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Planning for food system disruptions: lessons learned about resilience attributes from local governments' emergency food response efforts

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Introduction: Local governments in the United States are critical emergency food response actors during disruptions. They are perceived as being well-positioned to provide food, connect with community partners, and inform residents. A variety of resilience-related factors (referred to here as resilience attributes) influence the ease and pace of their responses. This exploratory study investigated how resilience attributes were associated with five local governments' emergency food response efforts during the early phases (April 2020–January 2021) of the COVID-19 pandemic and the facilitators and barriers to exhibiting higher levels of these resilience attributes.

Methods: Participants in this study were members of the Food System Resilience Community of Practice (CoP), which was a small group of local government stakeholders convened and facilitated by the Center for a Livable Future and the Bloomberg Center for Government Excellence at Johns Hopkins University. We used a mixed-method embedded design for the research: we collected survey data (April 2020) before the six-month CoP and completed semi-structured in-depth interviews (December 2020 and January 2021) after the CoP. We recorded, transcribed, and analyzed the interviews using the phronetic iterative approach and combined the quantitative and qualitative data using an analysis matrix.

Results: We found that preparedness, connectivity, capital reserves, diversity, redundancy, flexibility, and equity were a part of the local governments' emergency response efforts, and having higher levels of these attributes was supportive of work. We also identified cross-cutting facilitators and barriers that helped or hindered local governments in exhibiting these attributes.

Discussion: By examining five local governments' emergency food response efforts during the COVID-19 pandemic, we are able to better understand how resilience attributes were associated with efforts and what actions can help or hinder local governments in displaying these attributes. From this, we can identify programmatic and policy opportunities that can help local governments better prepare for and be resilient to future crises.

KEYWORDS

food system resilience, local government, resilience attributes, food planning, equity

1 Introduction

Local governments in the United States (US) play a critical role in responding to food system disruptions. The Tenth Amendment of the US Constitution gives states the power to respond to public health emergencies, which has been interpreted as delegable to local governments (Library of Congress, 2020). A Community of Practice (CoP) comprised of city representatives and researchers that took place during the early phases (April 2020–January 2021) of the Coronavirus Disease 2019 (COVID-19) pandemic presented a unique lens through which to study local government emergency food response efforts as the emergency food response efforts were largely coordinated by local governments.

COVID-19 disrupted food systems around the globe, and the disruptions shifted as the pandemic progressed. During the early phases of the pandemic, key impacts in the United States were school closures, supply chain disruptions, food price volatility, increased demand for emergency foods (Béné et al., 2021; Laborde et al., 2020), pressure on (and in some places danger to) food system workers (Ceryes et al., 2021; Saitone et al., 2021), to name a few. These disruptions disproportionately impacted people with low income, living in rural locations, or who were food insecure before the start of the pandemic (Niles et al., 2020; Kent et al., 2022). While early papers focused on the immediate impacts of COVID-19 on food systems, subsequent work has emphasized building more resilient systems post-pandemic (Sperling et al., 2022), understanding key vulnerabilities (Newell et al., 2022) and assets, such as supply chains (Jia et al., 2024) and urban agriculture (Gulyas and Edmondson, 2021 Qiu et al., 2024), and documenting how some systems demonstrated robustness and adaptability under pressure (Béné et al., 2021). Despite this growing body of work, limited empirical research has examined how local governments—often frontline actors in many emergency responses—operationalized food system resilience during the crisis and what can be learned for future planning.

Local governments responded to the food crises associated with COVID-19 in varying ways. For example, many set up new methods to provide meals to school-aged children with the shift to virtual learning (United States Department of Agriculture, 2022) and to residents who could not leave their homes (San Francisco Human Services Agency, 2021). They also developed new meal distribution sites and supported urban and local agriculture (Campbell, 2021). In some jurisdictions, local governments played a critical coordination role among local, state, and federal emergency food actors and non-profit and for-profit food partners (Baltimore City: Department of Planning, n.d.; New York City Food Policy, 2021). Some local governments also played a vital communication role with residents. They provided resources about where to access free meals, food banks and pantries, and resources on navigating enrollment and changes to federal food benefits (City of Denver, 2021). Prior to COVID-19, very few local governments had food system resilience plans or had food integrated into other emergency or disaster-related plans, so these new methods and processes were often developed without a road map or established precedent. While these interventions have been described in gray literature and city reports, there is limited peer-reviewed research evaluating them systematically or exploring multiple jurisdictions.

Since COVID-19, there have been some government-focused evaluations. One study specifically focused on local governments in the United States found that COVID-19 altered the perspectives of local government stakeholders on food production; it also found the need for additional knowledge and training to support government actors and a desire for policy integration (Campbell, 2021). A national-level analysis of resilience actions in Australia, New Zealand, Sweden, and the United States highlighted a need for additional preparedness activities (Lloyd et al., 2024). There have also been continued calls for efforts to build more resilient food systems (Sperling et al., 2022; Ben Hassen et al., 2025; Haji and Himpel, 2024). Yet, a gap remains in understanding the role of local government actions.

It is likely that various factors influence the ease and pace by which local governments respond to food crises and provide services; however, these factors, how they influence government actions, and the facilitators and barriers to these factors are less well established. Food system resilience offers a helpful lens for exploring these factors, as it merges resilience thinking with core food system functioning elements.

Food system resilience has been defined as the "capacity over time of a food system and its units at multiple levels, to provide sufficient, appropriate and accessible food to all, in the face of various and even unforeseen disturbances" (Tendall et al., 2015). Within the food system resilience literature, numerous factors have been proposed as enhancing or diminishing the resilience of socio-ecological systems (Maclean et al., 2014; Walker, 2020; Timpane-Padgham et al., 2017; Rockström et al., 2023). Certain attributes are more applicable to a food system (Meuwissen et al., 2019; Hodbod and Eakin, 2015; Worstell and Green, 2017; Food and Agriculture Organization of the United Nations (FAO), 2021; Karoliina et al., 2023), a specific crisis (Béné, 2020), or a specific part of the food supply chain (Davis et al., 2021; Toth et al., 2016). To identify attributes relevant to local governments' emergency food response efforts, we reviewed the literature on measuring resilience. As a research team, we selected the attributes that best fit the local government response context (Supplementary Data Sheet 1). For example, we did not include competition as a relevant attribute, as the aim of local government emergency response efforts is not competition. We also did not include attributes that measure elements outside of emergency food in the larger food supply chain, such as farm insurance or supply chain chokepoints. The attribute list was directly informed by Christophe Béné's application of resilience concepts to COVID-19 (Béné, 2020) and previous work done by our research team on local government and organizational food system resilience (Biehl et al., 2017; Biehl et al., 2018; Hecht et al., 2019; Chodur et al., 2018).

