Examining Disaster Planning Interfaces of the COVID-19 Emergency Meals-to-You Program

- Project Completion Report -

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Executive Summary

School closures during the COVID-19 pandemic left thousands of children in rural areas with limited access to essential meal services. To overcome this challenge, the Emergency Meals-to-You (eMTY) program was developed in partnership with the United States Department of Agriculture (USDA), Baylor Collaborative on Hunger and Poverty (BCHP), Chartwells, McLane Global and PepsiCo. The program provided five million meals a week for children affected through a multisectoral approach, which included leaders from the business, government, and academic sectors. It was rolled out across 43 states and Puerto Rico and reached as many as 127,216 households and 348 school districts. This included delivery of boxes containing 20 nutritious meals (10 breakfasts and 10 lunches) to cover what would normally be received at school over two school weeks.

To build on the success of eMTY, USDA funded a Baylor-run study to use the lessons learned to develop a disaster plan for future programs and examine options for enhancing food security in at risk communities. This included nine interviews, three focus groups (n=11) and five workshops (n=69) with people involved in eMTY, food service delivery, emergency management and other aspects of the food system. By leveraging this knowledge and experience, a 13-point action plan was developed. The recommendations include (in no priority order):
1. Local emergency managers integrate food sector stakeholders into activities, explore food access needs, and share findings with community organizations, private sector, and government agencies.
2. Schools establish a fully procurable menu that is costed and compliant with school needs and the USDA.
3. Strengthen environmental health services at schools and other support functions required for the health and well-being of children.
4. Emergency management systems exercise plans, agreements, protocols, and for providing food during a disaster situation.
5. Establish early warning systems for food-related emergencies.
6. Explore food availability/access risks and identify strategies for mitigating impacts.
7. Share data about nutritional and chronic health (e.g., allergies) needs from schools with the local emergency management committee.
8. Develop disaster plans for sustaining food supply and access at the school district level.
9. Map local food sector capacities and surge needs, including from farm to table.
10. Increase availability of the food sector workforce with relevant competencies and skills.
11. A nationwide application of the United Nations Food System Resilience, which was piloted and developed as part of this project.
12. Conduct a nationwide survey to allow a ranking and prioritization of the actions identified at school, local, regional, and national levels across different USDA regions and settings.
13. Explore adapting eMTY to address food insecurity for older adults.

Food system resilience is vital to mitigate the consequences of disasters and other crises on community and individual well-being. Addressing this timely need by delivering on the actions recommended would promulgate coordination of community networks that can pivot quickly to emergency production and distribution. It is difficult to solve complex problems such as improving food security during an emergency, so it is hoped this study and report can provide concrete guidance to improving food system and community resilience prior to future pandemics and disasters.

1.0 Project Governance

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2.0 Background and Rationale

An estimated 29.4 million children benefit from the services provided by the National School Lunch Program offered by the United States Department of Agriculture (USDA). This program provides food security for children who qualify for free or reduced priced lunches at school. However, school closures during the COVID-19 pandemic left thousands of children with limited access to essential meal services. The Emergency Meals-to-You (eMTY) program developed in partnership with USDA, the Baylor Collaborative on Hunger and Poverty (BCHP), McLane Global and PepsiCo was created to provide meals for rural children affected. This was a multi-sectoral program and included leaders from the business, government, and academic sectors. The eMTY program was rolled out across 43 states and Puerto Rico, reached 127,731 households and 361 school districts. This included delivery of boxes containing 20 nutritious meals (10 breakfasts and 10 lunches) to cover what would normally be received at school over two school weeks.

Prior to eMTY in 2019, USDA launched a three-year demonstration project, Meals-to-You (MTY). The aim was to test a solution to rural challenges associated with summer meals. An identical program with slightly different variations was introduced during the COVID-19 pandemic, the eMTY program. Elements of the program included:
- Partnering with suppliers to deliver meals directly to homes via mail carriers.
- Distributing boxes of non-perishable food items containing a week's worth of breakfasts, lunches, and snacks that follow Summer Food Service Program nutrition guidelines.
- Aligning program duration with weeks students are not in school.

To build on the success of eMTY, USDA funded a Baylor-run study to use the lessons learned to develop a pandemic and disaster plan for future programs and examine options for enhancing food security in at risk communities (<u>Attachment A</u>). This study included interviews, focus groups and workshops with people involved in eMTY, food service delivering, emergency management and other aspects of the food system. Exploring this was vital because food security is required to provide communities with the resilience required to rapidly overcome the health, societal and economic consequences of pandemics and disasters.[1] The experiences of those involved in the set up and delivery of the program were explored along with the perspectives of the recipients such as school administrators. Also, to enhance the sustainability of the findings and guide future directions, the emergency preparedness and response systems used for this program were examined.

3.0 Aim and Objectives

The aim was to examine disaster planning and health interfaces with the eMTY and develop strategies for mitigating food insecurity before, during and after pandemics and disasters. The objectives were to:
1. Examine disaster interfaces and the perspectives of service providers and recipients of the program.
2. Understand environmental public health services and delivery system characteristics of communities involved in the eMTY program.
3. Develop a disaster related food security and resilience action plan for at risk communities.
4. Establish a plan for rapid set-up of eMTY in a pandemic and disaster situation.

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[1] Ryan, B. J., Coppola, D., Canyon, D. V., Brickhouse, M., & Swienton, R. (2020). COVID-19 Community Stabilization and Sustainability Frame-work: An Integration of the Maslow Hierarchy of Needs and Social Determinants of Health. Disaster medicine and public health preparedness, 1-7.

