

The Impact of COVID-19 on a University Food System

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**Abstract**

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The University of Washington has 40 food retail and food service locations that serve over 43,000 students. When classes switched to remote learning in March 2020 as a result of the COVID-19 pandemic, it caused a major shock to the university's food system. This exploratory study examined the pandemic's impact on the university's food supply chain and consumer population through a mixed methods approach. Interviews with 11 food system stakeholders and a campus-wide consumer survey revealed that public health safety measures and the resulting economic fallout caused several supply-side disruptions, while panic buying caused demand-side disruptions. Each food supplier used an array of adaptive strategies to accommodate the combined effects of a decreased workforce and a dramatic switch in demand from the food service market to the retail market. Consumers decreased their visits to indoor food sources, while maintaining or increasing visits to outdoor food sources. Although they increased the

consumption of meals prepared at home, there was not a significant change in the prevalence of consumer food insecurity. This study contributes to an important body of research analyzing how different elements of a food system respond to disruptive events. The policy and planning recommendations and lessons learned from this study can provide a framework for this and other universities to develop the resilience of their food system.

## EXECUTIVE SUMMARY

On March 9, 2020, the University of Washington switched to all remote classes and exams in response to COVID-19. Two days later, on March 11, 2020 the World Health Organization declared COVID-19 a pandemic. This was a major disruption to the UW food system affecting both the food supply chain and consumer food security.

The aim of this case study was to explore how COVID-19 affected the UW food system from the perspective of both the food suppliers and food consumers (hereby defined as UW students, faculty, and staff). Specifically, this case study addresses the following questions:

1. What disruptions and factors associated with COVID-19 occurred in the UW food supply chain from the perspective of food suppliers and consumers?
2. What responses or adaptations occurred in the food supply chain as a result of COVID-19-related disruptions?
3. Did campus consumers change their frequency of purchase visits to retail and food services?
4. What types of food access changes did consumers experience?
5. What factors affected food access for consumers?
6. What types of food preparation/consumption behaviors did consumers experience?
7. What factors affected changes in food preparation/consumption behavior?

Using a mixed methods approach:

1. Interviews with various suppliers along the UW food supply chain illustrated disruptions that occurred in the supply side of the food system.
2. An online survey measured the impact COVID-19 had on campus food consumers.

### Key Findings: Qualitative Data from Stakeholder Interviews

<b>1. What disruptions and factors associated with COVID-19 occurred in the UW food supply chain from the perspective of food suppliers and campus consumers?</b>
<ul style="list-style-type: none"><li>• There was a switch in demand from food service to retail</li><li>• There was a shortage of some input supplies</li><li>• Food suppliers shutdown or reduced operations</li><li>• Consumers were panic buying</li><li>• Food suppliers had a decreased workforce</li><li>• Food suppliers had to quarantine their workers</li></ul>
<b>2. What responses or adaptations occurred in the food supply chain in response to COVID-19-related disruptions?</b>
<ul style="list-style-type: none"><li>• Food suppliers changed products to accommodate demand for retail or to-go items</li><li>• Food suppliers used substitutes for supply shortages</li><li>• Food suppliers reorganized worker positions to maintain a level of employment or efficiency</li><li>• Food suppliers increased the number of hours their employees were required to work</li><li>• Food suppliers furloughed workers</li></ul>

- Food suppliers increased hourly wages and hired more workers
- Food suppliers used substitutes for human labor.

### Key Findings: Quantitative Data from Survey

<b>3. Did campus consumers change their frequency of purchase visits to retail and food services?</b>
<ul style="list-style-type: none"> <li>• Purchase visits to indoor campus food service and food retail units decreased</li> <li>• Purchase visits to off-campus indoor food service and food retail units decreased</li> <li>• Purchase visits to campus and off-campus food trucks/mobile dining units remained the same</li> <li>• Purchase visits to campus and off-campus food banks/pantries remained the same</li> <li>• Participation in Community Supported Agriculture (CSA) increased</li> </ul>
<b>4. What types of food access changes did consumers experience?</b>
<ul style="list-style-type: none"> <li>• The rate of food insecurity and cultural food insecurity did not significantly change</li> </ul>
<b>5. What factors affected food access for consumers?</b>
<ul style="list-style-type: none"> <li>• Changes to campus cafés/coffee shops negatively impacted food access for the greatest percentage of consumers</li> <li>• Health concerns, food source locations, food source hours of operation, and lack of transportation were four major factors that negatively impacted food access</li> </ul>
<b>6. What types of food preparation/consumption behaviors did consumers experience?</b>
<ul style="list-style-type: none"> <li>• The average number of home-prepared meals eaten during an average week increased from approximately 13 to 16 meals.</li> </ul>
<b>7. What factors affected changes in food preparation/consumption behavior?</b>
<ul style="list-style-type: none"> <li>• Consumers benefitted from having available time</li> <li>• Consumer’s food access was negatively affected by a lack of ingredients</li> <li>• A greater percentage of the food insecure were negatively impacted by factors that limited food access than the food secure</li> <li>• A greater percentage of the food insecure were negatively impacted by the amount of time, access to ingredients, and access to cooking equipment in their ability to prepare food than the food secure</li> </ul>

### Considerations for Further Research and Exploration

Results from this case study highlight current weakness of the UW food system and potential ways to better prepare for future disruptions. These areas require further research and exploration and include:

- **Coordinate System-Wide Channels of Communication:** Develop a model of the UW food supply chain that includes the inputs and outputs of each component so that during a disruption, UW Dining, can identify and communicate what resources are needed and can be shared within the system.
- **Decentralize Food Sources to Increase Food Access:** Explore the use of mobile dining units, a mobile pantry, and mobile farmers markets to increase food access in

neighborhoods where high concentrations of students live.

- **Increase the Capacity of the UW Pantry:** Explore expanding the perishable food capacity of the UW Pantry by adding permanent space in an on-campus walk-in refrigerator and an additional on-site refrigerator.
- **Provide Continual Access to Campus Facilities for Food Production:** Explore ways to permit indoor farming operations to resume after passing an initial safety assessment.
- **Ascertain and Address Issues of Food Insecurity:** Investigate the underlying causes of student food insecurity and cultural food insecurity.
- **Reallocate Labor Resources in Emergency Plans:** Explore how to maintain the operation of essential tasks during a labor shortage in emergency management plans.
- **Use Web-based Communication Platforms:** Explore the use of open online platforms or mobile-device applications as a means of communication between campus food service units, food retail units, and consumers.

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# Introduction

## Food Systems

A food system consists of the actors, drivers, activities and relationships involved in the supply, demand, use, and disposal of food. ([Biehl et al., 2018](#); [Erickson et al. 2010](#); [Gottlieb & Joshi, 2010](#); [Nesheim et al., 2015](#)). A region's economic, environmental, and public health depends upon the stability and resilience of its food system. Understanding how food systems respond and adapt to major disruptions can help businesses, policy makers, and consumers better prepare for the negative impacts that may follow future disasters or other disruptive events.

### *The Food Supply Chain*

A key component of the food system is the food supply chain—a sequence of sectors (producers, manufacturers, wholesalers, distributors, retail businesses, and food service businesses) that turn raw materials and inputs into food for consumers. Producers (e.g., vegetable farms, dairy farms, egg farms, fisheries etc.) generate raw materials using external supply inputs (e.g., vegetable farms purchase seeds and fertilizers, dairy farms purchase animal feed, etc.). Manufacturers change the physical state or form of the raw material into a food product to enhance its value (e.g., grain mills grind wheat into flour, bakeries turn flour into bread, meat processing plants butcher animals and package the meat, cheesemakers turn milk into cheese, etc.). Wholesalers purchase, store, and sell large quantities of food products from producers and manufacturers. Distributors transport food products from these upstream sectors to retail and food service establishments. Retail establishments (hereto referred as “retail”) sell unprepared food to consumers primarily for off-of-premises consumption (e.g., grocery stores, farmers markets, convenient stores, etc.). Food service establishments (hereto referred as “food service”) sell prepared food for both on-and-off-of-premises consumption (e.g., restaurants, fast food chains, food trucks, cafeterias, etc.). The modernization of food systems, combined with the industrialization, economic growth, urbanization and globalization of societies has led to surplus food generation ([Thyberg & Tonjes, 2015](#)). Managing this food surplus and disposing food waste are other key components of the food system. Some food surplus is diverted to feeding hungry people through food recovery organizations like food banks, food pantries, and soup kitchens. Business and residencies dispose of what they cannot or do not donate to waste management companies that either send it to landfills or compost processing facilities.

