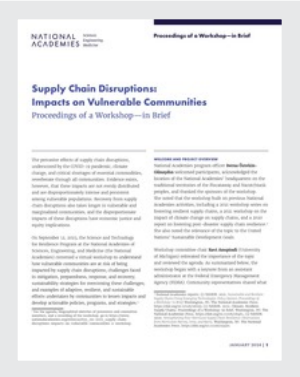

Supply Chain Disruptions: Impacts on Vulnerable Communities: Proceedings of a Workshop—in Brief (2024)

DETAILS

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Proceedings of a Workshop—in Brief

Supply Chain Disruptions: Impacts on Vulnerable Communities

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The pervasive effects of supply chain disruptions, underscored by the COVID-19 pandemic, climate change, and critical shortages of essential commodities, reverberate through all communities. Evidence exists, however, that these impacts are not evenly distributed and are disproportionately intense and persistent among vulnerable populations. Recovery from supply chain disruptions also takes longer in vulnerable and marginalized communities, and the disproportionate impacts of these disruptions have economic justice and equity implications.

On September 12, 2023, the Science and Technology for Resilience Program at the National Academies of Sciences, Engineering, and Medicine (the National Academies) convened a virtual workshop to understand how vulnerable communities are at risk of being impacted by supply chain disruptions; challenges faced in mitigation, preparedness, response, and recovery; sustainability strategies for overcoming these challenges; and examples of adaptive, resilient, and sustainable efforts undertaken by communities to lessen impacts and develop actionable policies, programs, and strategies.[1]

[1] For the agenda, biographical sketches of presenters and committee members, and a recording of the workshop, go to https://www.nationalacademies.org/event/40653_09-2023_supply-chain-disruptions-impacts-on-vulnerable-communities-a-workshop.

WELCOME AND PROJECT OVERVIEW

National Academies program officer **Berna Öztekin-Günaydın** welcomed participants, acknowledged the location of the National Academies' headquarters on the traditional territories of the Piscataway and Nacotchtank peoples, and thanked the sponsors of the workshop. She noted that the workshop built on previous National Academies activities, including a 2021 workshop series on fostering resilient supply chains, a 2021 workshop on the impact of climate change on supply chains, and a 2020 report on fostering post-disaster supply chain resilience.[2] She also noted the relevance of the topic to the United Nations' Sustainable Development Goals.

Workshop committee chair **Ravi Anupindi** (University of Michigan) reiterated the importance of the topic and reviewed the agenda. As summarized below, the workshop began with a keynote from an assistant administrator at the Federal Emergency Management Agency (FEMA). Community representatives shared what

[2] National Academies reports: (1) NASEM. 2021. *Sustainable and Resilient Supply Chains Using Emerging Technologies: Policy Options: Proceedings of a Workshop–in Brief.* Washington, DC: The National Academies Press. https://doi.org/10.17226/26193; (2) NASEM. 2022. Climate-Resilient Supply Chains: Proceedings of a Workshop–in Brief. Washington, DC: The National Academies Press. https://doi.org/10.17226/26461, (3) NASEM. 2020. *Strengthening Post-Hurricane Supply Chain Resilience: Observations from Hurricanes Harvey, Irma, and Maria.* Washington, DC: The National Academies Press. https://doi.org/10.17226/25490.

they have experienced related to supply chain disruptions (Panel 1), and nonprofit, private sector, and government presenters discussed how their sectors could better work together to deal with disruptions (Panel 2). Panelists also offered innovative approaches and strategies (Panel 3) and lessons learned to better prepare for the future (Panel 4). In a closing conversation, presenters reflected on the takeaways they gleaned from the workshop and suggested unaddressed needs related to policy, research, and action.

KEYNOTE ADDRESS

Jeffrey Dorko (FEMA) noted his position with FEMA's Office of Response and Recovery offers an operational, response-heavy perspective on the impacts of supply chain disruptions on communities. As background, he explained that under the Robert T. Stafford Act, disasters are locally executed, state managed, and federally supported.[3] A state governor or Tribal executive is in charge of response, with public and private entities coming together in the field through a vertical integration that flows from FEMA headquarters to FEMA regions to the states.

New Models of Response

Dorko acknowledged the strong capacity of the private sector in disaster response. For example, in a planning exercise in southern California, a large grocer estimated that it had capacity to feed 700,000 people for 30 days. Older FEMA models usually did not mobilize the local private sector as a first option but might instead bring in U.S. military assistance from farther away. As he related, understanding at FEMA has grown over the past decade around the need for supply chain resilience and "getting business back to business." In 2014, the FEMA Office of Business, Industry, and Infrastructure Integration was formed within the Logistics Directorate to build situational awareness.

After Hurricanes Harvey, Irma, and Maria all hit in 2017, FEMA commissioned a National Academies study on strengthening post-hurricane supply chain resilience, which he said has become a guiding light.[4] Relying on the old model, FEMA was trying to determine how to import food to Puerto Rico after Hurricane Maria, while a local grocery store was back in business, with a generator, the next day. Yet, while supply chains were more resilient than appreciated, some areas of the island remained unserved. FEMA now looks at how to enable the rapid restoration of supply chains and conducts root cause analysis, especially in smaller communities.