To better understand how these attributes could impact the local government context, we reviewed the food and disaster planning literature. Of note was the importance of integrating equity into planning and implementation (Mui et al., 2021, Ramaswami et al., 2022, Khojasteh, 2023), looking across multiple dimensions of food security and food environments (Mui et al., 2021, Cohen, 2022), and the role of food planners (Soma and Wakefield, 2011) and food policy councils (Palmer et al., 2020; Gupta et al., 2018).

We posited that preparedness, connectivity, capital reserves, diversity, redundancy, flexibility, and equity are core food system resilience attributes that are relevant to local governments' emergency food response to COVID-19. We have previously published descriptions and applied examples of these attributes (Moore et al., 2022), but briefly, we explain these in relation to local governments' emergency food response efforts to COVID-19.

- Preparedness: The level of advance preparation for food crisis response among local government and related actors.
- Connectivity: The presence, strength of relationships, and communication that local governments had with their local food system and related actors, such as emergency managers or the Federal Emergency Management Agency.
- Capital reserves: The resources (social, financial, natural, political, etc.) that jurisdictions or local governments had available to support their response efforts.
- Diversity: The number of *different* elements (actors, organizations) that served a similar purpose in the local government ecosystem.
- Redundancy: The number of *similar* elements that served the same purpose in the local government ecosystem.
- Flexibility: The ability of local governments to act and adapt with ease.
- Equity: The procedural, distributional, structural, and intergenerational considerations of the emergency food response efforts.

This paper examines the extent to which these resilience attributes were associated with local governments' management of the food system responses in the early phases of the COVID-19 pandemic, and the facilitators and barriers to local governments exhibiting these attributes. It then considers how the lessons learned about these attributes from COVID-19 can inform future policy and planning efforts that support long-term food system resilience. This article focuses specifically on local governments, rather than on the broader food system or non-governmental food system actors. Yet, by gaining a better understanding of how local governments responded to a major food disruption, we can gain insights into how the actors and processes that make up a system contribute to overall resilience.

2 Methods

This mixed methods study used a concurrent triangulation design to collect and analyze survey and qualitative interview data.

2.1 Food system resilience community of practice (CoP)

Participants in this study were members of the Food System Resilience Community of Practice (CoP). Communities of Practice are a method used to bring parties together around a specific topic or problem to promote shared learning (Wenger, 2011). We formed this CoP to advance local government food system resilience planning. Through a series of facilitated virtual conversations, representatives from cities and researchers from the Johns Hopkins Center for a Livable Future and the Bloomberg Center for Government Excellence provided a platform for local government participants to learn from one another and co-developed a planning guide to help local governments integrate food systems into their disaster preparedness and resilience planning (Moore et al., 2022). The CoP members provided feedback on developing resources, tested them between the sessions, and met one-on-one with the research team.

We initially planned to convene the CoP with a focus on food system resilience planning broadly. However, since the CoP launched at the same time as the start of the COVID-19 pandemic (March 2020), according to the World Health Organization (n.d.) and based on the desires of CoP members, we expanded the CoP focus to include COVID-19 response efforts. The CoP convened monthly from April to September 2020 for virtual 75-min sessions. At the culmination of the CoP, members attended a two-day virtual workshop in October 2020. The workshop focused on specific themes requested by the CoP members that built on the monthly sessions. The workshop was originally planned as an in-person event, but it was conducted virtually.

2.2 Recruitment and sampling

Recruitment for the CoP began in late 2019 with exploratory conversations with potentially interested cities. Formal invitations were issued in January 2020, and all five invited cities agreed to participate. While we had early discussions with other jurisdictions during the planning phase, the final sample included the same five cities we formally invited. Identifying and confirming two representatives per city took several months, and the CoP officially launched in April 2020.

Members of the CoP were representatives from five cities across the US. We invited these cities to participate in the CoP because of their geographic and demographic diversity, different government structures, varying levels of food system resilience planning, and interest in working on this issue. Each city had two to three representatives participate in the CoP. CoP members included a city council member, an administrator, an educator, a student, several planners, and project/program managers. The CoP members worked for city councils, offices of sustainability and climate action, departments of planning, public health, and the environment, food policy councils, and more. Despite the diversity of titles and departments among participants, many were involved in supporting food systems and/or food policy work within their local governments. This, however, did not mean that they exclusively worked on food system issues, but reflected the multiple places where food work is housed in local governments. Throughout this article, the participants' type of role is referred to as someone within the organization focused on food.

We invited all CoP members ($n = 11$) to take part in the research. Participants were allowed to join the CoP even if they did not participate in the research. We invited CoP members to complete an online pre-and post-survey and to do an exit interview at the end of the CoP period. Participants could choose to complete all, some, or none of the research elements. We asked participants to answer the survey and interview questions in their professional capacity.

All participants were 18 years or older and were local government staff and/or worked directly with local government on food policy. Participants provided virtual consent before taking the survey and oral consent for the interview. During the consent process, we informed participants about the purpose of the research, the risks of joining, and the potential benefits. This study was determined to be exempt by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board (IRB No. 11719).

2.3 Data collection

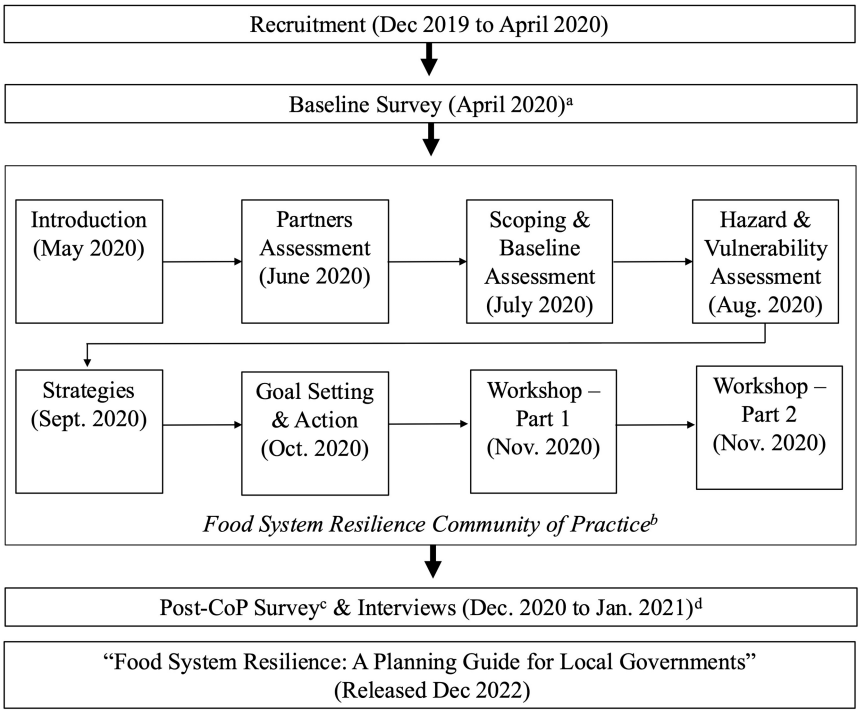
We used a mixed-method embedded intervention design to collect the data (Plano Clark et al., 2013). We first collected the quantitative pre-intervention data (April 2020), and then after the intervention (the CoP), we collected qualitative post-intervention data (December 2020–January 2021) (Figure 1). A post-CoP survey was also administered but was not included in this study as it focused on the experience of participating in the CoP but was not about COVID-19.

