SURTCOM 22-13

Food Access and Food Delivery Service: An Exploratory Study for the Role of Public Transportation During the COVID-19 Pandemic in 2020-2021

Image credit: Regional Transportation Commission of Southern Nevada

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Disclaimer

The contents presented in this report are the sole responsibility of the Upper Great Plains Transportation Institute and the authors.

ABSTRACT

In 2020, the COVID-19 pandemic created various economic, environmental, and social challenges, and public transportation was one of the primary and necessary services that were disrupted by the pandemic. Ridership demand decreased dramatically due to lockdown, many people working from home, and people at high risk of infections. In response to the negative impact of the pandemic on the transit agencies' service and food access, many agencies started a food delivery service. This study employed a mixed method approach with two national cross-sectional surveys (quantitative and qualitative) to evaluate food access in transit agencies' service areas. In addition, the study investigates the negative impact of the pandemic on transit agencies' operations and services and how the transit agencies responded to this interruption and decreased demand by providing a food delivery service. Results indicated that 57 of surveyed transit agencies provided food delivery years before the pandemic as one of their operational services to meet certain people's needs. Moreover, the results from both surveys and best practices were promising for better food access and support for the local food system.

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1. INTRODUCTION

Food is a basic human need that many in the United States and around the world struggle to meet. Lack of access to food, whether physical, social, or economic access, is referred to as food insecurity. The U.S. Department of Agriculture (USDA) defines individuals as food insecure if they have difficulty obtaining enough food to meet their needs or their family members' needs because of insufficient funds or other resources, such as transportation needed to access food. In fact, food insecurity is a transient situation and may occur at any time during the year to any person (Ribar and Hamrick 2003). According to the Center on Bugged and Policy Priorities (2022), the early months of the COVID-19 pandemic resulted in economic fallout that caused a significant hardship on employment and food. A crisis such as the COVID-19 pandemic can place many groups of people in food insecurity. For example, in Vermont, 35.5% additional individuals were classified as food insecure during the pandemic (Niles et al. 2020). Eating less food during the COVID-19 pandemic was also documented in New York (Clay and Rogus 2021), Minnesota (Larson et al. 2021), and Pittsburgh (Dubowitz et al. 2021).

Recognizing that not all food-insecure households are alike, the USDA classifies them into two types:

- Low food security: This group relies on federal food assistance programs, gets food from community food pantries such as food banks, or reduces food intake. They obtain enough food to avoid substantially disrupting their eating patterns. In the United States, 6.4% of households faced this type of low food security in 2019.
- Very low food security: In this category, one or more household members were disrupted, and food intake was reduced at least once a year because they had insufficient funds or other food resources. In 2019, 4.1% of U.S. households experienced very low food security (USDA-ERS Sep 2020).

According to USDA-Economic Research Service (ERS), 10.5% of U.S. households were food insecure in 2019, the lowest percentage of food insecurity in 20 years. Within these national statistics, certain groups of people were more affected than others, including single parents with children under 18, older people living alone, Latinos, Blacks, and Native Americans (Feeding America March 9, 2021). Food insecurity is associated with many of the costliest and most deadly preventable diseases in the United States, such as hypertension, diabetes, cancer, stroke, coronary heart disease (CHD), chronic obstructive pulmonary disease (COPD), and kidney disease (Gregory and Coleman-Jensen 2017). In addition, Muldoon et al. (2013) claimed that food insecure people are more likely to experience mental illness, and the chances increase among individuals who are food insufficient (hunger). According to Seligman and Schillinger (2010,1), "the concept of food insecurity encompasses the physical sensation of hunger and compensatory behaviors used to avoid hunger. These compensatory behaviors have enormous implications for preventing and managing chronic disease.". For example, relying on nutritionally poor foods (refined carbohydrates and foods with added sugars, fats, and sodium) to maintain the daily caloric intake is one of the coping strategies that low-income households usually adapt to compensate for the inadequacy of the food budget. However, these coping strategies can maintain the monthly low-income households' budget, but they do not support good health. Figure 1.1 shows how food insecurity status can lead to chronic diseases.

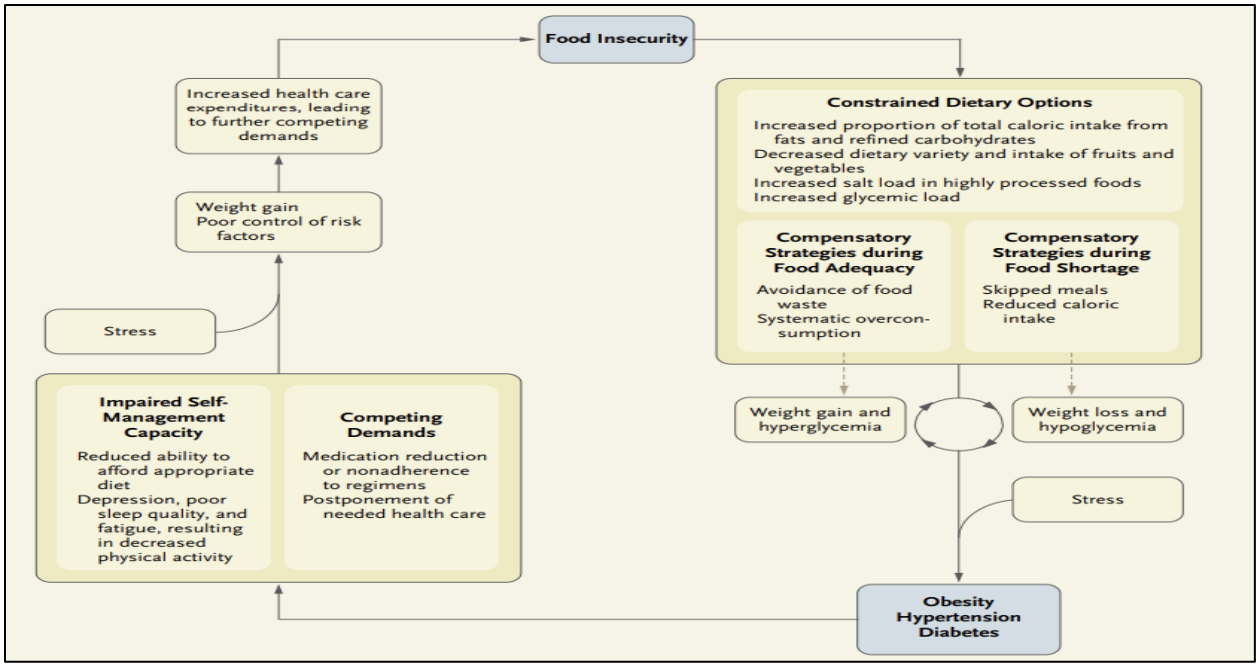

Figure 1.1 The Cycle of Food Insecurity and Chronic Diseases
Source: Adopted from Seligman and Schillinger (2010)

Furthermore, food insecurity is positively linked with poverty and the unemployment rate. Figure 1.2 shows the state-level prevalence of food insecurity from 2018 to 2020. Low income is one of the main factors that cause food insecurity. Another main factor that causes food insecurity and has a substantial negative impact on food security is the lack of transportation. The connection between transportation and food security is explained by two definitions: food access and food deserts. The USDA-ERS defines food access as the spatial accessibility to supermarkets, supercenters, and grocery stores, and affordability of food retailers, specifically factors such as travel time to shopping, availability of healthy foods, and food prices relative to transportation and socioeconomic resources of food buyers. A food desert is defined as an area with limited access to affordable and nutritious food (USDA-ERS 2011). Transportation and transit agencies' service operations play a role in addressing the food access and food desert situations impacting Americans. Figure 1.3 displays the U.S. food desert areas in 2009.

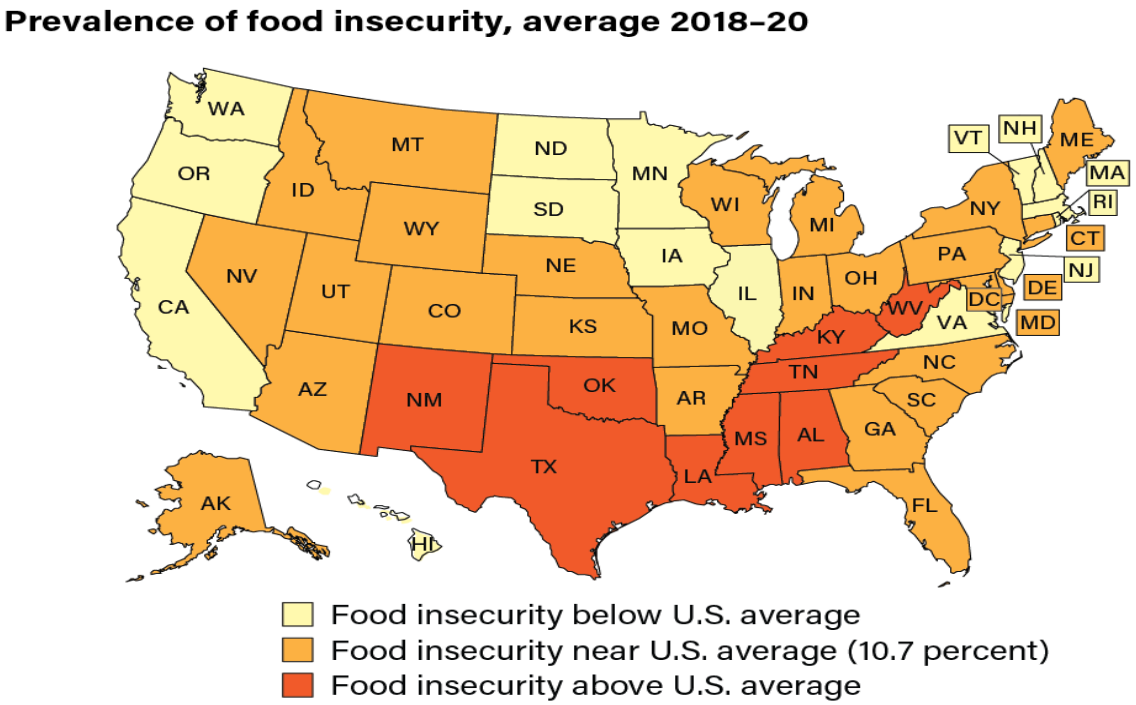

Figure 1.2 State-Level Prevalence of Food Insecurity 2018-2020
Source: USDA, ERS

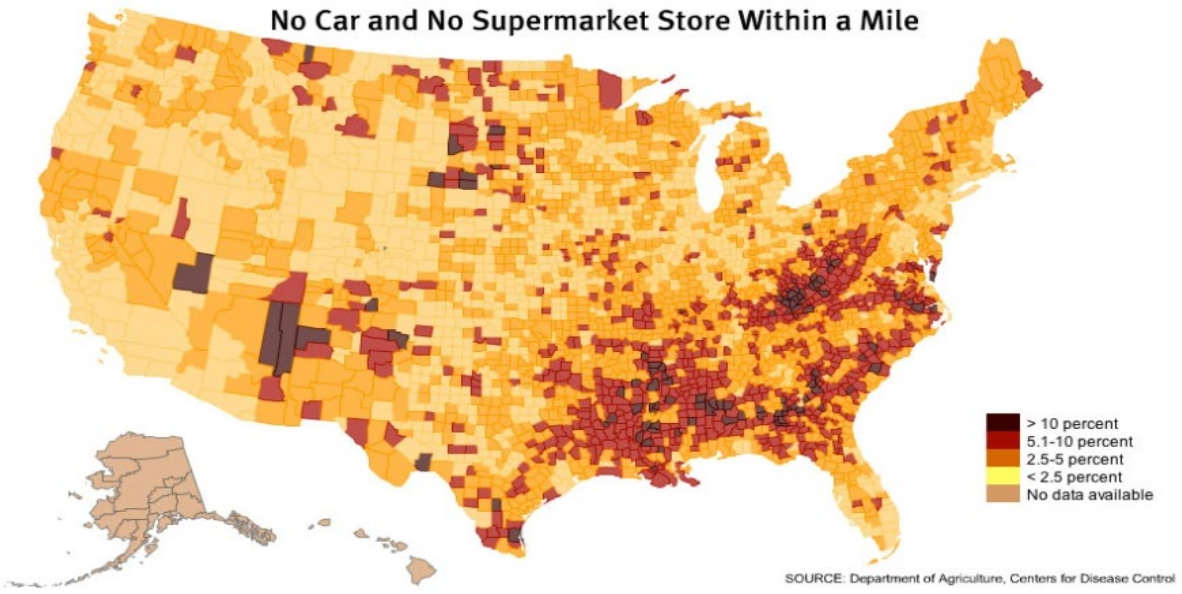

Figure 1.3 Number of City Residents Living in Food Deserts in 2009
Source: USDA-ERS

The COVID-19 pandemic may have exacerbated food access problems for many vulnerable populations in urban, rural, and tribal areas. To help increase food access for transit-dependent people affected by COVID-19 hardships and minimize non-essential travel, many transit agency providers connected with

local organizations to deliver food. A few examples of transit providers in urban areas that began to provide this service to increase food access for transit-dependent populations include the Capital Metropolitan Transportation Authority (Cap Metro) in Texas, the Regional Transportation Commission (RTC) in Nevada, and Metro Mobility in Minnesota. Similarly, transit agencies in rural areas provided services to help their communities during the COVID-19 pandemic (Wanek-Libman March 24, 2020). For example, in Michigan, the Charlevoix County Transit (CCT) waived its fare for all riders and supported seniors by delivering groceries and meals from the senior center to their homes (Benedict, Shurna, and Hansen 2020). In California, the Monterey-Salinas Transit District (MST) helped Meals on Wheels in Salinas Valley deliver meals to seniors and disabled people (C. Smith 2020). This kind of community engagement benefits transit-dependent people who have food delivered to their homes and helps to keep transit agencies stable during a drastic reduction in passengers and a general disruption of public transportation. The remarkable steps taken by the federal government, states, and localities to respond to the COVID-19 pandemic and its economic fallout deceased the hardship effect in 2020 and 2021 (Center on Bugged and Policy Priorities 2022)

1.1 Problem Statement

People with disabilities, seniors, low-income people, and other transit-dependent populations have difficulties accessing fresh, nutritious food. This food access problem was exacerbated by the adverse events of the COVID-19 pandemic that hit in March 2020. The pandemic intensified food access difficulties for people who depend on public transit for their grocery pickup, people at high risk of exposure to the virus, and people who live in places that mandated crowd control policies. This interruption in food access put many people in a situation where they faced some level of food insecurity. A Feeding America estimate expected that there would be 54 million people in the United States facing food insecurity during the pandemic, and 17 million of them would be children (Balch 2020). However, the estimate did not report the level of food insecurity or the period for the pandemic. In addition, according to the Association of American Medical Colleges, “food insecurity and poor nutrition are associated with several chronic illnesses that put people at higher risk for the more severe complications of COVID-19; the food access crisis threatens to exacerbate the already glaring disparities in health outcomes for vulnerable people.” (Balch 2020). Therefore, this study was conducted to evaluate the existing condition of food access in areas where public transportation serves and operates, and to measure the new food access provided by the public transportation agencies through food delivery.

