Effective Community Response to Food Insecurity:
Investigating Cross-Agency Collaboration in Tompkins County in the Context
of the COVID-19 Pandemic

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by
Jeremy Xu
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supervised by

Prof. Mildred Warner

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INTRODUCTION

Despite the fact that most of the populations in the United States have enough access to food for a healthy life, there are many disadvantaged groups suffering from food insecurity due to poverty, poor mobility, loneliness and many other reasons (Dewar et al., 2020), leading to a series of adverse health outcomes including anemia, behavioral problems and weak immune systems (Bleich et al., 2020; Hong & Henly, 2020). In 2019, food insecurity accounts for 10.5% (13.7 million households) in the United States, while the 2020 prevalence is expected to be higher during the COVID-19 pandemic (Kinsey et al., 2020). *Supplemental Nutrition Assistance Program* (SNAP, formerly food stamps), *Special Supplemental Nutrition Program for Women, Infants, and Children* (WIC), and the *National School Lunch Program* are three primary Federal nutrition assistance programs that help vulnerable populations get adequate food intake (Coleman-Jensen, 2019). *Meals on Wheels America*, a community-based organization, aims to support the living needs of older adults, addressing their risks of food insecurity and social isolation.

On March 11, 2020, the World Health Organization declared "coronavirus disease 2019" (Covid-19) as a global pandemic. As the number of illnesses kept growing, social distancing and stay-at-home orders were initiated to decrease the rate of transmission. Under this circumstance, schools were closed and switched to online teaching, and companies laid off employees and shrank payrolls to reduce the labor cost. On the other side, with higher demands for transportation services (Gray, 2020), more volunteers were needed to help with grocery shopping and food delivery. The changes in supply and demand during this crisis made it so critical to find an effective response to address food insecurity issues. This project analyzes one community's response to this challenge, exploring the question: *What are the factors that drive an effective community response to food insecurity in the context of the COVID-19 pandemic?*

The purpose of this project is to investigate how cross-agency collaboration promotes collaborative response to address food insecurity during this COVID-19 pandemic, by taking Tompkins County, New York as an example. The topic proceeds as follows. Firstly, we present an overview of food insecurity and new challenges when the pandemic hit, followed by a review of some of the existing food assistance programs in the United States to address food insecurity with claims related to the pandemic, and then we construct a framework of cross-agency collaboration to suit emergency food response. Next, in the methodology part, we conduct qualitative interviews and establish a cross-agency collaboration model. Results and discussion are based on interviews and organized by themes, which help to identify factors that drive an effective food response. Finally, we end with conclusions and questions for future development.

LITERATURE REVIEW

1. Overview of Food Insecurity

According to the United Nations Subcommittee on Nutrition, food insecurity is defined as the limited or uncertain availability of nutritionally adequate, safe foods or the inability to acquire personally acceptable foods in socially acceptable ways (Decker & Flynn, 2018). Different from hunger, which is the condition of physiological hunger at the individual level, food insecurity is the hardship of accessing food normally and is measured at the household level. Take Tompkins County as an example. In 2018, there were about 10,720 food insecure people in Tompkins County, accounting for 10.4% of the overall county residents (Feeding America, 2018). It is also remarkable that there are about 2300 children (15.0%) in Tompkins County who are identified as food insecure. In 2006, USDA classified the severity of food security into four levels: high food security, marginal food security, low food security, and very low food security (Nord, 2012). *High food security* is defined as no reported indications of food-access problems or limitations; *marginal food security* shows one or two reported indications of anxiety over food sufficiency or shortage of food in the house, without much indication of changes in diets or food intake; *low food security* is identified with reports of reduced quality, variety, or desirability of diet, with little or no indication of reduced food intake; *very low food security* shows reports of multiple indications of disrupted eating patterns and reduced food intake.

Studies have found that food insecurity is associated with negative health outcomes (Gundersen & Ziliak, 2015). For young children, food insecurity is related to anemia, reduced nutrient intake, cognitive problems, and mental disorders. Children from food-insecure households are more likely to have risk of birth defects, compared to those from food-secure families. For young adults who are identified with food insecurity, they have higher odds of a series of mental

health problems such as depression, anxiety or panic disorder, suicidal ideation, as well as poorer sleep outcomes like having trouble falling asleep (Nagata et al., 2019). For non-senior adults who are food insecure, chronic diseases including diabetes, hypertension, and hyperlipidemia are diagnosed at a higher rate (Gundersen & Ziliak, 2015). For older adults suffering from food insecurity, they tend to be less active, at higher risk of malnutrition and poor health status. For adults with disabilities who are considered as most vulnerable populations to food insecurity, they have shown poorer self-reported health and mental health (Brucker, 2017).

To deal with the challenge of food security and to make food access much easier, a large number of nutrition assistance programs such as Meals on Wheels program (MOW), Supplemental Nutrition Assistance Program (SNAP), Women, Infants, and Children (WIC), and the National School Lunch Program (NSLP) support vulnerable populations in the United States. These programs are effective to reduce the food insecurity rate, benefiting around 59% of food insecure households each year (Decker & Flynn, 2018). However, all the food policies and responses are based on a regular period; and once a state of emergency occurs, how can these food programs be implemented effectively and efficiently on the community level?

The COVID-19 pandemic brought about large crises on food and health, and new approaches were necessary to respond to these issues. 6.6 million unemployment insurance claims and over 700,000 job losses were reported in a single week when the pandemic just hit the nation at the end of March (Fitzpatrick et al., 2021). In addition, long-term school closures put many school children from poor families at risk of food insecurity, and thus school meal delivery became very important to make sure that they can still get food during the pandemic (Kinsey et al., 2020). Moreover, panic buying occurred among customers who wanted to store necessities as much as possible, and labor shortages became a rising challenge due to worker illness and social distancing

(Hobbs, 2020). Some supermarkets and grocery stores developed new policies such as regulating purchasing limits and setting specific shopping hours for older adults and vulnerable customers. Emergency food response is another important topic, and in this project, we will also explore how the pandemic changed the way local agencies serve the community, what new approaches they employed, and what were some of the challenges and the lessons learned.

2. A Patchwork of Food Assistance Programs

To further understand the role of food assistance programs (**Table 1**), we selected Meals on Wheels program (MOW), Supplemental Nutrition Assistance Program (SNAP), Women, Infants, and Children Program (WIC), National School Lunch Program (NSLP), and Local Food Pantries, to analyze how they are helping people to address hunger and food insecurity issues.