### *Just-In-Time Retail Economy*

The modern food supply chain operates in a just-in-time economy where production levels meet existing demand, preventing excessive overproduction or the accumulation of unused inventory. Food inventories are kept low so that the rate of retail food delivery corresponds with the rate of consumer food purchases. This high food turnover is economically efficient and profitable ([De Steur et al., 2016](#); [Huff et al. 2015](#)).

### *Size of Food Systems*

Food systems vary in scale. They range from hyperlocal, where producers bypass downstream sectors and sell directly to consumers, to global, where transnational companies move food products across country borders. There is no consensus around the definition of a local food system. It can be based on distance from production to consumption, means of production, social aspects, or supply chain characteristics. The United States Congress labels local and regional food product as something that can be transported less than 400 miles from its origin, or within the state in which it is produced ([H.R.2419, 2008](#)). By this designation, however, strawberries grown in Fallbrook, CA and sold at a market in Crescent City, CA are still considered local even though they traveled 824 miles to get from farm to plate.

### Food System Objectives

Although the main objective of the food system is to provide food to consumers, food systems differ in the motivations underlying this objective. Mainstream food systems operate primarily for profit maximization and utilize interstate and international supply chains. Alternative food systems prioritize social and environmental goals as well as economic profit and utilize a local/regional supply chain ([Cleveland et al., 2014](#)).

### Food System Model

[Figure 1](#) illustrates the different components of the food system. The figure expands upon the center diagram's pre-production, production, and post-production activities into a more detailed illustration of the food supply chain. The figure also extends the center diagram's loss, waste and disposal activities to include strategies to prevent or divert food waste.

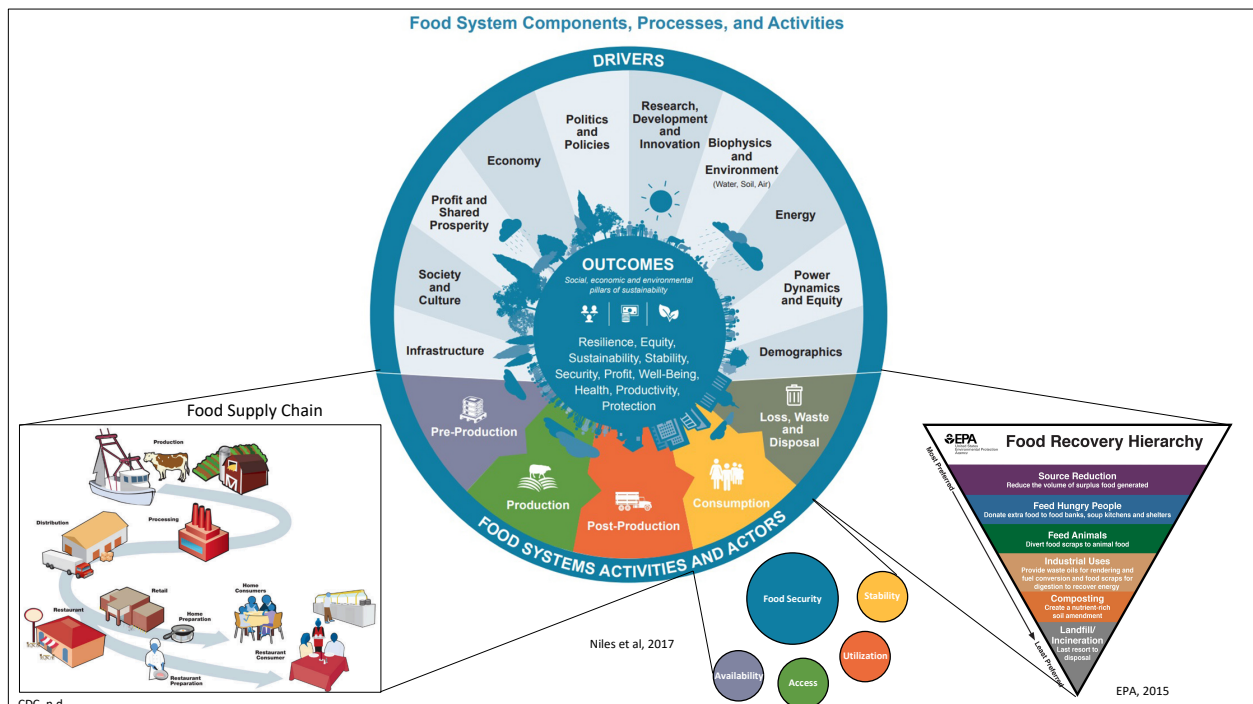


Figure 1. Conceptual model of the components, processes, and activities involved in a food system

## **Consumer Food Security**

Food security is a principal outcome of a food system. Food security, as defined by the Food and Agriculture Organization of the United Nations, is composed of four pillars: food availability, food access, food utilization, and food stability (FAO, 2009). Food availability is the amount, type and quality of food individuals have at their disposal. Food access is defined as an individual's ability to obtain the type, quality and quantity of food required. Food access can be viewed in terms of 1) the affordability of food that is available 2) how well allocation mechanisms such as markets and government policies work 3) whether consumers can meet their social and other food preferences. Food utilization is the ability to consume and benefit from food. Food utilization depends upon the nutritional and social values of food, the knowledge of food preparation, and the safety of food (Erickson et al., 2010). Food stability is the temporal dimension of food security and includes both the likelihood of experiencing food supply disruptions and the ability to recover from them. Culture influences how individuals obtain, process, store, prepare, share, and eat food (Briones Alonso et al., 2018), and thus intersects across each of these pillars.

The United States Department of Agriculture (USDA) found that 10.5% of the US population were food insecure, i.e. the lack of food security as previously defined, at least some point in time during 2019 (Coleman-Jensen et al., 2020). Food insecurity was found to occur at a higher rate among households with children, single-parent households, women and men living alone, households with black, non-Hispanic, and Hispanic households, and households with incomes below 185 percent of the poverty threshold. Shocks, or disruptions, to the food system can exacerbate these already existing problems with food security and needs to be further investigated to avoid worse outcomes.

## **The University Food System**

### *Universities as Case-Studies*

Tseng et al. (2015) showed that university food systems can be informative case studies to demonstrate relationships between food environments and individual food choices. Changes in food supply and demand are easier to discern within a university because of its relatively consistent population and resources, i.e. a large percentage of the student population eat meals on campus and there is a limited selection of campus food choices. Universities can also be a good barometer of patterns and trends occurring in larger food systems because students have high rates of food insecurity, and this vulnerability can make them an indicator of broader changes (Bruening et al., 2017; Nazmi et al, 2019).

### *Food Insecurity of Students*

The increasing price of higher education along with a decrease in purchasing power of need-based financial assistance has led to greater income disparities and higher rates of food insecurity among college students (Broton & Goldrick-Rab, 2018). Hughes et al. (2011) found students that rent, or share accommodations, have low incomes, or receive government assistance have a

significantly higher rate of food insecurity. This suggests that students are at a higher risk of food insecurity in part because of their inadequate income support. With a growing reliance on food pantries to supplement their diet, being away from home also increases their risk of food insecurity ([Goldrick-Rab et al., 2018](#)). Students also possess a low food literacy, defined as the ability to plan, shop for, prepare, and cook nutritionally balanced meals, which affects their diminished level of food security ([Knol et al. 2019](#)). Unlike other food insecure populations, many students cannot receive federal food assistance through the Supplemental Nutrition Assistance Program (SNAP) because they do not follow the requirement of being employed part time ([USDA, 2021](#)). In an environment of high rigor and stress that requires a certain level of acumen and ability, food insecurity can pose a serious problem to a student's performance and well-being. University students facing food insecurity have significantly poorer physical health, poorer mental health, poorer academic performance, high stress, fatigue, and are more likely to have difficulty attending classes ([Frank, 2018](#); [Martinez et al. 2020](#); [Silva et al., 2017](#); [Willis, 2020](#)).

Cultural food insecurity can also influence academic performance on university campuses. In a study on the impact of cultural food insecurity on the identity and well-being of second-generation American and international university students, Wright et al., ([2021](#)) found that cultural food insecurity diminished student well-being because of reduced cultural anchors. In addition to international students, second-generation American students would amount to a large percentage of the population at risk of cultural food insecurity.

### *Literature on University Food Systems*

Current literature on university food systems have focused on only a single element, sector, driver, or activity, and do not characterize these components in relation to the whole system. Studies have analyzed the distribution of food retail locations near colleges ([Vilme et al. 2020](#)), analyzed campus dining food waste patterns ([Ahmed et al. 2018](#)), examined potential for university administrations to lead efforts in developing sustainable food systems ([Grech et al., 2020](#); [Pothukuchi & Molnar, 2015](#)), and characterized existing alternative food systems within universities ([Barlett, 2017](#)). However, in order to best understand and characterize the impact of a disruption to a food system, the whole system must be studied.