4.0 Methodology

This study was completed through five sequential phases (Figure 1). Data was collected through initial interviews, interviews, focus groups, workshops, and a survey. The initial interviews were with representative from BCHP to examine eMTY efficacy and processes to inform development of a disaster plan, identify participants for interviews and focus groups, and guide selection of locations for workshops. This was followed by nine interviews and three focus groups from January to May 2021 and five workshops from August 2021 to January 2022 with a total of 89 participants. The interviews and focus groups were with participants involved in setting up and delivering the eMTY program. The workshops were conducted with professionals familiar with the program, emergency management, public health, or food systems. This was complemented by an environmental health survey distributed to staff and administrators serving in schools that participated in the eMTY program. The findings were integrated to develop an action plan and strategies for mitigating food insecurity before, during and after pandemics and disasters. Further information about the methodology is provided in the following.
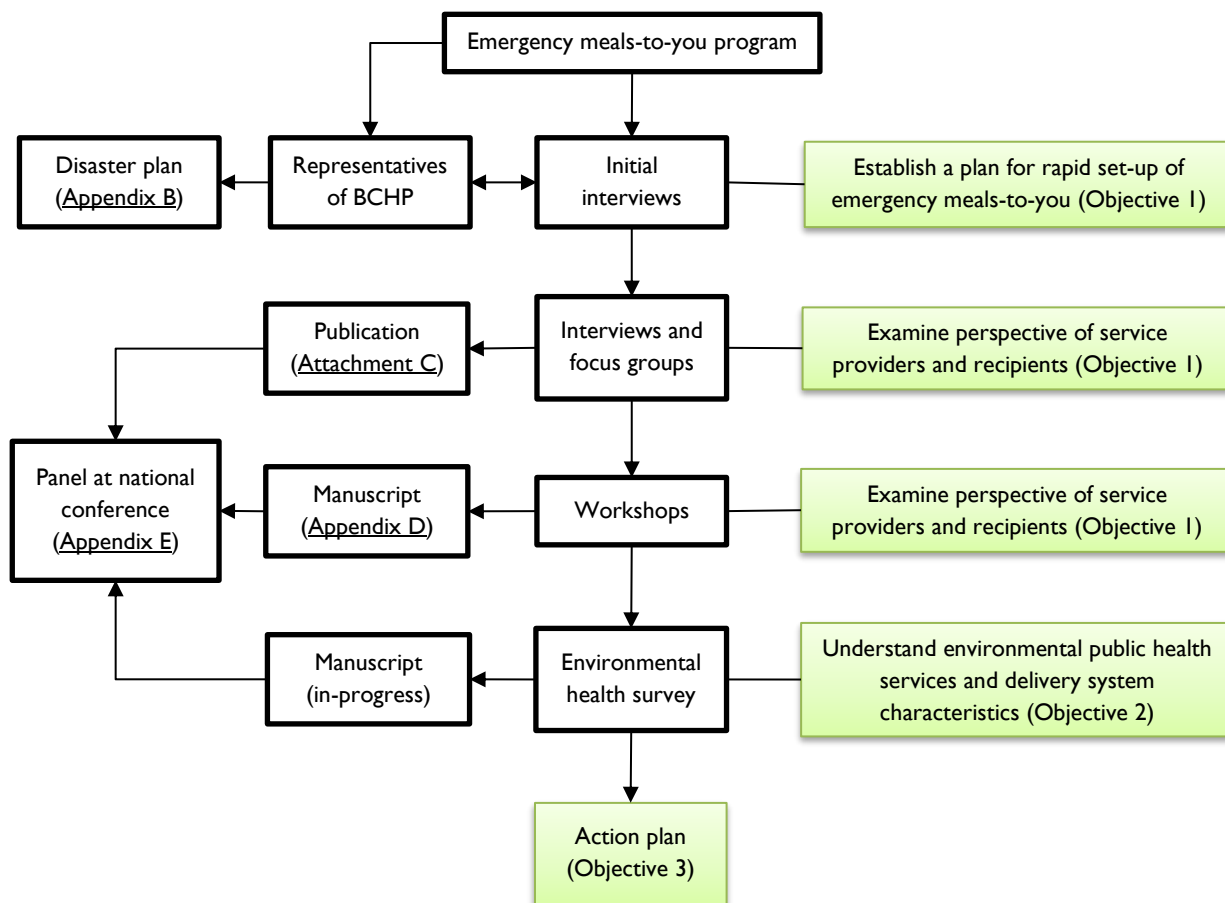

Figure 1. Project methodology and outputs

4.1 Interviews and Focus Groups

The interviews and focus groups were conducted with people involved in designing and implementing eMTY. A series of structured and open-ended questions were developed to guide the discussion and help understand the development and delivery of the program. Participants were selected through a purposive sampling strategy.[2] This included recruiting based on availability and roles in aiding the facilitation of the eMTY program.

The interview and focus group questions related to the participants experience with eMTY, areas of success and program improvement. The principle of saturation was used to determine when data collection would conclude.[3,4] This was achieved after the third focus group and eighth interview. The ninth interview was conducted to confirm saturation had been reached. Data was transcribed and thematically analyzed by manually placing key phrases, ideas, and concepts into Microsoft Excel™ spreadsheets. The process included organizing data, data description, and classification followed by interpretation. Across the three researchers involved in the analysis there was consensual interpretation of the data.[5]

4.2 Workshops

There were five workshops from August 2021 to January 2022 across the United States. The locations included Waco, Texas (August 3, 2021), Montgomery, Alabama (August 5, 2021), Fargo, North Dakota (August 12, 2021, St. Louis, Missouri (September 15, 2021) and Charleston, South Carolina (January 11, 2022). The USDA regions covered were the Heartland (St. Louis), Northern Plains (Fargo), Southern Plains (Waco), and Southern (Charleston and Montgomery). A modified version of the United Nations Public Health System Scorecard (Health Scorecard), which has a direct link to the Disaster Resilience Scorecard for Cities was used in the workshops.[6] This modified version, the Food System Resilience (Food Scorecard), was developed for this project and piloted. An overview of the methodology is provided in Figure 2.