1.1.1 Research Area and Approach

Two cross-sectional surveys (quantitative and qualitative) were conducted to fulfill the explanatory sequential mixed method that was designed to investigate the research problem of this study. Both surveys were distributed as an online questionnaire, using Qualtrics software, to 1,968 email addresses for transit agencies categorized as urban, rural, and tribal, including those receiving Section 5307, 5339, and 5311 funding. The first survey was a quantitative questionnaire aimed to collect quantitative data from 1,968 public transit agencies. The quantitative survey included 25 questions and covered three aspects: food access, food delivery and operation during the pandemic, and local food system support (Appendix A).

The first aspect was an evaluation of food access within the public transit agency service areas. The second aspect was to investigate how the transit agency responded to the pandemic by providing food delivery service and the impact on transit agency service operation. The third aspect was an examination of transit agencies’ willingness to support the local food system in their service areas. The survey was launched in December 2020 and was available for a month.

The second survey was sent to 148 agencies that agreed to respond to the follow-up survey. The follow-up survey included 34 questions to collect the qualitative data needed to complete the second part of the study. The second survey covered the same three aspects as the first survey but was designed to collect detailed information about food delivery, food access, and local food system support for a more comprehensive view of transit agencies' role in providing better food access in their service areas. The survey was launched in June 2021 and was available for a month. For survey questions and flow, see Appendix B. The results for the three aspects from both surveys were used to report the best practices of transit agencies during the pandemic and regarding food access in general.

1.1.2 Research Questions and Objectives

The main two questions driving this research were as follows:

1. What is the role of U.S. public transit agencies in increasing food access before, during, and after the COVID-19 pandemic?
2. How did public transit agencies in the U.S. respond to the COVID-19 pandemic, and what roles did they play in increasing food access by providing food delivery?

These two research questions allowed the study to fulfill its research objectives, which were:

- Identify transit agencies' roles in reducing food deserts and increasing food access in the United States.
- Identify transit agencies' abilities for food delivery to customers' homes.
- Measure the transit agencies' willingness to collaborate with food banks, local food entities, and other food suppliers in their areas.
- Document the best practices of transit agencies during the pandemic.

1.2 Organization of Report

The remainder of this report is organized as follows. Chapter 2 provides a review of literature in the following areas: food insecurity, food deserts, food systems, public transportation, and its relationship with food access. Chapter 3 includes an overview of the research methodology (explanatory sequential mixed method) used in this study. Chapter 4 provides the results and a discussion and the transit agencies' best practices from the two cross-sectional surveys used in this research. Chapter 5 presents the conclusions, recommendations, limitations, and suggestions for further studies.

2. LITERATURE REVIEW

2.1 Food Security, Food Insecurity, and Hunger

According to the National Research Council (2006, 15), "'food security' and 'food insecurity' are relatively new to both policy makers and the public, and they are sometimes confusing. While the term 'hunger' is not new, measurement of hunger and how hunger fits conceptually into food insecurity is not completely clear." Therefore, it is essential to understand food security and food insecurity as definitions and measurement units to distinguish them from hunger. The USDA adopted the Life Sciences Research Office (LSRO) definitions for food security and food insecurity and report food security, food insecurity without hunger, and food insecurity with hunger annually.

Food security is defined as the access for all household members at all times to enough food for an active, healthy life (i.e., nutritionally adequate and safe foods). In addition, each food-secure household member must be able to "acquire acceptable foods in socially acceptable ways (that is, without resorting to emergency food supplies, scavenging, stealing, or other coping strategies)." (USDA-ERS 2021). Furthermore, food insecurity is defined as "the limited or uncertain availability of nutritionally adequate and safe foods, or limited or uncertain ability to acquire acceptable foods in socially acceptable ways." (USDA-ERS 2021). According to the USDA classification, food insecurity has two types. The first is food insecurity without hunger. Individuals who face this type usually do not show any indication of reduced food intake, but they face reduced food quality, variety, or desirability of diet. The second type is food insecurity with hunger, where individuals may face multiple indications of disrupted eating patterns and reduced food intake (USDA-ERS Sept. 2020).

On the other hand, the USDA defined hunger "as an individual-level physiological condition that may result from food insecurity." (2020). However, the USDA has explicitly stated that the "USDA does not have a measure of hunger or the number of hungry people." (2021). The LSRO expert panel recommended that the USDA treat hunger as a separate concept from food insecurity. It should undertake a program to measure hunger, which is a potential consequence of food insecurity (National Research Council 2006). In 2006, the USDA introduced the new description of food insecurity and replaced food insecurity without hunger with low food security and food insecurity with hunger with very low food security.

As Larson and Moseley (2012) claimed, most previous U.S. food security research focused on finding relationships between the issue and some population groups based on socio-economic status, disabilities, gender, age, etc. A few studies investigated food insecurity issues in the United States through food availability and food access. For example, the relationship between food insecurity and socio-economic status among West African refugees with children under age five was investigated by Hadley, Zodhiates, and Sellen (2007). They found that 53% of the occurrence of food insecurity was associated with socioeconomic levels such as income, employment status, and participation in the food stamp program. Huang, Guo, and Kim (2010) analyzed the relationship between work disability and food insecurity. The authors suggested replacing the measurement unit for food insecurity from household income to household assets because it has higher accuracy and sensitivity rate. The household assets unit can count and include individuals or some disability categories under food insecurity, which is usually not captured by the other measurement units. Furthermore, Coleman-Jensen and Nord (2013) found that disabilities positively correlate with food insecurity.

Wolfe et al. (1996) studied food security in low-income older people living in rural and urban areas to determine the potential effect of welfare, health, and nutrition program changes on them. The study focused on the reasons that make rural older white populations less accepting of food stamps and other

government food assistance programs even if they need them. The research results indicated that SNAP and food assistance programs are linked with many negative stigmas, making them less desirable among older white people in rural areas (Wolfe et al. 1996). Lee and Frongillo Jr (2001) found that elderly persons with functional impairments face a new dimension of food insecurity. The inability to use food due to functional impairments can put many elderly persons under food insecurity regardless of food availability. Bowen and Barman-Adhikari (2016) investigated the relationship between food insecurity and gender. According to their study results, marginally housed females living in single room occupancy (SRO) faced food access challenges and were more significantly associated with food insecurity than males.

2.2 Food Access and Food Deserts

Reducing food insecurity is dependent on increasing food access in that area. Jiao et al. (2012) claimed that measuring access to food in any area depends on the mode, duration of travel, and costs of the food in a particular supermarket. Hirsch and Hillier (2013) investigated whether travel mode and distance to food shopping places differ among individuals in varying food environments and whether individual and household-level factors are associated with food shopping patterns. The results indicated that socioeconomic status, such as education, income, and car ownership, influenced distance traveled. DeJohn (2019) found that people who receive Supplemental Nutrition Assistance Program (SNAP) benefits are affected by how transit networks are designed and operated. For example, low transit access is experienced, especially for car-dependent neighborhoods.

This relationship between socioeconomic status and food shopping patterns was pointed out in an earlier study by Aggarwal et al. (2014), who reported the relationship between the distance to the supermarket and fruit and vegetable consumption. Fruit and vegetable consumption was not associated with physical distance to a supermarket but with supermarket choice. Also, the primary food supply was purchased from the nearest supermarket, but those who shopped at low-cost supermarkets traveled beyond their nearest supermarket. According to Grengs (2001), low-income neighborhoods or neighborhoods with a higher African American population percentage usually are associated with limited food access. In contrast, Ver et al. (2009) claimed that the lack of transportation infrastructure is the main reason for the poor food accessibility in small-urban and rural areas. In urban areas, limited food access is associated with "higher levels of racial segregation and greater income inequality." (Ver et al., 2009). To increase food access in many states, many supermarkets started to deliver food to SNAP participants using the Electronic Benefits Transfer (EBT) card. In California, the "CalFresh" program was designed to help people who are disabled, homebound, unable to get to the store, or quarantined to get their groceries delivered to them (Los Angeles County Department of Public Health n.a).

According to Cummins and Macintyre (2002), the term "food deserts" was reputedly first used in Scotland in the early 1990s to describe poor access to an affordable and healthy diet. In the United States, the term was defined by the USDA-ERS, Treasury, and Health and Human Services (HHS). Using census tract data, they described food deserts as "low-income census tracts with a substantial number or share of residents with low levels of access to retail outlets selling healthy and affordable foods" (USDA-ERS 2011). As claimed by Jiao et al. (2012, 1), "The criteria used to define low-income status and access to supermarkets greatly affect estimates of populations living in food deserts."

According to the Annie E. Casey Foundation (2021), food deserts are more common in three areas: areas where residents have low levels of education, low incomes, and high unemployment rates; areas with small populations; and areas with many abandoned or vacant homes. They identified food deserts based on three aspects:

1. Access to food: The distance to a store or the number of stores in an area.
2. Neighborhood resources: The neighborhood's average income and the availability of public transportation.
3. Household resources: The family income and the number of vehicles available.

2.3 Food Systems (Local Food and Non-Local) and Transportation Systems

Harper et al. (2009) claimed that most citizens and governments now relate all food access issues, hunger, public health, labor, and economic development to the food system. The Reinvestment Funds organization conducted a limited supermarket access (LSA) analysis to study urban and rural communities in 2016. According to the LSA analysis, 17.6 million people (5.6% of the population) lived in areas with limited supermarket access. Remarkably, some states, such as North Dakota, Idaho, and Iowa, were able to decrease the LSA percentage by more than 30% from 2010 to 2016. In contrast, the LSA percentage increased more than 25% in Maine and Nevada from 2010 to 2016. In addition, "Rhode Island, Pennsylvania, and Wisconsin were identified as the top three states where LSA areas are disproportionately located in low-income areas." (Progressive grocer 2018). According to the Reinvestment Funds (2020), most of the effort to increase food access had focused on urban areas, while "there are 11.3 million underserved rural residents living in areas that could support new or expanded food retail options.".

Nettles (2002) said even during periods of economic growth, millions of Americans (low-income individuals, the elderly, people with disabilities, and other transit-dependent populations) faced food insecurity and hunger and have difficulty accessing fresh, nutritious food. Transit-dependent people usually face four challenges: a longer travel time, decreased travel reliability due to switching routes, limitation on the carrying capacity, and food insecurity (King County Mobility Coalition 2019). Baek (2016) studied the relationship between public transportation and food insecurity. According to his study, increasing public transportation capacity will reduce food insecurity for households. Also, Baek (2016) claimed that poor households and poor African American households were the groups most affected by the impact of public transit. According to the Centers for Disease Control and Prevention (CDC), a poor transportation system decreases food access for transit-dependent people. Having access to reliable and affordable public transportation is essential to maintain food access for transit-dependent people. Public transit should improve transportation options to and from food sources (e.g., supermarkets and farmers' markets). Doing so will increase a community's access to healthy foods (CDC 2014). According to Dumas et al. (2021), many opportunities to use transportation to improve food access may improve diet quality and reduce chronic disease, especially in small communities. Proper nutrition is dependent upon the food access provided by transportation. Connecting food and transportation may revitalize rural and urban neighborhoods and improve the health and wellbeing of millions of people by focusing on community household needs. Also, this connection may bring many opportunities for society, such as connecting family farmers, food retailers, and consumers, facilitating and increasing access to affordable, healthy food and supermarkets. In addition, this effort may help farmers who operate small and mid-size farms to transport their products to market and meet untapped demand for local, fresh food. Because food and transportation are naturally two topics related to each other, the USDA-ERS provides a food access research atlas that presents a spatial overview of food access. This atlas is an indicator for low-income and other census tracts using different measures of supermarket accessibility and provides food access data for populations within census tracts. Also, it offers census-tract-level data on food access that can be downloaded for community planning or research purposes (USDA-ERS 2021). Likewise, the Reinvestment Fund provides LSA analysis through an interactive map for the 2016 data. The map presents options that include income availability of food nutrition programs such as the New Markets Tax

Credit Program (NMTC) and Community Development Block Grant Programs (CDBG) (Reinvestment Fund 2016).

2.4 FTA Grants and Funding Available for Public Transportation Systems

The FTA has partnered with state and local governments to create and enhance public transportation systems since 1964. The FTA provides many grants, such as 5307, 5311, and 5310, to local public transit systems. In January 2020, the FTA allocated $25 billion to recipients of the urbanized area and rural area formula funds (Coronavirus Aid, Relief, and Economic Security [CARES] Act). The CARES funding was for operating expenses for all rural and urban local public transit agencies "to maintain transit services as well as paying for administrative leave for transit personnel due to reduced operations during an emergency." Furthermore, capital and operating activities carried out in response to COVID-19 were eligible for reimbursement under the Urbanized (5307) and Rural (5311) Area Formula grants. In addition, the FTA Circular 5010.1E states that these funds can be used for meals or grocery delivery if the delivery service does not affect transit capacity. In general, most FTA funds can be reallocated in an emergency, "in cases where a recipient has reduced service levels in response to COVID-19, the recipient may utilize FTA funded assets for other emergency response activities as long as such use does not interfere with its remaining limited service." (Federal Transit Administration n.d.).

2.4.1 Grants and Funding for Urban and Rural Transit Agencies

The 5307 formula is a federal funding program designed for urbanized areas with a population above 50,000. The funding can be used for the following activities: planning, design, and evaluation of transit projects and other technical transportation-related studies; and capital investments in bus and bus-related activities such as replacement, etc. However, the federal share should not exceed 80% of the net project cost for capital expenditures. In addition, the federal share can be 90% for the cost of vehicle-related equipment attributable to compliance with the Americans with Disabilities Act (ADA). Funds can also be used for operating assistance in urban areas with a population below 200,000, but the federal share should not exceed 50% of the net project cost.

The 5311 formula is a federal funding program designed for rural areas with a population of less than 50,000, where many residents often rely on public transit. The funding can be used for the following activities: planning, capital, operating, job access and reverse commute projects, and the acquisition of public transportation services. However, the federal share should be 80% for capital projects, 50% for operating assistance, and 80% for (ADA) non-fixed route paratransit service (Federal Transit Administration n.d.).