Dorko welcomed ideas about how to knit together tools and other inputs, and how FEMA could act on the four recommendations in the National Academies study. No two disasters or communities are the same, and agility is required, he stressed. Planning and analyses need to improve, as does building relationships across sectors before disasters strike. Natural challenges, such as hurricanes and wildfires, are becoming more intense, but he said he particularly worries about larger, truly catastrophic events that will reach a different scale and scope. In those cases, everyone will be vulnerable. The lessons learned with the most vulnerable communities today will help a wider group in the future.

Solutions go back to relationships, planning, and exercises with public agencies and private entities in what he termed both a science and an art. He also emphasized the importance of working across FEMA. Dorko concluded with the need to integrate with the private sector to solve problems and restore supply chains.

Discussion

In reviewing what was learned from Hurricane Maria and other disasters and what knowledge is still needed, Dorko reflected on the continuing gap in gaining and maintaining a systems-level understanding. He noted several useful efforts. The Supply Chain Analysis Network brings together multiple partners to better prepare during what he referred to as "blue sky time." FEMA's National Business Emergency Operations Center can be stood up when needed to connect thousands of organizations. Finally, the Natural Response Framework, which is the federal government's guide to response to disasters and emergencies, includes a section that

[3] For more information on the Robert T. Stafford Act and other relevant disaster legislation, see https://www.fema.gov/disaster/stafford-act.

[4] The report made four recommendations related to supply chain disruptions, which were also discussed during Panel 4. NASEM. 2020. *Strengthening Post-Hurricane Supply Chain Resilience.* Washington, DC: National Academies Press. https://nap.nationalacademies.org/catalog/25490/strengthening-post-hurricane-supply-chain-resilience-observations-from-hurricanes-harvey.

promotes cross-sector coordination.[5] He clarified that the authorities and resources under the Stafford Act are an enabler and not a hindrance, but it is necessary to be smarter and use the authorities that already exist.

PANEL 1: COMMUNITY VOICES: DISRUPTIONS AND CHALLENGES

In introducing the first panel, workshop committee member **Benjamin Lyle Ruddell** (Northern Arizona University) posed three framing questions: How do supply chain disruptions impact local communities? What are some recent examples of community disruptions that occurred? Who will or should or can speak for a diverse and vulnerable community's supply chains?

Multiple Needs in Vulnerable Communities

Rev. **James L. Caldwell** (Coalition of Community Organizations [COCO]) began by noting that from a political perspective, Texas law requires the state to address economic drivers when disasters occur. Resources go primarily to those who boost the economy or provide jobs. While he said he understands the need to get economic engines back in operation, what that means is that communities of color and the underserved, such as Houston's Fifth Ward, do not get the resources they need. Underserved communities have limited access to essentials such as food, water, and medicine in normal times, and these disparities are exacerbated during disasters, with COVID-19 and severe winter storms as recent examples. COCO and partners address the needs as much as they can, which Caldwell said have economic, education, housing, transportation, mental health, and other ramifications.

Economic hardships are aggravated by a loss of jobs and reduced income opportunities. Those who work in hourly wage jobs or do gig work are in a particularly precarious position during disruptions and lockdowns. Healthcare inequities were also already a challenge, but COVID-19 supply chain disruptions further strained systems by limiting the availability of medical supplies, testing sites, and other needs. Education disruptions have occurred from "shrinkflation," in which school supplies, course materials, and equipment cost more for the same quantity as previously. School closings during the pandemic impacted students with limited digital access at home or who relied on school nutrition programs. Natural disasters worsen housing instability in underserved populations, Caldwell continued. Evictions spike, and power shortages worsen living conditions. Communities of color rely on public transit that may be disrupted during disasters, and many cannot access medical care and other essential services. The combined toll of supply chain disruptions and associated challenges result in a rise in psychological stress among vulnerable communities, Caldwell emphasized.

Reaching Tribal Nations and Other Remote Communities

Lynda Zambrano (National Tribal Emergency Management Council) discussed three incidents to illustrate the impacts of disasters. First, a 2022 typhoon in Alaska resulted in 67 villages under water, with no refrigeration or power. She noted Alaskans are often forgotten because of their remote location, and supply chain interruptions can be particularly difficult for them, especially in winter. One part of food insecurity often unaddressed is food sovereignty: that is, culturally appropriate foods. In this case, national food suppliers could send things like macaroni and cheese, but not salmon or moose meat, which Alaska Natives typically consume. If they do consume foods outside their normal diets, they can become ill, Zambrano pointed out.

Second, COVID-19 affected many local communities in terms of food, medical supplies, and other essentials. Remote villages and reservations closed their borders to individuals to prevent COVID-19 from coming in, but suppliers also either stopped bringing in supplies or vastly increased prices beyond what people could afford. This illustrates a challenge to resolve with FEMA, she suggested. The Stafford Act was initially state-centric and did not allow tribes to receive FEMA funding. Although changes have been made to allow Tribes to make direct requests to FEMA, many funding programs are not available for Tribes. The National Tribal Emergency Management Council offers trainings for Tribal leaders to understand how to access FEMA funding and other mechanisms.

[5] For more information, see https://www.fema.gov/emergency-managers/national-preparedness/frameworks/response.