Programs	Funding Source	Member Served	Organization Structure
Meals on Wheels program	Older Americans Act (OAA), community block grants handled by County Office for the Aging, client fees, churches, foundations, local donors	2.4 million older adults over 60 each year	- Meals on Wheels America as a leadership organization supporting 5,000 community-based programs across the country - About 2 million volunteers and staff for food delivery, friendly visits and safety checks
Supplemental Nutrition Assistance Program (SNAP)	U.S. Department of Agriculture	40 million low-income Americans each year	- Federal government pays the full cost of SNAP benefits, which are delivered monthly through electronic debit cards - Households can use SNAP to buy nutritious foods from over 238,000 authorized retailers nationwide

Women, Infants, and Children Program (WIC)	U.S. Department of Agriculture	About 6.87 million pregnant, postpartum, and breastfeeding women, infants, and children up to age 5	- USDA oversees WIC at the federal level and allocate funds to the local - Participants select WIC foods and pay with vouchers or electronic benefit cards
National School Lunch Program	U.S. Department of Agriculture, Families First Coronavirus Response Act (FFCRA), Coronavirus Aid, Relief, and Economic Security (CARES) Act	Nearly 100,000 schools/institutions serve school lunches to 29.6 million students each day	- Administered by USDA's Food and Nutrition Service - Low-income children are eligible to receive reduced-price or free meals at school
Food Pantries	Food bank, Donations	More than 37 million Americans in a nationwide network of 200 food banks and 60,000 food pantries	- Rely heavily on volunteer labor and donations - Food pantries receive distributions from food banks and provide food directly to those in need

Table 1. A patchwork of major food assistance programs (Meals on Wheels America, 2021; SNAP, 2019; WIC, 2019; School Nutrition Association, 2021; Feeding America, 2021)

Meals on Wheels program (MOW)

Meals on Wheels program (MOW) is one of the most popular food assistance programs where more than 2.4 million older adults over 60 years can receive home-delivered meals, with the help of over 2 million paid employees and volunteers in the United States (Meals on Wheels, 2021). Funded by the federal Older Americans Act and community block grants, Meals on Wheels has extended to 5000 programs in all 50 states since 1954 (Gualtieri et al., 2018). These programs are highly dependent on volunteers for food delivery, they also provide social connection and safety checking for older adults. Studies have demonstrated a reduced utilization rate of hospitalization, emergency department, and nursing home after older adults receive MOW services (Shan et al., 2019). Therefore, the Meals on Wheels program plays an important role in promoting health for older adults, and food security in particular.

Supplemental Nutrition Assistance Program (SNAP, formerly food stamps)

Supplemental Nutrition Assistance Program (SNAP) is the largest federal food assistance program in the United States that provides food stamps to nearly 40 million low-income households (Bleich et al., 2020; Hong & Henly, 2020). Studies have shown that SNAP is of great benefit to early child development in cognitive ability and physical health, especially to those in low socioeconomic status (Hong & Henly, 2020). However, food stamps are often depleted before the last week of the benefit month, which leads to a higher food insecurity rate for families compared to the first week (Bleich et al., 2020). Thus, other food assistance programs (such as food pantries) are necessary to make up the food gap in a sustainable way. Higher unemployment rate during the COVID-19 resulted in a higher dependence on food stamps, and temporary SNAP were released in March 2020 to provide emergency food supplements for struggling families (CBPP, 2021).

Women, Infants, and Children Program (WIC)

Women, Infants, and Children Program (WIC), as one of the largest food assistance programs in the US (another is SNAP), helps to meet the pressing nutritious food needs among low-income pregnant and lactating mothers, infants and children under the age of five (Hudak et al., 2020). Studies have shown that WIC can effectively improve pregnancy outcomes that benefit both mothers and babies, but the fact that low-income and minority communities have fewer grocery stores makes it less convenient for participants to redeem their benefits (Hudak et al., 2020). It would be especially hard for those populations to get food during the COVID-19 pandemic, where social distancing and transportation limits prevent them from travelling a long distance and purchasing their food in person.

National School Lunch Program (NSLP)

National School Lunch Program (NSLP) provides free or reduced-price lunches to nearly 17 million students from low-income families (Kim & Joo, 2020). Research has shown that NSLP enables students from poor households to meet daily food and nutrition needs, with a 14% reduction in very low food security (Kinsey et al., 2020). Concerns are that school closures during severe weather or pandemics will directly affect students' access to meals, resulting in a large number of missed meals and causing food insecurity problems. During the COVID-19, USDA worked closely with states to support the food needs of children when school was closed. The Families First Coronavirus Response Act (FFCRA) authorized several nationwide waivers to facilitate children to receive meals by meal delivery on bus routes, allowing parents to pick up meals, and establishing public private partnerships for food supply and distribution. Higher demands for food transportation have been put forward to ensure continuous food supply for school children during their study at home. According to a survey conducted by School Nutrition Association targeting 1,894 school districts nationwide, 81% of the school districts provided grab-and-go school meals services during COVID-19 closures, 42% provided meal delivery services directly to children's homes, and 32% utilized school bus routes to distribute meals across the local community (Pratt-Heavner, 2021).

Local Food Pantries

Food pantries (**Figure 1**) are community-based charitable organizations that provide food-insecure households with unprepared food and beverages at no cost, accounting for nearly 25% of monthly food sources among participants who are in pressing needs of food (Eicher-Miller, 2020;

Liu et al., 2020). A few of them are not eligible for the federal food assistance programs, while their low salaries force them to make hard choices between medicine, food and housing, and food pantries may help them to reduce their budget on buying food so as to pay for their housing rents and healthcare. However, studies have shown that despite the efficacy of food pantries in promoting food security around their serving community, challenges are that limited food products from local food banks make it less likely to offer people with healthy and nutritious food (Martin et al., 2019). And this challenge is expected to be larger as an increasing number of local residents rely on food pantries during the pandemic, and the nutrition quality of food cannot be guaranteed.
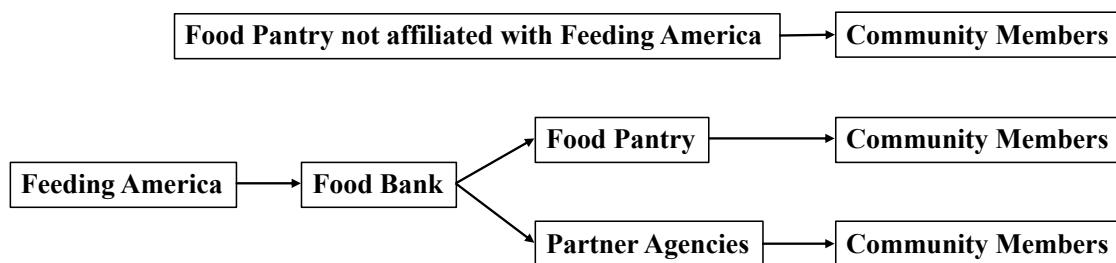
Figure 1. Food pantry organization structure
* Feeding America is a national level clearinghouse that raises funds and helps coordinate food delivery to local pantries.