The 5310 formula is a federal funding program designed to enhance the mobility of seniors and individuals with disabilities when the transportation service provided is unavailable, insufficient, or inappropriate. The formula is applied for rural and small urban areas based on each state's share of the population for these two groups. The funding can be used to "assist in financing innovative projects for the transportation disadvantaged that improve the coordination of transportation services and non-emergency medical transportation (NEMT) services, such as the deployment of coordination technology, projects that create or increase access to the community." It can also be used for nontraditional services such as incremental cost of providing same-day service or door-to-door service. However, the federal share should not exceed 80% for capital costs and 50% for operating assistance (Federal Transit Administration n.d.)

The CARES Act provides emergency assistance and health care response to support public transportation affected by the COVID-19 pandemic. CARES funding is disbursed through FTA apportionments to its urbanized area formula 5307 and rural formula 5311. Funding was provided at a 100% federal share, with no local match required, supporting capital, operating, and other expenses generally eligible under those programs to prevent, prepare for, and respond to COVID-19. The fund has been available since January 20, 2020, for all public transportation (large and small urban and rural) (Federal Transit Administration 2021).

2.5 Impact of COVID-19 on Food Security and Public Transit Systems

Public transit is commonly viewed as a social service, and the transit service has a significant effect on economic development, unemployment rate, and family assistance programs (Faulk and Hicks 2010). Therefore, transit agencies frequently evaluate their services and apply various new strategies to improve service reliability, use the agency capacity efficiently, and attract new passengers (Diab, Badami, and El-Geneidy 2015). According to Benedict, Shurna, and Hansen (2020), before the COVID-19 pandemic, many transit agencies and cities were working on innovative ways to meet customers' unique needs related to mobility difficulties. However, the negative impact of COVID-19 led to a significant transit demand decline for many U.S. public transit systems (Liu, Miller, and Scheff 2020). According to Wilbur et al. (2020), the highest percentage declines were in morning and evening commute times. Also, there was a significant difference in ridership decline between the high-income and low-income neighborhoods.

Furthermore, Niles et al. (2020) claimed that food access was disrupted due to COVID-19 and related restrictions, which increased food insecurity. Transit agencies began to use the formula funding under the emergency relief program as a coping strategy to the pandemic. Many public transit agencies in urban and rural areas used some of that funding to offer a food delivery service to maintain food access and manage food insecurity. Jiao and Azimian (2021,12) suggested "providing grocery vouchers and free grocery delivery services and increasing the number of mobile grocery stores" to cope with food insecurity challenges during the pandemic.

2.6 Urban, Rural, and Tribal Transit Agencies' Reaction to the Pandemic

Wanek-Libman (March 24, 2020) noted that many transit agency providers in urban and rural areas started to connect with local organizations to deliver food to riders at risk of infection and minimize non-essential travel as a response to COVID-19, and to limit the risk of spreading the pandemic. For example, transit agencies in Nevada, Texas, Iowa, Minnesota, and Michigan worked with local partners to deliver food to those who needed it (Wanek-Libman March 24, 2020). Furthermore, transit agencies in Phoenix, AZ, Las Vegas, NV, and Spokane, WA, launched food-delivery programs in response to the COVID pandemic (Smith 2020).

For example, in Texas, the Capital Metropolitan Transportation Authority (Cap Metro) in Austin worked with the H-E-B grocery store and the Central Texas Food Bank to provide free food kits to Cap Metro clients (Wanek-Libman, March 24, 2020). According to Smith (2020), by May 29, Cap Metro had delivered 300,000 free meals since beginning food delivery in March "as a way of putting idle vehicles and drivers to fair use." (Smith 2020). In addition, Dallas Area Rapid Transit (DART) delivered meals to Dallas Independent School District (DISD) to make sure students received the needed meals. DART delivered 1,500 meals per bus each week for 100 families and 15 meals per student, for a total of 4,500 meals weekly (DART 2020). Houston's Metropolitan Transportation Authority also started a food

delivery service. In San Antonio, VIA Metropolitan Transit teamed up with food banks to help make sure homebound residents do not go hungry (VIA 2020). In addition to the food delivery service, some Texas transit agencies in Austin and San Antonio used their sidelined buses and transit vans for other service diversification, such as Wi-Fi. To increase access to the Internet, they deployed Wi-Fi-equipped buses to serve as mobile hotspots in locations where such service is spotty or nonexistent (Smith 2020).

In Nevada, the Regional Transportation Commission (RTC) worked with Three Square to ensure that seniors get necessities and have access to food through deliveries (RTC 2020). In Minnesota, people can buy their groceries and other household essentials online, and Metro Mobility has certified drivers to pick up the orders and deliver them for free. In Linn County, IA, the Livingston Essential Transportation Service (LETS) transported food throughout the county to combat food insecurity (Wanek-Libman, March 24, 2020).

In Colorado, the Regional Transportation District (RTD) observed an 80% to 85% decline in ridership during the pandemic since many were working from home and taking fewer trips. This decline in ridership led to having a lot of excess capacity with available vehicles and drivers, which motivated the RTD to provide the delivery service program. RTD created a grocery and meal delivery program within its Access-a-Ride division. RTD's delivery program included 10 grocery stores, food banks, senior centers, or community nonprofit organizations customers can contact to schedule orders for pickup and delivery by RTD. In addition, the RTD agency was motivated to offer this program when the agency realized that many of their "customers were located in food deserts, didn't own personal vehicles, or didn't feel safe going out and using transit to risk possible exposure to COVID-19." (Hansen 2020). The service allowed the RTD agency to keep the operation active during a period of decreased trip demand and provide a valuable service to its community at the same time (Hansen 2020, Mass Transit 2020).

In Washington state, in response to the COVID-19 pandemic, some transit agencies and nonprofit transportation providers started delivering food, meals, and prescriptions to people in need (WSDT n.a). For example, in response to the pandemic, the Island Transit agency launched a new service (the delivery of essential items) to assist Island County social service agencies and food banks during the pandemic (Caldwell 2020). In Oklahoma, Tulsa Transit teamed up with Meals on Wheels to deliver food to seniors (Metro Magazine April 23, 2020). Administrators with TriMet, the transit system serving the Portland, OR, region, believed that food delivery during the COVID-19 pandemic was a win-win situation for the company and customers. People in Oregon and Southwest Washington followed orders to stay home and practice social distancing, which increased the demand for food deliveries. As a result of the COVID-19 quarantine and stay-home policy, TriMet could reduce the working hours for drivers due to lower ridership. Therefore, TriMet teamed up with Meals on Wheels during the earlier stage of the pandemic in 2020 to meet the increased demand for Meals on Wheels service and reduce TriMet drivers' working hours (Mass Transit, TriMet teams up with Meals on Wheels to deliver food 2020).

According to Wanek-Libman (March 19, 2020), "While transit agencies in larger cities continue to operate service and take hits in both ridership and revenues, smaller transit providers are temporarily halting service to mitigate the spread of novel coronavirus (COVID-19). Some are ceasing all service, others are concentrating on providing only medically essential trips." (Wanek-Libman March 19, 2020). For example, in Livingston County, MI, Livingston Essential Transportation Service (LETS) limited its services to medical rides and dialysis patients and assisted Meals on Wheels and other local food pantries to ensure meals were being delivered to people at their homes. Macatawa Area Express (MAX), located in Holland, MI, suspended all bus routes and provided only medical and grocery store rides. At the same time, Green Bay Metro Transit in Green Bay, WI, and Great Falls Transit in Great Falls, MT, provided only medical trips. (Wanek-Libman March 19, 2020). On the other hand, Gordon (2020) said that, unlike the urban transit agencies that suspended their service during the COVID-19 pandemic, many rural transit

agencies did not shut down when their respective states issued stay-at-home orders because public transit agencies in rural areas are a lifeline for the most vulnerable people who live there. Gordon added, “Not only did many rural transit agencies stay open, but they are also facing expenses and various inefficiencies that are pushing their budgets” (Gordon 2020).

Rall (2020) observed how rural and tribal transit systems in many states struggled to continue providing service compared with urban transit systems. For example, rural transit systems in Oklahoma were trying to continue providing service in the face of plummeting fare revenues and increased costs associated with the need for cleaning vehicles and providing enough service to allow for safe spacing of passengers. Furthermore, many of the rural transit systems drivers in Oklahoma were often older than urban drivers due to the modest pay and the nature of driving (part-time) for rural and tribal transit systems. According to Rall (2020), many drivers were “skittish about continuing to work.” They are over 65, which made them at greater risk of complications or even death from COVID-19. In addition, Rall (2020) said it was most likely the issues that Oklahoma's rural and tribal transit systems were facing were challenging other U.S. rural and tribal transit systems as well. The author also claimed that rural and tribal transit agencies are operating on very tight margins with unstable financial support, and this crisis put them at a breaking point (Rall 2020). According to Benedict, Shurna, and Hansen (2020), Area 10 on Aging in Indiana provided medical prescription and grocery deliveries in a four-county area. In Washington, a delivery program was provided for both tribal members and homebound individuals by Squaxin Island Transit. In some cases, rural transit agencies, such as in Okotoks and Montgomery County in Maryland, teamed up with local taxicab companies to assist them with deliveries (Benedict, Shurna, and Hansen 2020).

The Monterey-Salinas Transit District (MST) responded to the pandemic by donating two vehicles in California. The first vehicle was used by a veteran’s group to take homeless veterans to food, medical services, and shelters. The second vehicle was used by a nonprofit organization that trains youth to work in the hospitality industry. In addition, MST provided two buses to be converted into mobile COVID-19 testing facilities to support the local agriculture industry and test workers in the fields. Also, MST helped Meals on Wheels in Salinas Valley to deliver 8,000 meals to seniors and persons with disabilities (C. Smith 2020). Charlevoix County Transit (CCT) in Michigan waived its fare for all riders and eligibility requirements for medical transportation services. The agency supported at-risk individuals and seniors by delivering groceries and meals from the senior center to their homes. In addition, CCT delivered prescription medications and provided rides to a school food program and a local restaurant that offered free or discounted meals to students (Benedict, Shurna, and Hansen 2020; Benedict and Hansen 2020). In Pennsylvania, the rabbittransit agency provided rides to homeless people to safe quarantine locations and testing facilities (Lynott and Heller 2020). Benedict, Shurna, and Hansen (2020) believed that the transit agencies’ delivery programs (food, prescriptions, and in some cases, mail and package delivery) will continue after the COVID-19 pandemic and will remain for life “as there will undoubtedly be an ongoing need for certain populations to continue to access these services where traditional public transit is not a feasible option.”.

3. METHODOLOGY

3.1 Research Approach

This research depended on primary data collection due to the nature of the research problem. In most cases, when the study field has scant information and data, scholars prefer to rely on primary data. Because this research investigated public transportation related to food access, few researchers had previously examined this field. Consequently, primary data collection was the appropriate approach for this study. In addition, because the COVID-19 pandemic is recent, existing data sources are lacking. Likewise, similarities and differences of transit agencies and customer preferences and perspectives for transportation should be examined and reported for each region and county. Therefore, primary data collection is the most common approach to collect data and gather information in the transportation field. Moreover, we relied on primary data collection due to the nature of the research problems because studies that investigated U.S. public transit agencies and food access either before or during the COVID-19 pandemic were scarce.

3.1.1 Explanatory Sequential Mixed Method Design

Because this study investigates two broad and exploratory research questions, the explanatory sequential mixed methods design was chosen to investigate the research problem. As Creswell and Creswell (2018) stated, a mixed-methods strategy is the best method to examine a research problem that has not been investigated and documented in the literature, primarily when the researcher emphasizes quantitative and qualitative databases. Additionally, quantitative and qualitative data collection integration provides additional information for the overview and more profound insight beyond the information provided by either the quantitative or qualitative data alone. This approach describes trends, attitudes, and opinions of a population and allows us to test sample variables and define the associations among them.

3.1.2 Survey Development, Testing, and Evaluation

Two cross-sectional national surveys were used to gather information (quantitative and qualitative data) based on an online survey technique using the Qualtrics online software. Both surveys were tested and evaluated before launching by professional experts in food access and transportation systems. Also, both surveys were tested to ensure that questions were readable and accessible from any electronic device.

3.1.3 Survey Recipients

Public transit agencies' contact information (name of the agency, location, director name, email, etc.) was obtained from the 2016 National Transit Database. The contact list included 1,968 transit agencies categorized as urban, rural, and tribal. The urban agencies are those receiving section 5307 funding. Rural agencies are those in areas with a population of less than 50,000 receiving Section 5311 funding. Tribal agencies are those operated by federally recognized Indian tribes to provide services on or around Indian reservations or tribal land in rural areas. They receive Section 5311c funding.

3.2 The Quantitative Survey (The Inquiry Survey)

The first survey included three aspects: food access, food delivery and operation during the pandemic, and local food system support. The first was intended to evaluate food access in areas where transit agencies provide their services. The second was designed to measure the impacts of the COVID-19 pandemic on operation and service and assess the provided food delivery services as a response to the pandemic to maintain food access in service areas. The last aspect examined transit agencies' willingness to support the local food systems. These three aspects (food access, food delivery, and supporting the local food system) were used as criteria to identify and report transit agencies' best practices from the first survey. Also, a final open-ended question gave respondents an opportunity to provide additional feedback that they wanted to share but was not included in the other questions. At the end of the first survey, participants were asked if they agreed to participate in the follow-up qualitative study, which allowed us to investigate the three aspects in detail.

The survey included 25 questions, with a mix of multiple-choice, binary, open-ended, fill-in-the-blank, and 7-point Likert scale questions. For example, to measure respondents' level of interest in providing food delivery, the Likert scale offered 7 answer options ranging. An answer of "1" represented the lowest level of interest, the midpoint "4" represented a neutral option, and "7" represented the highest level of interest. Some of the questions were conditional, appearing for respondents based on their response to the previous questions. The survey was launched in December 2020 and was available for a month for 1,968 public transit agencies. The survey instrument is provided in Appendix A.

3.3 The Qualitative Survey (The Follow-Up Survey)

The second survey aimed to collect qualitative data to better understand the three aspects investigated in the first survey. The survey was sent to 148 agencies that agreed to respond to the follow-up survey. The survey covered three sections. The first section collected transit agency information. The second section covered food delivery and was divided into three subsections: operation, funding, and demand. The third and last section was about transit agencies and their engagement in the local food systems. The food access, food delivery, and supporting local food system aspects were used as the criteria to identify and report the best practices of transit agencies from the second survey.