The workshops were completed in two parts and in-total each workshop took approximately six hours. During the first four hours participants completed the Scorecard with two facilitators providing clarifying information about each indicator. Each indicator assessment generally took between five to ten minutes to complete. Participants were encouraged to complete the Food Scorecard based on their role and expertise, experiences, and perspectives. The final two hours focused on anonymized data interpretation and analysis.

The scorecard results from each participant were aggregated and then a mean for each indicator was calculated. Results were presented to the workshop participants as a table with the lowest ranking four to five indicators highlighted for group discussion. The decision on removal, clarification and ranking of an indicator for discussion was determined by workshop participants through a consensus approach. Once consensus was reached on the indicators to be discussed, workshop participants began developing priority actions for each selected indicator. When finalized, the priority actions were applied to a ranking grid. This impact vs difficulty process allowed workshop participants to discuss and visualize

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[2] Creswell, JW. Qualitative inquiry and research design: Choosing among five approaches. Washington DC: Sage Publications, 2013.

[3] Birks, M, & Millis, J. Grounded theory: A practical guide. London: Sage Publications, Ltd, 2011.

[4] Glaser, B., & Strauss, A. The discovery of grounded theory: Strategies for qualitative research. Piscataway: Transaction Publishers, 1967.

[5] O'Connor, C, & Joffe, H. Intercoder Reliability in Qualitative Research: Debates and Practical Guidelines. International Journal of Qualitative Methods. 2020; 19: 1-9.

[6] UNDRR. (2020b). Disaster Resilience Scorecard for Cities - Public Health System Resilience Addendum. Retrieved from https://mcr2030.undrr.org/public-health-system-resilience-scorecard.

the priority actions in terms of which should be addressed initially according to the impact on food systems and difficulty to solve.[7] When complete, the priority actions were presented to the participants for input and finalization.
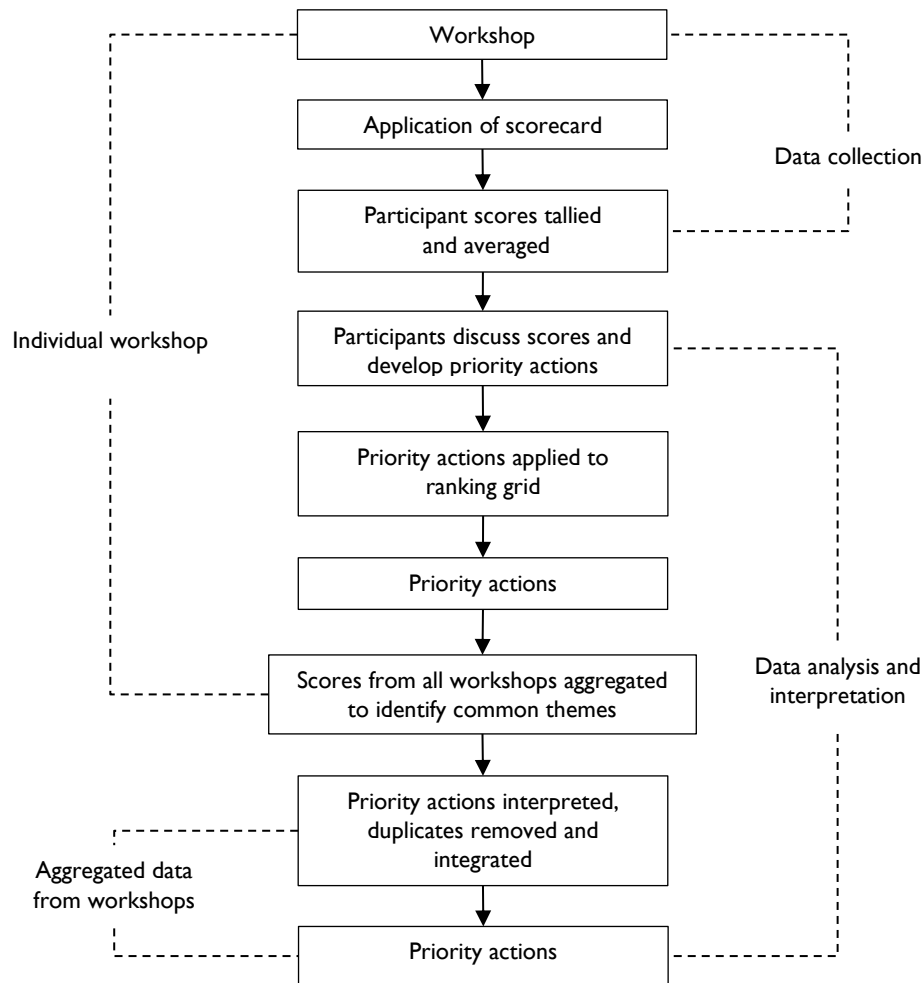
Figure 2. Workshop methodology

Following the individual workshops, data were collated, interpreted, and analyzed by the research team. The mean scores for each indicator from the workshops were combined and then averaged. This was conducted to aid interpretation and identify priority actions from all five workshops. All priority actions were collated and grouped into different themes. We then identified where there was duplication and interpreted the data to develop consolidated priority actions. At this point no ranking for the priority actions across all workshops was applied because the goal was to provide recommendations representative of all workshops.

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[7] Simon, R. W., & Canacari, E. G. (2012). A practical guide to applying lean tools and management principles to health care improvement projects. AORN Journal, 95(1), 85-103.