Zambrano's third example was the possibility of a Cascadia Subduction Zone earthquake, which could devastate parts of Alaska, California, Oregon, and Washington, including coastal areas where many unique tribal nations live. She urged learning from each disaster and setting up planning events to address issues that arose. For example, the Council used the COVID-19 situation to consider how supplies would be distributed during an earthquake. A cadre of aviation assets was identified consisting of 105 volunteer pilots in a six-state area and another 2,000 in Alaska. Exercises were carried out in 2020, 2022, and another is planned for 2024.

Concurring with Caldwell about the range of disparities after a disaster, Zambrano urged participants not to forget the BIPOC (Black, Indigenous, and People of Color) nonprofits that have been on "the boots on the ground for decades" and saved many lives during COVID-19.

Local Food Connections

As **Martine Hippolyte** (FRESHFARM) stressed, existing disparities amplify supply chain impacts. "Intuitively, we know this, but it is important to name," she said. She also underscored that "those closest to the problems are closest to the solutions." FRESHFARM is a nonprofit in Washington, DC, with the mission to build a more equitable and resilient food system in the mid-Atlantic region. Its three pillars are farmers markets (nearly 30 in the region), food education (currently in 19 Washington, DC public schools), and resilience (through pop-up food hubs). Thirty percent of FRESHFARM farmers and growers are first-generation, 29 percent are BIPOC, and 20 percent are immigrants and/or refugees.

Supply chain disruptions disproportionately impact vulnerable communities directly and indirectly, Hippolyte continued, and create financial strain, confusion, (generational) mistrust, fear, time burdens, and lack of engagement. She commented that it takes years to build trust and about one second to lose it.

Hippolyte offered several examples of potential solutions. The Pop-Up Food Hub is a low-infrastructure decentralized food distribution program that keeps fresh local food affordable while creating new revenue for family farms. FRESHFARM engages with residents at farmers markets to destigmatize federal benefits and enhance knowledge of local produce. Tools that were suggested by families have been created. Community food educators are trained to work in their communities. FoodPrints, an education program, strengthens supply chain resilience by improving the long-term health and educational outcomes of students. Coalition building and intentional relationships are important to identify solutions, she stressed.

Involving the Business Community

Hawai'i's closest landmass is California, more than 2,400 miles away, reminded **Sherry Menor-McNamara** (Hawaii Chamber of Commerce). Supply chain disruptions increase costs and create food insecurity, she said. Most residents in Hawai'i live in O'ahu, but the state has six major islands with 10 commercial harbors in total. The great majority (85 to 90 percent) of food and fuel are imported, which is one reason that Hawai'i has the highest cost of living in the nation. Most shipping takes place on a just-in-time basis, and the trip from the West Coast takes about four days. A lack of warehouse space means suppliers must factor in extra time, as well as a day or two to ship from O'ahu to the other islands. Topography also presents logistical challenges. When the tourism industry declines, the workforce is cut. Health care access, especially in rural areas, and energy supply are also impacted.

In the recent Maui wildlife tragedy, people mobilized quickly, Menor-McNamara said. Shipping and transportation companies donated goods, services, and time. Community members mobilized their own boats from one side of the island to the other. The challenge, she pointed out, is coordination at different levels of government. How to rebuild the housing and getting supplies to an already expensive area are causes of concern. When asked who should speak for the community, Menor-McNamara suggested that community-based organizations, government agencies, and elected officials are important but must coordinate their efforts. In the wildfire and other recent disasters, chambers of commerce and other business associations supported small businesses, especially in hospitality. Many that were previously competitors are now working together, she observed.

Discussion

To best assist people in dealing with psychological stress exacerbated by supply chain disruptions, Caldwell underscored the need to connect individuals with local resources and make them aware of how to alleviate stressors in a holistic manner.

Zambrano elaborated on the value of partnering with on-the-ground nonprofits. "We have learned in emergency management that people often work in silos," she commented. Reflecting on the exercise making use of volunteer pilots, for example, she pointed to the required teamwork with airports, suppliers, farmers, and others. The Fresh Food Coalition, which she helped co-found, operates in six states with more than 700 nonprofits and 574 tribal nations.

Hippolyte commented that nonprofits often rely on entities with funding. Local organizations must raise their visibility so larger organizations are aware of what they are doing, she recommended. Menor-McNamara urged a clear communication plan or strategy so the private sector can most effectively contribute after a disaster. When there are coordinated efforts, a private-sector representative should be in the discussions to provide critical input, she added. Ruddell closed the panel by reinforcing the need for responsibility and knowing who is doing what during a disruption as an important area for improvement.

PANEL 2: WHO'S DOING WHAT: GOVERNMENT AGENCIES, NGOS, PRIVATE SECTOR

Expanding on perspectives of different organizational entities, workshop committee member **Özlem Ergun** (Northeastern University) moderated a panel to understand how public, nonprofit, and private organizations can mitigate and respond to supply chain disruptions to eliminate or reduce the impact on vulnerable communities.