This survey included 34 questions; most of the questions were open-ended to collect the qualitative data needed for the second part of this research. Also, it had some fill-in-the-blank, multiple-choice, binary, and 7-point Likert scale questions. The survey was launched in June 2021 and was available for a month (see Appendix B for survey questions and flow).

4. RESULTS AND DISCUSSION

Two cross-sectional surveys (quantitative and qualitative) were designed for the explanatory sequential mixed method used for this research. The first survey (the inquiry survey) was designed to collect quantitative data for the first phase of this research and was sent to 1,968 public transit agencies. The survey was launched in December 2020 and was available for a month. After analyzing and studying the quantitative results, a second survey was designed (the follow-up survey) to collect the qualitative data needed for the second phase of the research. The follow-up survey was sent to 148 transit agencies that agreed to respond to follow-up questions. The follow-up survey was launched in June 2021 and was available for a month.

4.1 Quantitative Results from the Inquiry Survey

As mentioned earlier, the first survey covered three aspects: food access, food delivery, and supporting the local food system. Also, the survey was designed to measure events that resulted from the COVID-19 pandemic's impact on transit agencies' operations and service and how agencies responded by launching food delivery services to maintain food access.

The first survey collected 410 responses from 392 public transit agencies. Eighteen responses were deleted due to replications. The response rate for the first survey was 22.2%. The reliability of rates and statistics reported are highly dependent on the number of responses in each category. The results of the quantitative part of this research were analyzed as descriptive and inferential statistics.

4.1.1 Response Distribution and Transit Agency Characteristics

The 392 responses were received from transit agencies in almost all states. In general, the distribution of the responses compared to the geographic distribution of transit agencies was acceptable. The highest response rates were from Nebraska, Oregon, and Wyoming, with 30, 29, and 20 replies, respectively. Nineteen transit agencies from Montana responded to the survey, 18 from California, and 18 from Michigan. The departments of transportation (DOTs) in these states sent emails to local transit agencies to encourage them to participate in this study, which increased the number of responses from those states. Responses and distribution are further illustrated in Figure 4.1, which shows the number of transit agencies that responded to the first survey in each state. In addition, tables 4.1, 4.2, and 4.3 show the characteristics of the responding transit agencies, including geographic classification, vehicles operated, operations statistics, and the classification of service area based on population. Of the respondents, 67% (248 out of 269) were rural transit agencies, 30% (110) were urban transit agencies, and 3% (11) were tribal transit agencies (Table 4.1).

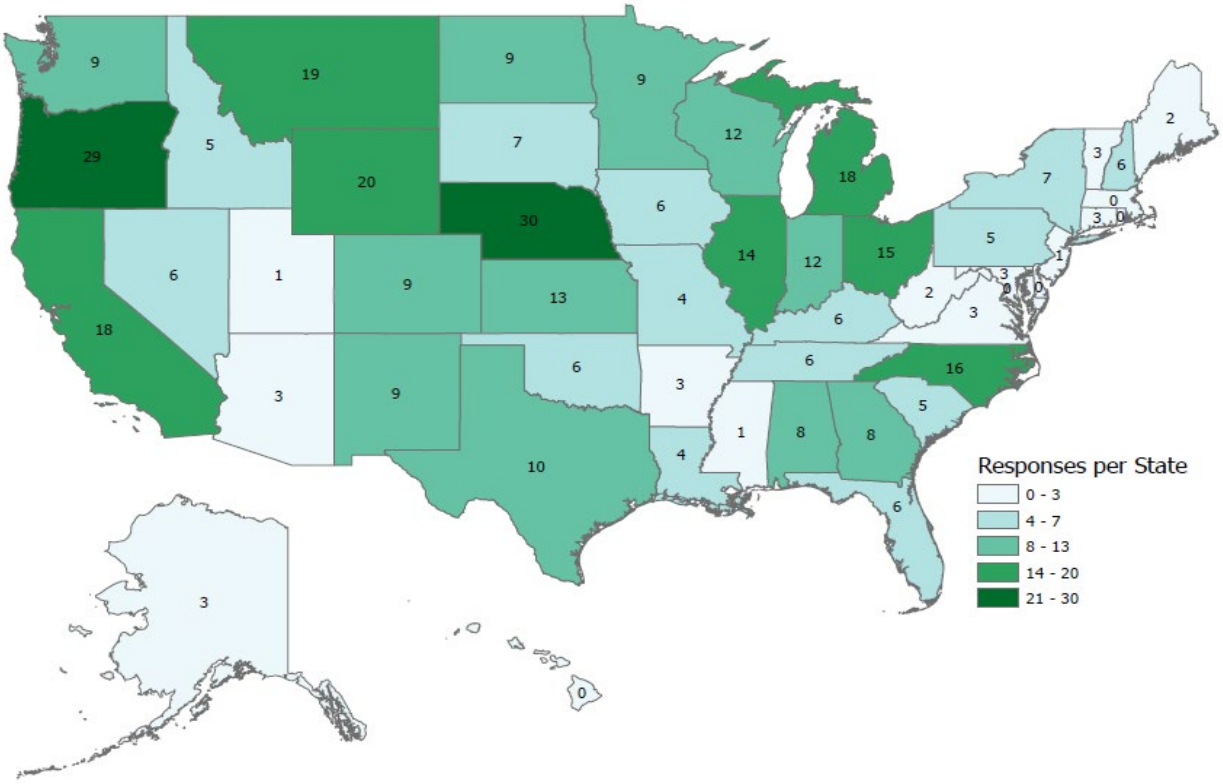

Figure 4.1 First Survey Response Distribution by State (n=392)

Table 4.1 First Survey Percentage of Agencies That Were Urban, Rural, and Tribal (n=392)

Classification	Number	Percent
Urban	110	30%
Rural	248	67%
Tribal	11	3%

Note: Missing info for 23 agencies

Table 4.2 First Survey Transit Agencies' Vehicles Operation (n=392)

	Vehicles operated in max service	Ridership	Vehicle revenue miles	Vehicle revenue hours
Average	40	1,162,717	1,390,187	88,735
10th percentile	2	5,443	36,803	2,487
25th percentile	5	21,803	101,200	7,591
Median	12	72,374	348,070	21,657
75th percentile	28	306,760	860,072	55,436
90th percentile	70	1,215,752	2,288,259	139,333

Note: Missing information for 23 agencies

Table 4.3 First Survey Transit Agencies' Service Area Classification Based on Population (n=392)

Population			
Min	Max	Number	Percent
0	49,999	273	69%
50,000	99,999	32	8%
100,000	199,999	20	5%
200,000	299,999	13	3%
300,000	399,999	10	3%
400,000	499,999	1	0%
500,000	999,999	18	5%
1,000,000	1,999,999	17	4%
2,000,000	4,999,999	6	2%
5,000,000	5,000,000 <	3	1%

Note: Missing info for 23 agencies

4.1.2 Food Access and Local Food Support

Ninety-nine percent (387) of transit agencies have a grocery store or supermarket within their service area (Table 4.4). Furthermore, 95% (372) of transit agencies provide rides to the grocery store or supermarket within their service area (Tables 4.5). In addition to the current situation for food access, transit agencies were asked if they were willing to cooperate with food banks and other organizations to increase food access within their service areas. Nearly 70% (246) of surveyed transit agencies were willing to collaborate with other organizations to improve food access, only 7% (27) were unwilling, and 25% (89) were uncertain (Tables 4.6)

Table 4.4 Transit Agencies That Have Grocery Stores/Supermarkets Within Transit Agency Service Area (n=392)

Response Options	Percentage	Count
Yes	99%	387
No	1%	5

Table 4.5 Transit Agencies That Provide Rides to a Grocery Store/Supermarket (n=392)

Response Options	Percentage	Count
Yes	95%	372
No	5%	20

Table 4.6 Transit Agencies That Were Willing to Cooperate with Food Banks and Other Organizations to Increase Food Access (n=362)

Response Options	Percentage	Count
Yes	68%	246
No	7%	27
Uncertain	25%	89

4.1.3 The Impact of COVID-19 on Transit Agencies' Operations and Services

Public transportation is one of the most vital services for society, especially during catastrophes such as natural disasters or pandemics. Transit agency strategies regarding operation and type of service during these challenging times are very crucial. Thirty-eight percent (136) of the surveyed transit agencies did not change their service and continued offering the same operations and services they provided before the pandemic (Table 4.7). However, the social distancing restrictions enacted in response to the pandemic varied by state, county, and even city. Millions of Americans were under the stay-at-home directives. These restrictions negatively impacted transit agencies across the United States and forced many agencies to change their operation and service strategies during the pandemic. The impact of the pandemic forced 35% (128) of the surveyed transit agencies to reduce the number of vehicles in service and 31% (112) to reduce the number of drivers.

Additionally, 33% (118) of the surveyed agencies reduced fares. Nearly 30% (107) had to reduce their service hours, and the same number of agencies had to eliminate or reduce service on one or more routes. Only 12% (44) reduced their service in some geographic coverage areas (Table 4.7).

Table 4.7 Transit Agencies' Strategies for Operation and Service During the COVID-19 Pandemic (n=362)

Response Options	Percentage	Count
We kept our service the same	38%	136
We reduced the number of vehicles in service	35%	128
We reduced the number of drivers	31%	112
We reduced fares	33%	118
We reduced our service hours	30%	107
We reduced some of the geographic coverage of our service	12%	44
We eliminated or reduced service on one or more routes	30%	107
Other, please specify	25%	91

Transit agencies adopted these new operation and service strategies because of the decrease in the demand for their services. Ninety percent (325 out of 363) of the surveyed transit agencies experienced a decrease in the demand for their services (Table 4.8). Furthermore, transit agencies who witnessed a demand decrease for their service were asked about the percentage decrease that has been recorded. They were separated into five groups based on the average percentage decrease (Figure 4.3). The first group included 109 transit agencies, which reported 41% to 60% decreases in ridership; the second group included 85 transit agencies, which reported 61% to 80% declines. The third group consisted of 60 transit agencies, which reported 61% to 80% declines; the fourth group included 32 agencies, which reported an 81% to 100% decrease in ridership. Only 29 transit agencies were in the last group, which witnessed a demand decrease between 0% and 20%.

Table 4.8 Demand Decrease for Transit Agencies' Service Due to COVID-19 Pandemic (n=363)

Response Options	Percentage	Count
Yes	90%	325
No	10%	38

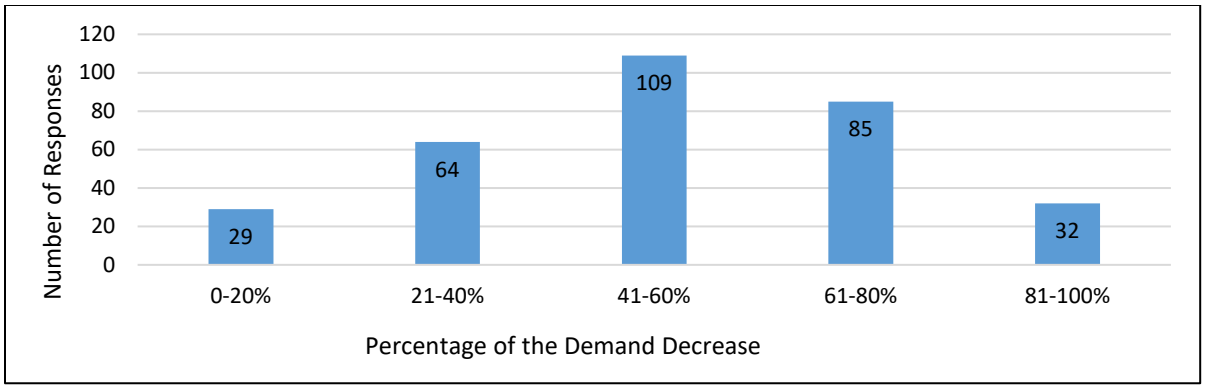

Figure 4.2 The Average Decrease in Ridership Due to COVID-19 (n=319)

4.1.4 Food Delivery Service

The negative impact of COVID-19 on transit agencies decreased the demand for rides and interrupted food access. Many national transit agencies responded to disrupted food access by providing food delivery service. We measured transit agencies' level of interest in providing food delivery; we used the Likert scale and offered 7 answer options ranging from an answer of "1," representing the lowest level of interest, the midpoint "4," representing a neutral option, and "7" representing the highest level of interest. The 7-point Likert scales were collapsed into 3-point scales for descriptive summary analysis. From one to three counted as the low, four, the midpoint was considered neutral, and five to seven were deemed high. Of the respondents, 62% were highly interested in providing food delivery to their customers. In contrast, only 16% of the respondents recorded at the low point (see Table 4.9 for percentage and count for each category).

Table 4.9 Agencies' Level of Interest in Providing Food Delivery (n=389)

7-point Likert scale	3-point scale	Percentage	Count
1	Low	10%	38
2		4%	16
3		2%	6
4	Neutral	21%	81
5		9%	36
6		14%	53
7	High	39%	153
8	N/A	2%	6

The survey results found that 15% (57) of surveyed transit agencies provided food delivery services before the pandemic as one of their operational services to meet certain people's needs (Table 4.10). This result supports Benedict, Shurna, and Hansen's (2020) claim that some transit agencies were working on innovative ways to meet customers' unique needs. Also, the 33% (128) of transit agencies that offered the service during the first wave (after March 2020) of the pandemic may be among those working on innovations. The quick response to the pandemic might indicate their proactive preparation for delivering groceries or preparing meals for their customers. Only 2% (8) of transit agencies started delivery service during the second wave of the pandemic (after October 2020). Furthermore, among the 50% (193) of transit agencies who provided food delivery service, 44% (83) of agencies planned to continue the service after the pandemic is over. Benedict, Shurna, and Hansen (2020) expected the delivery programs to continue after the pandemic and remain indefinitely.

In comparison, 41% (78) of the respondents were uncertain if they could keep providing this service, and only 15% (28) indicated that they would not continue food delivery after the pandemic is over (Table 4.11). There were nine general reasons that the 78 transit agencies were uncertain about offering the food delivery after the pandemic is over:

- Senior centers and other nutrition sites were temporarily closed during the pandemic, which created the need for food delivery, but once these centers reopen, there will be no need for food delivery.
- The lockdown, isolation, and quarantine period created a temporary need for food delivery, and this demand is not permanent to keep offering the service after the pandemic.
- Internal agency policies or state laws require transit agencies to focus on transportation only.
- Agencies lack sufficient staff, funding, vehicles, or time.
- There is a lack of grocery stores (food suppliers) to cooperate with the agency.
- FTA requirements do not allow those who receive federal funds to continue this service.
- The service was a temporary coordinated effort between the agency and food suppliers or meal delivery program.
- State DOT does not allow food delivery on public vehicles.
- Agencies would have to compete with the private transportation sector.