## **Food System Disruptions**

### *Disruptions to Food Supply Chain Operations*

Food supply chains are particularly vulnerable to disruptions because their rigid structures are designed to meet the “just-in-time” market demands, which often prioritize efficiency rather than resilience ([Keating 2013](#); [Nijhuis et. al, 2018](#)). Moreover, because the food supply chain is comprised of multiple sectors, each dependent of the operation of another, any disruption to one sector puts the function of the whole system at risk ([Buldyrev et al. 2010](#)). Acute disruptions could also indirectly impact the food supply chain by altering consumer behavior. These events can create uncertainty and volatility in consumer demand, making it particularly difficult to maintain food inventories in a just-in-time economy. The rising demand on an already weakened food system could result in a positive feedback loop of consumer panic buying ([Peck, 2006](#); [Vo](#)

[and Thiel, 2006](#)). Hobbs (2020) predicted that a just-in-time model of food retail would be ill suited to a major demand-side shock, such as panic buying, and efforts to redirect food from food service supply chains to retail would result in lags in inventory.

### *Disruptions to the Food Supply Chain Labor Force*

The food system is also vulnerable to biological and public health disruptions because each sector in the food supply chain relies on a healthy labor force. Disruptions such as bioterrorism and pandemics can cause high worker absenteeism. For example, Slonim (2010) found that a labor shortage caused by the 1918-1919 Spanish Flu pandemic resulted in unharvested crops in Toronto, Canada. Migrant farmworkers, of whom some sectors of food supply chain heavily rely upon, may be more vulnerable than the general population to human influenza pandemics due to living conditions, suboptimal access to health services, and potential communication barriers resulting from language and culture (Villarejo, 2003). Individuals that work directly with processing raw meat are more vulnerable than the general population to zoonotic influenza transmissions. Meyers et al. (2006) showed that pig farmers and meat processing workers demonstrated an increased risk of swine influenza virus infection.

Food supply chain disruptions, like the ones aforementioned, are expected to become a more frequent occurrence due to climate change (Hatfield et al., 2014) or future pandemics (Huff et al., 2015).

## **COVID-19 Pandemic: A Disruption to the Food System**

### *A Literature Review*

COVID-19 (hereto referred as “COVID”) is a highly transmissible disease that causes respiratory failure. It was first detected in China in December 2019 and quickly spread to other countries. The World Health Organization declared COVID a pandemic on March 11, 2020 (WHO, 2020). It became a major disruption to the food system, affecting both the food supply chain and consumer food security. Food manufacturing plants experienced reduced, suspended, or discontinued production because factory workers had to quarantine themselves or because of high rates of worker absenteeism (Aday and Aday, 2020; Hobbs, 2020; Laborde et al., 2020; Stephens et al., 2020). Aday and Aday (2020) found that food purchases from food service and retail had shifted from 50:50 pre-pandemic to nearly 0:100 during the pandemic and that the amount of time spent per shopping visit increased during the pandemic. Banerjee et al. (2021) determined that the shelter-at-home orders used to slow the spread of COVID resulted in fewer people visiting restaurant in both rural and urban counties. Kim and Lee (2020) found that consumers that perceived a higher threat of COVID expressed a higher preference for dining in a restaurant with private rooms. Wang et al., (2020) showed that stockpiling behavior was an outcome of risk perception and was the source for a demand shock to the food supply chain. Chanerides et al. (2020) and Grashuis et al. (2020) found in areas where COVID was spreading at an increasing rate, there was a decrease in in-person grocery shopping and an increase in purchases of food online. Mittal and Grimm (2020) identified different food retailers adopting information and communication technology to maintain business with their customers to uphold the requirements for social distancing. Using cross-national survey of Chinese and U.S.

households, Dou et al. (2021) reported an increased efficiency in the use of food, families spent more time cooking and eating together, and food purchasing patterns shifted from frequent trips to the store to dramatic increases in online shopping. They concluded that household food security weakened during COVID, with large increases in people worrying about or experiencing food shortages. Niles et al. (2020) and Stephens et al. (2020) showed that COVID created financial, physical, and environmental health and safety barriers to food access. The loss of a job reduced an individual's financial ability to afford food. The stay-at-home orders reduced an individual's ability to access food if they had to rely on public transit, which was still operational, but to a more limited degree. Individuals with personal health and safety concerns, especially from those who were themselves at high risk or were part of a household with someone at high risk, experienced a reduction of food security.

### **COVID's Impact on the University Food System**

The food service industry was one of the hardest hit sectors of the economy starting at the onset of the pandemic. Because many students work in that industry, they disproportionately experienced a higher rate of unemployment than the general population (Gould & Kassa, 2020; Chen, 2021). Furthermore, some students were not eligible to receive a one-time \$1,200 federal stimulus check because they were claimed as dependents by their parents (Lederer et al., 2021) or because they did not have a social security number due to their immigration status. Defeyter et al. (2020) studied the impact of COVID on the level of food security and lived experiences among students at three universities, two in the UK and one in the U.S. when these universities had closed the majority of their buildings and went to remote learning. From their survey data, they found nearly 35% of students reported low or very low levels of food security and 41% of students were worried that their food would run out. The best predictor of the level of food security was a student's living arrangement during the pandemic. Students who were living on their own or with other students were more likely to experience low or very low levels of food insecurity compared to those students living with family members. They also saw a relationship between mental health and level of food insecurity.

There have been some studies assessing how students' diets and consumption habits have changed during COVID. Gallo et al. (2020) examined the effect of isolation measures on university students during the early phase of the pandemic in Australia. They found that some students reported an increase in the number of meals and snacks they ate, some students bought more food during each singular shopping trip, some students made pastries at home, and some students bought less packaged food. Jia et al. (2021) studied how the COVID outbreak and lockdown affected youth diet patterns in China. They observed changes in consumption of different food products between different sexes and different ages. Huber et al. (2020) investigated the effect of lockdown measures on nutrition behavior among young adults in Germany. Investigators found that food intake increased in 31.2% and decreased in 16.8% of participants, and the increase was mainly in the form of pastries and bread. Owens et al. (2020) analyzed student response data from a 2-item Food Sufficiency Screener (Hager et al., 2010) and a 6-Item USDA Food Security Survey (USDA, 2020). They found that some of the students were food insecure and that the strongest predictor of food insecurity was a change in a student's living arrangement. These studies analyzed COVID's impact on the university consumer

population; however, to date there has not been any examination of how COVID has impacted a university's food system.

COVID is a 'natural experiment' that presents an opportunity to understand systematic food system strengths and weaknesses, as well as identify ways in which consumer demands and needs change. The University of Washington (UW) has 40 food retail and food service locations that serve over 43,000 students. When classes switched to remote learning in March 2020 as a result of the COVID-19 pandemic, it caused a major shock to the university's food system, resulting in a number of cascading events (see [Figure 2](#) for a timeline of events). This is an exploratory case study on the impact of COVID on the UW food system. This exploratory case study analyzes COVID's impact on both food suppliers and food consumers affiliated with the UW food system.

The following are research aims for the food supply chain:

1. Identify COVID-19-related disruptions and factors associated with these disruptions
2. Identify responses or adaptations to COVID-19-related disruptions

The following are research aims for food consumers:

1. Characterize changes in frequency of retail and food service purchases
2. Describe changes in food access
  - a. Identify factors associated with changes in food access
3. Describe changes in food preparation/consumption behavior
  - a. Identify factors associated with changes in food preparation/consumption behavior