Community Engagement as a Science

Jessica Dandridge (Water Collaborative of Greater New Orleans) explained the Water Collaborative helps people live and thrive with water. Its focus is on collaboration in all activities, creating a space for self-determination and autonomy in places with a lot of climate disasters, and trauma-informed policy making. Dandridge referred to the "4Rs" to recover from disruptions: resources, rapidity, robustness, and redundancy. Another important concept, she added, is to move from a goal of resilience to one of thriving: not to rebuild the status quo, asserted, but to build better. The challenges are bigger than what people need day to day, such as a generator or food, but changes to the underlying infrastructure, she said. Dandridge stressed that community stakeholder engagement is a science, with techniques and skillsets that require education and practice. Many disaster response agencies do not understand this, and she sometimes faces skepticism from engineers and scientists, she said.

As examples, the Water Collaborative is working with the City of New Orleans to develop a civic science and community engagement framework. Engagement is aligned across agencies, with an app for two-way communications. By respecting the importance of residential and community knowledge, a new swath of information and opportunities emerges, she said. Another program, the Community Lighthouse Program,[6] was set up after Hurricane Ida and organized by a coalition of churches so that each church is equipped with emergency back-up power to help a minimum of 100 residents. Similarly, the Water Collaborative is working with the Coastal Protection Restoration Authority[7] to create coastal resilience hubs, a network of hubs where residents learn about coastal issues and resources available to them, especially for disasters.

Dandridge concluded with three recommendations: building a cross-sector engagement office that supports residents as its sole, full-time job; treating community engagement as a science with a focus on trust building; and strengthening local voices and translating the work, in terms of both concepts and language, so everyone can understand the issues.

The Need for Transparency

W. Craig Vanderwagon (retired, Indian Health Service, U.S. Public Health Service) began by stating that climate

[6] For more information, see https://www.togethernola.org/home.
[7] For more information, see https://coastal.la.gov/.

is the principal challenge now and into the future, and it "begins and ends with community." Supply chain disruptions can take two forms, he noted: chronic shortages, where supply is undercut by quality or production challenges, and disaster, where demand exceeds supply. In the former case, he called out Angels for Change, which is a cross-sectoral group that makes cancer medications available to children. Focusing on disaster, he discussed the impact on vulnerable communities and what federal, state, and local groups can do. In addition to first response, he called for more attention to mitigation to help stop future problems.

On the federal side, he called out special programs like the emPower Program in the Administration for Strategic Preparedness and Response (ASPR) of the U.S. Public Health Service, which assists people who need electricity-dependent medical treatment during disasters.[8] One could argue for more advocacy around identification of other special issues with focused services, he commented. ASPR has also funded regional disaster entities that work with academic medical centers on outreach to communities about how they will respond to disasters.

Stockpiles started as a reactive tool in the late 1990s, he continued. They were kept in federal hands and not transparent, although some changes have been made. At least five states have received grants to develop a coherent federal-state stockpile pathway. A City Readiness Program has been ongoing for about 25 years that has led to better planning. More needs to be done, and it needs to be more transparent.

Bringing in the Private Sector

Katie Murphy (C&S Wholesaler) began a discussion on the role of the private sector. C&S is the largest grocery wholesaler in the United States. Murphy observed, as continuity manager, she has seen not only natural disasters, but also an increase in manmade disruptions in vulnerable communities, such as those related to labor actions, drinking water (boil water warnings), or specific products like baby formula. Jurisdictions can plan better and engage with the private sector to figure out how to mitigate disruptions, but there is a lack of investment in day-to-day infrastructure. She pointed out that emergency managers often do not have the funding to do planning.

C&S employees are critical to supporting communities yet may also be vulnerable themselves. The company tries to support them and surges in additional manpower during a disaster. Best practices to support their employees and the impacted communities have been developed, such as working with manufacturer partners and transportation companies. To illustrate the complexity of commodity and supply chain disruptions, she gave the crisis in baby formula as an example. Baby formula is tied to how states offer benefits (e.g., through WIC/SNAP). Food and water related crises, therefore, may not be managed through Emergency Support Functions (ESFs, which makes it difficult for the government to find out the needs of impacted communities.[9] A holistic picture is important but hard to get when emergency managers are working through the lens of ESFs. She lauded the government's work with the private sector over the last two years, but urged more pre-disaster, blue-sky planning. Vulnerable communities access the supply chain differently in rural and urban areas. The public sector has to understand the issues during blue skies to pivot during disasters.

A Shared-Value Approach

Brooks Nelson (Walmart.org) explained Walmart.org is the philanthropic arm of Walmart and the Walmart Foundation, involving both corporate and philanthropic giving. Its shared-value approach creates value for business and society, he said. Issues are selected where Walmart has business assets in place to transform systems and effect change across the lifecycle of disasters: before, during, and after. Homing in on Walmart's Community Disaster Response Strategy and Principles, Nelson noted the effort to quickly serve underrepresented communities through a hyper-local response, such as leveraging transportation and working with local merchants to get products into communities.

[8] For more information, see https://empowerprogram.hhs.gov/emPOWER-AI-Fact-Sheet.pdf.

[9] For more information on ESF and ESF 14, see https://www.fema.gov/emergency-managers/national-preparedness/frameworks/response#esf and https://www.fema.gov/sites/default/files/2020-07/fema_ESF_14_Business-Infrastructure.pdf.