On the other hand, the other half (199) of surveyed transit agencies that did not provide food delivery service at any time during 2020 (Table 4.10) were asked if they would provide the food delivery service in 2021. Thirty-four percent (67 out of 198) of transit agencies were uncertain, and 66% (131 out of 198) were sure they would not include this service in their operations (Table 4.12)

Table 4.10 Periods When Transit Agencies Began Food Delivery Service (n=392)

Response Options	Percentage	Count
Food delivery service before the pandemic	15%	57
Food delivery service during the first wave of the pandemic (after March 2020)	33%	128
Food delivery service during the second wave of the pandemic (after October 2020)	2%	8
Does not provide food delivery service	50%	199

Table 4.11 Transit Agencies That Planned to Continue the Food Delivery Service After the Pandemic is Over (n=189)

Response Options	Percentage	Count
Yes	44%	83
No	15%	28
Uncertain	41%	78

Table 4.12 Transit Agencies That Did Not Provide Food Delivery Service in 2020 and Might Offer It in 2021 (n=198)

Response Options	Percentage	Count
Yes	0%	0
Uncertain	34%	67
No	66%	131

Of the transit agencies that provided food delivery service, 77% (148) provided food delivery without charging any fee for the service (Table 4.13). The agencies that charged a fee for the service applied various methods for determining fees and payment for the food delivery service. Some agencies charged per mile, others charged per meal, and some had a fixed fee for each delivery. Other agencies asked for an optional donation. Some agencies used a third party to determine the fee and collect the service payment. Furthermore, SNAP and EBT benefits were accepted as payment by 14% (6) of the agencies that charged a fee (Table 4.14).

Table 4.13 Fee Charged for Food Delivery Service (n=191)

Response Options	Percentage	Count
Yes	23%	43
No	77%	148

Table 4.14 Transit Agencies That Accepted SNAP and EBT Benefits (n=42)

Response Options	Percentage	Count
Yes	14%	6
No	86%	36

Table 4.15 presents the preferred methods for agencies to deliver food. Sixty-two percent (118) of the transit agencies that provided food delivery service preferred to pick up groceries from the source and deliver them to the customer's home. Only 9% of the respondents chose to work as an aggregation point where they receive groceries from the food provider source and then distribute it to customers. Further, 29% of the respondents described other methods for collecting, distributing, or providing access to food for their community, which can be categorized into three types as follows:

- Some transit agencies worked exclusively with specific food suppliers such as food banks or meals-on-wheels and accepted both methods.
- Some transit agencies worked exclusively with third parties for home delivery. The agency was used as an aggregation point to collect and store the daily donated food. In some cases, agencies picked up groceries from food providers to aggregate them in many small distribution sites where customers could pick them up or used volunteers to deliver them to the customer's home.
- Some transit agencies did the shopping and home delivery at the same time.

Table 4.15 Methods for the Food Delivery Service (n=190)

Response Options	Percentage	Count
The agency picks up food and delivers it to the customer	62%	118
The distributor brings food to the agency, and the agency delivers it to the customer	9%	18
Other	29%	54

Table 4.16 shows how often transit agencies provided the food delivery service to their customers. Seventy percent (126) of the transit agencies delivered food to their customers more than once a week. The second-highest percentage (18%) was for transit agencies that provided the service once a week. The survey also asked transit agencies providing food delivery service to identify which customers were eligible for this service (Table 4.17). For the groups that were not included in the survey, respondents chose the other option, and their choice for this option was classified into eight groups:

- those eligible for food bank service, since the agency only worked with food banks
- low-income people

- only quarantined and isolated people
- an employee and his family working on the food distribution
- those with mental illness or substance abuse problems and certified paratransit customers (people with disabilities)
- school-age children and their families
- only homeless people
- people who qualify for food assistance by the agency

Table 4.16 Frequency of the Food Delivery Service (n=181)

Response Options	Percentage	Count
More than once a week	70%	126
About once a week	18%	32
About 1 to 3 times per month	9%	18
Less than once a month	3%	5

Table 4.17 Customers Eligible for Food Delivery Service (n=180)

Response Options	Percentage	Count
Seniors	67%	120
People with disabilities	54%	97
People requiring assistance with grocery shopping/preparing meals	29%	52
People on Medicaid/Medicare or a member of a health insurance plan that offers a paid meal benefit	19%	34
Anyone can utilize the service	47%	84
Other, please specify	13%	24

Note: The total count for all these choices is 411 and was selected by 180 transit agencies that provided food delivery service.

Three main obstacles may hinder a transit agency's ability to provide food delivery: vehicle capacity, staff availability, and funding. As shown in (Table 4.18), 57% of surveyed transit agencies have the vehicle capacity to provide food delivery service, while 27% do not. Also, 38% of the surveyed transit agencies reported they have enough staff to provide the service, but 36% reported they did not. Furthermore, 16% and 26% of surveyed transit agencies were unsure if their vehicle and staff capacity, respectively, would allow them to provide a food delivery service.

Table 4.18 Transit Agencies Vehicle and Staff Capacity

Response Options	Vehicle Capacity(n=364)		Staff Capacity(n=362)	
	Percentage	Count	Percentage	Count
Yes	57%	209	38%	135
No	27%	97	36%	133
Uncertain	16%	58	26%	94

On the other hand, Table 4.19 shows that 62% (222) of transit agencies know about the Section 5311 funding that rural agencies can use for package delivery. We do not know if these transit agencies used the 5311 fund or not for food delivery service. However, Table 4.20 shows that 31% (111) of the transit agencies used other funds to provide food delivery service. FTA Circular 5010.1 E indicates that funds can be used for grocery or meal delivery. But this service "must not conflict with the approved purposes of the asset and must not interfere with the intended transit uses of the project property." In emergencies, such as the COVID-19 pandemic, the transit agencies may utilize FTA-funded assets for this situation if such use does not interfere with its remaining limited service. As shown in Table 4.20, 31% of transit agencies used funding other than Section 5311, which included Section 5307, Title III Senior Nutrition, Meals on Wheels, CARES meals, Agency on Aging, and grants from APEX wind farms for a meal or grocery delivery.

Table 4.19 Transit Agencies That Were Aware of Section 5311 Funding that Can Be Used for Package Delivery (n=360)

Response Options	Percentage	Count
Yes	62%	222
No	38%	138

Table 4.20 Transit Agencies That Received Other Funding Programs (n=360)

Response Options	Percentage	Count
Yes	31%	111
No	69%	249

Moreover, transit agencies were asked at the end of the survey to share their feedback to fully understand the food delivery service and the challenges facing transit agencies. We received 214 responses out of 392 total respondents. The input from these agencies described the challenges and some success stories about the food delivery service, which allowed for the second survey to focus on the food delivery service.

4.1.5 Correlation Analysis

This analysis adopted the correlation analysis design to assess the relationship between one predictor variable (the agency's level of interest in providing food delivery service) and two outcome variables. The first outcome variable was the period when transit agencies started the food delivery service. The second outcome variable was the transit agencies' willingness to continue the service in 2021.

Table 4.21 shows the correlation between the first outcome variable and the predictor variable. There was a positive correlation between the period when the transit agencies started the food delivery service and their level of interest in providing food delivery service. Eighty-one percent of the transit agencies that started the food delivery service before the pandemic were very interested in delivering food.

Table 4.21 Relationship between the Level of Interest and Initial Period for the Food Delivery Service (n=392)

Transit agencies that provided food delivery service to their customers before and during the COVID-19 pandemic.

		Total	Before the pandemic	During the first wave of the pandemic	During the second wave of the pandemic	Does not provide a food delivery service
What is your agency's level of interest in providing food delivery service	Total Count (Answering)	392	57	128	7	198
	Not Interested 1	10%	0%	1%	0%	19%
	2	4%	0%	1%	0%	8%
	3	2%	0%	2%	0%	2%
	4	21%	5%	12%	0%	32%
	5	9%	2%	14%	13%	8%
	6	14%	9%	16%	13%	13%
	Very Interested 7	39%	81%	54%	63%	16%

Table 4.22 represents the correlation analysis for the second outcome variable and the predictor variable. Similarly, the second outcome variable was positively correlated to the predictor variable. Eighty-two percent of the transit agencies that were willing to continue the food delivery service in 2021 showed a higher level of interest (7) in providing food delivery service, compared with 29% recorded for transit agencies that were not willing to continue the service in 2021.

Table 4.22 Relationship between the Level of Interest and Food Delivery Service in 2021 (n=392)

Transit agencies planning to continue the service after the COVID-19 pandemic

		Total	Yes	No	Uncertain
What is your agency's level of interest in providing delivery of food/groceries/prepared meals to	Total Count	187	82	28	77
	Not Interested 1	1%	0%	4%	0%
	2	1%	0%	0%	1%
	3	1%	0%	7%	0%
	4	10%	3%	14%	16%
	5	11%	4%	29%	12%
	6	14%	11%	18%	16%
	Very Interested 7	63%	82%	29%	56%

4.2 Qualitative Results from the Follow-Up Survey

As mentioned earlier, the purpose of the second survey was to follow up with the transit agencies that agreed to participate in this survey. The follow-up questionnaire included 34 questions and covered five sections. First, transit agency information was collected to study the distribution of the responses and classify the transit agencies surveyed. The second section of the survey (the food delivery service aspect) was divided into three sections: operation, rules, regulations, funding, and demand. The last section focused on access to the local food system from the transit agencies' perspectives. The three aspects examined in the first and second surveys (food access, food delivery, and support of the local food

system) were used as criteria to identify and report transit agencies' best practices from the second survey. The second survey was sent to 148 agencies who agreed to respond to the follow-up survey. We received 85 responses from 63 transit agencies; 22 replies were deleted from the analysis because they were duplicates. The response rate for the follow-up survey was 43%.

4.2.1 Response Distribution and Transit Agency Characteristics

Due to the pre-arranged emails from DOTs to the local transit agencies, the second survey received a high number of responses from Oregon, Nebraska, and Washington, with six, five, and five replies, respectively. Four replies came from Wyoming, as well as from Michigan. Responses and distribution are further illustrated in Figure 4.3, which shows the number of transit agencies that responded to the second survey in each state. In addition, tables 4.23, 4.24, 4.25, and 4.26 show the characteristics of the responding transit agencies: geographic classification, size, number of vehicles in operation, and service area population. Of the respondents, 85% (50 out of 63) were rural transit agencies, 14% were urban transit agencies, and 2% were tribal transit agencies. Transit agencies were further categorized by size (number of drivers, administration, and board members) and service area population (Table 4.24). The average service area population of responding agencies was 77,840, and populations ranged from 260 to 1.3 million.

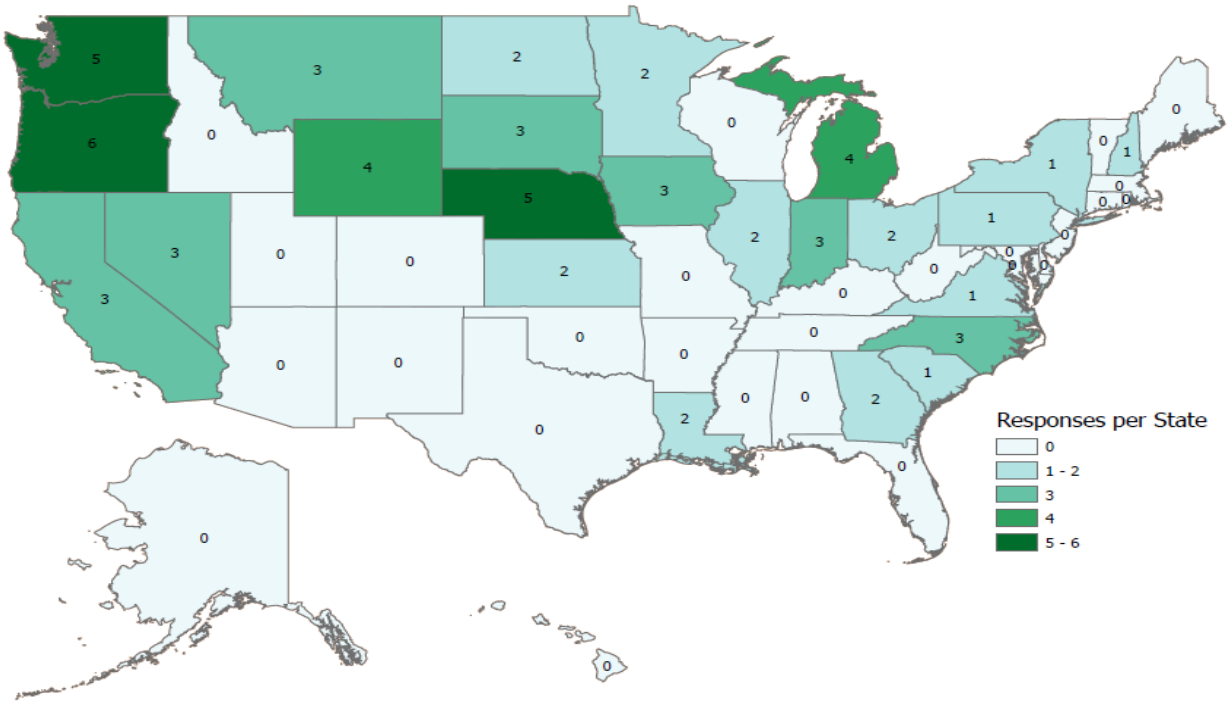

Figure 4.3 Second Survey Transit Agency Response Distribution by State (n=63)

Table 4.23 Second Survey Percentage of Agencies That Were Urban, Rural, and Tribal (n=59)

Classification	Number	Percent
Urban	8	13%
Rural	54	84%
Tribe	2	3%

Note: Data missing info for 4 agencies

Table 4.24 Transit Agencies' Size and Populations Served (n=63)

	Total # of Workers	Total # of Drivers	Total # of Administration	Total # of board members	Service area population
Average	29	22	5	8	77,840
Max	200	115	25	21	1,300,000
Min	2	2	1	0	260

Table 4.25 Second Survey Transit Agencies' Vehicles Operated (n=59)

	Vehicles operated in max service	Ridership	Vehicle revenue miles	Vehicle revenue hours
Average	37	1,220,546	1,077,494	71,517
10th percentile	3	4,779	39,510	2,501
25th percentile	7	24,079	181,828	9,872
Median	12	58,611	360,306	21,177
75th percentile	27	137,769	767,926	45,985
90th percentile	45	321,229	1,229,949	65,795

Note: Data missing info for 4 agencies

Table 4.26 Second Survey Transit Agencies' Service Area Classification Based on Population (n=59)

Population			
Min	Max	Number	Percent
0	49,999	51	86%
50,000	99,999	2	3%
100,000	199,999	1	2%
200,000	299,999	0	0%
300,000	399,999	0	0%
400,000	499,999	0	0%
500,000	999,999	0	0%
1,000,000	1,999,999	4	7%
2,000,000	4,999,999	0	0%
5,000,000		1	2%

Note: Data missing info for 4 agencies

4.2.2 Food Delivery

It was expected that transit agencies started food delivery service in 2020 during the pandemic. But the first survey revealed that 15% (57 out of 193) of transit agencies started food delivery service before the pandemic. Thus, the purpose of the second survey was to investigate food delivery service in detail from the perspective of transit agencies that offered the service before and during the pandemic. First, we analyzed the food delivery service operation and the factors that influenced the service operation. After that, we evaluated the rules, regulations, and funding needed by transit agencies to offer and operate a food delivery service. In the last section of the food delivery section, we measured the recorded demand for food delivery service by the transit agencies that provided the service.