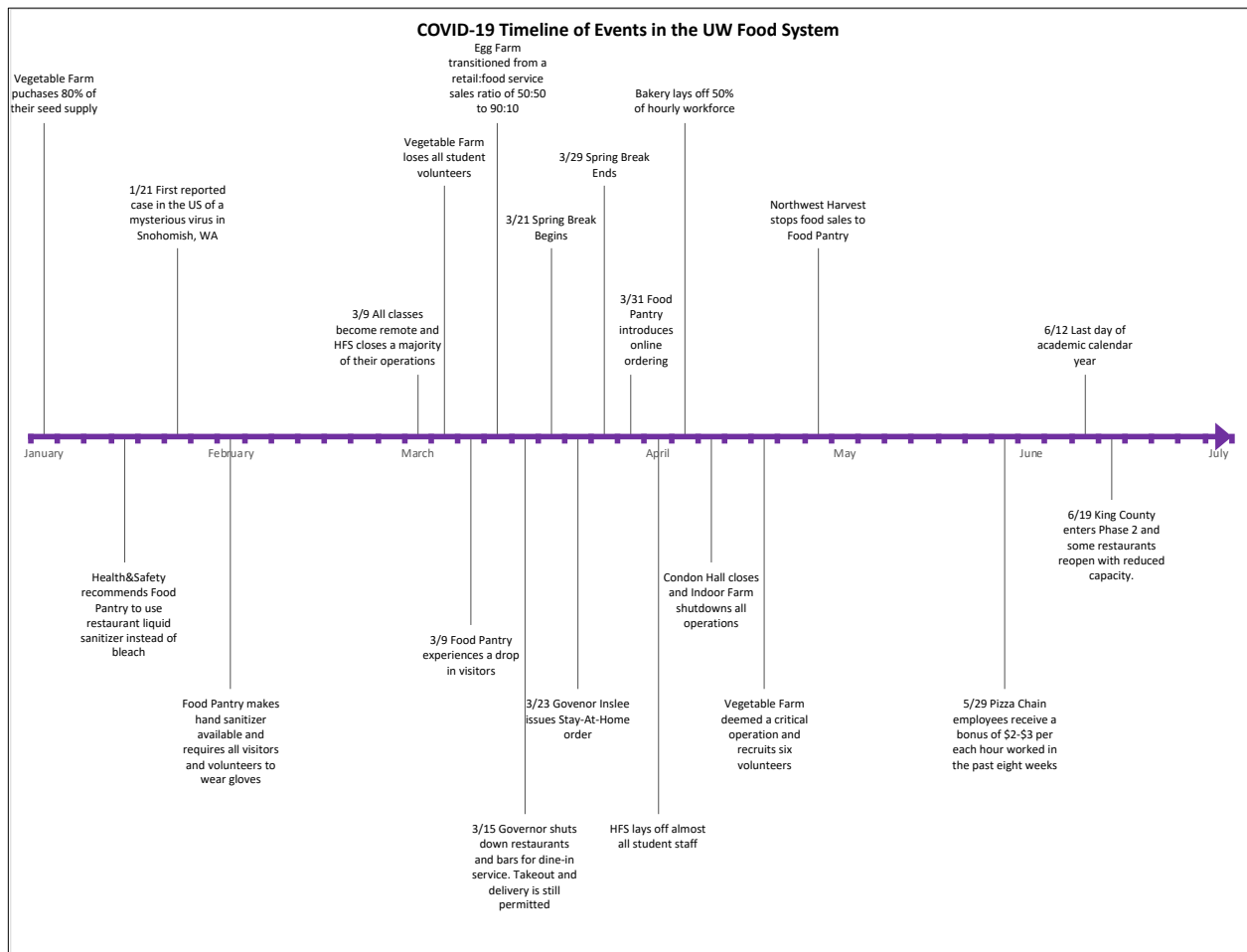


Figure 2. Time of events in the UW food system from pre-COVID to COVID

Note: A nursing home in Snohomish, WA reported the first known case of a mysterious virus, that would later be known as COVID-19, on January 21, 2020 (DOH, 2020; Sun & Bernstein, 2020). On March 9, 2020 all classes at the University of Washington stopped meeting in-person, and all classes and exams were conducted remotely (Cauce, 2020). Spring Break started on March 21, 2020 and many students returned home. Governor Inslee issued a Stay-At-Home order on March 23, 2020 “requiring every Washingtonian to stay home unless they need to pursue an essential activity; ban all gatherings for social, spiritual and recreational purposes; close all businesses except essential businesses” (Inslee, 2020). Spring Break ended on March 29, 2020, however, many students did not return to campus because of the Stay-At-Home order.

# Methods

According to Creswell (1998) and Yin (2013), conducting an exploratory case study is an appropriate method for examining the impact of a sudden phenomenon, like COVID, on a system. Because a food system includes different sets of characteristics for the food supply chain and for consumers, a mixed methods approach was used to gauge the impact across the whole system. This study combines the qualitative methods used by Hecht et al. (2019) to explore the ways food suppliers attach to issues and situations with the quantitative methods Van et al. (2010) used to capture data from the broadest sample among the population of consumers. The qualitative methods are outlined in **Section I** and the quantitative methods are outlined in **Section II** of this chapter.

## I. Interview Method and Approach: Food Suppliers

### *Stratified Sampling and Key Informant Selection*

Stratified purposive sampling was used to collect information from a diversity of food suppliers to illustrate the details unique to each sector and those in common between them (Creswell, 1998). Categories of food suppliers were identified using Hecht et al.'s (2019) list of key actors in a food system disaster response. The corresponding food suppliers for UW were identified through the Housing and Food Services (HFS) website (HFS, 2020). University waste management was also included as a key stakeholder. Cross referencing the food suppliers specified in a university pandemic planning tabletop exercise (Beaton et al. 2007) with UW's Comprehensive Emergency Management Plan (CEMP) (UW, 2020), The Office of Student Life and HFS were identified as the administrative departments responsible for ensuring the safety and supply of food on campus during an emergency. Through the Office of Student Life's website, the administrative staff responsible for addressing food insecurity on campus were identified as a food system stakeholder. Referencing an organizational chart of UW Dining (HFS, n.d.), a department within HFS responsible for providing food on campus identified a key administrative staff as a food system stakeholder.

A combination of telephone calls and e-mails were used to recruit 19 participants. Of those, 11 agreed to be interviewed including at least one representative from each sector of the food supply chain (see Table 1). All participants were 18 years or older. Interviews took place from July 27, 2020 to August 26, 2020. Interviews were conducted online using the remote conference platform Zoom and lasted between 23 to 105 minutes. Recordings were automatically transcribed. During the consent process, interviewees were informed that their participation was voluntary and confidential, and their identities would not be revealed in the study results. All participants provided verbal informed consent. The UW Human Subjects Division determined this component of the study did not involve "human subjects" as defined by federal regulations and did not require exempt status or IRB review.

Table 1. Food suppliers interviewed per food system sector

FOOD SYSTEM SECTOR	Stakeholder	n INTERVIEWED
Producer/Farmer	Indoor Farm, Vegetable Farm, Egg Farm	3
Manufacturer	Bakery	1
Wholesale distributor	National Wholesale Distributer	1
Retail	N/A	0
Food Service	Pizza Chain, Campus Dining	2
Food Recovery	Food pantry	1
Waste Management	Campus Waste Management	1
Administration/Policy	Office of Student Life, Housing and Food Services	2

n=11

### *General Outline of Interview Guides*

Three interview guides were created to account for differences between food providers, waste management, and UW administration. Questions in each interview guide were divided into the three phases of education continuity management disruption response outlined by the US Department of Education ([ED, 2013](#)) and Schätter et al., ([2019](#)): Phase 1) *Mitigation and Preparedness* are actions taken to prevent, lessen or eliminate the impact of an event or emergency. Phase 2) *Response* are actions taken to stabilize an emergency happening or certain to happen. Phase 3) *Recovery* are adaptive actions used to restore the situation back to its prior state. Questions were organized into six topic areas (food supply chain, food loss, labor/employment, transportation, economy, environmental public health, and future assessment) based on information from an informal literature review ([Kafarakis, 2020](#); [UW, 2020](#)). Questions were framed in a semi-structured format to allow for more detailed data from participants' free expression and from improvised follow-up questions based on participants' responses ([Galletta, 2012](#); [Rubin and Rubin, 2005](#)).

### *Food Supplier Interview Guide*

The structure, format, and contents of the food suppliers interview guide were modifications based on interview guides from two prior studies. One by Hecht et al., ([2019](#)) which assessed business continuity management and pandemic preparedness in an urban food system. The other by Peck ([2006](#)) which analyzed various ways that workers in the food manufacturing industry could be affected by a pandemic. Additional questions were inspired by an interview guide used by Burton ([2011](#)) that studied pandemic influenza preparedness and business continuity strategies among small and medium-sized businesses. Because farm workers are a particularly vulnerable population, another set of questions were added to the interview guide based on a list of socioeconomic factors Steege et al., ([2009](#)) identified that increased the risk of farmworkers' exposure to pandemic influenza. [Table 2](#) outlines the literature used to develop the questions in this interview guide. Questions in the final interview guide were organized by the following nine categories: stakeholder profile, food supply and production, labor/employment, transportation, environmental health/public safety, food loss/food waste, financial outlook, future assessment,

and organizational background (see [Appendix I](#)). The interview guide was not pre-tested due to limited time and the small sample of food suppliers available.