For the pre-intervention data, we administered a thirty-question baseline survey via Qualtrics in April 2020. The survey asked participants to describe their and their cities' food system resilience planning activities. Because we issued the survey after the World Health Organization declaration of the COVID-19 pandemic (March 2020), we asked participants to describe how COVID-19 influenced their food system resilience perceptions and work. For each question assessing resilience planning activities, knowledge and perceptions, we asked participants to respond both in terms of pre-pandemic (both factual information and recalled perceptions) and how they would respond *since* the pandemic started. Participants completed the pre-intervention baseline survey just prior to the start of the CoP.

We developed the survey from three primary sources: First, we based it on a CoP Theory of Change that we developed based on the preparedness and resilience literature. A Theory of Change is a visual depiction of how an activity or intervention can lead to expected outcomes and through what mechanism (Center for Theory of Change, 2023). In our Theory of Change, we expected that participating in the CoP would improve short-term outcomes such as improved knowledge and motivation, response efficacy, and critical awareness of hazards, and that, over time, these could impact medium- and longer-term resilience. Second, we used existing measurement tools from the Federal Emergency Management Agency and the Bloomberg Center for Government Excellence. Third, we adapted the tools based on risk perception, self-efficacy, critical awareness, and preparedness theories and concepts (Paton, 2003; Paton and Johnston, 2017; Adams et al., 2019; Hoffmann and Muttarak, 2017; Mishra and Suar, 2007). The list of survey questions is provided in the supplementary materials (Supplementary Table S2).

We collected the qualitative data for this study from in-depth interviews with CoP participants in December 2020 and January 2021. We invited all CoP participants for interviews, regardless of whether they had completed the survey.

After obtaining oral consent, we conducted the interviews, which were recorded and transcribed using Zoom. The interviews lasted between thirty minutes to an hour. Three research team members conducted interviews. At least two team members were present for each interview, and we alternated notetaking and interviewing roles. We used a semi-structured interview guide (Supplementary Table S3) to direct the interviews. The interview guide contained questions relating to participants' experiences with and knowledge gained from participating in the CoP and their perceptions of the strengths and challenges of their local governments' food response to COVID-19. We allocated approximately equal time to the two sets of questions. This paper focuses primarily on results from the latter set of questions relating to perceived strengths and weaknesses in government food responses.



Notes. Data for this manuscript came from the baseline survey (a) and the post-CoP interviews (d). The post-CoP survey is excluded from this evaluation as it did not focus on COVID-19 (c). The "Food System Resilience: A Planning Guide for Local Governments" came from the Food Systems Resilience Community of Practice Sessions (b).

FIGURE 1
Mixed methods embedded intervention design highlighting the sequence and timing of the pre-intervention baseline survey, the intervention, and post-intervention qualitative interview data.

2.4 Data analysis

We cleaned and analyzed the quantitative data using Excel Version 16.16.27. We completed descriptive statistics for the relevant questions and compared the values for pre-COVID (factual and recalled perceptions) and current facts/perceptions during the first year of the COVID-19 response (April 2020). Due to the small sample size, we did not assess statistical significance.

We analyzed the qualitative data using a phronetic iterative approach (Tracy, 2018). A phronetic iterative approach combines inductive and deductive approaches and has been used in other urban food systems qualitative work (Hecht et al., 2019; Biehl et al., 2018).

We did primary and secondary cycle coding (Tracy, 2018). Three research team members (EM, EB, and MB) each independently open-coded (Tracy, 2018; Charmaz, 2014; Glaser and Strauss, 2017) one interview and met to discuss and iterate on the codes. We developed an initial codebook based on the emergent codes and our *a priori* research questions (Supplementary Table S4). Using this codebook, we then coded an additional interview and again met to discuss the codes and reconcile any differences. We coded the remaining interviews separately, reconciling issues as needed. We used Atlas. Ti 9.0 for file management and coding.

We used axial coding techniques to identify themes within each code report using Excel Version 16.16.27. For each passage, we used an inductive approach to allow themes to emerge from the data and a deductive approach to applying the proposed resilience attributes. Using this technique, we independently coded the reports for strengths and weaknesses in the responses and lessons learned and then met to discuss the themes. We then independently analyzed two additional code reports and met to discuss them. We continued this process until all relevant code reports were analyzed. We used analytical memos to document our evolving thoughts on patterns and themes.

Based on the coding, memos, and group discussions, we decided to reassemble and integrate the quantitative and qualitative data using a matrix analysis that organized the data by resilience attributes (Miles et al., 2014). For the qualitative data, as a research team, we discussed how the participants' descriptions of the food system resilience attributes in the local government ecosystem may have been related to the participants' perceptions of their local governments' short-term emergency food response efforts. For the quantitative data, we organized survey questions and responses by the resilience attributes (i.e., survey questions about networks and communication were added to the matrix column on connectivity). As survey questions were role-specific and experience-specific (i.e., how often do you collaborate with others on food system issues), we did not group survey responses by cities.

Within each resilience attribute, we also explored the perceived facilitators and barriers to having that attribute, as several representatives of the CoP suggested that presenting the actions that may have helped or hindered the response efforts could be useful in understanding their work. We included both factors within the local government ecosystem (e.g., staffing, leadership, coordination) and broader systemic or structural conditions that shape a local government's ability to act (e.g., historical disinvestment, entrenched inequities, and external policy constraints). Each item was identified through multiple coded excerpts across interviews and reflects patterns shared by more than one participant. Consistent with best practices in qualitative research, we focused on capturing thematic breadth and depth rather than quantifying responses, particularly given the small, purposively selected sample (Miles et al., 2014).

We present the top-ranked barriers to food system resilience identified through the survey, insights from the qualitative interviews, and the triangulated results.