Ninety percent of the country lives within ten miles of a Walmart facility, he noted. One principle is to focus on life-sustaining needs of food, water, cleaning and medical supplies, and be fast to execute. Referring to the conversations about working with community partners, Nelson commented this as both a challenge and opportunity on the ground. During Hurricane Ian, for example, a local organization recognized that a large population of undocumented workers was receiving no assistance, which Walmart then helped provide. Community champions and social media posts can reveal grassroots areas that are not getting products. It is important to work with diverse-led organizations and communities that are not getting other support. Walmart has partnered with the American Logistics Aid Network to think about how to coordinate between the retailer and nonprofit sectors to achieve "the right project at the right time in the right place."

Discussion

Ergun noted the common themes of collaboration, transparency, and communication, as well as roadblocks. She asked each presenter to identify one big challenge and a potential solution to removing a roadblock. Vanderwagon suggested engaging local people in a particular problem set, such as what is in the stockpile and if it will meet needs. Dandridge offered what she termed both a metaphysical and a technical answer to remind agency personnel that "if you are working in an agency, your job is to serve. Be vulnerable enough to listen with courage and empathy." Rather than impose data on the solution, see if the data reflects the reality, she urged. On the technical side, she reiterated that collaboration is a science. In her view, it is a misconception that the public does not care about policy (versus politics) or is not able to care about or understand the issues. Murphy stressed that the private sector can be a force multiplier, but there should be better mechanisms to collaborate with the public sector. Nelson said technical solutions and more open communications would help.

Dandridge suggested that some groups may not trust corporate entities, and trust should be built before a disaster. In the South, she observed, face time is important. Nonprofits could use a dashboard or other tools to minimize duplication and reduce frustration on both ends. James Caldwell (see Panel 1) added that without a lens of equity, change will not occur, and communications and transparency are irrelevant. Murphy commented that because funds are limited, only communities that get resources are able to do the most robust planning, which she said is a critical gap.

PANEL 3: INNOVATIVE APPROACHES AND SUSTAINABLE STRATEGIES

Workshop committee member **Tinglong Dai** (Johns Hopkins University) moderated a panel to focus on local solutions to address vulnerabilities. Harkening to the supply chain stressors of the past several years, he noted the shortcomings of conventional strategies in safeguarding vulnerable communities and the need for innovation that can be sustained.

A Marketplace Model

Carla Chinavare (Wayne Metro Community Agency) discussed how supply chain disruptions affect human services and a potential response called the Families First Marketplace.[10] As one of about 1,000 community action agencies nationwide, Wayne Metro connects people from vulnerable communities to wraparound support, including health, housing, education, and other services. Echoing other presenters, she described how the pandemic affected the food supply chain and was particularly challenging for low-income households in Wayne County, MI. The agency had conducted emergency food distribution in the past and realized its unique position to meet the need in 2020. Through $1.6 million in federal and state COVID-19 relief funding, the goal was to get food to people who needed it most. Partnerships were the key, she stressed.

Chinavare said the agency sought a different approach than long lines of people all receiving the same food. Wayne Metro had a relationship with Atlas Wholesale Foods through its HeadStart program. Brainstorming together led to the creation of Families First Marketplace as an online marketplace through which individuals and families could choose from an inventory of food

[10] For more information, see https://www.waynemetro.org/food/.

and household items. Using Wayne County's existing in-house call center, about 4,000 income-eligible households established accounts with $750 in food credits. They placed orders online or by phone. Atlas packaged and delivered the orders to them directly. Through the online program, people shared photos, experiences, and recipes, which could be shared with funders and other community stakeholders.

In thinking about what made the Marketplace work, Chinavare reflected on the existing relationship and infrastructure with Atlas, dedicated customer service through the call center, and shared organizational cultures.

Connecting Supply and Demand

The challenge faced by the Los Angeles Food Bank during the pandemic, **Chris Tang** (UCLA) reported, was to serve millions of people, but without certainty about who they were and where the supplies would come from. Before COVID-19, the food bank distributed about 1 million pounds of food per week though 600 agencies. The pandemic surged demand for food by 80 percent. Many of the food bank's usual distributing agencies closed, donations flattened, farm operations were disrupted, and fewer people volunteered at the food bank. Nationwide, Tang related, the government recognized the need to sustain the food supply. The U.S. Department of Agriculture (USDA) earmarked $16 billion for farmers and ranchers to stay afloat and $3 billion in indirect support to ship food to food banks. Through the Food Box Program, USDA purchased produce, dairy, and meat that approved distributors used to pack boxes to distribute through food banks and other agents.[11]

The Los Angeles Food Bank was one of these agents but initially did not have capability to handle the volume in terms of manpower or storage space. To solve the problem, a team comprised of members of the food bank, UCLA, and the company Salesforce came together to manage the flows of food. In 40 days, via Zoom and email, the group created a Decision Support System dashboard that tracked food supply and allocation (who, what, when, how much, truck type, and delivery days). The impact was more equitable allocation of food, reduced management burden, and improved accuracy in terms of deliveries and invoicing. The innovative partnership also inspired efforts to improve more equitable access to health care and vaccinations, Tang said.

[11] The program ran from May 2020 to May 2021. For more information, see https://www.ams.usda.gov/selling-food-to-usda/farmers-to-families-food-box.

