless and special needs evacuation planning: A literature review. *Journal of Planning Literature*, *26*(4), 420–431. doi: https://doi.org/10.1177/0885412211412315.

Romero, S., and Jordan, M. (2017, August 29). It was an uneasy time for immigrants in Texas. Then the rains came. *The New York Times*. Available: https://www.nytimes.com/2017/08/29/us/immigration-harvey-border-patrol.html.

Saenz, R., and Sparks, C. (2020). *The Inequities of Job Loss and Recovery Amid the COVID-19 Pandemic*. University of New Hampshire, Carsey School of Public Policy. Available: https://carsey.unh.edu/publication/inequities-job-loss-recovery-amid-COVID-pandemic.

Sammer, C. E., Lykens, K., Singh, K. P., Mains, D. A., and Lackan, N. A. (2010). What is patient safety culture? A review of the literature. *Journal of Nursing Scholarship*, *42*(2), 156–165. doi: https://doi.org/10.1111/j.1547-5069.2009.01330.x.

Schmeltz, M. T., González, S. K., Fuentes, L., Kwan, A., Ortega-Williams, A., and Cowan, L. P. (2013). Lessons from Hurricane Sandy: A Community Response in Brooklyn, New York. *Journal of Urban Health : Bulletin of the New York Academy of Medicine*, 90(5), 799–809.

Sedensky, M. (2020, August 26). Nursing homes juggle hurricane evacuations amid virus fears. *AP News*. Available: https://apnews.com/article/52aa69b8de6c1d1c02bee1ab7524cf08.

Sharkey, P. (2007). Survival and death in New Orleans: An empirical look at the human impact of Katrina. *Journal of Black Studies*, *37*(4), 482–501. doi: https://doi.org/10.1177/0021934706296188.

Shultz, J. M., Kossin, J. P., Hertelendy, A., Burkle, F., Fugate, C., Sherman, R., Bakalar, J., Berg, K., Maggioni, A., Espinel, Z., Sands, D. E., LaRocque, R. C., Salas, R. N., and Galea, S. (2020). Mitigating the twin threats of climate-driven Atlantic hurricanes and COVID-19 transmission. *Disaster Medicine and Public Health Preparedness*, 1–10. doi: https://doi.org/10.1017/dmp.2020.243.

Tierney, K., and Bevc, C. (2007). Disaster as war: Militarism and the social construction of disaster in New Orleans. In *The Sociology of Katrina: Perspectives on a Modern Catastrophe* (Vol. 1, pp. 37–54). Lanham, MD: Rowman & Littlefield.

U.S. Census Bureau. (2020). *Community Resilience Estimates: Quick Guide*. Available: https://www2.census.gov/data/experimental-data-products/community-resilience-estimates/2020/technical-document.pdf.

Wei, H.-L., Lindell, M. K., Prater, C. S., Wei, J., Wang, F., and Ge, Y. G. (2018). Perceived stakeholder characteristics and protective action for influenza emergencies: A comparative study of respondents in the United States and China. *International Journal of Mass Emergencies & Disasters*, *36*(1).

Westwood, R. (2020, September 4). Only about 200 of more than 11,000 Hurricane Laura evacuees have been tested for COVID-19. *New Orleans Public Radio WWHO*. Available: https://www.wwno.org/post/only-about-200-more-11000-hurricane-laura-evacuees-have-been-tested-covid-19.

Whittaker, J., McLennan, B., and Handmer, J. (2015). A review of informal volunteerism in emergencies and disasters: Definition, opportunities and challenges. *International Journal of Disaster Risk Reduction*, *13*, 358–368. doi: https://doi.org/10.1016/j.ijdrr.2015.07.010.

Wong, S., Broader, J., and Shaheen, S. (2020). *A Checklist of Immediate Actions for Addressing COVID-19 as Part of Evacuation Planning*. doi: https://doi.org/10.7922/G25H7DJT.

Wood, M. M., Mileti, D. S., Kano, M., Kelley, M. M., Regan, R., and Bourque, L. B. (2012). Communicating actionable risk for terrorism and other hazards⋆. *Risk Analysis*, *32*(4), 601–615. doi: https://doi.org/10.1111/j.1539-6924.2011.01645.x.

Wood, M. M., Mileti, D. S., Bean, H., Liu, B. F., Sutton, J., and Madden, S. (2018). Milling and public warnings. *Environment and Behavior*, *50*(5), 535–566. doi: https://doi.org/10.1177/0013916517709561.

World Health Organization. (2017). Communicating risk in public health emergencies: A WHO guideline for emergency risk communication (ERC) policy and practice. World Health Organization. Licence: CC BY-NC-SA 3.0 IGO.

Yusuf, J.-E., Hill, S., Landaeta, E., Whytlaw, J., and Richardson, T. (2020). The compound threat of COVID-19 and hazards: Public management and policy issues from a stakeholder perspective. *The Journal of Korean Policy Studies*, *11*(2), 149–181.

Yusuf, W., Behr, J., Dunn, E., and Marshall, J. (2020a). *Workshop #5: Workforce: Evacuations, Shelter Staffing, Workforce Structure, Capacity, PPE, and Telemedicine: After-Action Report (AAR)*. Available: https://digitalcommons.odu.edu/odurc-presentations/25.

Yusuf, W., Behr, J., Marshall, J., and Dunn, E. (2020b). *Workshop #4: Public Messaging: Risk Communication for Disaster Preparedness, Evacuation, and Sheltering: After-Action Report (AAR)*. Available: https://digitalcommons.odu.edu/odurc-presentations/23.

Zhang, F., Morss, R. E., Sippel, J. A., Beckman, T. K., Clements, N. C., Hampshire, N. L., Harvey, J. N., Hernandez, J. M., Morgan, Z. C., Mosier, R. M., Wang, S., and Winkley, S. D. (2007). An in-person survey investigating public perceptions of and response to Hurricane Rita forecasts along the Texas Coast. *Weather and Forecasting*, *22*, 1177–1190.

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