We developed suggested policy and programmatic recommendations that could be taken within local governments to help build/support each resilience attribute. The recommendations are directly linked to the facilitators and barriers reported by the participants in the survey and interviews. However, to help make the recommendations actionable, we provide additional context and examples. The examples come from suggestions from the city representatives from the CoP meetings, surveys, and interviews. For recommendations where no specific examples were available in these sources, the research team provided a specific example from their knowledge. Items where the research team provided a specific policy or programmatic recommendation are indicated with an asterisk (*).

3 Results

Eight participants completed the survey, which took approximately 15 min to complete. Nine participants completed the in-depth interviews, which lasted 30–60 min. The final codebook contained 66 codes, grouped into codes that focused on COVID-19 and codes focused on evaluating the CoP (Supplementary Table S4).

3.1 City characteristics

Table 1 presents the baseline characteristics of the Community of Practice cities. The cities were all in different geographic regions. The smallest was Moorhead, MN, with less than 50,000 people, and the largest was Austin, TX, with a population greater than 900,000. Baltimore, MD, was the most densely populated. Austin and Moorhead have a Council-Manager form of government. Baltimore, Denver, and Orlando have a Mayor-Council form of government. For consistency, we used county food insecurity levels from before the start of the COVID-19 pandemic. Baltimore's county had the highest level of food insecurity before the COVID-19 pandemic at 15.8%, and Moorhead's county had the lowest at 8.5% (Feeding America, 2019). Austin and Denver had the highest median household incomes, followed by Moorhead, Orlando, and Baltimore. Only Denver had a food plan in 2020.

The emergency food response efforts in the cities were locally contextualized, but there were cross-cutting actions. Due to the increased demand for emergency foods, all included cities emphasized helping to provide or facilitate access to food. For some, this was directly coordinated by the local government, while for others, this was done in partnership with food banks or non-profit and for-profit food providers. These efforts included a mobile food distribution site and delivery, and emergency food boxes for pick-up. Internally, within the government ecosystem, participants in this study played a coordinating role of convening food system actors in the city and/or participating in emergency operations meetings to provide a food systems

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TABLE 1 Baseline characteristics of the community of practice cities in 2020.

City	Population[a]	Population density[a,b]	Geographic region[c]	Form of government[d]	% Food insecure[e]	Median household income[a]	Food plan[f]
Austin, TX	961,900	3,006	South (West South Central)	Council-manager	12.8	$78,964	no
Baltimore, MD	585,693	7,236	South (South Atlantic)	Mayor-council	15.8	$54,124	no
Denver, CO	715,522	4,674	West (Mountain)	Mayor- council	10.7	$78,177	yes
Orlando, FL	307,573	2,780	Southeast	Mayor- council	11.2	$58,968	no
Moorhead, MN	44,505	1,999	Midwest	Council-manager	8.5	$62,940	no

[a]Data are from the U.S. Census Bureau (2020) census of population and housing, updated every 10 years. Decennial Census by Decades; [b]Population density is people per square mile; [c]Regions are from the U.S. Census Bureau, Census Regions and Divisions of the United States (U.S. Census Bureau, 2022); [d]Form of government is based on the International City/County Association categorization (National League of Cities, 2022); [e] % food insecure is provided at the county level for consistency in measurement. Percent food insecure estimates are from 2019, from Feeding America (Feeding America, 2019); [f]Indicates if the city had a local government–issued food plan in 2020.

perspective on pandemic response efforts. Many of the local governments helped residents access information and navigate benefits changes, such as pandemic Electronic Benefits Transfer (EBT) or school meal programs. The work was not done solely by the local governments and, in some places, was not led by the local governments, but they all played an active role in the emergency food response efforts.

3.2 Resilience attributes

We found that the participants described all the resilience attributes when discussing or responding to survey questions about the strengths and weaknesses of their COVID-19 food response efforts. Participants emphasized the importance of some attributes more than others. Preparedness, connectivity, and capital reserves were the most commonly referenced attributes. Diversity, flexibility, and redundancy were less common. Equity was generally described as a cross-cutting principle that needed to be embedded into all actions.

3.2.1 Preparedness

Participants discussed that their local government's level of preparedness in responding to the COVID-19 food disruptions was related to its previous experience with disruptive events, although none of the former disruptions mentioned were infectious diseases. They also highlighted that experience with past disruptive events led to putting plans or processes in place, which could be drawn on during COVID-19 – although the level of formalization in these plans and processes differed. One participant explained,

> *"I think that essentially our biggest strength was that from day one…we were already calling our partners and having daily calls about our plans. And that's because we had another plan in place…we knew that that wasn't going to be the right plan for that situation, but because we'd already done that first round of work, we knew that we could call people together, and they knew what we were talking about, and we could kind of get things started" (Participant A).*

Among participants whose local government did not have an existing plan, several said they wished they had a plan they could have used or adapted during COVID-19. They expressed that having a plan would have helped to make the emergency response efforts easier because they would have known the key actors, what actions were required, and who was doing what tasks. Participants further highlighted the importance of having clearly designated roles and responsibilities related to food. In locations where this was present, this was noted as a key strength. Reflecting on their experience, an interviewee stated,

> *"… We already had somebody that was in local foods, and you know, tasks [related] to this. And that was some of what I saw with the other cities is that they don't have a direct office, or they didn't specifically have somebody that was tasked with local foods. So, it was kind of this circus juggling act of, who's going to take this, and how long are they going to take it for, what specifically are they going to do. Fortunately for us, we had that locked in place" (Participant B).*

In the interviews, participants also discussed how they felt their jurisdiction could be better prepared for future disruptive events. They mentioned a need to better understand what are the key food system assets in their jurisdiction and improved data on food systems during disasters. One big challenge discussed was the lack of long-term food system resilience planning that helps build capacities, resources, connections, and capitals that can reduce the impact of future disruptions and expedite recovery from them. Reasons for this planning gap included competing emergencies, lack of funds, and lack of staff time, to name a few. Participants suggested that COVID-19 and other disasters provide an opportunity to advocate for longer-term resilience planning and work.

The survey results triangulated interview findings about preparedness. In the survey, participants indicated how prepared they felt their jurisdictions were for disruptions prior to COVID-19 and during the pandemic. Only one person (1/8) reported that their jurisdiction had a designated person who focused on food working in emergency operations. However, all respondents (8/8) indicated that their leadership designated individuals with expertise in food to work with emergency operations during the COVID-19 response. The number of participants who reported that they thought about food system

hazards in their professional role daily or a few times/week also increased from before (2/8) to during the COVID-19 response (8/8).