Medicine Availability in Underserved Communities

Discussing medicines more fully, **Dima Qato** (University of Southern California) noted pharmacy closures before, during, and after COVID-19. While a U.S. priority has been domestic production of pharmaceutical products, distribution is often not considered but is also a part of the supply chain for medicines to reach patients. Affordability is also an issue for many patients who need them.

Solutions must address the equity challenge, Qato said, especially because the nationwide net loss of pharmacies has especially impacted communities of color. Ensuring access must be more strategic, she and a colleague urged in a recent paper.[12] As an equity issue, when patients are encouraged to get a three- to six-month supply of a medicine, they may face stock-out or affordability challenges. Turning to COVID-19 vaccinations, she said an initial response was the Federal Retail Pharmacy Program for COVID-19 Vaccinations. However, it mostly involved pharmacy chains, whereas most communities of color have no or only independent pharmacies.

Qato offered several solutions to ensure access: (1) ensure pharmacy access in the wake of pharmacy closures, such as through expanded home delivery; (2) prevent stockpiling of essential medicines; (3) prevent stock-outs by monitoring needs and forecasting demand; and (4) expand pharmacy services. The Essentials Medicine List[13] developed by the Food and Drug Administration is useful so that pharmacies know what they should have in stock, but she urged local, not national, lists, as is done in other countries.

Discussion

Looking at the overall pharmaceutical supply chain, Qato said changes are needed at various levels, given how the

[12] G. Alexander and D. Qato. 2020. Ensuring access to medications in the US during the COVID-19 pandemic. JAMA. doi: 10.1001/jama.2020.6016.
[13] For more information, see https://www.fda.gov/news-events/press-announcements/fda-publishes-list-essential-medicines-medical-countermeasures-critical-inputs-required-executive.

health system is structured. Pharmacies be paid enough to remain operational and pharmacy networks should be more open and flexible. The lack of transparency about drug shortages plays out locally.

When asked about the continuation of the Families First Marketplace, Chinavare noted that it had depended on COVID-19 funding and continuously funding has been difficult. Looking at the root cause of food insecurity, the agency does what she termed journey-mapping with clients, so that funders understand the systems-level issues that impact people. Tang added the importance of two-way communication. A database of consumers' preferred food choices could be built, for example, which agencies could use as they seek funding and supplies.

PANEL 4: PREPARATIONS: LESSONS LEARNED AND GETTING READY FOR THE FUTURE

The final panel, moderated by workshop committee member **Felicia Jefferson** (University of Nevada, Reno), looked at ways to mitigate supply chain disruptions.

Context and Sample Solutions

Erick Jones (University of Nevada, Reno)'s presentation focused on four components: the context for supply chain disruptions, examples of the impacts on vulnerable communities, sample solutions, and concluding observations and opportunities. In discussing the context for supply chain disruptions, he called attention to Executive Order 14017, which identified four areas of supply chain risks and asked for review of these risk areas (semiconductors, critical minerals and materials, pharmacies, and electric vehicle batteries) within 100 days by the Assistant to the President for National Security Affairs (APNSA) and the Assistant to the President for Economic Policy (APEP), in coordination with the heads of appropriate agencies. The purpose of this review is to realize secure, resilient, and diverse supply chains.[14] He also said the pandemic revealed that in the U.S. we are prone to both international and local challenges related to sourcing from different countries/resources. For example, many challenges related to supply and labor for cobalt in China are similar to challenges in the United States as we expand mining supply chain activities. As we talked about these activities, we looked at response, recovery and opportunities, Jones said.

As sample solutions, he focused on artificial intelligence and how different information can assist vulnerable communities. Another solution that worked during the pandemic was identifying and working with individuals that communities trust (e.g., local pharmacists). Also, in the path to net-zero emissions, communities need to trust that they won't be harmed in the process when mineral extraction takes place for lithium batteries, often in remote areas, and that wealth is built for these communities. Banks, citizens, and communities must work together to benefit when these activities occur.

In providing concluding observations and opportunities, Jones mentioned that he serves on two economic development councils convened by the Nevada Governor. They worked on how to get federal funding and partner with communities and community-based organizations to implement these solutions. One of the ideas is infrastructure related, how technologies such as 5G can be utilized by vulnerable communities to collect accurate data, so they can be part of the solution. The other one is providing technical knowledge about technologies that enable these communities to have a voice and create wealth and connectivity.

Emergency Preparedness and the Role of Volunteers

Collin Arnold (New Orleans Office of Homeland Security and Emergency Preparedness) described his agency's active public outreach through a campaign called NOLA Ready.[15] He reflected that, as other presenters described, COVID-19 remains present in agency conversations and offers a lot to learn about preparedness, response, and recovery from large-scale incidents. His office administers crisis and consequence management under federal and state guidance during all hazards, including hurricanes, other storms, and special events like Mardi

[14] The text of E.O. 14017, "America's Supply Chains," can be found at https://www.whitehouse.gov/briefing-room/presidential-actions/2021/02/24/executive-order-on-americas-supply-chains/.

[15] For more information, see https://ready.nola.gov/home/.

Gras or the Super Bowl. City, state, and federal agencies are all involved.