### *Waste Management Interview Guide*

The waste management interview guide was similar in structure and content to the food supplier interview guide. However, because the waste management sector exists downstream of the consumer and has a fundamentally different function and operation than those of food suppliers, the interview guide required some modifications. Instead of questions about food supply and production, the interview guide included questions about the food waste stream and input supplies. The interview guide (see [Appendix I](#)) was not pre-tested due to limited time and the small sample of stakeholders available.

### *Administration Interview Guide*

The university administration controls the flow of food from food suppliers to consumers. They determine the supply of food needed on campus and contract with food suppliers to meet consumer demand. The university administration interview guide was based on a qualitative study by Fillmore ([2011](#)) assessing the response of university administration to the Great Iowa Flood of 2008 (see [Table 2](#)). The interview guide was organized by the three phases of disruption response to specifically capture the changes of food availability on campus. The interview guide (see [Appendix I](#)) was not pre-tested due to limited time and the small sample of stakeholders available.

Table 2. Literature references for different stakeholder questions in interview guides

Stakeholder	Citation
Producer/Farmer	( <a href="#">Steegen et al., 2009</a> )
Manufacturer	( <a href="#">Hecht et al., 2019</a> ); ( <a href="#">Peck, 2006</a> )
Wholesale Distributer	( <a href="#">Hecht et al., 2019</a> ); ( <a href="#">Peck, 2006</a> )
Retail	( <a href="#">Burton et al., 2011</a> )
Food Service	( <a href="#">Hecht et al., 2019</a> ); ( <a href="#">Peck, 2006</a> )
Food Recovery	( <a href="#">Hecht et al., 2019</a> ); ( <a href="#">Peck, 2006</a> )
Administration	( <a href="#">Fillmore et al., 2011</a> )

## **II. Survey Method and Approach: Consumers**

### *Survey Development and Distribution*

An anonymous online cross-sectional survey (see [Appendix IV](#)) was designed to assess the impact of COVID on food consumers and gather data from a large subset of the population (any

individual affiliated with UW, including students, faculty, and staff) to better capture a range of experiences. The survey had 27 questions, grouped into three sections: 1) Frequency of visits to retail and food service locations 2) Food access 3) Food preparation and consumption behavior. Questions in each category referred to two time periods: Pre-COVID (January 1-March 8, 2020) and COVID (March 9-June 12, 2020). There were 25 demographic and background questions, including food security status, living situation, and student enrollment and employment status.

The first section included a list of food service and food retail establishments located on and off campus that were open during both pre-COVID and COVID (HFS, 2020). Food access and preparation/consumption questions were drawn from a survey Magnus (1994) used to assess food access after Hurricane Andrew. Their study included questions about problems and changes in food purchasing, food choice, and food preparation. Background and demographic questions were partially inspired by two studies on university populations that had experienced an outbreak of swine flu H1N1 (Mitchell et al., 2004; Van et al., 2010). Food insecurity status was determined using a two-screener survey (Hager et al., 2010). At the time the survey questionnaire was developed, literature on how to measure cultural food insecurity was not referenced. Instead, a Likert scale question was used for respondents to rate how often they felt they “had access to culturally relevant foods.” Table 3 outlines the literature used to develop different sections of the survey. All survey responses were optional.

Table 3. References to survey questions

Survey Section Topic	Citation
Changes in purchase visits to retail and food service locations	(HFS, 2020)
Changes in food access	(Magnus, 1994)
Changes in food preparation and consumption behavior	(Magnus, 1994)
Background and demographic info	(Mitchell et al., 2004; Van et al., 2010)
Food insecurity	(Hager et al., 2010)

The survey was created using the Qualtrics online platform. It was first piloted by a select sample of food system stakeholders (student n=1, staff n=2, faculty n=1, food supplier n=1, university administrator n=1). After making the suggested revisions and edits, an email was sent to 386 professors, student groups, university organizations, and departments requesting that the survey link be broadcast broadly among their contacts. This distribution process was repeated once a week for four consecutive weeks. In addition, staff from HFS posted twenty-four flyers publicizing the survey at campus residences over the course of four weeks between July and August. The survey opened on July 6, 2020 and closed on August 24th, 2020, a total of 51 days in operation. Each respondent was able to complete only one survey.

# Results

This chapter is divided into two sections to outline the impact of COVID on both the supply side and the demand side of the food system. **Section I** presents the findings from interviews with food suppliers. **Section II** presents the findings from the analysis of a consumer survey.

## I. Interviews with Food Supply Chain Stakeholders

Eleven food system stakeholders, including at least one food supplier from each sector of the food supply chain, were interviewed for this study (see [Table 1](#)). Interviews were analyzed using the methodology outlined by Saldaña (2009). Each interview recording was listened to, transcribed, and then listened to again to ensure the transcription accurately represented what each participant said. Excerpts that addressed the research aims were taken from the interviews and entered into a spreadsheet organized by seven of the categories listed in the food supplier interview guide: *operations*; *revenue*; *labor*; *products*; *transportation*; *environmental health & safety*; *food waste*. Six new categories were later added after the initial reading of the transcripts: *operation input*; *operation output* (the two were originally combined under the category *operation*); *customer experiences*; *worker morale/experiences*; *workplace environment*; *communication*. These excerpts were then organized temporally into the following four periods to outline the sequence of events: 1) disruptions; 2) disruption factors; 3) adaptations; 4) future planning. An additional category, *reflections*, was also added, but did not belong to any period. Each unique excerpt was then assigned a code—a word or phrase that represented the summarized content. Codes from two of the longest interviews were gathered into a new spreadsheet to formulate a preliminary codebook. Excerpts with different content were assigned a new code and added to the codebook, while excerpts with overlapping content were included under a pre-existing code. This reduced the potential for coding redundancies across interviews. The preliminary codebooks (see [Appendix II](#) and [Appendix III](#)) acted as a reference for coding the remaining interviews using the same methodology. The resulting codes from all of the interviews were then regrouped into common themes and examined for patterns.

Infrequent codes or codes with marginally relevant data were not considered for analysis. There emerged 238 unique codes from the 13 categories. Only the codes belonging to the categories *operations* and *labor* were selected for analysis because these categories best addressed the research aims. Codes under *operations* best illustrated what happened to the production of the food supply and how food suppliers responded to different situations. The operation of businesses and organizations along the food supply chain require a functional labor force and the transmission of COVID can put those workers at risk of infection and illness; therefore, codes in under *labor* best illustrated what happened to food supply operations and how food suppliers responded to different situations. Codes for these categories were sorted into two groups—**disruptions** and **adaptations**. The following subsections address each of the qualitative research aims, organized by category and group. Codes assigned to the two categories are depicted using graphic illustration, detailed descriptions, and supporting quotes.

### COVID-RELATED DISRUPTIONS TO THE FOOD SUPPLY CHAIN

## DISRUPTIONS TO OPERATIONS

The interview data analysis revealed four COVID-related disruptions to UW food supply chain operations: 1) A switch in demand from food service to retail 2) A shortage of some input supplies 3) Shutdown or reduced operations 4) Consumer panic buying of food staples. [Figure 3](#) depicts where along the food supply chain each occurred. The vertical axis lists the four disruptions along a scale with the greatest number of respondent food suppliers affected at the top to the least number affected at the bottom. The horizontal axis lists the sectors impacted by each disruption in the order that food flows from production to disposal. Below the figure are detailed descriptions of each disruption.