4.2.2.1 Operation

Many transit agencies started a food delivery service at different points during the pandemic, beginning in March 2020. However, the second survey results indicated that 22% (14 out of 63) of transit agencies started their food delivery service before the pandemic. In fact, one agency started food delivery as early as 1967, and others had also been providing the service for multiple decades. In contrast, 78% (50 out 63) of transit agencies started a food delivery service as a response to COVID-19 in 2020, except for one transit agency that began in February 2021. Most of the transit agencies that offered the service in 2020 as response to COVID-19 started it in March or April.

Furthermore, Table 4.27 presents transit agencies that provided food delivery in 2020 and were still providing the service in July 2021 when they responded to the second survey. Sixty-seven percent (43) of the surveyed transit agencies were still providing the service as of July 2021, compared with 32% (20) who stopped providing food delivery. The transit agencies that stopped providing food delivery were divided into two groups. The first group stopped food delivery service as early as June 2020 when ride services resumed or after that based on local/state regulations for reopening. The second group (seven transit agencies) stopped the service in 2021. The three main reasons for discontinuing the service were the shortage of staff, resumption of regular transit service, and reopening of senior centers.

Table 4.27 Percentage of Transit Agencies with a Food Delivery Service in 2020 That Continued Providing the Service as of July 2021 (n= 63)

Response Options	Percentage	Count
Yes	67%	43
No	32%	20

Fifty-one percent (22 of 43) of the transit agencies that provided the food delivery service in 2020 and were still providing it in 2021 were planning to continue food delivery after 2021. Only 9% (4) of the transit agencies decided not to continue the service after 2021, while 40% (17) were uncertain (see Table 4.28).

Table 4.28 Transit Agencies That Provided the Food Delivery Service in 2020-2021 and Planning to Continue the Service after 2021 (n=43)

Response Options	Percentage	Count
Yes	51%	22
No	9%	4
Uncertain	40%	17

Those transit agencies that were uncertain about continuing the service after 2021 provided several reasons for their uncertainty, which can be categorized into five groups:

- Some transit agencies were unsure if the regulations and funding that supported food delivery during the COVID-19 pandemic would allow them to continue the service after 2021.
- Transit agencies that provided rides to senior centers in their area were uncertain if there was a need for the service after senior centers were reopened.
- Some transit agencies were uncertain because of the shortage of staff, vehicles, and the availability of volunteers. For example, one agency was willing and determined to strengthen the relationship between the agency and local grocery store, but they did not have enough capacity.

- Some transit agencies were unsure if the demand for the service would remain the same after the pandemic.
- Two agencies assisted the meals on wheels program, and they were unsure if the program would need their help and support after the pandemic.

In some cases, the food delivery service was provided because of a transit provider's initiative. In this scenario, the transit agency was interested in providing the service and teamed up with a food supplier to offer the service. In contrast, in other cases, the food delivery service was provided because a food supplier was interested in providing the service for the community and asked the agency for logistical support. Forty-three percent (26 of 60) of the surveyed transit agencies initiated the food delivery because they were interested in providing the service. In contrast, 20% (12 transit agencies) provided the service to support local/regional food suppliers based on a supplier's request (Table 4.29). The remaining 37% (22) of responding agencies selected the last option (other). In this scenario, both parties were interested in providing the service. Some agencies teamed up with food suppliers years before the pandemic and ran many food programs, such as meal delivery and local/non-local food delivery programs. One agency identified itself as a senior center. Some of the food suppliers that teamed up with agencies are shown below.

- area agencies on aging, services for seniors, or senior centers
- food banks
- meals on wheels
- private company
- local food pantry
- personal donation to the community
- a nutritional program feeding home-delivered and congregate meals in several counties

Table 4.29 Initiation of the Food Delivery Service (n=60)

Response Options	Percentage	Count
Our transit agency with food suppliers' assistance.	43%	26
The food suppliers with our transit agency's assistance.	20%	12
Other	37%	22

Transit agencies that provided food delivery were motivated by many reasons to offer this service. Most commonly, the service was a reaction to the pandemic to meet the needed demand for food during the pandemic period. However, some transit agencies started food delivery years before the pandemic and were motivated by the need that existed in the community they serve. One agency said they have been aware of the community's need for food delivery in their service area since 1985, and this need has continued to grow. In most cases, the communities that need this service have clients who are older or have disabilities. For example, one agency said, "Our Vision and Mission are all about seeing a need and being innovative with solving issues in communities." Consequently, the food delivery service certainly fills an essential need in the community regardless of what motivated the transit agency. Providing health to the community served is the second-most common motivator to offer the service.

On the other hand, the time it took to plan and launch the food delivery service varied from one agency to another based on many factors, such as the agency's size (number of people involved in making this decision) and if the service was initiated by the agency or another organization. Based on survey responses from 63 agencies, the time needed to plan and launch the service is summarized into seven categories (see Table 4.30).

Table 4.30 Time Needed to Plan and Launch the Food Delivery Service (n=63)

Number of transit agencies	Time needed to plan and launch the service
25	Immediate response to COVID-19. But they did not specify the time for planning and launching
18	Between one day to several days
10	Between one week to several weeks
4	Started the food delivery service before the pandemic, and there was no record for this information
3	Between an hour to several hours
2	Between a month to several months
1	Referred the planning and launching to another organization

Food suppliers that provided transit agencies with food to deliver are classified into six categories:

- food banks
- schools
- area agencies on aging, services for seniors, senior centers, community kitchens, and community centers
- hospitals and assisted living centers
- meals on Wheels
- private companies, local grocery stores, and supermarkets such as Sysco, Dillon's, Walmart, Save-A-Lot

Food suppliers provided transit agencies with one or more of these four food types: cooked meals, groceries, fresh food (local and non-local), and frozen food (cooked and uncooked). Table 4.31 shows the count and percentage for each food type supplied.

Table 4.31 Types of Food Supplied to Transit Agencies by Food Suppliers (n=61)

Types of Food Supplied	Percentage	Count
Cooked	57%	35
Grocery	69%	42
Fresh (local and non-local food)	30%	18
Frozen	16%	10
All the above	10%	6

Table 4.32 lists some of the challenges transit agencies faced while providing food delivery. Agencies responded to all challenges faced while providing the service. Twenty-two percent of the respondents did not face any of the listed challenges. But 26 agencies indicated that they faced operational issues such as a staff or vehicle shortage. Further, 30 of the transit agencies had a problem with logistics, and 15 agencies did not have enough funding. Unfortunately, 46% of the transit agencies were still facing challenges (Tables 4.33).

Table 4.32 Challenges That Transit Agencies Faced Providing Food Delivery Service in 2020 (n=61)

Response Options	Percentage	Count
Management	11%	7
Logistics	31%	19
Operation (labors and vehicles)	43%	26
Finances	25%	15
Other	7%	4
None of the above	43%	26

Table 4.33 Transit Agencies That Were Still Facing Challenges with Food Delivery Service in 2021 (n=61)

Response Options	Percentage	Count
Yes	46%	28
No	54%	33

Also, transit agencies listed the top three challenges they faced regarding food delivery service. These top challenges were classified into 13 obstacles:

- advertising and informing people about the service
- communication and cooperation between suppliers, customers, and the agency, including informing customers when their food was delivered
- loading and unloading food boxes, packing meals, and keeping it hot, as well as organizing orders
- meeting Department of Health and Human Services (DHHS) food safety requirements, such as cooling equipment and other equipment needed on vehicles
- lack of supplies such as containers
- logistically, it was hard to maintain the scheduled rides for people who have appointments and provide food delivery service on the same day
- coordinating the shopping and delivery at the same time
- payment for the groceries (dealing with debit cards and food benefits)
- availability of drivers, unmotivated drivers, and safety of drivers
- inclement weather
- insufficient funding for the service before COVID-19 and uncertain funding after the pandemic
- long travel distances in rural areas
- exploiting the service from people who do not need it, and some drivers wanted unemployment benefits

Regardless of the transit agencies' challenges, 80% (50 of 63) of the agencies believed they used an appropriate strategy and would not have done anything different in hindsight. On the other hand, 20% (13 of 63) of the transit agencies thought there were things they could have done differently to provide a better food delivery service (Table 4.34). These strategies that were expected to improve the service if it was implemented earlier were classified into four groups:

- implementing better marketing and advertising for the service
- using software to track and improve the service
- understanding food suppliers' expectations and enhancing communication with all service entities
- starting the service earlier

Furthermore, 39% (24 of 61) of the agencies indicated there were some external issues and factors that needed to change to provide a better food delivery service (Table 4.35). These factors were classified into four categories:

- modification of the guidelines and regulations
- operational issues (number of drivers)
- need for more funding
- effective collaboration among all local/regional/entities and USDA

Table 4.34 Applying Different Strategies to Provide the Food Delivery Service (n=63)

Response Options	Percentage	Count
Yes	20%	13
No	80%	50

Table 4.35 Outside Factors that Need to Be Changed to Provide a Better Food Delivery Service (n=61)

Response Options	Percentage	Count
Yes	39%	24
No	61%	37

4.2.2.2 Rules, Regulations, and Funding

Rules and regulations are essential factors that control a transit agency's ability to provide food delivery. These critical factors influence transit agencies at three levels: local, state, and federal. Table 4.36 shows the transit agencies' opinions about the existing rules and regulations. Fifty-three percent (31 of 59) of the surveyed transit agencies agreed that current rules and regulations limit their ability regarding food delivery and need to be modified to allow them to increase food access. Usually, rules and regulations are interpreted as those regarding the use of funding. For example, many transit agencies believe that the Federal Transit Administration (FTA) funding (Section 5310 and Section 5311) needs to be modified. The exceptions made for the 5310 and 5311 formulas in 2020 to use the proceeds of this funding during the pandemic should become permanent. This modification would allow transit agencies to continue food delivery service and increase food access.

On the other hand, other transit agencies believed that the limitation on the regulation of the incidental services is preventing them from being cost-effective. One respondent said, "Change regulations on incidental services. Make it so an on-demand system (or at least rural systems) can prioritize food deliveries without having to pick up these people, take them to the food bank and return them home. This is harder on the system than picking up items with no monetary exchange." Below is a comment from one of the respondents describing the issue:

> "Because of the pandemic, some of the regulations have been relaxed. Long term, I believe if this service is needed to continue, the service must be viewed as an eligible expense on the state and federal levels. I firmly believe that delivering products to people rather than people to products is the most cost-effective and effective way to meet that need. Why bring someone out of their home to ride a bus for an undetermined time to go shop when efforts can be made to save the miles and hours and meet the same goal."

Table 4.36 Local, State, Federal Rules and Regulations Need to Be Modified to Help Public Transit Agencies Provide Food Delivery Service and Increase Access to Local Food (n=59)

Response Options	Percentage	Count
Yes	53%	31
No	47%	28

As stated previously, funding is an essential factor for transit agencies. Fifty-eight percent (35 of 60) of the transit agencies said they need more funds to continue a food delivery service (Table 4.37). The FTA's exception for funds was used as a response to the pandemic. Even if they are willing, transit agencies may not continue food delivery services unless they find alternative funding to cover the cost after the pandemic is over. Almost 90% of the 40 transit agencies explained that the funding should come from the state and federal levels. The cost of food delivery service is high, and transit agencies cannot offer it without funding.

Table 4.37 Transit Agencies Needed Extra Funds and Support for Food Delivery Service (n=60)

Response Options	Percentage	Count
Yes	58%	35
No	42%	25

While most funds come from the FTA, other sources provide grants to increase food access. For example, HHS, Housing and Urban Development (HUD), Veteran Affairs (VA), and the Department of Agriculture (USDA) also provide funds for this purpose. Thirty-seven percent (21 of 56) of the surveyed transit agencies were aware of this funding (Table 4.38). The transit agencies that had been aware of this funding were as follows:

- Some transit agencies have used HHS grants. However, the HHS funds ride to food sites, not deliver food to customers.
- One transit agency said they received "grants from many of those agencies."
- One transit agency said that they "have been notified about funding from these sources," but they did not indicate if they received any of them or not.
- One transit agency said that they are seeking those opportunities.

Table 4.38 Transit Agencies Awareness About Funding Other Than the Federal Transit Administration (FTA) Funds (n=56)

Response Options	Percentage	Count
Yes	37%	21
No	63%	35

4.2.2.3 Demand

Marketing and advertising are essential factors for creating and increasing the demand for most services, especially if the service is new. Fifty-seven transit agencies reported how they informed customers when they started the food delivery service. These 57 responses were classified into four types:

- Many transit agencies advertising the food delivery service used more than one marketing channel to inform the public, including phone blasts, emails, radio announcements, social media, and flyers.
- Some transit agencies use only one marketing channel, such as social media (agency website or posting on Facebook).

- Some transit agencies did not advertise but relied on word of mouth to inform the public, and others just informed their regular customers.
- Some transit agencies provided the service as a logistics entity and depended on the food suppliers to inform the public.

Forty-nine transit agencies provided an estimate for the number of customers who received food delivery service in 2020 and 2021, but three agencies provided it only in 2020. Those customer numbers were just an estimate because some transit agencies did not have the exact number of customers. Also, some of the agencies reported the number of customers as families, which means there was more than one than one member who received the service. The number of customers was grouped into eight groups. The first group was for transit agencies that reported zero customers. The second, third, fourth, fifth, and sixth groups included transit agencies that reported the number of customers ranging from 1-100, 101-200, 201-300, 301-400, and 401-500, respectively. In the seventh group, the customer number was more than 500 and less than 1,000 customers; in the last group, the customer number was more than 1,000 (Figure 4.4).