The patchwork of food assistance programs (**Table 1**) targets a variety of different populations and groups who are at risk of food insecurity. For *households* with low-income, they can get food by using food stamps, which typically only meet their needs during the first several weeks of their benefit month, and thus they have to find additional food sources such as food pantries. For *older adults* with mobility issues, they can get food from Meals on Wheels where they can receive hot meals every day by home delivery. For *lactating mothers and infants*, they can get food through the WIC program, which can meet their basic needs for nutritious supplemental foods. For *school children* whose families don't have enough food, they can get free

or reduced-price school lunches through the National School Lunch Program. For other homeless or working-poor families, they may receive food from local food pantries.

These existing programs contribute to addressing food insecurity issues in the United States; however, one of the challenges of these programs is that they are separate, and coordination can be especially important during the crisis. Therefore, collaborative response to food insecurity issues is essential, in which the cross-agency collaboration could combine all these "patches" together and produce a nice "patchwork quilt". It is expected that such a collaboration will help to build up a more reliable food supply system to deal with the challenge of food security under emergency circumstances, as well as to eliminate the drawbacks in each of the programs on a long-term basis.

3. Cross-agency Collaboration in General

Building up effective governance needs partnerships and collaborations (Milward & Provan, 2000). A governmental agency should rely on other governmental agencies, and the public and private sectors to deliver safe and reliable public services. In this case, a clear principal-agent relationship is expected to increase the efficiency and efficacy of the governance structure and provider network. Therefore, cross-agency collaboration is considered as a key to promoting service delivery, where the partnerships can be established among a variety of public and private sectors, including local government, schools, businesses, and many other institutions (Warner & Zhang, 2020). Such a collaboration could be effectively applied to improving the emergency food supply and distribution system by building up a collaboration framework that is based on the existing food assistance programs, local government and non-profit organizations, as well as food, transportation, and information providers. In the context of the COVID-19 pandemic, cross-agency

collaboration is expected to improve effective governance by integrating and utilizing resources, thus advancing the capacity of local governmental agencies in food supply and distribution. For this thesis, we explore how cross-agency collaboration is able to integrate services and work with different community partners so as to meet the pressing food needs from all populations on the community level. The framework of cross-agency collaboration was developed to fit this project (Warner & Zhang, 2020), which includes *information exchange, funding, transportation, and innovative approaches,* as four basic factors that drive an effective community response to food insecurity.

Information Exchange

Information exchange is critical for local residents to be informed and approach the services they need (Warner & Zhang, 2020), and a trusted coordinator or information provider is thus needed to collect and convey information across the community, especially under emergency circumstances when supplies and demands are constantly changing. During a public crisis like the COVID-19 pandemic, quality information is regarded as an important factor that will facilitate the general public to be informed and take on the correct steps to address their needs (Bernardino & Bacelar Nicolau, 2020). In addition, studies have indicated that excellent information exchange can contribute to a higher efficiency of emergency response (Fan et al., 2019), in which better communication and resource allocation is made possible. Therefore, it is expected that the challenges of ambiguous or untrusted information could be solved with effective information exchange, which helps to build up a trusted relationship between local residents, the government and non-profit service providers.

Flexible Funding

Secure and stable funding sources are essential for local agencies to sustain their operations. A combination of reasonable funding and institutional design will result in positive outcomes (Milward & Provan, 2000). Research has indicated that local funding is positively associated with the quality of public health services across the community (Beatty et al., 2020), and thus, an emergency food supply and distribution system will require funding to support high quality service delivery. Barriers are that diverse funding streams may result in the unequal distribution of resources for different populations (Warner & Zhang, 2020), and so it is expected that a collaborative response will balance the diverse needs and benefit a larger population through cross-agency collaboration, where a supportive relationship is built to help local agencies get consistent financial support.

Transportation

Transportation is viewed as an important element for vulnerable populations to receive high-quality care (Fraze et al., 2016). Research has shown that transportation problems will potentially contribute to food insecurity and lower nutrient intake (Kamp, 2010). In normal times, public transit, paratransit, school buses, and some volunteer drivers help meet the diverse needs of transportation across the community; however, with the pandemic leading to higher demands for emergency food supply and distribution, a highly collaborative network for service delivery was needed. This was affirmed by previous research where enhanced access to transportation was expected for school meals delivery in response to school closures during the pandemic (Jablonski et al., 2021). Cross-agency collaboration, in this project, is expected to demonstrate its efficacy in building up a reliable food delivery system with the partnership of different transportation agencies.

Innovative Approaches

Innovative approaches have been explored in some previous studies for school meal services during COVID-19, including using school buses for mobile distribution, meal resources sharing, new distribution sites, and partnership with local agencies (Kinsey et al., 2020). Such innovations are the driving forces that promote collaborative response, thus solving the barriers in unbalanced resource allocation across the community. In this project, we are exploring how innovative approaches help to establish a dynamic relationship in response to the crisis, in hopes of gaining new insights on cross-agency collaboration.

METHODS

1. Overview and Definitions

In this project, we applied qualitative research methods to investigate the collaborative response to food insecurity on the community level (Furst et al., 1996; DiCicco-Bloom & Crabtree, 2006). Interviewees were selected from governmental agencies or non-profit organizations in Tompkins County, NY, who were considered as key players in this emergency food response. This included funders, transportation providers, food providers, and information providers. Seven agencies were chosen, including Child Development Council, Foodnet Meals on Wheels, Gadabout, Love Living at Home, Tompkins County Office for the Aging, United Way of Tompkins County, and Way2Go. The Child Development Council is a non-profit organization which promotes the healthy development of children and families at home, in childcare and in the community. Foodnet Meals on Wheels is a social service organization which provides over 170,000 meals to about 800 older adults and others throughout Tompkins County, and they also provide congregate dining, comprehensive nutrition services and referral coordination. Gadabout is a para-transit agency that provides transportation services to anyone over 60 and disabled residents within Tompkins County. Love Living at Home (LLH) is a grassroots organization that builds village connections within Tompkins County to help members who are 62 or older. Tompkins County Office for the Aging (COFA) is a county government social services agency that assists older adults and helps address long-term care needs of all people in the community. The United Way of Tompkins County (UWTC) raises contributions to support the growth of individuals and the agencies that help residents in Tompkins County. Way2Go is a program of Cornell Cooperative Extension of Tompkins County to support community transportation services. All the scheduled interviews were one-time interviews ranging from 30 to 60 minutes each. Teri

Reinemann, Leaders of the Tompkins County Age Friendly Center for Excellence, helped with the interviews. Positions of interviewees were variable within the sample, which included: Chief Executive Officer, Executive Director, Director, and Team Leader. Other agencies, though not interviewed, were also mentioned during the interview and included in this study (**Table 2**).