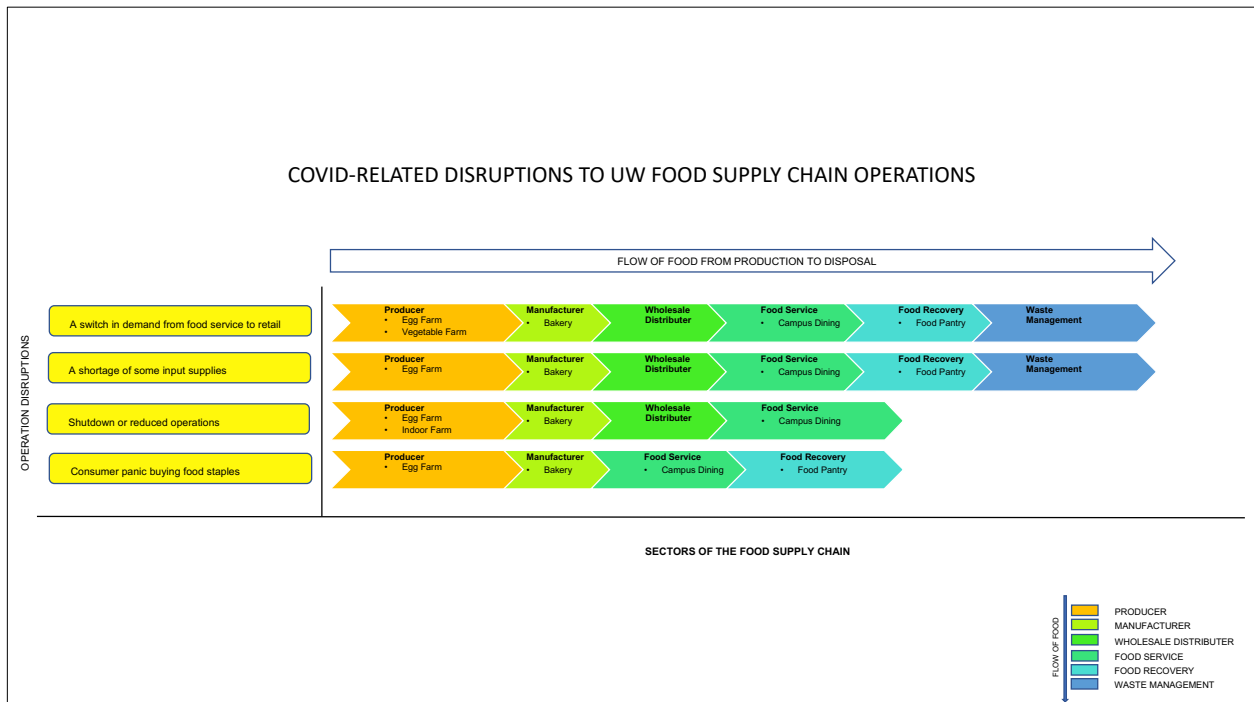


Figure 3. COVID disruptions to UW food supply chain stakeholder operations

### A Switch in Demand from Food Service to Retail

Every sector of the food supply chain had to adjust to a switch in market demand from food service to retail as a result of the culmination of three events: 1) the Governor’s emergency proclamation to shutdown dine-in service for restaurants and bars 2) the Governor’s Stay-At-Home declaration (see [Figure 2](#) for timeline of events) 3) consumer panic buying. The following examples highlight some of the challenges that food suppliers encountered (see the first disruption listed in [Figure 3](#)).

#### The Egg Farm

The egg farm's products are designed specifically for a particular market, and when the demand for the two markets switched, they struggled to balance their supply with the new change in demand. The Supply Chain Manager noted that they normally would sell 50% of their egg products to retail and 50% of their egg products to food service. However, by the second week of March their business had shifted to become 90% retail and 10% food service:

*We had a business very intentionally designed to use every kind of egg we could; and retail is not necessarily designed to use every different type of egg...managing inventory is really difficult when you know business was not designed for this.*

An egg shortage in both food service and retail markets forced some food service businesses to purchase eggs sold in the retail market. However, because eggs sold in retail are generally of higher value and sold at a higher price relative to the food service market, the same Supply Chain Manager also noted that it was difficult for some food service businesses to afford these eggs at a time when their revenue was already decreasing:

*All the food service business that's left, they're all struggling. So it's a lot harder for people to say, 'I'm going to pay extra to get organic and organic liquid eggs, or pasteurized or something.'*

The egg farm experienced a sudden increase in demand for many of their products in the retail market, but this demand was not uniform across all products. For example, demand increased for organic and pasture raised eggs. However, conventional liquid eggs, which usually has a demand in the food service market, did not have enough of a demand in the retail market to offset the drop in sales from food services. In the end, the egg farm had to donate one million servings of liquid eggs to food banks and composted the rest.

### The Vegetable Farm

A switch in sales from food service to retail changed the business model of a vegetable farm. The vegetable farm lost between 90-95% of revenue (about \$12,000) when university dining services stopped purchasing their food. At around the same time, however, the vegetable farm experienced an increase in sales of community supported agriculture (CSA) subscriptions. When consumers were largely confined to making meals at home, the CSA subscriptions provided them with a weekly box of farm fresh produce that they could pick up themselves in a low-risk outdoor environment. During the pandemic, CSA shares for the vegetable farm increased 26% from 60 to 76 shares for the first time in the farm's 16-year history.

### The Bakery

Large food service centers such as university campuses, tech campuses, and airports have enough market buying power to affect the operations of many businesses upstream in the food supply chain. COVID highlighted the influence of these large centers when demand switched from food service to retail, and consumer traffic at these venues dramatically decreased. A Food Safety/Quality Assurance Director at a bakery explained that many of their donuts, danishes, and

breakfast pastries were sold in small coffee shops or kiosks, and when these venues lost consumers, sales of their retail products took a “sharp decline”.

### The Wholesale Distributer

A National Account Executive at a wholesale distributor said that there was an increasing demand for both disposable and take-out containers for their food service customers that remained open as well as an increase in grab-n-go items that customers could heat themselves at home:

*A lot of our customers are now buying disposables and take-out items, like containers. So we had to focus more on bringing in a lot of disposable items and take out items and, you know, take out utensils. So we have to focus more on those than what we were using before...I know a lot of our customers, especially my customers, were looking for grab-n-go items, stuff that you really can't cook. A lot of easy grab-n-go that customers can just take heat up themselves and go.*

### Waste Management

A switch in sales from food service to retail also had an impact on downstream sectors. Campus waste management reported that compost decreased 270 tons from April-June 2020 compared to the same quarter last year. Sixty percent of the decrease came from residence and dining halls because students left campus and numerous campus food service establishments closed. As a result, they cut their food waste collection schedule, from at a high of 6 times a week to once a week.

## **A Shortage of Some Input Supplies**

The combination of a switch in demand from food service to retail, the shutdown and reduction of food supplier operations, and consumer panic buying caused shortages of some input supplies at every sector of the food supply chain (see the second disruption listed in [Figure 3](#)). The following examples highlight some of the challenges that suppliers encountered.

### The Egg Farm

The combination of a shift in sales from food service to retail and consumer panic buying had created a high consumer demand for eggs at retail establishments everywhere. This situation caused the egg farm to compete with other egg farms for the same limited supply of egg cartons. The egg farm normally uses different packaging for eggs sold to food service and retail markets. This meant that when the demand for eggs in food service decreased and the egg farm had a surplus of those cartons, they could not substitute that packaging for the shortage in retail egg cartons they were experiencing.

### The Wholesale Distributer

The wholesale distributor experienced a shortage in meat products as a result of both panic buying and some meat suppliers shutting down their operations:

*You know, there was beef shortages, there was pork shortages. First there was toilet paper because everybody was buying, the demand overcame what the supply was and with a lot of the plants closing down on the center of the plate, which is the protein, we were running into some issues there.*

### The Food Pantry

Downstream sectors also experienced a shortage of input supplies. Panic buying in March made it difficult for the food pantry to purchase some food staples like rice. Then in April, a food bank that was one of their primary low-cost food suppliers stopped selling to them and redirected their sales to other food pantries instead.

## **Shutdown or Reduced Operations**

The public health and safety guidelines to slow the spread of COVID caused some upstream businesses to shut down or reduce their operations (see the third disruption listed in [Figure 3](#)). On March 9, 2020 UW canceled all in-person classes and instituted remote learning for all coursework (see [Figure 2](#) for timeline of events). As a result, food suppliers located on campus either lost their customer base or their operating space. The following examples highlight some of the challenges that food suppliers encountered.

### The Indoor Farm

A student-run indoor farm located on campus had to stop their entire operation because they could no longer access their supplies and equipment when the building they used closed down.

### Campus Dining

Nine campus food service establishments remained open during COVID out of 38 and only one out of the four retail establishments remained open ([HFS, 2020](#)). The establishments that continued operating experienced a reduction in customer traffic. “We went from, you know, full speed to really doing 10 to 15% of our business,” said a cook from campus dining.

### The Bakery

Because many food suppliers often require in-person work, and COVID can spread more rapidly when people are indoors in close proximity, businesses shut down their operations whenever workers fell ill as a prevention measure. For example, the bakery, being a rather large operation, had to take dramatic actions whenever a worker had contracted the virus, came into contact with someone infected, or displayed any symptoms of illness:

*We've shut down whole departments and shorted orders, because yeah, it's just not worth it for us to shut down the plant right? So it's easier to get in front of that*

*concern and keep everybody out, even if it means shorting orders from a department versus shutting down the plant.*

### The Wholesale Distributer

The public health and safety measures implemented by some businesses also impacted the amount of inventory available to businesses downstream. For example, the wholesale distributor had a shortage of products because some of their food suppliers had shut down their operations:

*A couple of the plants that manufacture the food shut down because of COVID; either because employees were, you know, tested positive, they have to shut down for so long, clean and then bring it back up.*

### **Consumer Panic Buying Food Staples**

During the first few weeks of the pandemic, in mid-March, there were shortages of both shelf-stable and staple food products (e.g., eggs, dairy, flour, bread, etc.) at retail establishments because of the statewide stay-at-home orders and consumer stockpiling. At that time, COVID was not well understood and there was a lot of public anxiety about the unknown ([Altstedter & Hong, 2020](#)). This consumer behavior caused shortages of raw materials and supply inputs, and redirected product operations in businesses and organizations upstream and downstream of the consumer (see the fourth disruption listed in [Figure 3](#)).