4.3   Survey

An environmental health survey consisting of fifty-one questions was distributed to staff and administrators serving in schools that participated in the eMTY program. The survey leveraged approaches and lessons learned during UNCOVER-EH, a recent national assessment of environmental public health in local communities by Co-PI Dr. Bryan Brooks with the Centers for Disease Control and Prevention.[8]

A primary objective for this survey was to identify how the COVID-19 pandemic impacted the state of environmental health delivery services in eMTY participating schools. The survey was available electronically via Sawtooth Software's Lighthouse Suite. All responses were recorded, however, data analysis only captured completed surveys. The design, procedure, and analytical approach used had been applied in other published articles.[9]

The internet survey delivery protocol developed by Dillman, Smyth, & Christian (2014) was used for this study.[10] This involved initial pre-notice of the upcoming survey was sent to the nutrition, food handling, and administrative staff at the eMTY participating schools in May of 2022. The first invitation for the survey was then sent out via email later that same month. In June of 2022, a follow-up reminder, second survey invitation, and final notice were sent out to potential survey participants. After the survey was closed later that same month, data analysis was conducted for the over one hundred survey responses. Using SigmaPlot software, bar plots were developed to visualize the responses for each survey question.

4.4   Human Subjects Approval Statement

This study was determined by Baylor University to meet the exclusion criteria for institutional review board approval per 45 CFR 46.102(e) & (l) (appendix F).

5.0 Expected Outputs

The expected outputs from this project included:
- Publication – Pandemic/disaster plan for implementing Emergency Meals-to-You (Complete – Attachment B).
- Publication – Environmental public health services and health system delivery characteristics, and comparative assessment of communities receiving Emergency Meals-to-You (Complete – manuscript in-progress).
- Publication – Food security and resilience action plan for priority communities (Complete – Attachment G).
- Publication – Strategies for mitigating food insecurity before, during and after pandemics and disasters (Complete – Attachments C and D).

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[8] https://www.cdc.gov/nceh/ehs/uncover-eh/index.html
[9] Rudd, M. A., & Lawton, R. N. (2013). Scientists' prioritization of global coastal research questions. Marine Policy, 39, 101-111.
[10] Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). Internet, phone, mail, and mixed-mode surveys: the tailored design method: John Wiley & Sons.

6.0 Results

6.1 Disaster Plan

A disaster plan was completed on July 30, 2021 (Attachment B). It builds on experiences of the eMTY and outlines the roles, responsibilities, and actions required to maintain food availability and access. The plan applies to localized or wide scale school closures due to any event. However, it may be adapted to accommodate rapid distribution of meals to vulnerable populations in response to a school closure or other disaster events which limits a community's access to food. Revision of the plan should be conducted following incident debriefings, or as data is procured that may improve the document. The BCHP Executive Director authorizes, and issues changes to this document until it is superseded. This document and the associated attachments are living documents.

6.2 Interviews and Focus Groups

There were nine interviews and three focus groups from January to May 2021. One focus group had five participants and two were held with three. Participants included project coordinator/management (BCHP and USDA), food vendors (Chartwells K12, Canteen, and General Mills), logistics and packaging (McLane Hunger Solutions and PepsiCo's Food for Good), transport services (United Parcel Service) and emergency management (emergency management professional). The findings were compiled into a peer-reviewed paper titled "Mobilizing and Delivering Essential Meals to Children and Families Affected by School Closures During COVID-19 and Beyond", which was published in the *Journal of School Health* (Appendix D).

Participants described the eMTY delivery system characteristics, and recommended strategies for strengthening food access and resilience. The program leveraged a multisectoral approach. Components relied on each other and included: schools; public/private partnership; eligibility; relationships; experience; centralized communication; food quality and branding; logistics; and transport. A description of the program themes and components is provided in Figure 3.

Strategies identified for enhancing food system resilience for school children were categorized into 14 areas (Table 1). Within each, the sector identifying, possible actions for implementation along with relevance to schools (listed in no particular order) are presented. There were three strategies identified from the government, non-profit and private sectors. These related to a fully procurable menu (strategy 1), documenting dietary needs (strategy 2), and providing shelf stable meals (strategy 14). There were another two strategies identified by two sectors and the other nine by one sector.

Figure 3. Description of the eMTY program

Strategy	Sector identifying	Possible action	School role
1. Establishing a fully procurable and costed menu compliant with school needs and the USDA.	Government Non-profit Private	Schools identify menu with focus on shelf stable foods. Share information with school district, USDA, and other partners. USDA or central organization to collate and monitor.	Yes
2. Understanding and documenting population served as part of school lunch programs, such as dietary needs, and sharing this with the local emergency management committee.	Government Non-profit Private	Schools use student registration documents to estimate dietary and other meal needs. Ensure this is sharable (de-identified) and updated annually.	Yes
3. Identifying surge capacity in transportation and supplies at the local level.	Private	Schools could leverage existing transportation networks such as buses and drivers. USDA or a central organization could identify, approve, and coordinate across all levels.	Yes
4. Incorporating food access and security at schools to emergency operations center functions, activities, and exercises (local and district level).	Private	Schools could use their own site and align with emergency management system.	Yes
5. Tailoring communication strategies to suit the school community (email or text message).	Non-profit	School tracks the most effective communication methods. USDA or designated organization could monitor and update to maintain preparedness.	Yes
6. Maintaining a list of individuals and addresses for targeted deliveries.	Government Private	This could be maintained annually and shared as required with supporting organizations.	Yes
7. Expanding program to ship boxes of non-food items. For example, essentials found in a grocery store (toothbrush, paper towels, etc.).	Private	Schools could identify vulnerable students to provide an estimate of resource needs. USDA or a designated central organization could oversee and coordinate.	Partial
8. Pre-approving school districts to be part of the program.	Private	Schools should review their eligibility (or potential) with USDA.	Partial
9. Expanding program to support shelters used for displaced populations.	Government	School could be part of this if a designated shelter.	Partial
10. Creating central organization to communicate and liaise with schools and suppliers of food.	Private	USDA or a designated central organization would lead and communicate this with schools at local, district and regional levels.	Limited
11. Creating a heat map of distribution hubs based on social determinants of health and disaster risk.	Private	USDA and support organizations lead with engagement of schools as required.	Limited
12. Identifying and approving reserve vendors for emergency programs.	Private	School arrangements could be made within the community. USDA or a central organization could oversee and coordinate.	Limited
13. Capturing regional strengths of vendors and shippers to develop response plan. Merge for nation-wide disasters.	Non-profit Private	USDA or a designated central organization.	No
14. Supplying shelf-stable boxed meals to emergency responders.	Government Non-profit Private	Recommend this across the entire emergency management spectrum.	No