Key Players	Agencies
Funders	*Tompkins County Office for the Aging (COFA) *United Way of Tompkins County (UWTC) Community Foundation of Tompkins County
Food Providers	*Child Development Council *Foodnet Meals on Wheels Food Bank of the Southern Tier Food Pantries
Transportation Providers	*Foodnet Meals on Wheels *Gadabout *Love Living at Home (LLH) Tompkins County School Buses
Information Providers	*Way2Go 2-1-1 Tompkins/Cortland The Faster & Farther Network (F&F)

Table 2. Agencies and organizations in Tompkins County for emergency food response
* Selected agencies for the interview.

2. Qualitative Data Collection

We conducted semi-structured interviews, where open-ended questions were tailored to each of the seven cases (**Table 3**), and the conversation was mainly focused on the innovative approaches as well as emergency responses to food supply and distribution during the COVID-19 pandemic. Interviewees were encouraged to further elaborate upon the themes that were salient to them, such as volunteer management, transportation, social connection and technology, food insecurity and health inequity, and cross-agency collaboration. All the interviews were conducted online via the video meeting Zoom in summer 2020, and were audio taped and transcribed for text analysis. Themes, patterns, and characteristics of individual agencies or organizations were

identified by constructing concept maps and case summaries from each interview transcript. Themes and categories in general were then affirmed from these identified factors, and we explored connections among these cases to develop a model of cross-agency collaboration.

Child Development Council
(focusing on the healthy development of children)
- Please describe children's food access and nutrition intake before and during the pandemic.
- What are the challenges in food transportation for children, especially for those from low-income families? How can those children receive adequate food and nutrition during the pandemic?
- Are there any partnered organizations that can help children get adequate nutrition during the pandemic?

Foodnet Meals on Wheels
(focusing on the food and healthcare of older adults)
- Have the criteria of people's eligibility for home-delivered meals changed during the pandemic?
- Compared with in-person nutrition counseling, how are the nutrition services going during the pandemic?
- How are the recipes or menus modified during the pandemic?
- How has COVID-19 changed their approach to group dining?
- How are the community volunteers recruited and assigned prior to and during the pandemic? Are there a shortage of volunteers during this time? How are the operations during the pandemic different from that in usual time?
- How do you think the collaboration could be further conducted with different partners in the future to address those food insecurity problems for a better food delivery system in our community?
- If the COVID-19 continues to affect our food system just like the way it has in recent months, how long is your agency able to continue doing this?
- Are there any problems noticed from this pandemic in terms of health equity and food insecurity? How is Foodnet Meals on Wheels committed to promoting equity in food access among people in different social groups?
- What do you think about the use of technology in Foodnet Meals on Wheels that helps to promote food transportation and social connection?

Gadabout
(focusing on providing transportation services to older adults)
- How are the volunteers in Gadabout assigned and committed to the food transportation services?

- During the pandemic, how are the changes in people's eligibility or charging prices to receive Gadabout services?
- During the pandemic, how are the collaboration among community organizations going on during this period?
- Are there any problems with delivering food during the pandemic?

Love Living at Home
(focusing on the social connection among older adults)

- Are there any actions taken for old people to ensure their food supply during the pandemic?
- Have the criteria of people's eligibility for membership changed during the pandemic?
- Has the transportation service changed during the pandemic?
- Are there any differences for the volunteers being recruited and assigned before and during the pandemic?
- Could you tell me more about how human connections are maintained during the pandemic?
- Are there any collaborations between LLH and other organizations during the pandemic?
- As a grass-roots organization, how can LLH be supported by local government / local organizations?
- After the pandemic, what do you think could be improved to build up an age-friendly community in Tompkins County?

Tompkins County Office for the Aging
(focusing on the long-term healthcare of older adults)

- Are there any actions that COFA has taken for people to ensure their food supply during the pandemic?
- How can people have access to information such as meal delivery and grocery shopping during the pandemic?
- Are there any technologies used to help older adults get connected and obtain food?
- How are the volunteer services going on during the pandemic?
- Could you tell me more about the cross-agency collaboration and partnership that COFA did on food supply and distribution during the pandemic?
- What do you think could be improved for COFA after the pandemic in Tompkins County?

United Way of Tompkins County
(focusing on education, financial stability and health in local community)

- Could you give a brief introduction about the United Way of Tompkins County?
- What did UWTC do during the pandemic to help individuals get food?
- How are the volunteer services going on during the pandemic?
- Could you give some examples about how United Way is partnered with other organizations for food supply and distribution during the pandemic?
- How is the United Way committed to supporting local organizations in the long term?
- What are the key challenges United Way is faced with? How could UWTC solve these challenges in the future?

Way2Go
(focusing on the support of community transportation services)
• Are there any actions that Way2Go has taken for people to ensure their food supply during the pandemic?
• How do you think Way2Go contributes to food access and distribution across the local community?
• How are the volunteer services going on during the pandemic?
• Could you tell me more about the collaboration between Way2Go and other organizations during the pandemic?
• How is Way2Go committed to promoting equity in food access and distribution among people in different social groups during the pandemic or in the future practices?
• After the pandemic, what aspects do you think could be improved to build up an age-friendly community in Tompkins County?

Table 3. Interview guide for seven selected agencies.