3.2.2 Connectivity

The participants perceived connectivity as a strength and a challenge in their response efforts. Participants said that they were able to form new partnerships with governmental and non-governmental actors working on food in response to COVID-19 and that these partnerships would not have otherwise occurred. In the survey, participants reported an increased frequency of talking about food system hazards with others within the respondents' department (Figure 2A). Within departments, 4 participants reported daily communication during COVID-19 (compared to 0 prior), and 3 reported communication a few times per week (compared to 2 prior) (Figure 2A). Outside departments, 4 participants also reported daily communication during COVID-19 (compared to 0 prior), and 3 reported a few times per week (compared to 0 prior) (Figure 2B).

Several participants noted that their emergency food response was aided by multiple actors in their city partnering on the efforts, such as the school districts allowing the use of school buses to deliver food to different city locations or because of collaboration with non-profit or government partners (state/federal and other local government agencies) in their communities.

Participants spoke about challenges in achieving desired levels of connectivity. These ranged from supply chain failures to more localized issues. Several participants perceived that food was not as connected to emergency operations and emergency response efforts as it should have been and that important food actors may have been left out of the initial response efforts. Explaining this challenge, one person noted.

> *"Before the pandemic, there seemed to be an anecdotal notion that we [city government] understand the roles and responsibilities of organizations within our food system, and so, I think there was this false sense of, we understand who's doing what, where everybody is, etc., and the pandemic has highlighted that we actually don't know. So, we need to have a clear understanding of the roles and responsibilities of different stakeholders" (Participant C).*

In the survey, when asked which local government departments participants interacted with on food system topics, both before and during the COVID-19 response, participants indicated that departments of economic development and health were important collaborators. During the COVID-19 pandemic, collaboration with emergency management departments increased, and collaboration with sustainability departments decreased. Participants emphasized the need to establish communication and build trust between food system actors before a disruptive event to improve connectivity in future disasters.

3.2.3 Capital reserves

Participants emphasized the importance of political, social, and financial capital in the local government ecosystem for

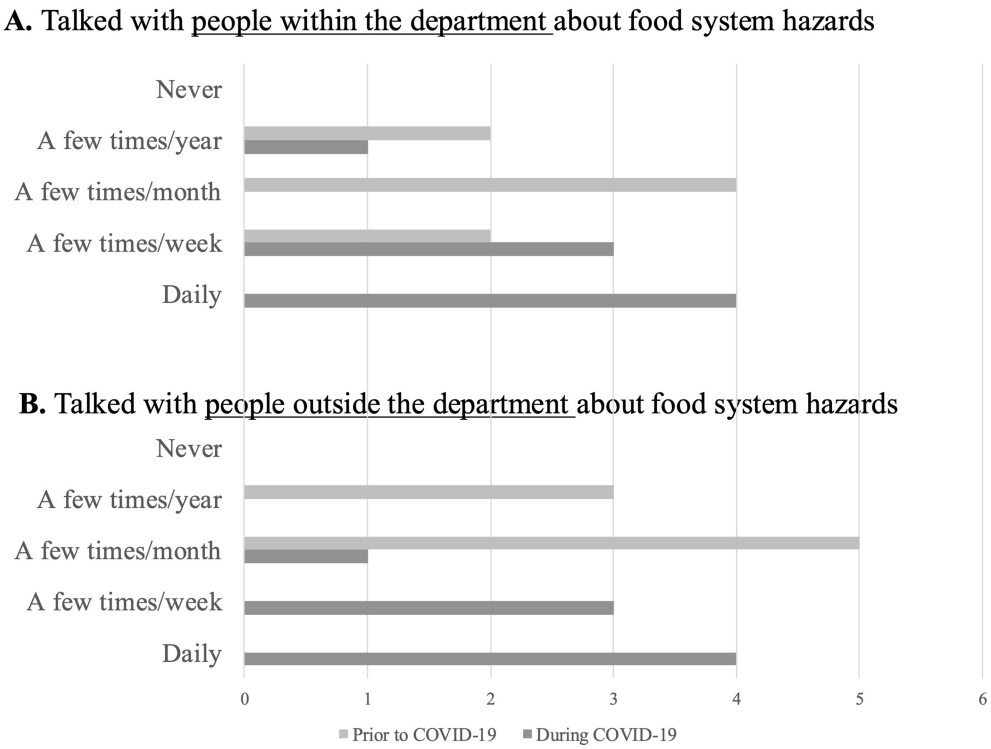

FIGURE 2
Frequency of communication about food system hazards reported by local government participants (n = 8) before and during the COVID-19 response. **(A)** shows communication with people *within the department;* **(B)** shows communication with people *outside the department*. Bars reflect the number of participants selecting each frequency category. Data are from survey Questions 13 and 14. Dark grey indicates responses prior to COVID-19; light grey indicates responses during the first year of COVID-19 response efforts.

successful food planning and response efforts. Several participants noted that community and social capital had bolstered the emergency response efforts. One explained that the pandemic response involved an "all-hands-on-deck" approach, with people from the government and beyond stepping up and helping wherever was needed to support the emergency food response. At the same time, participants expressed the need to make sure that response efforts were strengthening community capital. They highlighted the need to make sure that those in the community with the greatest need are a part of the decision-making and implementation because efforts that do not engage non-governmental partners will be less successful and equitable.

In Table 2, we provide the survey responses for the top-ranked barriers to food system resilience work (the full 1 to 8 ranking is in Supplementary Figure S1). While the survey asked questions about a variety of barriers related to different factors and capital reserves, such as knowledge, motivation, financial resources, we observed that those related to financial and political capital were reported as the top barriers.

Lack of financial capital ("no funding/not enough funding") was noted as the top barrier in the survey, with 37.5 percent (3/8) of survey participants ranking it as the greatest challenge to their work. Lack of political capital ("lack of leadership support") was reported as the top barrier for 25 percent (2/8) of respondents.

In addition, in the survey question about political capital (question 15), asking respondents if they felt they had strong support from city government leaders for their long-term food resilience planning, half (4/8) of the survey respondents indicated that they disagreed or were neutral. Despite this challenge, in the interviews (which took place in December 2020–January 2021), participants discussed a perception that COVID-19 and other disruptions may be shifting the way that local government leaders view food systems and that, moving forward, there may be greater receptivity to and political capital to support food resilience work. One CoP member stated.

> *"The biggest lesson is that food is never considered a top priority for those who are not food insecure, and now it has become blatantly obvious that it is a big issue" (Participant D).*

When asked what resources would help them with long-term resilience planning, participants listed additional support from leadership, staff time, funding for planning, implementation and communication engagement, and more data collection that includes analysis and community truth-testing.