Figure 4.4 Comparison of Number of Customers Receiving the Food Delivery Service in 2020 and 2021 (n=49)

Furthermore, the second survey measured the number of orders received every week for the service. The maximum order number received was 3,645, the minimum was one order, and the average was 220 orders per week. The number of orders was categorized into four groups, as shown in Figure 4.5. The largest share of agencies provided 100 or fewer orders per week, and most provided 500 or fewer, while a small number of agencies served a larger number of orders. However, 45% (26 of 56) of the surveyed transit agencies indicated that, for many reasons, the number of orders fluctuated from week to week (Table 4.39). For example, transit agencies cited changes to customer needs and weather. Another linked the fluctuation to the type of cooked meals and customer preference. One said, "If it is a fish day or pork day, fewer people want the meals." Another agency associated the severity of COVID-19 on demand: "In 2020, April, May, June, and July were our busiest as far as grocery delivery. This correlates with the high

COVID-19 rate in our county. It tapered off until November and December, when grocery delivery increased again. In 2021 the rate dropped significantly."

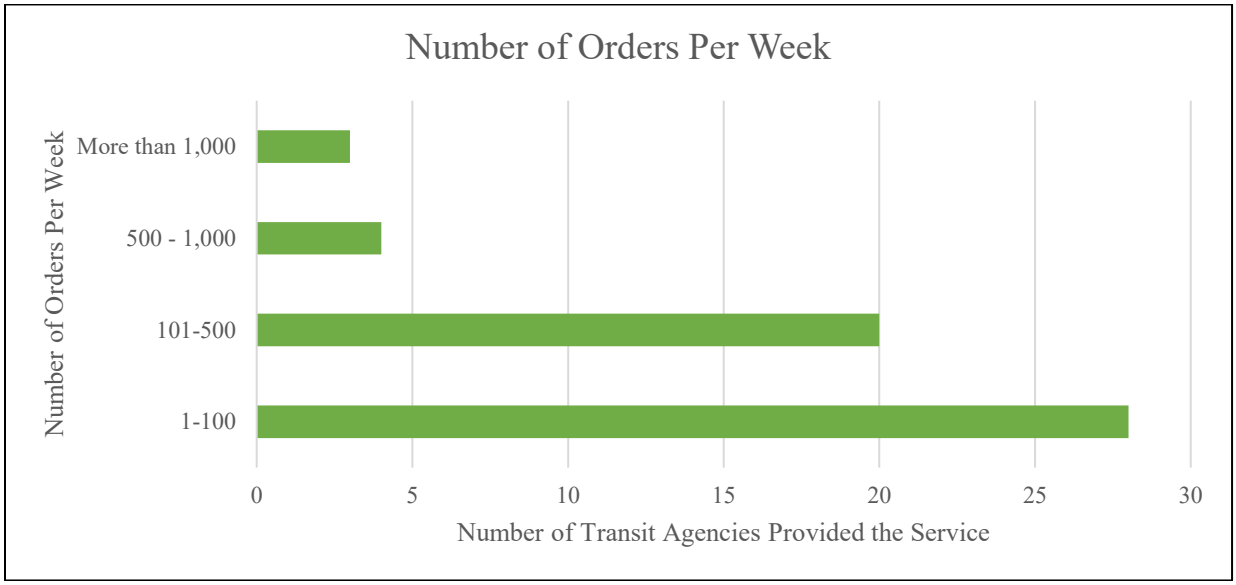

Figure 4.5 Number of Orders per Week (n=53)

Table 4.39 Transit Agencies That Experienced Fluctuation in Order Numbers from Week to Week (n=56)

Response Options	Percentage	Count
Yes	46%	26
No	54%	30

Furthermore, 18 of 54 transit agencies expected that the demand for food delivery would increase in three years. Some linked this increase to the increase in the population of older adults. Only one agency correlated increased demand to the rise of low-income areas, and some did not provide any reasons for their expectations. Some agencies did not have any expectations regarding future demand, while some expected demand would remain the same, and only six agencies expected that the demand would decrease.

Respondents from 14 transit agencies shared their thoughts about the service. Most of the feedback was positive, and almost all the respondents were willing to continue the delivery service and support their local food system to improve community health. Some of them were already providing community service in addition to their service as a transit agency. Others were interested in hearing and learning new ideas to improve the community that their agency serves.

4.2.3 Food Access and Local Food Support

The interruption of global/regional food supply chains due to the COVID-19 pandemic in 2020 confirmed the importance of empowering and improving the local food system supply chains. Seventy-six percent (42 of 55) of the surveyed transit agencies were interested in playing a role in increasing access to local food in their service area (Table 4.40). However, the shortage of funding, staff, and vehicles seems to limit many transit agencies' abilities. Interestingly, a transit agency in Indiana said, "Our agency also hosts a 'Unity Garden' at our site that volunteers maintain and produce available for everyone to pick."

An agency in Wyoming said, “Our governor has started the hunger initiative that helps out local gardeners, and they, in turn, share their produce with us.”

Table 4.40 Transit Agencies That Were Interested in Playing a Role in Increasing Access to Local Food in Their Service Area (n=55)

Response Options	Percentage	Count
Yes	76%	42
No	24%	13

Table 4.41 shows the types of food transit agencies preferred to handle and deliver. Transit agencies were asked to rate their interest in the following types of foods: grocery orders, cooked meals, fresh local food, and community-supported agriculture (CSA). Results showed little difference in preferences regarding the type of food, though a slight preference was found for cooked meals and fresh local food.

Table 4.41 Level of Interest for Food Types That Transit Agencies Were Interested in Handling and Delivering (n=56)

Response Options	Level of Interest: Not at all interested 1		2		3		4		5		6		Extremely interested 7	
	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count		Count
Grocery orders	22%	12	9%	5	5%	3	18%	10	13%	7	9%	5	20%	11
Cooked meal	18%	10	7%	4	4%	2	20%	11	9%	5	11%	6	23%	13
Fresh local food	16%	9	5%	3	2%	1	20%	11	11%	6	13%	7	22%	12
Community-supported agriculture (CSA)	14%	8	5%	3	5%	3	21%	12	13%	7	7%	4	20%	11

Thirty-eight (21 of 56) transit agencies provide trips to local food venues (Table 4.42). The agencies that provided these trips were classified into three groups:

- transit agencies that provided trips to farmer's markets, either upon request or with a fixed schedule
- transit agencies that offered trips to a food bank or grocery stores where local foods were available
- transit agencies that picked up local produce from a local farmer and delivered it to their customers in the senior center

In addition to the provided trips to local food sites to increase access to local food, some agencies also expressed interest in further efforts to improve local food access. Seventy-one percent (40 of 56) of the transit agencies were interested in cooperating with local food system entities to create a business partnership that promoted local food and increased food access (Table 4.43).

Table 4.42 Transit Agencies That Provided Trips to Local Food Venues (n=56)

Response Options	Percentage	Count
Yes	38%	21
No	62%	35

Table 4.43 Transit Agency Interested in a Business Partnership with Local Food System Entities to Promote Local Food or Increasing Food Access (n=56)

Response Options	Percentage	Count
Yes	71%	40
No	29%	16

4.3 Transit Agencies Best Practices Evaluation

The results from food delivery service, food access, and local food system aspects from both surveys were analyzed to report transit agencies' best practices. Five parameters were obtained from the first survey, three to identify best practices in food delivery service and the other two to recognize the transit agencies' best practices in increasing food access and supporting the local food system. Also, five parameters were utilized from the second survey to report the transit agencies' best practices in food delivery and three for food access and supporting the local food system.

4.3.1 Best Practices from the First Survey

Three parameters were used to identify transit agencies' best practices in food delivery. The first factors were the starting period for a food delivery service, and the second parameter was transit agencies' willingness and ability to continue the service after the pandemic. The awareness about Section 5311 funding was the third parameter. Also, rides to a grocery store/supermarket in a service area and the transit agencies' willingness to work with food suppliers (such as a food bank) to increase food access were the two parameters used to identify the transit agencies' best practices in improving food access and supporting local food systems.

During the COVID-19 pandemic, many transit agencies responded to the pandemic's negative effects and new demands by offering food delivery. The results indicated that 57 transit agencies provided food delivery as one of their operational services to meet certain individuals' needs before the pandemic. After March 2020 (the first wave of the pandemic), 128 transit agencies started to deliver groceries or prepared meals to their customers, and only eight transit agencies started this service during the second wave of the

pandemic (after October 2020). In comparison, 199 transit agencies do not offer the service. The 193 transit agencies that provided food delivery service to meet their customers' demands were considered better practices than the 199 transit agencies that did not offer it.

Transit agencies that offered food delivery may recognize the importance of food delivery service, which might create a commitment for some transit agencies to see food delivery as an essential service that must be added to the agency's regular operation. Of the 193 transit agencies that provided food delivery service, 83 planned to continue the service after the pandemic is over, 78 were uncertain, and 28 indicated they would not continue the service. Also, transit agencies committing to meet their customers' needs should be updated with the latest rules and regulations, which may allow them to maintain the service. The results indicated there were 222 transit agencies aware of Section 5311 funds, which rural agencies can use for package delivery. These 83 transit agencies and the 222 agencies applied better food delivery service practices within their service areas; because they planned to continue the service and were aware of how to fund it.

Furthermore, most transit agencies surveyed utilized the agency capacity to increase food access and support their local food systems. There were 372 transit agencies providing rides to the grocery store or supermarkets within their service areas compared to 20 transit agencies that did not. Additionally, 246 transit agencies were willing to cooperate with food suppliers such as food banks and other organizations to increase food access in their service area, compared with 27 who were not willing and the 89 who were uncertain. Transit agencies that provide rides to the grocery store or supermarkets and are willing to cooperate with food suppliers and other organizations to increase food access in their service areas are considered agencies that link food accessibility in their operation strategies. These transit agencies can better integrate food accessibility into planning, projects, and programs faster and better than other transit agencies.

4.3.2 Best Practices from the Second Survey

From the first survey, 148 transit agencies agreed to answer the second survey; the second survey followed up with those transit agencies that wanted to provide the best service they could in their service areas. The second survey traced the food delivery service, food access, and local food system support aspects to report on best practices. Five parameters were used to identify transit agencies' best practices in food delivery: the year food delivery started, transit agencies that were still providing the food delivery service in 2021, transit agencies that were planning to continue delivering food after 2021, initiation of the food delivery service, and awareness of funding that supports food delivery service other than FTA funds. In addition, three factors were utilized for transit agencies' best practices in increasing food access and supporting local food systems: interest in increasing access to local food, trips to local food venues, and interest in a business partnership with local food system entities.

Of the 63 transit agencies that responded to the second survey, 14 started a food delivery service years before the pandemic. Providing the service for all these years probably allowed these agencies to gain experience, which may help them manage the demand for food delivery during the pandemic better than agencies that offered the service during the first or second waves. Furthermore, from 60 transit agencies, 26 initiated the food delivery service by themselves. These agencies identified the need and found food suppliers by themselves compared with 12 agencies that offered the service to support and help food suppliers. The remaining 22 agencies offered the service because they were interested in it and wanted to help food suppliers. In addition, 43 transit agencies provided food delivery in 2020 and 2021, and 22 of these transit agencies were planning to continue the food delivery after 2021. There were also 21 transit agencies aware of funding other than FTA funds that can support a food delivery service. Compared with

other agencies, these transit agencies applied better food delivery service practices within their service areas.

Moreover, many transit agencies provided better food access and were more willing to support local food systems than other agencies. There were 42 transit agencies interested in playing a role in increasing access to local food in their service area, and 21 transit agencies provided trips to local food venues. In addition to trips provided to local food sites to support the local food system, 40 transit agencies were interested in cooperating with local food system entities to create a business partnership that promoted and supported the local food system within their service areas.

5. CONCLUSIONS

This research addressed the role of U.S. public transit agencies in maintaining food access before, during, and after the COVID-19 pandemic and how they responded to the pandemic by providing food delivery service. Simultaneously, the study results identified transit agencies' roles in increasing food access and supporting local food systems. The quantitative survey results reported 57 transit agencies offered a food delivery service before the pandemic, 128 transit agencies provided the service during the first wave of the pandemic (after March 2020), and eight additional agencies during the second wave of the pandemic (after October 2020). Of the transit agencies that began food delivery service before 2020, 81% were very interested in delivering food to those who may need it within their service area. Additionally, 82% of the transit agencies willing to continue the food delivery service in 2021 showed a higher level of interest in providing the service. The first survey was enough to get a holistic view of food delivery, food access, and transit agencies' support of the local food system. However, this explanatory mixed study was designed to collect detailed information about food delivery, food access, and local food system support aspects.

Consequently, the follow-up survey was designed to extract in-depth information about food delivery, food access, and local food system support aspects. The results from the second survey revealed that 14 of 63 transit agencies set up a food delivery service years before the pandemic. In addition, the results showing the level of transit agencies' concern about increasing food access and support for their local food system from both surveys were promising for better food access and support for local food systems.

U.S. public transit agencies play a vital role in increasing food access and supporting local food systems. Transit agencies showed great concern about maintaining food access during the pandemic and meeting their customers' demand for food delivery service. The way they responded to the pandemic with delivery services was outstanding. Additionally, some agencies were already meeting the demand before the pandemic. Others were willing to meet the demand regardless of whether it was identified during or after the pandemic. All these actions and others indicate the U.S. public transit agencies' contribution to maintaining food access and meeting the demand for food delivery during the pandemic. Also, these actions indirectly helped control food insecurity and unemployment rates during the pandemic.

According to transit agencies' responses from both surveys and best practices identified, this study determined three possible types of organizational visions: traditional, supply-demand, and societal. These three visions might influence agencies' missions and operations. Traditional public transportation-focused agencies consider public transportation a service that connects node to node and access to work and focus on that service. Supply-demand-focused transit agencies adopt a neutral vision. They see their agencies as organizations that respond to the law of supply and demand. The operation in these transit agencies is influenced by agency capacity, customers demand, and management awareness about regulation (e.g., funding). They provide new services based on the agency's capacity, management awareness of the demand, and funding to support this service. Societal-focused transit agencies consider public transportation a community service. They seek opportunities to initiate services and play different roles to offer the best for their community needs. A societal-focused agency's vision can influence the agency's mission, which affects the entire operation and service. One respondent said that the agency was motivated to launch and provide food delivery service because of the agency's vision and mission. "Our Vision and Mission are all about seeing a need and being innovative with solving issues in communities."