3. Data Analysis

To explore the research question on the factors that drive an effective community response to food insecurity in the context of the COVID-19 pandemic, we applied an inductive modeling method to analyze the exploratory data (Bush-Kaufman et al., 2019). A network of emergency food systems was created to visualize the dimensions as well as their corresponding approaches based on the interview content. Descriptions of an emergency food system that emerged in response to the challenge of food insecurity during the pandemic were grouped into four main dimensions: financial support from federal and local agencies, procurement and supply of healthy food, food transportation and delivery within the community, and information services provided by local agencies (**Figure 2**). The "other" dimension involved other innovative approaches to supporting the emergency food system, which are really essential but did not fit in the four outlined dimensions.
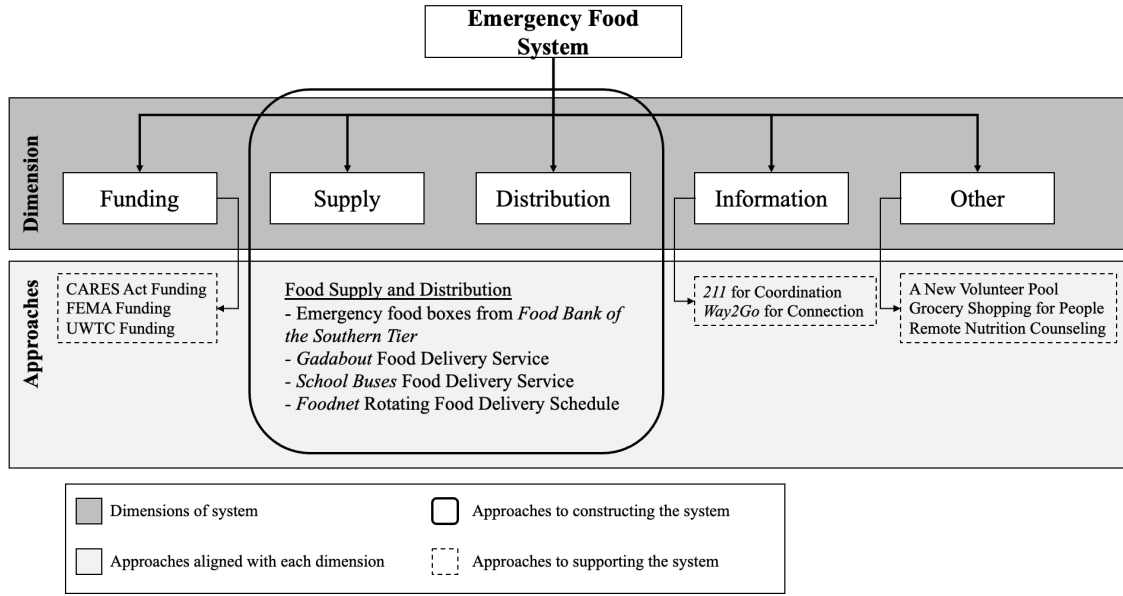
Figure 2. Visualization of descriptions of an emergency food system and associated approaches

4. Network Analysis

To visualize the food supply and distribution system, we applied social network methods (Borgatti et al., 2009; Hanneman & Riddle, 2005) to analyze the cross-agency collaboration network. A sociogram is composed of nodes connected by edges, which represent the relationship among different stakeholders. In this research, we used a simple network structure (**Figure 3**) to indicate the emergency food supply and distribution network in the context of COVID-19 pandemic. Each line segment represents a channel for agency collaboration or client-agency relationship; central agency is colored red; service providers (funder, food-, transportation-, and information provider) are colored blue; community members are colored green.
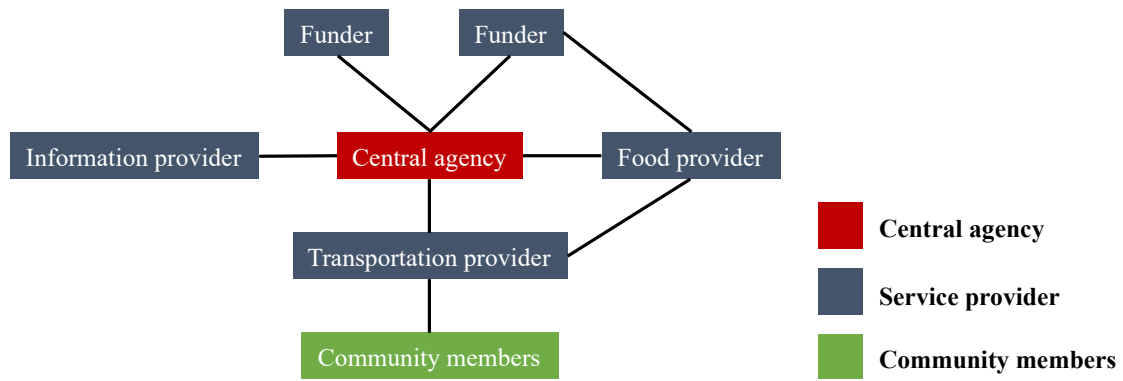
Figure 3. A simple graph of cross-agency collaboration network

RESULTS

Interviewees were 7 key players representing agencies classified as: funders (n=2), food providers (n=2), transportation providers (n=3), and information providers (n=1). Foodnet Meals on Wheels was defined as both a food provider and transportation provider.

1. Defining Factors to Building Up a Reliable Emergency Food System

The themes identified by interviewees in pursuit of a reliable emergency food system include commitment to transportation, volunteer management, funding, social connection, technology, food security, health equity, and innovation. **Table 4** lists some themes and sample quotes, which are considered as key factors to drive an effective emergency food response. In this thesis, transportation explores the degree to which food delivery is achieved to meet the needs of people at risk of food insecurity. Volunteer management assesses the degree to which volunteers and staff are engaged in the emergency food system. Funding measures the degree to which financial resources are reasonably distributed to build up the food system. Technology explores the degree to which electronic devices are applied to make a positive impact on the food system. Social connection assesses the degree to which people from different social groups are connected. Food security measures the degree to which people have easy access to nutritionally adequate and safe foods. Health equity explores the degree to which people from all social groups are cared and considered, so as to help them get healthy foods. Innovation assesses the degree to which new approaches are proposed and implemented to promote a more effective and efficient food system in a sustainable way.

Theme	Sample Quote
Transportation	"We would actually pick up [the meal boxes] at the drop off locations at the Southern Tier Food Boxing locations and deliver to individuals. … We also teamed up with the Child Development Council and we were delivering baby supplies to parents that have no other way to access them within the community. … As long as we can coordinate those food deliveries with rider pickups, I foresee us continuing providing the food service deliveries. We also partnered with New Field Food Pantry, so now we're taking people of New field to the food pantries on Mondays, we've done quite a bit of deliveries for them." *(Gadabout Interviewee)* "We partnered with local school districts. They used school buses to deliver meals to families. Families who are requesting supplies, if they had a schooling child participating in the school districts, we then could pack of their supplies and get to the school district, and the school would deliver the baby supplies along with their meals." *(Child development Council Interviewee)* "Transportation is this cross-cutting issue and can produce a barrier in any number of sectors people getting to work: people getting to healthcare services, people accessing food, people accessing community and social situations. …" *(Way2Go Interviewee)*
Volunteer management	"Our driver pool tends to be on the older side. A lot of our drivers are in their early 60s all the way to 80, and it's been difficult when the pandemic hit. We have a lack of volunteers because our volunteers were in that vulnerable age bracket, and we focus our energy and use the younger staff drivers to fulfill the need. Prior to COVID-19, we were scheduling from 280 to 320 trips per day, we dropped down to 60 trips per day at one point." *(Gadabout Interviewee)* "We now have a list of 300 people who have reached out directly to the United Way saying we want to volunteer in the community. A number of folks were teachers who were no longer in the classroom and also some graduate students at Cornell. We have lots of volunteers. It's just difficult getting them opportunities to engage right now." *(UWTC Interviewee)*
Funding	"We've been fortunate enough to receive some of the CARES Act funding for transportation for Tompkins County and also some FEMA funding that we were able to use for food delivery." *(Gadabout Interviewee)*