### The Bakery

The bakery faced shortages of flour and eggs:

*So all of a sudden there was a shortage of liquid eggs in the supply chain to us. And we were shorted. In fact, we've been shorted on eggs several occasions. And now, most recently flour. Where the farmers can't keep up with the demand for people running out to buy bread, you know, the staples, eggs, bread, flour, milk.*

### The Food Pantry

Consumer panic buying also affected food recovery. A surge in retail demand affected the food pantry's ability to find food staples at Costco. "When people started panic buying and hoarding, it took weeks before I got rice", the Pantry Coordinator said.

## **ADDITIONAL CONSIDERATIONS FOR OPERATIONS**

The interview data indicated that businesses and organizations experienced other events during COVID that could not be categorized as disruptions. Because these events still affected the food supply chain, they may provide important information to note, and are therefore listed here.

## Supply of Some Inputs Unaffected

### The Vegetable Farm, The Egg Farm, and the Indoor Farm

The supply of products sold in the commercial retail market, were largely unaffected by panic buying. For example, there was no shortage of commercial supplies like farm equipment, chicken feed, egg-laying hens, or plant growing medium.

### Pizza Chain

Food supplies for the pizza chain were mostly stable. A Customer Service Manager there explained that they only experienced a shortage of spicy pepperoni from a local vender, but they did not present that as a supply chain disruption since the same vender provided them with an oversupply of meatballs.

## An Increase in Some Input Supply

### The Food Pantry

Many individuals, campus organizations, and departments organized food drives that ultimately helped the food pantry maintain a stable supply of food. The food pantry had to acquire additional cold storage units from the university and campus dining to accommodate the influx of perishable foods.

In addition to an increase in food donations, the food pantry also received an influx of financial donations. Corporations that had never given largess to the food pantry before were donating thousands of dollars to them, and students were donating the unspent money on their student cards as they moved off campus. "It's been great. It sounds a bit weird to say that the pandemic has been great for us financially. It's because more people are aware of us and more people want to give us money," said the Food Pantry Coordinator.

## DISRUPTIONS TO LABOR

There were two major disruptions to the UW food supply chain labor force as a result of COVID. [Figure 4](#) illustrates these disruptions. The vertical axis lists the two disruptions along a scale with the greatest number of food suppliers affected at the top to the least number affected at the bottom. The horizontal axis lists the sectors impacted by each disruption in the order that food flows from production to disposal. Below the figure are detailed descriptions of the two labor disruptions.

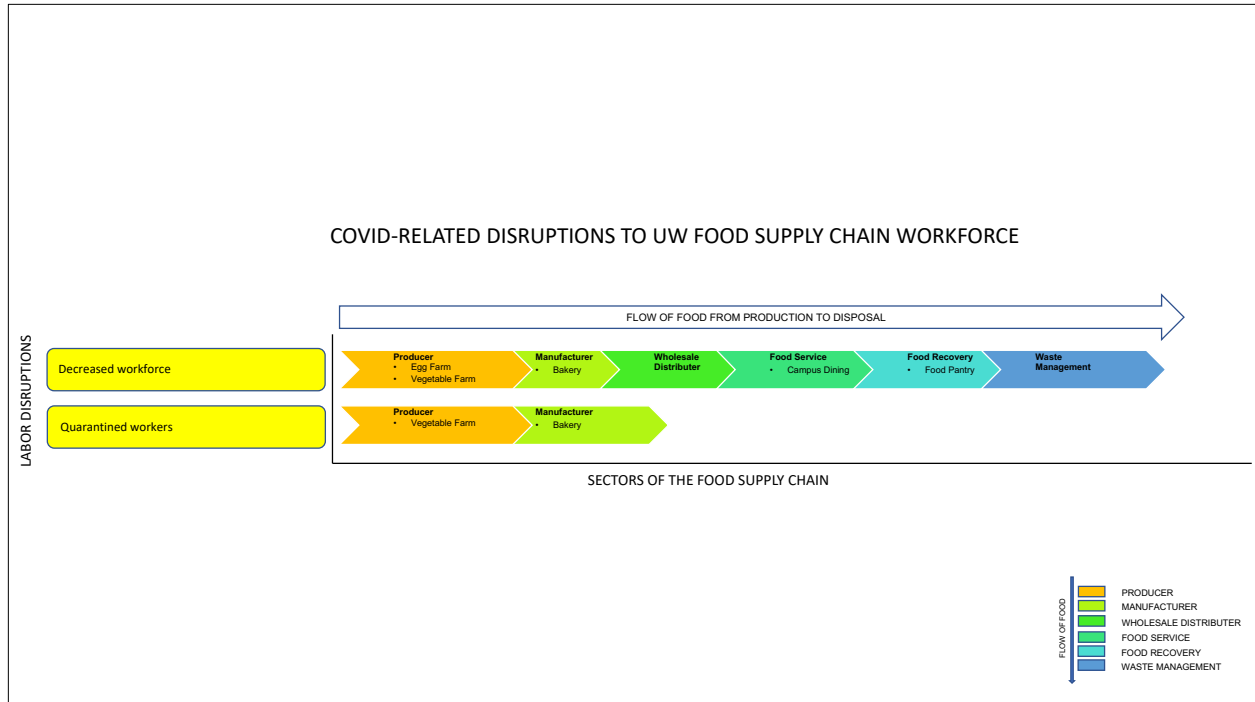


Figure 4. COVID disruptions to UW food supply chain labor

## Decreased Workforce

The revenue gained from the increase in demand in retail did not completely offset the loss in revenue that resulted from a decrease in demand in food service. Businesses had to furlough employees and/or reduce their workhours (see first disruption in [Figure 4](#)). The following examples highlight some of the disruptions that food suppliers encountered.

### The Vegetable Farm

Each spring quarter, the vegetable farm receives roughly 300 student volunteers. When all classes became remote due to COVID, the vegetable farm lost all volunteer labor, and everything had to be done by only two paid staff.

### The Bakery

A large portion of the bakery's revenue came from its sales to food service clients. When many of these clients reduced or stopped their operations, the bakery started to lose revenue. As a result, the bakery had to reduce their labor force by letting some of their employees go:

*We used to employ between 140 and 150 maybe 160 tops. Within two weeks we had cut the labor force in half.*

### Campus Dining

The university dining service closed 29 food service locations and the nine that remained open had reduced hours of operation. Because of the reduced campus operations, the university dining service first laid off student workers, then furloughed hourly workers.

### The Food Pantry

Some organizations and businesses allowed their employees or volunteers with underlying health conditions to work remotely. Not all jobs, however, could be done this way, and accommodating employee's health needs posed a challenge for some businesses and organizations. For example, the gleaning intern at the food pantry decided to work from home, but because they could not actually do their job remotely, and because the vegetable farm was donating a larger portion of its produce to the food pantry, the loss of the gleaning intern at a critical point in time had a big effect on the food pantry's operations and labor force. "We lost the gleaning intern at the most critical time for the gleaning," said the Food Pantry Coordinator.

### **Quarantined Workers**

When individuals contracted the virus, came into contact with someone infected, or displayed any symptoms of illness, businesses and organizations either had to quarantine their workers or stop their operations completely (see second disruption in [Figure 4](#)).

### The Vegetable Farm

After the university administration granted the vegetable farm permission to hire more staff, they would lose one student staff a week due to them having to quarantine. This constant staff rotation prevented the vegetable farm from having a consistent work schedule and slowed down their operations.

## **ADAPTATIONS TO FOOD SUPPLY CHAIN COVID-RELATED DISRUPTIONS**

### **ADAPTATIONS TO OPERATION DISRUPTIONS**

Food suppliers employed different adaptive strategies to overcome the various disruptions to their operations. [Figure 5](#) is a graphic summary of these findings. The vertical axis lists the two adaptations along a scale with the adaptation used by the greatest number of food suppliers at the top to the least number at the bottom. The horizontal axis lists the sectors that adapted to each disruption in the order that food flows from production to disposal. Below the figure are detailed descriptions of these adaptations.