A large part of NOLA Ready is engaging volunteers. He noted the Stafford Act has provisions for working with nonprofits, volunteers, and donations during declared disasters. If tracked correctly, a cost-share with the federal government can be worked out for reimbursement. More importantly, he said, volunteers are able to come in quickly, often faster than the government, to a community after a disaster. His goal is to harness and welcome volunteers, rather than try to push them out as some jurisdictions do. While he acknowledged that too many people self-dispatching can create chaos, it works with coordination in advance. An established, trained volunteer corps, especially in communities with historic vulnerabilities, is valuable. The government then provides a backstop as the volunteers burn out, he added. He also stressed the importance of a relationship with FEMA, which New Orleans has. Katrina is still a huge part of the city's story, he said.

Vulnerability, Access to Goods, and Stocks and Flows

Jarrod Goentzel (MIT) pointed to parallels between a focus on vulnerable communities and the more general recommendations in the 2020 National Academies report on post-hurricane supply chain resilience (referred to by Jeffrey Dorko). In particular, he pointed to the report's first recommendation to shift the focus from bringing in relief supplies to ensuring that a community's regular supply chains can be restored. He noted three areas relevant to the current workshop—understanding vulnerability, ensuring access to goods, and understanding stocks and flows.

As discussed throughout the panels, understanding vulnerability requires listening, Goentzel underscored. Domestic data sources that include FEMA's Resilience Analysis and Planning Tool (RAPT) and the CDC/ATSDR Social Vulnerability Index can be used to analyze and take preparatory action, as he showed with an example from Hurricane Idalia in Florida.[16] The international community, which does not have as much GIS data as in the United States, has developed field-based needs assessments, such as standards compiled by the Inter-Agency Standing Committee.[17] These field-based methods include transect walks, observations of living conditions, conversations with key informants, and focus groups. He suggested that these methods can complement data and provide nuance in the United States. Another global example he offered is a framework used in a Rohingya refugee camp. Rigorously studying vulnerability and sharing what is learned can build system-level understanding that is key to identifying strategies.

Once vulnerability is understood, access to the goods people need can be better addressed. In the Hurricane Idalia example, the projected hardest-hit area was a rural area without many grocery stores, which revealed the gaps to fill for emergency management. Yet, he also warned against falling prey to misleading data, such as failing to account for edge effects when looking at GIS data on food availability.[18]

Understanding stocks and flows is key to the supply chain, he continued. In looking at personal protective equipment stockpiles during COVID-19, supply managers reported very low-level inventory going into COVID-19, especially certain segments of providers such as skilled nursing and assisted living facilities. A study by MIT's Humanitarian Supply Chain lab and Center for Disaster Management recommended strengthening the monitoring of all types of facilities, and he noted a Centers for Medicaid and Medicare requirement around national emergency and preparedness requirements. Related to flows, he reminded participants about the port crisis in which freight was held up at U.S. ports, exacerbating supply chain disruptions. One positive result was the creation of the U.S. Department of

[16] The RAPT is a GIS planning tool to inform strategies for emergency preparedness, response and recovery. It can be accessed at https://fema.maps.arcgis.com/apps/webappviewer/index.html?id=90c0c996a5e242a79345cdbc5f758fc6. The CDC/ATSDR Social Vulnerability Index is developed by the Department of Health and Human Services and is available at https://www.atsdr.cdc.gov/placeandhealth/svi/index.html. It uses 16 U.S. census variables to help local officials identify communities that may need support before, during, or after disasters.

[17] IASC's Multi Cluster/Sector Initial Rapid Assessment Manual (MIRA), see https://interagencystandingcommittee.org/iasc-transformative-agenda/documents-public/multi-clustersector-initial-rapid-assessment-mira-manual.

[18] R.C. Sadler et al. 2011. An application of the edge effect in measuring accessibility to multiple food retailer types in Southwestern Ontario, Canada. *International Journal of Health Geographics*, 10(1), 1–15. https://doi.org/10.1186/1476-072X-10-34.

Transportation's Freight Logistics Optimization Works (FLOW) program.[19] It is voluntary, participatory, and useful in sharing common information and a common picture of the network of related supply chains, he said, as it leverages existing authorities to collect sensitive information about port traffic. Reciprocal value creation was built in with unique data, so there is motivation to participate, especially from the private sector. He noted FLOW is a good model around a specific problem, allowing local authorities to address vulnerability in a community.

Sustainability and Supply Chains

Patrick Branco (Hawai'i Green Growth) presented on Hawai'i Green Growth, a public–private partnership that he suggested can mitigate supply chain disruptions. Founded in 2011, it is one of eight sustainability hubs around the world. Through work done by Hawai'i Green Growth, the state adopted the Aloha+ Challenge in 2014 and governors, mayors, and major corporate leaders have signed on to the challenge since then.[20] The United Nations' (UN) 17 Sustainable Development Goals (SDGs) were localized to six goals: clean energy, local food, natural resource, waste reduction, green workforce and education, and smart sustainable communities. A dashboard provides accountability and transparency on progress toward the goals, Branco explained.

Hawai'i Green Growth has conducted and submitted Voluntary Local Reviews to the UN (the United States is one of the few countries in the world that does not submit a national review to the UN) and is encouraging other states to do so. They are also scaling their model to Guam and Palau to localize the SDGs, compile data, and inform policy making.