	"We're really pushing for additional funding to come in to support everything that comes up new because of the COVID. … We want to focus on keeping steady what we always do to make sure that the funding that people relied on is good here and doesn't go anywhere."
	(UWTC Interviewee)
Technology	"If the demand were to increase to a place, that [rotating meal delivery schedule] is another great way to manage demand and service. … So, technology is probably our future."
	(Foodnet Interviewee)
	"I do think we'll stay connected with doing more phone calls than we ever had. …"
	(LLH Interviewee)
	"I think when push comes to shove, people will use technology because it's their only choice, you know, I mean, look at us on Zoom. … We're still working with technology. I mean, if this was 10 years from now, we won't be having the same complications, because I don't see anybody not having the technology to be able to do whatever they want."
	(COFA Interviewee)
Social connection	"If people are disabled or they are aging and isolated, it can create problems that may lead to health problems. In some cases, transportation could also be a barrier. It's hard, as one can't walk into their homes for their protection and for our protection [during the pandemic]. This isn't just about the typical social isolation for older adults, they are socially isolated purposefully."
	(COFA Interviewee)
Food security	"We want to make sure everyone has the food that they need. For some of the older adults, having fruits and vegetables is not easy, because their money goes to other things, and they don't get much in food stamps (SNAP). We called around to all the stores to see if there was going to be senior shopping hours, and if people could use their SNAP benefit cards there, and we created a list of that."
	(COFA Interviewee)
Health equity	"The pandemic has amplified the inequities that exist. Senior malnutrition has always been complex. That hasn't changed with the pandemic. Health disparities have always been here, before 2020. But this pandemic, with all the racial violence, and the mass exposure of inequity, the social determinants of health, and how that impacts health equity, leaves us saying, 'What action can we take as a system; what can we do differently?' We don't have all the answers for that, not yet, but we are committed. This work is going to involve talking to lots of

	partners, having difficult discussions, listening, learning, and understanding our role. It is going to mean taking a very active look at our policies, practices, and our programming internally and committing to action steps." *(Foodnet Interviewee)*
Innovation	"Now we're starting to think about innovation for sustainability. And what are the practices that I've worked well there's something to be said about some of the telehealth component. …" *(Foodnet Interviewee)* "Learning flexibility is the key to life. Flexibility has helped us move faster. We didn't even know we could move faster. It has helped us to be able to get the money - money out to agencies who need it a lot quicker. Before the COVID hit, we would never have thought that was possible. So now we are going through and looking at other parts." *(UWTC Interviewee)*

Table 4. Themes for identifying factors: quotes from interviewees demonstrating their pursuit of a reliable emergency food system

2. Cross-Agency Collaboration Network

We described the collaboration network (**Figure 4**) based on interview materials that involve several governmental agencies and community organizations in Tompkins County, where *Tompkins County Office for the Aging (COFA)* is regarded as the central agency that coordinates food supply and distribution during the pandemic to ensure food security among older adults (Xu, 2020). *The Child Development Council* partnered with Gadabout and local school districts for delivery of baby supplies via their buses. *Foodnet Meals on Wheels*, as both a food provider and transportation provider, received stimulus funding from COFA, partnered with *Food Bank of the Southern Tier* and delivered some emergency meal boxes to older adults. *Gadabout* is an important para-transit provider, but they also picked up food boxes at the Southern Tier Food Bank drop off locations and delivered them to individuals. Moreover, *211* became the centralized hub for information exchange during the COVID-19, where people could call to get services, to have questions answered, and to get help with food delivery.
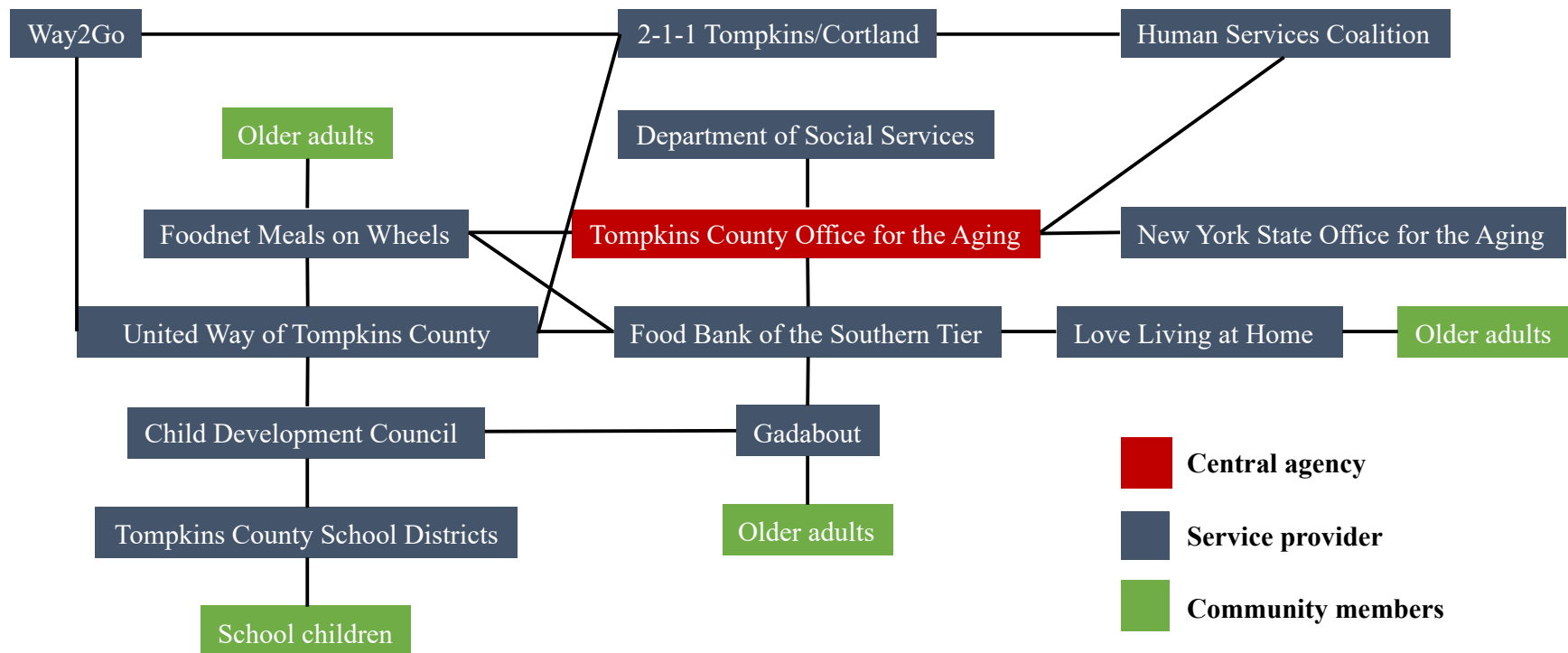
Figure 4. Cross-agency collaboration network for food supply and distribution in the context of the COVID-19 pandemic (county government centered)

* Diagrams with other centralized agencies can be referred to the appendix.