These three visions are a typical result because U.S. public transit agencies have various purposes that serve different geographical (urban, rural, and tribal) areas. For example, a transit agency serving a metropolitan area might prefer to adopt the traditional vision to suit the operational purpose in that area. This might be one of the reasons why some transit agencies did not provide food delivery service at any

time during 2020-2021. On the other hand, some organizations might be influenced by "impact bias." Over the years, their predictions for traditional operations have prevented them from recognizing new demands for new services. Other factors and challenges found and reported in this study might also prevent those agencies that did not provide food delivery service or prohibit some agencies from continuing after the pandemic. Furthermore, to better understand the implications of these results, future studies could address these three visions and examine their impact on food delivery services, food access, and support of local food systems. Also, studying the 57 transit agencies that provided food delivery service before the pandemic as a case study to identify agencies' classification, motives, capacity, etc., might be beneficial for other agencies and organizations interested in increasing food access and local food system support.

Drawing from the findings, this study recommends that transit agencies that did not provide rides to a grocery store or supermarket within their service areas reassess their operations to offer their customers access to affordable food retailers. Similarly, transit agencies that could not provide the service or continue it after the pandemic may reevaluate the customers' demand within their service areas and find new funding if there is a need for the service. In many cases, an agency's capacity might be insufficient to increase access to food and support the local food system, requiring more cooperation with other agencies, grocery stores, supermarkets, and other food suppliers to satisfy customers' needs in that service area. Moreover, the transit agencies' concern about food access issues was integrated into their visions and missions, which was the primary motive for all their effort. This concern and cooperation allowed some transit agencies to provide food delivery service for free or accept SNAP and EBT benefits as payment for the service.

Due to the nature of the surveys, since both were national, the results of this study may vary from state to state. Furthermore, the results of this study may fit rural areas more than urban and tribal areas because the rural transit agencies that responded to both surveys outnumbered other types of agencies. In addition, a service takes two manifestations that can be perceived differently by different parties. This study presented the service from the providers' perspective but not from the service receivers. As a result, the provided information (food delivery service, food access, and local food system support) were from the transit agencies' perspective and did not present customers' opinions. Indeed, examining the services from the customers' perspective will fill some gaps in the literature review, for example, analyzing transit-dependent customers' needs and differentiating between food insecurity and hunger among them.

There is a need to review and revise current policies and regulations at all levels (federal, state, and local) to develop new standards that will allow public transportation to deliver food and other essentials such as prescriptions to those who need delivery service. In addition to modifying old grants and assigning new funds to motivate and engage transit agencies to increase access to healthy, affordable food and support local food initiatives, there is a need to identify the additional costs of modifying transit policy in transit to allows delivery of food and other essential items.

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APPENDIX A. Quantitative Survey (The Inquiry Survey)

Q1 Please complete the information:

- ○ Name of Agency (1) _____
- ○ Address (2) _____
- ○ State/City (3) _____
- ○ Zip Code (4) _____
- ○ Person Completing Survey (5) _____
- ○ Title/Department (6) _____
- ○ Phone (7) _____
- ○ e-mail (8) _____

Q2 What is your agency's level of interest in providing delivery of food/groceries/prepared meals to those who may need it within your service area?

	Not Interested 1 (1)	2 (2)	3 (3)	Neutral 4 (4)	5 (5)	6 (6)	Very Interested 7 (7)	N/A (8)
Rate your answer (1)	○	○	○	○	○	○	○	○

Q3 Are there grocery stores/supermarkets in your service area?

- ○ Yes (1)
- ○ No (2)

Q4 Does your agency provide rides to a grocery store/supermarket in your service area?

- ○ Yes (1)
- ○ No (2)

Q5 Some transit agencies started to deliver food/groceries/prepared meals to their customers during the COVID-19 pandemic. Which of the following statements describes your agency's situation?

- ○ Our agency launched a home delivery service to deliver food/groceries/prepared meals before the pandemic. (1)
- ○ Our agency launched a home delivery service to deliver food/groceries/prepared meals during the first wave of the pandemic (i.e., after March 2020). (2)
- ○ Our agency launched a home delivery service to deliver food/groceries/prepared meals during the second wave of the pandemic (i.e., after October 2020). (3)
- ○ Our agency does not provide a food/groceries/prepared meals delivery service. (4)

Display This Question:

If Some transit agencies started to deliver food/groceries/prepared meals to their customers during... = Our agency does not provide a food/groceries/prepared meals delivery service.

Q6 Is your agency planning to start a delivery service in 2021?

- ○ Yes (1)
- ○ Uncertain (2)
- ○ No (3)

Display This Question:

If Some transit agencies started to deliver food/groceries/prepared meals to their customers during... != Our agency does not provide a food/groceries/prepared meals delivery service.

Q7 Do you charge a fee for this service?

- ○ Yes (1)
- ○ No (2)

Display This Question:

If Do you charge a fee for this service? = Yes

Q8 What was the fee?

_____

Display This Question:

If Do you charge a fee for this service? = Yes

Q9 Does your agency accept customer's SNAP and EBT benefits to pay for their orders?

- ○ Yes (1)
- ○ No (2)

Display This Question:

If Some transit agencies started to deliver food/groceries/prepared meals to their customers during... != Our agency does not provide a food/groceries/prepared meals delivery service.

Q10 Does your agency plan to continue the service after the COVID-19 pandemic?

- ○ Yes (1)
- ○ No (2)
- ○ Uncertain (3)

Display This Question:

If Does your agency plan to continue the service after the COVID-19 pandemic? = No

Q11 Please explain why you will not continue the service.

_____

Display This Question:

If Some transit agencies started to deliver food/groceries/prepared meals to their customers during... != Our agency does not provide a food/groceries/prepared meals delivery service.

Q12 What is the best method for your agency to provide the food/groceries/prepared meals delivery service?

- ☐ The agency will pick-up the grocery/food from the distributor/grocery store and deliver it to the customer's home. (1)
- ☐ The distributor/grocery store will bring all the grocery/food that needs to be delivered to the agency, and your agency will be responsible for customers' delivery only. (2)
- ☐ Other, please specify (3)

Display This Question:

If Some transit agencies started to deliver food/groceries/prepared meals to their customers during... != Our agency does not provide a food/groceries/prepared meals delivery service.

Q13 How frequently have you provided this service?

- ☐ More than once a week (1)
- ☐ About once a week (2)
- ☐ About 1 to 3 times per month (3)
- ☐ Less than once a month (4)
- ☐ Other, please specify (5)

Display This Question:

If Some transit agencies started to deliver food/groceries/prepared meals to their customers during... != Our agency does not provide a food/groceries/prepared meals delivery service.

Q14 Who is eligible for the food/groceries/prepared meals delivery service? (Select all applicable answers)

- ☐ Seniors (1)
- ☐ People with disabilities (2)
- ☐ People requiring assistance with grocery shopping/preparing meals (3)
- ☐ People on Medicaid/Medicare or a member of a Health Insurance Plan that offers a paid meal benefit (4)
- ☐ Anyone can utilize the service (5)
- ☐ Other, please specify (6)

Q15 Is your agency willing to work with food banks/other organizations like Meals on Wheels in your area to increase food access to residents?

- ○ Yes (1)
- ○ No (2)
- ○ Uncertain (3)

Q16 Does your agency have the vehicle capacity to provide food/groceries/prepared meals delivery service?

- ○ Yes (1)
- ○ No (2)
- ○ Uncertain (3)

Q17 Does your agency have the staff needed to be able to provide food/groceries/prepared meals delivery service?

- ○ Yes (1)
- ○ No (2)
- ○ Uncertain (3)

Q18 Is your agency aware that Section 5311 funds can be used for services such as package delivery?

- ○ Yes (1)
- ○ No (2)

Q19 Has your agency used any other funding programs to provide food/grocery delivery services?

- ☐ Yes, please identify which funding programs. (1) _____
- ☐ No (2)

Q20 Prior to COVID-19, on average, how many one-way rides did your agency provide per day?

_____

Q21 During the COVID-19 pandemic, did your agency change its service schedule? Please select all answers that suit your agency situation

- ☐ We kept our service the same (1)
- ☐ We reduced the number of vehicles in service (2)
- ☐ We reduced the number of drivers (3)
- ☐ We reduced fares (4)
- ☐ We reduced our service hours (5)
- ☐ We reduced some of the geographic coverage of our service (6)
- ☐ We eliminated or reduced service on one or more routes (7)
- ☐ Other, please specify (8)

Q22 Did your agency experience a decrease in demand for rides during the COVID-19 pandemic?

- ○ Yes (1)
- ○ No (2)

Display This Question:

If Did your agency experience a decrease in demand for rides during the COVID-19 pandemic? = Yes

Q23 What was the percentage decrease?

_____

Q24 Please share any other thoughts/challenges that your agency faces in providing access to food.

_____

Display This Question:

If Some transit agencies started to deliver food/groceries/prepared meals to their customers during... != Our agency does not provide a food/groceries/prepared meals delivery service.

Q25 To expand the study results and provide best practice solutions for transit agencies and other public transportation stakeholders, we plan to conduct phone interviews with some of survey participants Are you willing to participate in a phone interview for the second phase of this study? Do you agree to contact you and participate in the second phase of this study?

- ○ Yes (1)
- ○ No (2)

APPENDIX B. Qualitative Survey (the follow-up Survey)

Q1 Please complete the information:

- ○ Name of Agency (1) _____
- ○ State (2) _____
- ○ Zip Code (3) _____

Q2 What is your transit agency classification?

- ○ Urban (1)
- ○ Rural (2)
- ○ Tribal (3)
- ○ Other, please explain (4) _____

Q3 What is the population of your transit agency's service area?

_____

Q4 What is the total number of workers in your transit agency? Specify the total for each of the positions listed below?

- ○ Total numbers of workers in your transit agency (1)
- ○ Drivers (2)
- ○ Administration (3)
- ○ The board members of your transit agency (4)

Q5 When did your transit agency start delivering food?

- ○ Month (1) _____
- ○ Year (2) _____

Q6 Does your transit agency still provide food delivery?

- ○ Yes (1)
- ○ No (2)

Display This Question:

If Does your transit agency still provide food delivery? = No

Q7 When did your transit agency stop delivering food?

_____

Display This Question:

If Does your transit agency still provide food delivery? = Yes

Q8 Does your transit agency plan to continue delivering food after 2021?

- ○ Yes (1)
- ○ No (2)
- ○ Uncertain (3)

Display This Question:

If Does your transit agency plan to continue delivering food after 2021? = Uncertain

Q9 Please explain why your transit agency is uncertain about continuing the service after 2021.

_____

Q10 Who initiated the food delivery service? Please choose one answer.

- ○ Our transit agency with food suppliers' assistance. (1)
- ○ The food suppliers with our transit agency's assistance. (2)
- ○ Other, please explain (3) _____

Q11 How long did it take to plan and launch the food delivery services?

_____

Q12 Who is/was your food supplier, e.g., grocery store, food bank, etc.?

_____

Q13 What type of food is/was delivered (cooked, grocery, or fresh local food)?

_____

Q14 What motivated your transit agency to launch and provide the food delivery service? (For example, it was a response to demand or a reaction to the pandemic.)

_____

Q15 Describe the benefits of providing food delivery in your community. Do you see this service as filling an essential need within the community? Please explain.

_____

Q16 What are/were the top three challenges that your agency has faced in providing food delivery?

_____

Q17 Have you faced challenges with any of the following in providing food delivery? Choose as many as apply.

- ☐ Management (1)
- ☐ Logistics (2)
- ☐ Operation (labors and vehicles) (3)
- ☐ Finances (4)
- ☐ Other, please explain (5)
- ☐ None of the above (6)

Q18 Does your transit agency still face any challenges?

- ○ Yes, please explain (1) _____
- ○ No (2)

Q19 Looking back, is there anything your agency could have done differently that may have yielded better results? For example, implementing reliable software for receiving orders, checking inventory, scheduling, etc.

- ○ Yes, please explain (1) _____
- ○ No (2)

Q20 Are there any factors outside your agency's control that need to change for your agency to provide a better food delivery service?

- ○ Yes, please explain (1) _____
- ○ No (2)

Q21 Are there rules or regulations at the local, state, or federal levels that could be modified to help public transit agencies provide food delivery or increase access to local food?

- ○ Yes, please explain (1) _____
- ○ No (2)

Q22 Does the food delivery service need more funds and support? If you answer yes, is there a specific need for funding from local, state, or federal levels?

- ○ Yes, please explain (1) _____
- ○ No (2)

Q23 How many customers received the service in 2020, and how many have received the service 2021?

- ○ 2020 (1) _____
- ○ 2021 (2) _____

Q24 How many orders do/did you deliver within a typical week?

_____

Q25 Do the number of orders vary significantly from week to week?

- ○ Yes, please explain 1) _____
- ○ No (2)

Q26 How did your transit agency inform customers about the food delivery service?

_____

Q27 What are your agency's expectations about the demand for food delivery in the coming three years?

_____

Q28 Is your transit agency aware of funding that supports the food delivery service other than the Federal Transit Administration (FTA), such as the Department of Health and Human Services (HHS), Housing and Urban Development (HUD), Veteran Affairs (VA), and Department of Agriculture (DOA)?

- ○ Yes, please explain (1) _____
- ○ No (2)

Q29 Is your transit agency interested in playing a role in increasing access to local food in your service area?

- ○ Yes, please explain (1) _____
- ○ No (2)

Q30 How interested is your transit agency in handling the following types of food deliveries?

	Rate your answer						
	Not at all interested 1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	Extremely interested 7 (7)
Grocery orders (1)	○	○	○	○	○	○	○
Cooked meal (2)	○	○	○	○	○	○	○
Fresh local food (3)	○	○	○	○	○	○	○
Community-supported agriculture (CSA) NOTE: Community-supported agriculture (CSA) is a local food system approach to connect the farmers and consumers within the food system more closely by allowing the consumer to subscribe to the harvest of a specific farm or group of farms. (4)	○	○	○	○	○	○	○

Q31 Is your transit agency providing or has it provided trips to local farms that sell local food (You-pick), farmer's markets, or food hubs?

- ○ Yes, please explain (1) _____
- ○ No (2)

Q32 Is your transit agency interested in a business partnership with local food system entities promoting local food or increasing food access?

- ○ Yes (1)
- ○ No (2)

Q33 Do you have any additional thoughts that you would like to share with us?

_____

Q34 Would you like to receive an electronic copy of the report on the role public transportation plays on access to food after it is completed?

- ○ Yes, please enter your email (1)
- ○ No (2)