Discussion

Branco noted that one way the Hawai'i Green Growth model succeeds is through cross-sector collaboration. Working groups are chaired by a community leader and sometimes an elected official, and they meet quarterly to share information to move change. Jones elaborated on the lithium supply chain and mining on indigenous land and stressed the importance of getting wealth back to communities. It is important to keep things simple and bring people to the table. Investment banking must play a part in sustainability, Jones stressed.

Discussing the role of data, Goentzel said a holistic view is needed. Local stakeholders, volunteers, and others can complement the wealth of demographic and GIS data. If done effectively, a better assessment of vulnerability can result. Arnold offered a food supply example from COVID-19. Nonprofits in New Orleans could not keep up with the demand for food, while small businesses and restaurants suffered. Over the course of 14 months, his agency received $30 million to feed about 30,000 people a day. Keeping within FEMA guidelines, 600 restaurants cooked, packaged, and dispatched local drivers to make deliveries. He noted the importance of seeking funding with a plan with cascading benefits: in this case, stimulating economy, providing food for vulnerable populations, and encouraging people not to go outside. The model could be used in other disasters, he said.

FIRESIDE CHAT: WHAT HAVE WE HEARD, WHAT NEEDS TO BE ADDRESSED

In the concluding session, workshop chair Ravi Anupindi spoke with **Ivis Garcia** (Texas A&M) and **David Kaufman** (CNA) about their takeaways from the workshop. Beginning with an assessment of the current state of supply chains affecting vulnerable communities, Kaufman commented on the progress made since Hurricane Katrina. Throughout the workshop, he commented, presenters recognized both progress and more work to do. In the government space, he acknowledged the tremendous effort to build the capabilities and capacity to act directly in relief operations. Initially, that effort did not incorporate a nuanced understanding of vulnerability in communities or of better use of private sector strategic capacity to produce outcomes. Awareness has grown about these issues, but more work is needed to target support to those most in need and create the transition from awareness to action, he observed.

Garcia commented about the great things that people are accomplishing in government agencies, the private

[19] For more information, see https://www.bts.gov/flow.
[20] For more information, see https://alohachallenge.hawaii.gov/.

sector, and nonprofits. She highlighted "the glass is half full" and called attention to strengths and what has been learned. However, she reflected on the need for more coordination, particularly with the private sector. She urged thinking locally, regionally, nationally, and globally. To better serve low-income communities—rural, urban, places with chronic health conditions—she reflected on the need to be culturally sensitive when offering assistance.

Anupindi commented on the solutions offered throughout the workshop. FEMA is a coordinating agency, but primarily top down, and asked Kaufman and Garcia how to connect with community groups that are often bottom up. Kaufman commented on two cross-boundary axes expressed during the discussion: Government to civil society, which is hierarchical, and decentralized engagement, which he noted is critical but harder for government agencies to do. Garcia said from an asset-focused perspective, she would look at what is already working in a local community. FEMA tend to be hierarchical, which can be more efficient. Communities, in contrast, operate in a more circular fashion. Sometimes they have ideas and people, but not funding. Agencies can help with resources, capacity building, and communications, she suggested, noting that workshop participants are working in different sectors and could serve as connectors.

Funding is a recurring issue, Anupindi commented, especially as multiple disasters strike. A lot of money is spent on response, but not enough between disasters to build resilience, and he asked which agency or other entity should take responsibility or whether policy change is needed for this to happen. Kaufman said the hard part is that resilience planning does not touch just one agency, so a shift in governance is needed to deliberately design in actions and hooks when implementing housing, social service, education, and other programs. The preexisting conditions in a community are important to understand the effects of a disaster, but that is not how programs are designed in traditional government models, he commented. Garcia said funding for capacity building is important, for example so smaller, community-based organizations learn how to access the funding that is available.

In considering new research, policies, or tools, Garcia stressed the value of giving power to communities. Tools that build understanding of local conditions and combine qualitative and quantitative methods to do community analysis are important to do in a community-based way, to build this power. People who are closest to the problems are closest to the solution, and there is a need to focus more on participatory research, she urged. Kaufman highlighted three areas of research gaps. First, he called for understanding scarcity and the need to de-risk private capital investment decisions for production capacity. Procurement strategies to de-risk decisions are needed because scarcity will occur again. Second, in talking about how the government can engage with the private sector, he said the next step forward would involve how the public sector can take action designed to expedite or accelerate private commodity flows. Third, engineered sectors (e.g., telecommunications) have a gap in their regulatory regimes that set a preference for rate-setting interests and keeping prices low, which has a real effect on resiliency in those sectors.

DISCLAIMER This Proceedings of a Workshop–in Brief was prepared by **Berna Öztekin-Günaydın** and **Paula Whitacre** as a factual summary of what occurred at the workshop. The planning committee's role was limited to planning the workshop. The statements made are those of the rapporteurs or individual workshop participants and do not necessarily represent the views of all workshop participants; the planning committee; or the National Academies of Sciences, Engineering, and Medicine.

REVIEWERS To ensure that it meets institutional standards for quality and objectivity, this Proceedings of a Workshop–in Brief was reviewed in draft form by **Kathy Fulton,** American Logistics Aid Network, and **Diana Ramirez-Rios,** The State University of New York, University at Buffalo. The review comments and draft manuscript remain confidential to protect the integrity of the process.

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