DISCUSSION

This thesis hypothesized that there are several key factors that drive an effective response to the challenge of food insecurity during the COVID-19 pandemic. By building up an emergency food supply and distribution system at the community level, Tompkins County provided a unique case to explore the initiatives and new approaches taken by local government agencies and organizations in meeting the pressing food needs among older adults and young children during the pandemic. Our research has identified some explicit and implicit factors that contribute to the entire food response, and we also highlighted the importance of cross-agency collaboration that may potentially relieve the burden of governmental agencies and improve effective governance in public service delivery with the joint efforts of local organizations.

Multiple factors contribute to a reliable emergency food supply system

Based on our interview materials, we found that a reliable emergency food supply system is made up of several explicit and implicit factors. Explicit factors are observable, including *transportation*, *volunteer management*, *funding*, and *technology*. Transportation is the primary factor, which allows people with mobility issues to get meals through food delivery services. Older adults, specifically, are vulnerable populations that have difficulty accessing healthy foods and hot meals, and thus food delivery is important to address their needs. During the pandemic, such needs are more salient. School children also need attention, as school closures will make it harder for them to get hot meals if they depend on school lunch programs. This results in a higher demand for food delivery, and thus more transportation facilities and volunteers are needed. Volunteer engagement and management will improve the efficiency of food supply and distribution, and thus a pool of suitable volunteers is needed. Funding is also regarded as a key factor that will ensure

proper operation of the system. Since reasonable and flexible funding will make a positive impact on public service delivery (Milward & Provan, 2000), it makes sense that more funding, such as CARES Act funding and FEMA funding, is allocated to food delivery during the pandemic. Technology will also contribute to the success of the food system, which allows further social connections and makes it easier to get in contact with those who are in need of help or at risk of food insecurity.

Compared to these explicit factors that are acting on the system, implicit factors are potentially influencing the system on a long-term basis. *Social connection*, as one of the driving forces in the food system, highlights its unique values to build up close relationships between humans. It is also the reason why such an emergency food supply system is built to help and support vulnerable populations during the pandemic. *Food security*, as an important public health topic, continues driving the process of public policy formulation and implementation. Food assistance program as a whole, plays a critical role to help people from all age groups get access to foods and keep developing the emergency food system during the pandemic. Besides, *health equity* is another important factor that may evaluate the effectiveness of the local food system in addressing food insecurity. Since food insecurity will result in adverse health outcomes among populations regardless of age, gender, and race, it is really essential to take health equity into consideration by reassessing the current food policy and consolidating the emergency food system. *Innovation*, as a vital component that ensures the sustainability of the food system, and it is expected to achieve high efficiency in food supply and distribution in the long-term period. Taking innovative approaches, such as delivering food by school buses, will help to build up a more dynamic system, so that the emergency response is more efficient and effective to meet the needs and narrow the gap between supply and demand.

Cross-agency collaboration promotes food security and effective governance

Partnerships and collaboration between governmental agencies and other firms or nonprofit organizations will lead to more effective public service delivery and community response to public issues (Milward & Provan, 2000). Therefore, in this thesis, we are investigating how cross-agency collaboration will promote food security and effective governance in the context of the COVID-19 pandemic. Our results have demonstrated the hypothesis that cross-agency collaboration will help to build up a reliable food supply and distribution system that involves several key partners including funders, food providers, transportation providers, and information providers. Public service delivery is thus decentralized from the governmental agencies towards the network of cross-agency collaboration with the joint efforts of providers.

According to the cross-agency collaboration network, *Tompkins County Office for the Aging (COFA)* is regarded as a powerful core agency that integrates and coordinates other agencies and organizations, so that the entire emergency food system is effective and efficient to support the food needs during the pandemic. *Information providers*, such as 211 and Way2Go, are important because they provided the latest information to local residents during the pandemic to help them find food resources and support their needs. *Funders*, such as COFA and UWTC, are important because they allocated funds to other agencies and organizations so that the food system can get consistent financial support for operation. *Food providers*, such as Food Bank of the Southern Tier and food pantries, are important because they provided emergency food resources to community members so as to reduce the risk of food insecurity during the COVID-19 pandemic. *Transportation providers*, such as Gadabout and school buses, are important because they help vulnerable populations have easier access to food by providing food delivery services. These

providers constitute a cross-agency collaboration network that supports and partners with each other to secure the process of food supply and distribution, which further addressed the challenge of food insecurity during the pandemic. Therefore, we regard it as an effective community response.

The cross-agency collaboration during the COVID-19 pandemic in Tompkins County, NY has demonstrated how the dynamics of multi-agency relationships were applied differently in response to the crisis. Higher levels of collaboration are expected to develop a stronger and more reliable food supply system. However, our research has only covered older adults and young children, and there are other groups such as the working poor and homeless people that we did not reach. We only focused on the emergency circumstances in which the COVID-19 pandemic is treated as a short-term response, and thus further research is needed to explore effective governance through cross-agency collaboration with a long-term response to address food insecurity.

CONCLUSIONS

Our research explored the potential factors that drive an effective community response to food insecurity in the context of the COVID-19 pandemic. We found seven key factors that contribute to a reliable emergency food supply system either explicitly or implicitly, including transportation, volunteer management, funding, technology, social connection, food security, health equity, and innovation. We also demonstrated the importance of cross-agency collaboration in addressing food insecurity and promoting effective governance, centering on a governmental agency, accompanied with dynamic partnerships of information providers, funders, food providers, and transportation providers.