Table 1. Recommended strategies for sustaining essential meals

An overarching theme across the strategies interpreted was a priority for understanding food needs at the school level (for example, dietary needs) and how distribution networks could be rapidly scaled. This was highlighted by a statement that "a lot of these kids rely on the schools for their nutrition and the schools shut down (Interview 4)." To assist this process schools could, for example, "build a fully procurable menu, fully costed and USDA compliant ahead of time (Focus Group 2)." This could be complemented by a focus on shelf stable foods and maintaining a "…list of individuals and addresses for targeted deliveries (Interview 9)." Future programs could focus on working with schools to "ship boxes of non-food items… anything found in a grocery store (toothbrush, paper towels, etc.) (Focus Group 3)." More broadly, there was a recommendation to capture regional strengths of vendors and shippers to develop a response plan that could be merged for nation-wide disasters.

At the school level, the strategies provide a framework to help sustain essential meals in rural areas. This could be achieved by:
- Establishing a fully procurable and costed menu compliant with school needs and the USDA.
- Understanding and documenting population served as part of school lunch programs, such as dietary needs, and sharing this with the local emergency management committee.
- Identifying surge capacity in transportation and supplies at the local level.
- Incorporating food access and security at schools to emergency operations center functions, activities, and exercises (local and district level).
- Tailoring communication strategies to the school community (for example, email or text message).
- Maintaining a list of individuals and addresses for targeted deliveries.

These actions would be complementary to the Pandemic Electronic Benefit Transfer (PEBT) and other programs through a rural focus. Meal programs administered through sites that allow congregate feeding works well in condensed urban areas, however, in low population densities many cannot access the available food programs or stores. By implementing these recommendations, schools could begin working towards a framework that strengthens food access and availability for students and their families in rural areas affected by school closures.

6.3   Workshops
There were 69 participants across the five workshops. Participants included school administrators and regional managers, emergency preparedness representatives, child nutrition specialists, companies and organizations involved in supplying and coordinating food delivery, and government officials familiar with the eMTY program, transportation experts, and environmental health professionals. The others included public health professionals, registered dieticians, human resources, facilities and operations managers, and academics. The findings were compiled into a manuscript titled "Strengthening food systems resilience before, during and after disasters and other crises", which was submitted to the *Journal of Homeland Security and Emergency Management* (Attachment D).

The workshop in Montgomery, AL, had the most participants with 20 (16 in-person and 4 virtual). This was followed by Waco, TX, with 15 participants (10 in-person and 5 virtual), Fargo, ND, 14 (11 in-person and 3 virtual) and 10 in-person participants at both the St. Louis, MO, and Charleston, SC, workshops. An interpretation of findings, rankings and recommendations from each workshop are provided below along with integrated priority actions.

6.3.1 Waco, Texas

A common theme was the need to integrate the food and school sectors within the emergency management system. For example, the schools closed for instruction during COVID-19 often had their kitchens open and were able to prepare food and cook meals. However, in some instances this was an untapped resource for surging food supply. By expanding emergency management systems to include food and school sectors existing capacities and organizations, which are already well-versed in food supply and surge capacity, they would become part of disaster mitigation, preparedness, response, and recovery actions. The workshop report is available at <u>Attachment H</u>. Participants recommended:

1. Sharing of data about nutritional needs at the school level.
2. Mapping farm-to-school-to-table to identify resilience needs.
3. Strengthening of local food providers.
4. Surge capacity for rural locations.

6.3.2 Montgomery, Alabama

In general, participants highlighted the important role of schools and teachers within the food system during disasters. It was recommended school-collected data (nutritional and health needs) and logistical capacities (use of school kitchens) be considered during disaster planning and emergency management processes. Complementary to this would be planning to use school bus routes to deliver meals to children and their families. Partnerships should also be developed with local churches and other influential entities in the community, which are not directly related to the food systems but vital in connecting families in need. The workshop report is available at <u>Attachment I</u>. Participants recommended:

1. Representation of schools and food sectors on local emergency committee (school and food sector).
2. Representation on multi-sectoral committees (school).
3. Local level plans to maintain food availability and access (for example, school districts aligned with sporting clubs, churches and other local organizations).
4. Sharing nutritional needs and allergy information with local emergency committee.

6.3.3 Fargo, North Dakota

Overall, participants believed incorporating eMTY (or a similar program) and integrating food availability/access into disaster scenarios within local emergency management governance structures would help enhance food system resilience. Also, from an environmental public health perspective, food availability and access generally are not discussed in emergency planning but should be. There is also a need to increase local knowledge, community awareness, and community linkages to funding and food. These could be achieved by conducting table-top exercises and strengthening existing partnerships and organizations, which are already well-versed in food supply and surge capacity. The workshop report is available at <u>Attachment J</u>. Participants recommended:

1. Incorporate Emergency Meals-to-You program into disaster governance at local levels.
2. Include food availability/access emergencies as disaster scenarios.
3. Include pre-existing chronic health issues and nutritional needs in food sector disaster planning.
4. Increase local community awareness (schools and organizations) and linkages with emergency funding. for food availability, access, and dissemination.

6.3.4   St. Louis, Missouri

Preserving local ecosystems was considered important. This is because urban environmental degradation reduces the ability to produce local food. There is also a need for more coordinated community networks of pantries, food banks, warehouses, and retail outlets, which can pivot quickly to emergency production and distribution. The group also suggested an eMTY-type effort to address elder hunger, which could begin with co-ordination and rationalization of existing programs. Overall, participants suggested current supply chains are too long and vulnerable. More diverse and local food sources are required. The workshop report is available at <u>Attachment K</u>. Participants recommended:

1.   Protecting ecosystem services that provide food sector benefits.
2.   Making the emergency-meals-to-you program part of disaster governance.
3.   Mitigating long term impacts of disasters on the food sector and well-being.
4.   Ensuring availability of food sector workforce with relevant competencies and skills for disaster resilience.
5.   Establish early warning systems for food-related emergencies.