3.2.4 Redundancy and diversity

As this study focused on the local government ecosystem as the unit of investigation, redundancy was defined as having multiple of the same elements that can serve the same purpose within the local government ecosystem (e.g., two staff members who both work on emergency food). Participants expressed a need for redundancy within the local government food actors to avoid burnout. A participant expressed.

> *"We were all just working like 80 hours a week trying to get all that stuff done, which like shouldn't have been the case…we should have had more of a structure of dispersing all of those responsibilities amongst people who knew how to do them" (Participant A).*

Diversity was defined as having different elements that could serve the same purpose (e.g., two different types of organizations serving emergency foods in a jurisdiction). In terms of diversity, participants discussed that having multiple and diverse actors providing emergency food in the larger food system ecosystem, in addition to the local government, was helpful to response efforts. Food banks, schools, health departments, and other local government agencies were noted as essential actors in helping to provide emergency food.

Participants noted that there can be an overreliance on some organizations without redundant and diverse actors able to provide emergency foods. This system could be considered less resilient, as the people within the overused organizations can burn out, or if the primary organization fails, there may be no backup resources ready to serve the community. Establishing redundancies and diversity can make communities better equipped to respond to and recover from future disasters. The survey highlighted the lack of redundancy in food systems staff within organizations. Prior to COVID-19, only one city had a designated staff person who focused on food who sat within the city's emergency operations center during a disruptive event. During COVID-19, it increased to half (4/8) of respondents stating that they had one or multiple designated food systems staff working with emergency operations.

TABLE 2 Survey responses for the top barriers to food system resilience work.

Top barrier to food system resilience work (Corresponding capital type/ underlying factor/resilient attribute)	Percent of responses (n = 8)
No funding/not enough funding (financial capital)	37.5
Lack of leadership support (political capital)	25
No designated person to do the work (human capital)	12.5
Do not know how to measure food system resilience (knowledge)	12.5
Food systems are perceived as being at less risk of threats (risk perception)	12.5
Not enough time available (human capital)	0
Lack of coordination across departments (connectivity)	0
Do not know how to get started (knowledge)	0

Participants were asked to rank on a scale of 1 (most challenging) to 8 (least challenging) their barriers to food system resilience work. The table shows the results for the most challenging. Data are from survey question 18. Full results are in Supplementary Figure S1.

3.2.5 Flexibility

Responses relating to flexibility focused on the pace at which local governments were able to adapt. Participants noted that their local governments were able to act quickly to provide emergency food when the pandemic began. During the COVID-19 pandemic, congregate feeding and food distribution were not advisable, so local governments had to develop new food distribution methods rapidly. One participant explained.

> *"Making such major pivots so quickly, I think, is huge. Changing your distribution mechanism overnight is no small feat" (Participant E).*

Participants also highlighted the importance and willingness of local governments to get creative – for the COVID-19 response and for future responses, highlighting the importance of finding unique ways to find, finance, and distribute food. These flexibilities were notable given that changes within local governments often require several steps and approvals.

3.2.6 Equity

Equity was central to many participants' thinking about how emergency foods should be distributed and what is needed to build more resilient and just future food systems. Participants expressed that an equity-centered approach should focus on community collaboration. One participant explained that "focusing on the community aspect is probably the most important" (Participant D), which was echoed by others in the need to work with impacted individuals and communities. In practice, this was described as putting the community at the center of and co-leading food system resilience planning processes. It was also described as designating specific resources and creating easier access to food and food services for communities that are disproportionately impacted by disasters and people with vulnerabilities.

Participants also expressed that many of the food crises related to COVID-19 were rooted in structural, systemic inequities. Poverty, racism, access to services, and COVID-19 "exposed all the cracks in our system" (Participant F). Participants expressed that to address food equitably, it needs to be approached as a systems issue: food needs to be discussed in the context of housing policy, health policy, immigration policy, zoning, and more. One participant suggested approaching food resilience from a "food in all plans" perspective, where the goal is to have it be a part of all work rather than siloed to one department or plan. Explaining the importance of thinking beyond food to the "root causes" of vulnerability, a participant explained.

> *"The challenge is to think beyond just food to think of what is the root cause of the situation… I think food is definitely something we should be focused on, but we have to also understand that food is just one piece of a larger discussion that we need to talk about" (Participant D).*

3.3 Facilitators and barriers

In this section, we present the items that participants described as helping or hindering their local governments' level of preparedness, connectivity, capital reserves, diversity, redundancy, flexibility, and equity. In Table 3A, we provide a

TABLE 3 Participant reported facilitators and barriers to their local governments' ability to demonstrate resilience attributes.

A. Facilitators of exhibiting the resilience attribute
Preparedness
• A plan in place • People in place • High motivation because of the crisis • Leadership awareness of the importance of food system resilience planning
Connectivity
• Established internal local government and external (e.g., with businesses, non-profits, state organizations) connections before the crisis • Frequent communication between internal local government food actors • Frequent communication between system-wide food actors • Willingness by governmental and non-governmental actors to form new and non-traditional partnerships
Capital reserves
• An "all-hands-on-deck" approach within governmental and non-governmental actors • Recognition by leadership of the need for community partnerships/ownership in food work
Diversity and redundancy
• Different internal government actors (agencies, departments, etc.) were willing to step in • Different external actors (non-profits, businesses, etc.) were willing to step in to help
Flexibility
• Willingness to act quickly, even if actions were imperfect • Creativity • Adapting and adopting processes/plans/documents from other jurisdictions
Equity
• Designated resources for black, indigenous, and other people of color • Nutrition, culture, choice, and capacity were considered in types of food served • Community organizations and networks lead efforts
B. Barriers to exhibiting the resilience attribute
Preparedness
• Lack of a designated food person • Food not in response plan and is often left out of planning • Competition for funding/time/resources • Limited funding/time/resources • Motivation wanes over time
Connectivity
• Connectivity failures between partners • Not knowing actors working on food inside and outside of local government • Building trust between local government and outside actors takes time • Not including all stakeholders
Capital reserves
• Lack of financial support for food planning • Lack of political will • Lack of time allocated for food planning

(Continued)

TABLE 3 (Continued)

B. Barriers to exhibiting the resilience attribute
Diversity and redundancy
• Lack of internal redundancy of roles • Long work hours/ burnout • Insufficient actors to provide emergency foods
Flexibility
• Different disasters require distinct food distribution methods • Hard to institutionalize lessons learned • Need to work at the "speed of trust"
Equity
• Lack of procedural equity in response efforts, with some groups left out of the processes • Community-centered and -owned work requires a non-traditional way of thinking • Working on food alone will not solve the issues; need a multipronged approach • Structural inequities in the food and emergency response systems

Findings come from triangulated interview and survey data.

summary of the facilitators, and in Table 3B, we describe the reported barriers. The themes presented are triangulated results from the interviews and the survey.