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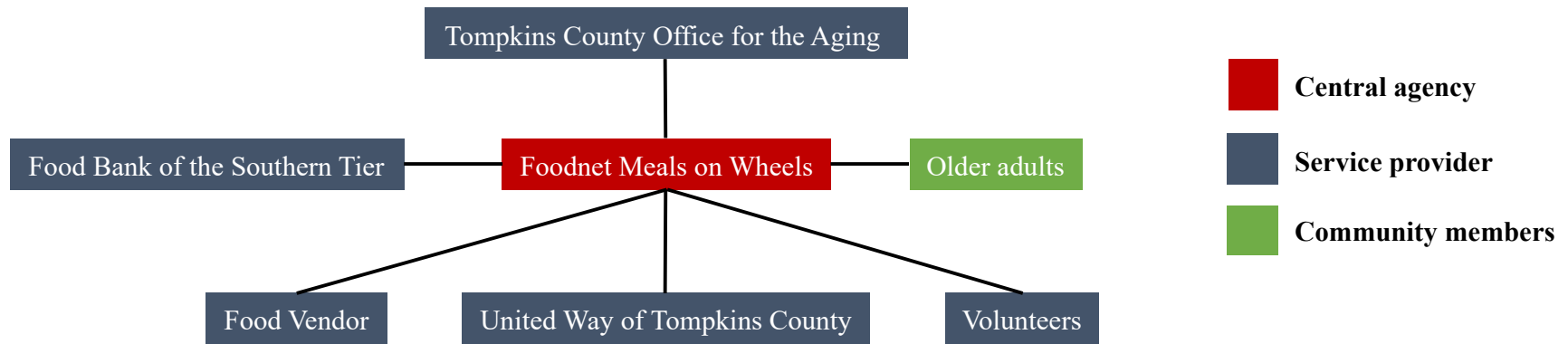
APPENDIX

Figure 5. Cross-agency collaboration network for food supply and distribution during the COVID-19 pandemic (Food & transportation provider - Foodnet Meals on Wheels as the central agency)
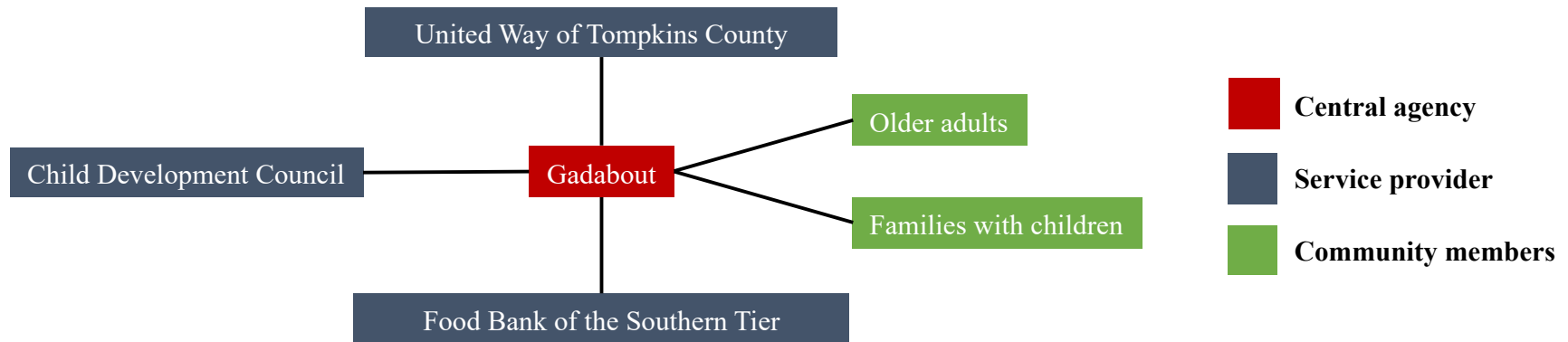

Figure 6. Cross-agency collaboration network for food supply and distribution during the COVID-19 pandemic (Transportation provider - Gadabout as the central agency)
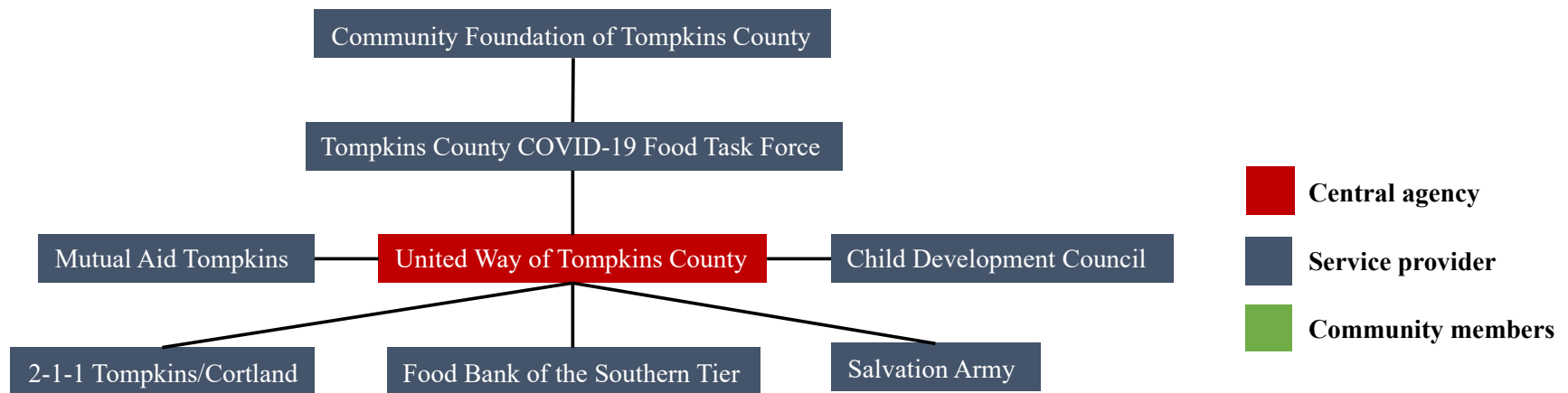
Figure 7. Cross-agency collaboration network for food supply and distribution during the COVID-19 pandemic (Funder – United Way of Tompkins County as the central agency)
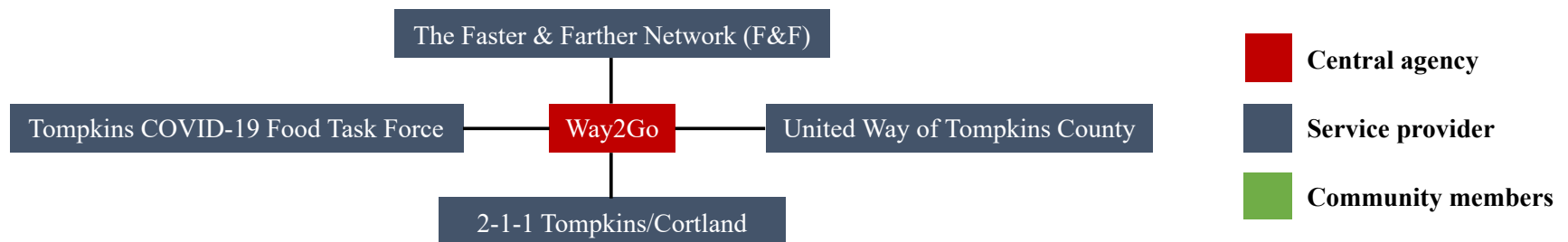

Figure 8. Cross-agency collaboration network for food supply and distribution during the COVID-19 pandemic (Information provider – Way2Go as the central agency)