6.3.5   Charleston, South Carolina

A common theme was the need to focus locally on surge capacity. It was recommended a partnership be created among farmers, retailers, and the emergency sector to preserve farm-to-food processes. This would bolster the economy, shorten supply chains, and help protect local agricultural ecosystems. The workshop report is available at <u>Attachment L</u>. Participants recommended:

1.   Promote, monitor, and assess school and community food service needs through local emergency management structures.
2.   Leverage existing food sector capacities to establish and improve disaster risk management mechanisms.
3.   Identify stakeholders and engage responders to understand local food access needs.
4.   Develop and establish early warning systems for local food sector disruption.

6.3.6   Integrated Priority Actions

There were nine integrated priority actions identified as representing areas in greater need of investment and effort to improve food security and community resilience. The actions include:

1.   Coordination: Local emergency managers identify food sector stakeholders, explore food access needs, and share findings with community organizations, private sector, and government agencies.
2.   Early Warning Systems: Establish early warning systems for food-related emergencies.
3.   Ecosystems: Preservation and management of ecosystem services that provide food sector benefits.
4.   Governance: Local emergency committee include representatives from schools and the food sector.
5.   Mitigation: Explore food availability/access risks and identify strategies for mitigating impacts.
6.   Nutrition: Share data about nutritional and chronic health (e.g., allergies) needs from schools with the local emergency management committee.
7.   Planning: Develop disaster plans for sustaining food supply and access at the school district level.
8.   Supply Chain: Map local food sector capacities and surge needs, including from farm to table.
9.   Workforce: Availability of the food sector workforce with relevant competencies and skills.

The overarching aspect of these actions is to ensure better integration of the food sector with the emergency management system, data sharing and ensuring access to nutritious food. Most of these actions could be implemented as part of the mitigation and preparedness phases of emergency management. Also, emergency management systems are local, designed to coordinate complicated tasks in crises, multidisciplinary and are in-place around the country and world. Providing a ready-made framework for locally driven initiatives to strengthen food systems now and into the future.

6.4   Survey

An environmental health survey was distributed to schools and school districts that were part of eMTY. The aim was to identify the potential impact of COVID-19 on delivery of environmental health services in schools. This survey was distributed to around 300 professionals and to date there have been over 100 responses. A preliminary data analysis has been completed and these results are provided in the following:

- There was a 38% reduction in food safety inspections at schools during the COVID-19 pandemic.
- 56% of schools surveyed were built before 1978 and 30% had been repainted in the past 5 years.
- 75% of schools developed plans during the COVID-19 pandemic.
- Only 2% of known drinking water testing frequency was impacted by COVID-19.
- Approximately 10% of schools with a private water source (e.g. well) indicated this was not routinely tested in-line with the Safe Drinking Water Act.
- 13% of schools indicated environmental health related problems had previously been identified in schools. The most common related to food safety followed by physical structure, asbestos, chemical management, indoor air quality and health facilities.
- There was limited impact on mold (3%) and vector/pest inspects (6%).

6.5   Action Plan

Based on discussions with the research team and considering inputs provided throughout the project, a 13-point action plan is recommended (listed in no priority order):

1. Local emergency managers integrate food sector stakeholders into activities, explore food access needs, and share findings with community organizations, private sector, and government agencies.
2. Schools establish fully procurable menu that is costed and compliant with school needs and USDA.
3. Strengthen environmental health services at schools and other support functions required for the health and well-being of children.
4. Emergency management systems exercise plans, agreements, protocols, and for providing food during a disaster situation.
5. Establish early warning systems for food-related emergencies.
6. Explore food availability/access risks and identify strategies for mitigating impacts.
7. Share data about nutritional and chronic health (e.g., allergies) needs from schools with the local emergency management committee.
8. Develop disaster plans for sustaining food supply and access at the school district level.
9. Map local food sector capacities and surge needs, including from farm to table.
10. Increase availability of the food sector workforce with relevant competencies and skills.
11. A nationwide application of the United Nations Food Scorecard, which was piloted and developed as part of this project.
12. Conduct a nationwide survey to allow a ranking and prioritization of the actions identified at school, local, regional, and national levels across different USDA regions and settings.
13. Explore adapting eMTY to address food insecurity for older adults.

7.0 Tasks completed

All project objectives and expected outputs were completed. This included interviews, focus groups, workshops, development of a disaster plan and an action plan. An overview of the tasks completed in-line with the project objectives and other accomplishments is provided in the following.

7.1 Outputs aligned with Objectives

- Objective 1: Manuscript "Mobilizing and Delivering Essential Meals to Children and Families Affected by School Closures During COVID-19 and Beyond" has been published by the *Journal of School Health* – https://doi.org/10.1111/josh.13188 (Attachment C). Another manuscript "Strengthening food systems resilience before, during and after disasters and other crises" was submitted to the *Journal of Homeland Security and Emergency Management* (Attachment D).
- Objective 2: Distribution of an environmental health survey to schools and school districts that were part of eMTY. The survey has closed, preliminary data analyzed, and a manuscript is being drafted.
- Objective 3: A disaster related food security and resilience action plan has been developed (Attachment G).
- Objective 4: A disaster plan to guide rapid set-up of eMTY in a pandemic and disaster situation has been developed (Attachment B).