Participant responses demonstrated that each resilience attribute could act as both a facilitator when present and a barrier when absent. For example, within Preparedness, some participants highlighted how staffing, leadership, and prior planning enabled swift responses, whereas other participants explained that the absence of these same factors hindered efforts. This pattern was also evident in responses related to Connectivity. In some cities, existing internal and external relationships enabled rapid coordination and innovation during the emergency response, but other participants described weak or absent connections as barriers that slowed or complicated their efforts.

3.4 Programmatic and policy recommendations

Based on the findings that resilience attributes are associated with emergency response efforts and that various factors helped or hindered the establishment of these attributes, we suggest that there are several policy and programmatic opportunities to strengthen key resilience attributes. In Table 4, we offer strategies that could strengthen resilience attributes within local governments. The ideas came from the city representatives (a full description of the development of the recommendations is in the methods).

Participants identified a wide range of programmatic and policy strategies to strengthen local food system resilience across all six attributes. Many strategies, including incorporating food into emergency response plans and strengthening existing partnerships, were provided directly by participants during the interviews. Other strategies, marked with an asterisk in Table 4, were developed by the research team in response to challenges raised by participants (e.g., long work hours or burnout). These additions aimed to translate barriers into actionable ideas.

4 Discussion

This study explored how resilience attributes were associated with local governments' emergency food response efforts to COVID-19 and how cross-cutting lessons learned about the attributes may help to build resilience to future food system disruptions. Our findings focus on three areas: how the resilience attributes showed up in the emergency food response efforts, the facilitators and barriers to exhibiting the resilience attributes, and programmatic and policy recommendations that can support the establishment of the attributes during disasters.

Our findings supported our premise that preparedness, connectivity, capital reserves, diversity, redundancy, flexibility, and equity all influenced how local government food actors were able to respond to the food crises associated with COVID-19. Having a relatively high level of an attribute (i.e., higher preparedness because they had a food resilience plan in place) helped support emergency response efforts, and the reverse. Higher perceived levels of the attributes were facilitated or inhibited by internal and external factors, such as funding, leadership support, peer learning, and collaboration and communication with food partners (Tables 3A,B). These findings indicate the importance of investing in organizational development and policies that build these attributes so that future crises are less disruptive. Actions may be specific strategies for strengthening internal resilience attributes or garnering leadership and policymaker support for food resilience planning. Our suggested policy and programmatic recommendations (Table 4) can help practitioners develop actions that are right for their jurisdictional context. We weighted each factor as equally important, as the "best" place for a jurisdiction to start on this work will be context-specific. Some may want to begin or advance a planning process or focus on building connections, while others may want to focus internally on building diversity and redundancy. As more jurisdictions implement strategies and evaluate them, prioritization of certain strategies may emerge.

While the primary aim of this study was to explore overarching themes, our findings revealed a noteworthy trend: the commonalities among city responses outweighed the differences. The challenges posed by COVID-19, including issues like burnout and the pursuit of equity, transcended jurisdictional boundaries. Shared among these areas were also facilitators, such as a collective willingness among government and non-governmental entities to collaborate and assist wherever necessary. Notably, distinctions arose primarily in resource allocation—variations in pre-pandemic plans, personnel, and connections. Nevertheless, despite geographical and demographic disparities among cities, a valuable lesson emerged: the exchange of successes and challenges is a tool for mutual learning.

This study adds to the growing body of literature on food system resilience. Previous work on food system resilience attributes (Béné, 2020; Worstell and Green, 2017; Tendall et al., 2015; Eakin et al., 2017) has been primarily theoretical. This study applies theoretical attributes to the real and prolonged crisis of COVID-19 and helps to further the understanding of how resilience attributes are associated with emergency response efforts. It supports previous work on resilience attributes (Supplementary Table S1) by providing applied evidence. Further, this study expands the literature by applying these theoretical food resilience constructs to a local government ecosystem. Previous work has applied them to farming (Meuwissen et al., 2019), supply chains (Food and Agriculture Organization of the United Nations

TABLE 4 Programmatic and policy strategies to build food system resilience attributes in the local government ecosystem.

Resilience attribute	Programmatic or policy strategy
Preparedness	Create food resilience plans (local, regional, state, national) Add food to emergency response plan Add food resilience into existing plans (e.g., sustainability & disaster preparedness, comprehensive plan, climate action) Designate a person in emergency management focused on food system responses*
	Establish key food procurement and distribution contracts prior to disasters so can be used during emergencies* Use learnings from disasters such as COVID-19 to advocate for planning, preparedness, and resilience work
Connectivity	Map existing relationships between food actors in government and community
	Form relationships between food actors*
	Strengthen relationships between existing food partners [e.g., host convenings (monthly, quarterly, yearly, etc.)] with the food actors*
	Build trust with community partners
Capital reserves	Designate funds to support internal local government resilience planning inclusive of food
	Create/designate funds to support community resilience planning and management (e.g., a specific grant for community partners to lead this work)
	Build buy-in at all levels of government*
	Communicate about food resilience with community and business partners*
Diversity and redundancy	Put human resources policies into place to avoid staff burnout during crises
	Staff more than one person within local government who focus on food systems*
	Identify critical emergency food system assets and their distribution*
Flexibility	Build flexibilities into current emergency food response policies*
	Institutionalize flexibilities that occurred during COVID-19*
Equity	Orient food resilience work to be community-owned and led
	Collaborate with the government equity office on food resilience work
	Designate resources for building resilience in impacted communities*

Items marked with an asterisk (*) were not directly suggested by participants but were derived from participant-identified challenges or themes, with the strategies developed strategies developed by the research team.

(FAO), 2021), communities (Maclean et al., 2014), and other sectors, but as local governments are key emergency food response actors, it is critical to understand how they can enhance their resilience and to identify possible opportunities to improve future response efforts and build longer-term resilience to crises. Our findings are also impactful as they explore cross-cutting themes from five diverse US jurisdictions. Several global case studies have explored food resilience and COVID-19 (Coopmans et al., 2021; Worstell, 2020; Jones et al., 2022; Dixon et al., 2021), but our work is not isolated to one location and is focused on the U. S.