7.2 Other Accomplishments

- A food system resilience scorecard was piloted during the workshops. This was a modified version of the United Nations public health system scorecard. This modification was well received by the workshop participants and underwent a peer-review process involving international and multidisciplinary stakeholders. This includes representatives from the United Nations Office for Disaster Risk Reduction (UNDRR) and Food and Agricultural Organization of the United Nations.   This scorecard has now been launched by UNDRR on their website – https://mcr2030.undrr.org/food-system-resilience-scorecard. The official title is Disaster Resilience Scorecard for Cities: Food System Resilience – Addendum (Attachment M).
- The research team conducted a panel presentation at the National Environmental Health Association Annual Educational Conference on June 30, 2022 titled "Exploring Food Security and Environmental Health Systems Resiliency for School Aged Children" (Attachment E).
- Four graduate research assistants supported the project. The students were part of the Master of Public Health program majoring in environmental health science.
- A smartphone App piloted to facilitate attendee input into the food system scorecard worked well. Efforts are now underway to seek funding to formalize this App.
- Dr. Brickhouse, Dr. Brooks and Dr. Ryan met with stakeholders in Washington DC on January 6 and 7. This included Baylor lobbyist Arnold and Porter, and staff from Senator Cornyn's Office.
- To help with promotion of the findings and the next steps, the research team have developed a white paper (Attachment N), poster template (Attachment O), and presentation template (Attachment P).

8.0 Challenges

The project was completed during the COVID-19 pandemic. This created challenges in relation to conducting interviews, focus groups and workshops, personnel management, and the timeframe for achieving some milestones/outputs. To overcome this challenge, interviews and focus groups were conducted virtually. Workshops were held using a hybrid model and an App was piloted to allow in-person and remote participants to complete the scorecard and actively contribute.

Throughout this project, the researchers were actively involved in various COVID-19 activities. For example, Dr. Ryan, Dr. Brickhouse, and Dr. Brooks were involved in implementing and guiding environmental public health activities at Baylor to ensure a successful re-opening in August 2020 and then sustaining operations during COVID-19 pandemic. For Dr. Ryan and Dr. Brooks, this was in addition to their standard activities at the university. This contributed to the delay in finalizing the manuscript related to environmental public health service characteristics of schools involved in eMTY.

The COVID-19 pandemic also reduced the amount of travel and other funds used. For example, some participants were not comfortable traveling. However, the remaining funds have provided the opportunity for a no-cost-extension (NCE) to conduct a nationwide survey using BCHP networks to rank and prioritize the actions identified to strengthen food security. An application for the NCE has been submitted and is under review.

9.0 Budget

On June 30, 2022, there was $41,012.98 remaining in the overall budget (Table 2). This surplus in funds can be attributed focusing on delivering the aims and objectives in a financially efficient manner and the COVID-19 pandemic. The COVID-19 pandemic reduced the amount of travel and other funds used. For example, some participants were not comfortable traveling. However, this now provides an opportunity for a no-cost-extension (NCE) to conduct a nationwide survey using BCHP networks to rank and prioritize the actions identified to strengthen food security. An application for the NCE has been submitted and is under review.

Funding Source - Total	Category	Expenditure Category	Budget Amount	Expenses	Commitments	Remaining
Internal	DIRECT	DOMESTIC TRAVEL	$0.00	$2,056.52	$0.00	-$2,056.52
	DIRECT	TUITION	$191,000.00	$0.00	$0.00	$191,000.00
	DIRECT Total		**$191,000.00**	**$2,056.52**	**$0.00**	**$188,943.48**
Internal Total			**$191,000.00**	**$2,056.52**	**$0.00**	**$188,943.48**
US Dept of Agriculture	DIRECT	SALARIES AND WAGES	$97,157.00	$100,327.20	$0.00	-$3,170.20
	DIRECT	FRINGE BENEFITS	$24,210.00	$8,203.83	$0.00	$16,006.17
	DIRECT	DOMESTIC TRAVEL	$34,600.00	$27,162.41	$0.00	$7,437.59
	DIRECT	CONTRACTED SERVICES	$25,000.00	$7,184.00	$0.00	$17,816.00
	DIRECT	MATERIALS AND SUPPLIES	$5,000.00	$2,368.09	$0.00	$2,631.91
	DIRECT	RESEARCH SUBJECT INCENTIVE	$0.00	$800.00	$554.00	-$1,354.00
	DIRECT	PARTICIPANT SUPPORT	$10,000.00	$11,690.07	$0.00	-$1,690.07
	DIRECT	MISCELLANEOUS	$3,500.00	$12,188.77	$0.00	-$8,688.77
	DIRECT Total		**$199,467.00**	**$169,924.37**	**$554.00**	**$28,988.63**
	INDIRECT	INDIRECT EXPENSE	$72,945.00	$60,920.65	$0.00	$12,024.35
	INDIRECT Total		**$72,945.00**	**$60,920.65**	**$0.00**	**$12,024.35**
Total			**$272,412.00**	**$230,845.02**	**$554.00**	**$41,012.98**

Table 2. Budget

10.0 Future Activities

If a NCE is approved, the research team will distribute a nationwide survey using BCHP networks to rank and prioritize the actions identified to strengthen food security. This would help prioritize what actions identified from the interviews, focus groups, workshops and the survey should be implemented in different settings. It would help inform priority actions at school, local, regional, and national levels across different USDA regions and settings. Allowing strategies to be tailored to meet local needs and priorities for mitigating food insecurity before, during and after pandemics and disasters.

A third manuscript will be finalized in the coming months. This will relate to the environmental public health service characteristics of schools involved in eMTY. Achieving this will provide further evidence on the need for this program and for environmental public health services to be strengthened at schools, especially in rural areas.

The project team hopes to support further implementation of this methodology in other parts of the nation and world. The launch of the United Nations food system resilience scorecard, which stemmed from this project is recognition of the potential for this type of project to provide a much-needed community driven basis for understanding how to strengthen food systems. Ultimately, providing a template for developing strategies for mitigating food insecurity before, during and after pandemics and disasters.