While this study focuses on the early phases of the COVID-19 pandemic, the policy strategies in Table 4 are designed to support resilience building beyond that period. Since the pandemic, food systems have continued to experience challenges due to natural and human-made disruptions, including disasters, inflation, and conflict. Although these issues are beyond the scope of the data in this manuscript, they underscore the importance of continued investment in food system resilience and long-term planning. This study also offers an example of a collaborative, real-time research approach that can be applied to evaluate and inform responses to emerging threats.

While efforts taken to build these attributes will vary based on social and political context, there are several resources that are available to support jurisdictions in this work. The Food and Agriculture Organization of the United Nations and Resource Centre on Urban Agriculture and Food Security published in 2023 a planning handbook for "Building sustainable and resilience in city regional food systems" (Food and Agriculture Organization of the United Nations (FAO), 2023) (international scope). The Johns Hopkins Center for a Livable Future published a resource to also support jurisdictions in this work: "Food Systems Resilience: A Planning Guide for Local Governments" (Moore et al., 2022) (US-oriented). Both resources help jurisdictions anticipate food system disruptions and develop policy and programmatic strategies that can help limit the impacts of and build resilience to future food system disruptions. The United Nations Office for Disaster Risk Reduction offers a food system resilience addendum to the Disaster Resilience Scorecard to support cities in this work (UNDRR, 2022), and the North American Food Systems Network provides a "Community & Agriculture Resilience Audit Tool" (North American Food Systems Network, 2023). There are also a growing number of examples from cities around the world that are doing this work that can serve as process case studies (Zeuli and Nijhuis, 2017; Biehl et al., 2018) or sample plans (City of Vancouver, 2016; Baltimore City, n.d.).

This paper is novel from the resources noted above in that it provides a structured investigation of how resilience attributes helped or hindered real-time emergency food response efforts. While the referenced resources are intended to help local jurisdictions plan for future disruptions, this work reflects actual response efforts—what worked well and what was challenging. By evaluating how these attributes showed up during a real crisis, we offer empirical insights

that can help cities and future planning resources be more effectively tailored to the realities of resilience work. Importantly, this manuscript is distinct from "Food Systems Resilience: A Planning Guide for Local Governments." Although both efforts involved the same group of cities, the Planning Guide is an actionable tool designed to support jurisdictions through worksheets and planning activities. This paper, however, examines the COVID-19 response efforts and identifies key lessons from that experience and applies them to policy and programmatic recommendations.

There is also a need to consider what role other actors can and should play in promoting and managing food system resilience. While the policy recommendations presented in this manuscript are focused on local government actors, this work must be done in partnership. Actions taken by federal, state, and regional actors aimed at promoting food resilience can support local government work. For example, creating a more resilient national food supply chain can help make sure foods are available locally during crises. There is a need for additional funding to support local government and community actions focused on long-term resilience planning. Often, funding is made available during crises, but the longer-term work that will support effective responses to future events must also be prioritized.

This study offers new insights into how food system resilience attributes were associated with local governments' initial response to the COVID-19 pandemic and how these findings can inform future policies. It also has some limitations. The information is based on interviews and surveys with a small number of participants, given the small overall population of our CoP participants. We were thus unable to test the significance of changes between pre-COVID and during-COVID survey responses, nor did we reach saturation on all themes. The interviewers were associated with the CoP, which means that social desirability bias may have influenced what the interviewees shared. However, since the survey was taken before the CoP began, these responses are less likely to have been influenced by social desirability.

While participants came from cities that were at different stages in their food system resilience planning and work, and individuals from within cities worked at different agencies/organizations, our sample skews toward jurisdictions with existing plans, engagement or at least significant interest in food work. While this selection bias may influence the generalizability of the quantitative data, this purposive sample of those engaged and with expertise in the field is consistent with qualitative research and adds depth to the qualitative findings. Our findings, however, should be viewed primarily as reflective of the individuals we worked with and are not generalizable to all local governments or staff within the participating cities. The findings are based on how participants described work related to the resilience attributes; some attributes may have been present but not reported during the interview or were experienced by someone outside the CoP. Additional research is needed to explore the resilience attributes amongst a larger and nationally representative sample.

There is a need for future research exploring similar questions but with a focus on additional resilience attributes, other types of disasters, other types of actors such as food assistance organizations, businesses, or community-based organizations, other contexts and outside of the local government ecosystem. While this study allowed us to explore themes across diverse cities, the role that resilience attributes play in other disasters will differ, as will the role that they play in long-term recovery and resilience. This study focused on the emergency food response to COVID-19, the programmatic and policy actions presented focus on how lessons learned from a disaster can inform long-term resilience. Echoed throughout the CoP was a sentiment that investing in the actions that build resilience is the harder, longer-term work that too often gets put off and that shifting behaviors during disasters alone will not change future conditions.

This paper aims to help identify concrete actions that local governments can take to plan for and manage food system resilience. While the policy actions may support resilience management in the longer-term the research was not designed to assess resilience outcomes. There is a great need for future work exploring which attributes or characteristics best help food systems recover from and prepare for future disasters. As more strategies aimed at building resilience are implemented at different scales, future research is needed to evaluate the impacts of these actions so as to understand how efforts taken further up the food supply chain can impact local and regional resilience and how local government actions impact communities and individuals. Rigorous multi-scaled evaluations can help to promote the transferability of effective strategies between places and reduce unintended consequences and harms. More research into these topics can help to build a collective understanding of what actions are needed to support resilient and equitable food systems (de Raymond et al., 2021; Roosevelt et al., 2023; Zurek et al., 2022; Davis et al., 2021).

This research identified multiple barriers to local government engagement in food system resilience planning activities, including adequacy of local government support and funding. Given the many food system vulnerabilities and the frequency and severity of disruptions that threaten population food security, local governments and funders must address these barriers even as research proceeds to refine the resilience strategies.

5 Conclusion

Using mixed methods, this study explores how key resilience attributes were associated with local governments' emergency food response to COVID-19. We found that having higher levels of preparedness, connectivity, capital reserves, diversity, redundancy, flexibility, and equity strengthened perceived response efforts and that lower levels impaired efforts. We also found that there were internal and external actions that facilitated or impeded these attributes. Utilizing the lessons learned about the attributes can help identify policy and programmatic opportunities to enhance food system resilience capacity.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

EM: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. MB: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology,

Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. EB: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Writing – original draft, Writing – review & editing. RN: Conceptualization, Data curation, Investigation, Methodology, Project administration, Resources, Supervision, Writing – original draft, Writing – review & editing, Funding acquisition, Investigation, Methodology, Resources, Software.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The authors declare that Gen AI was used in the creation of this manuscript. The authors used ChatGPT (OpenAI) to support clarity and grammar improvements during the editing process. All substantive content and interpretations are the authors' own.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fsufs.2025.1563045/full#supplementary-material

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