11.0 Discussion

Strengthening food system resilience is vital to help mitigate the health, societal and economic consequences of disasters and other crises in the short, medium, and long-term.[11] Achieving such resiliency is increasingly urgent because an estimated 50 million people are food insecure in the United States, making this one of the leading public health and nutrition issues for the nation.[12,13] For example, inadequate access to nutritious food is associated with higher health-care costs and poor health outcomes for both adults and children, suggesting it may be an important driver of health disparities.[14] Poor nutrition is also related to serious adverse health effects such as suppressed body growth, accelerated aging, reduced muscle mass and strength, reduced bone density, reduced heart contractility, lower lung capacity, limited cognitive performance and reduced immune response to infective agents.[15] Therefore, a new path towards strengthening food system resilience cam be built on existing and previous programs, including eMTY.

In an unprecedented time of need for school children, the eMTY program worked with public/private partners to ensure children in rural areas affected by school closures had access to essential meals. The school closures, a strategy used in some areas in response to COVID-19, left households of children in some of the country's hardest hit communities scrambling for ways to replace much-needed meal resources.[16] The eMTY used the summer MTY pilot as a template and leveraged pre-existing multisectoral relationships to rapidly scale up. An important aspect of eMTY was the focus on quality well-presented meals, a key element in addressing food insecurity and reducing childhood obesity.[17,18] The Urban Institute found this type of program, based on MTY, has the same level of effectiveness as the NSLP in terms of reducing food insecurity.[19] Central to the success were schools and their interface with vendors, transport companies, families, and children. This combined with the use of shelf-stable boxed meals allowed nutritious, safe, and brand-named food to be delivered to households and schools.

Efforts have been made to address the food insecurity challenge. For example, the Supplemental Nutrition Assistance Program (SNAP) allows eligible people to buy food in authorized retail food outlets. However, many do not participate for the following reasons: transaction costs such as time and cost spent traveling to a SNAP office, the benefit level can be quite small (for one or two person households this could be as low as $16 per month), and receiving SNAP may carry a negative stigma[20]. Complementary to this effort are the SBP and NSLP, which are supported and funded by the USDA.

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The school closures and eMTY provided an opportunity to reflect on these programs and consider alternatives for underserved populations. For example, the eMTY could provide another template for addressing food insecurity for older adults. The particularly vulnerable are older adults with caregiving responsibilities aged 50 to 59 years.[21] Older seniors are less likely to be food insecure compared to younger seniors.[12] Among elderly food insecurity and nutrient deficiency often result in low level of vitamins E, C, D, B2, B12, zinc, phosphorus, and calcium. These findings could serve to policy makers to build food security more oriented to risk groups.[22]

There is a need to integrate the food sector and schools with emergency management systems. Addressing this need could allow food related emergency scenarios to be better considered and promulgate coordination of community networks such pantries, food banks, warehouses, and retail outlets that can pivot quickly to emergency production and distribution. Also, the agency administrating the SBP and NSLP varies by jurisdiction, however, each works directly with local educational bodies.[23]

A challenge for rural schools in establishing and maintaining food safety standards is access to environmental health services.[24] Professionals in this field deliver essential meals, which encompasses food safety, hazardous materials, healthy buildings, infectious diseases, drinking water supplies, vector-borne diseases, and other concerns that may compromise individual and community well-being.[25] This lack of access is a timely and urgent concern. For example, in Texas there are 254 counties[26] with 121 local health departments.[27] Such gaps in services and delivery potentially leaves most counties without the ability to provide the environmental health support required to help maintain safe practices in schools and across the entire supply chain cycle. To address this gap environmental health services need to be strengthened at schools, especially in rural areas.

The Food Scorecard was effective in unpacking the requirements of the Ten Essentials and how they relate to the food system resilience. Linking to the "Ten Essentials" helped ensure a holistic coverage of the disaster resilience field, including factors indirectly influencing food systems.[28] Other versions of the scorecard have been used around the world and the popularity is demonstrated by the Health Scorecard now being available in over ten languages. It also supports the perspective that resilience is a "system-of systems" issue that affects multiple physical and social systems, and therefore needs to be addressed in each of these systems. Overall, this approach is translatable to different settings and scenarios because of the level of granularity used to identify areas needing improvement to strengthen resilience. This Food Scorecard has now been peer-reviewed and updated by a team of multidisciplinary and international stakeholders, and launched online by the United Nations in August 2022 (https://mcr2030.undrr.org/food-system-resilience-scorecard).

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As the project has progressed the need for a nationwide survey using BCHP networks to rank and prioritize the actions identified to strengthen food security has become evident. This is needed because there is no prioritization of what actions identified from the interviews, focus groups, workshops and survey should be implemented in different settings. A nationwide survey would address this by informing priority actions at school, local, regional, and national levels across different USDA regions and settings. Allowing strategies to be tailored to meet local needs and priorities for mitigating food insecurity before, during and after pandemics and disasters.

12.0 Conclusion

Food system resilience is vital to mitigate the consequences of disasters and other crises on community and individual well-being. The COVID-19 pandemic demonstrated how food systems can be impacted, especially for vulnerable populations such as children. School closures compromised essential meals for many children across the United States. To help address this food security crisis, a nontraditional public/private partnership model, eMTY, was set up and implemented to deliver meals to students in affected rural areas affected. By leveraging the knowledge and experiences of this program, we were able to identify, rank and prioritize actions for strengthening food system resilience. These include integrating the food sector and schools within emergency management, mapping local food sector capacities, working with schools to receive de-identified data about nutritional, allergy and other health needs, developing disaster plans for sustaining food access at the school district level, and protecting ecosystem services and agricultural areas. Addressing this timely need by delivering on the actions recommended would promulgate coordination of community networks that can pivot quickly to emergency production and distribution. It is difficult to solve complex problems such as improving food security during an emergency, so it is hoped this study and report can provide concrete guidance to improving food system and community resilience prior to future pandemics and disasters.