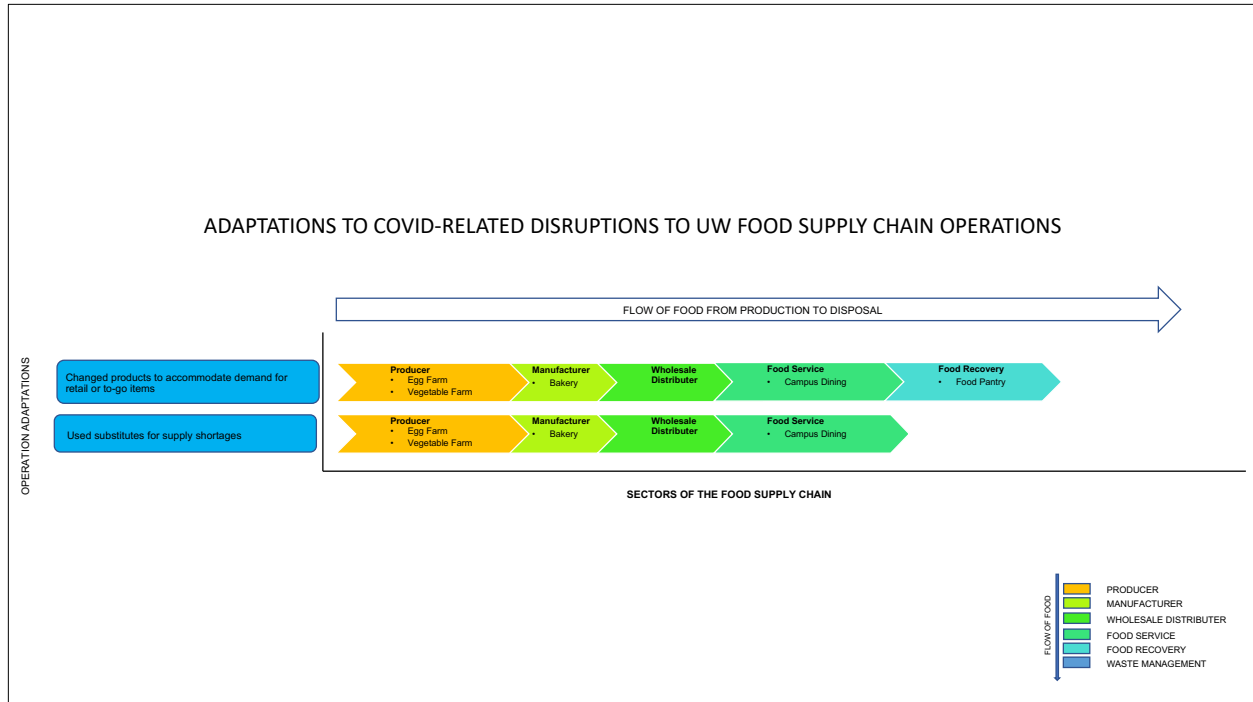


Figure 5. UW food supply chain adaptations to operations disrupted by COVID

### **Changed Products to Accommodate an Increased Demand for Retail or To-Go Items**

Businesses and organizations in the food supply chain had to reorganize their operations to adapt to the decrease in demand for food service products and increase in demand for retail products. One of their adaptive strategies was to change their products to meet the increasing demand for take-out and to-go items (see the first adaptation listed in [Figure 5](#)). The following examples highlight some of the particular adaptive strategies used by suppliers.

#### The Egg Farm

The egg farm had to transition from selling their medium-sized eggs from food service to retail. According to their Supply Chain Manager, medium eggs are normally not desirable in retail and are often sold as hard-boiled eggs to food service. But because so much of the food service market vanished, the egg farm had to market their medium eggs in retail. Because there was such high demand for all fresh eggs in retail as a result of consumer panic buying, they did not have any problem with this, and were able to sell fresh medium eggs in high quantities.

#### The Vegetable Farm

Some consumers who were concerned over their health and safety saw the advantage of purchasing CSA subscriptions from the vegetable farm, especially when travel and in-person interactions were limited. Unlike purchasing produce at a farmer's market or directly on site, CSA subscriptions were purchased online. The online retail portal posed a challenge to some older clientele who were less technologically literate. To accommodate their new clientele, the Production Manager had to teach them how to use the website to buy what they wanted.

The produce for each CSA order was packaged into plastic totes that were sanitized before and after every use to maintain a high level of health and safety. The shift from one large food service buyer to several individual CSA shareholders required more time and effort for the vegetable farm staff to sell their products.

### The Bakery

The bakery saw a decrease in demand for baked goods sold at food service establishments because many of their clients either had to shut down or saw a dramatic decrease in consumer traffic. However, when many consumers were spending much of their time sheltered at home, it created a burgeoning direct-to-consumer product market. A couple of their online retail clients took advantage of the situation and marketed frozen heat-n-eat cinnamon rolls to consumers:

*The cinnamon roll, for whatever reason, they think people stay at home, and there they may be more apt to eat. The good ol' sugary sweet stuff. I think there's a psychology there too, and other kind of sugary sweet stuff. You know, at least in terms of cinnamon rolls have gone, you know, crazy!*

### The Wholesale Distributor

The wholesale distributor had to make adjustments to some of their products to meet the university's requests for to-go items. For example, soup to-go was a popular new item and they had to package the soups to include nutritional information and cooking instructions.

### Campus Dining

At an on-campus food service location, the majority of food was precooked, and consumers served themselves in the dine-in environment, with only 10% of the food cooked to order. During COVID that completely changed when dine-in service ended, and everything had to be cooked to order.

### The Food Pantry

Before COVID, the food pantry operated under an in-person client choice model where clients shopped for what they wanted. In order to reduce in-person contact among the volunteers and clients, the Pantry Coordinator stopped allowing in-person visits and offered an online ordering instead (See [Figure 2](#) for a timeline of events). They created a Google Form for clients to request the items they wanted. The clients then were able to pick up their order at the pantry when it was ready. This reduced the in-person contact time from 15 down to five minutes. The remaining five minutes was the time the client spent transferring food from their pre-packed shopping basket to their own bags.

<b>Used Substitutes for Supply Shortages</b>
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Businesses used product substitutions to make up for supply shortages that resulted from panic buying or COVID public health measures (see the second adaptation listed in [Figure 5](#)). The following examples highlight some of the particular adaptive strategies used by various food suppliers.

### The Egg Farm

In order to overcome the egg carton shortage, the egg farm worked with their retail client to sell eggs in flats or used other non-traditional packaging.

### The Vegetable Farm

The vegetable farm was unable to receive the seed orders during COVID because seed companies were also experiencing a demand shock due to panic buying.

### The Bakery

Sometimes the bakery had to substitute what they had in their inventory, which was more expensive, for less expensive ingredients that were unavailable. For example, they already had organic liquid eggs in stock when the panic buying started, and they used this as a substitute for shortages in conventional liquid eggs.

The bakery was also able to make some substitutions with help from their supply distributor. For example, when they experienced a shortage of flour, their supply distributor, who was already very familiar with their products, was able to analyze the recipe profile to find a close enough substitute, “so it changes the characteristics but if you're not a connoisseur of bread, per se, it's difficult sometimes to see the changes,” said the Food Safety/Quality Assurance Director.

### Campus Dining

Panic buying also caused supply shortages for campus dining. Normally, cooks would design a menu and then order the necessary ingredients. However, due to food shortages, they now took an inventory of the available food supply and then designed the menu accordingly.

Campus dining also experienced a supply surplus as a result of COVID public health measures. When many students left campus either because classes switched to remote learning or because the Governor's stay-at-home order did not allow them to return, the campus consumer population dropped, and campus dining had to compost their unused surplus. To reduce food waste, the university dining administration took the inventory from closed units and created a central commissary to store surplus food stock. Food service units then used this shared commissary to shop for the ingredients they needed.

### The Wholesale Distributer

COVID public health measures were another cause of food supply shortages. Meat processing factory operations had to temporarily stop when their workers were infected with COVID. This

resulted in a shortage of supplies downstream from them. For example, because some meat manufacturing facilities shutdown, the wholesale distributor faced a shortage of meat products. To supply their clients with the missing products, they sourced substitutes from different internal divisions, other purveyors, or other manufacturers.

**ADDITIONAL CONSIDERATIONS FOR OPERATION RESPONSES**

The interview data indicated that businesses and organizations experienced other responses to COVID-related disruptions that could not be categorized as adaptations. Because these events still affected the food supply chain, they may provide important information to note, and are therefore listed here:

**Preparation of Product Supplies Pre-COVID**

The Vegetable Farm

The Manager of the vegetable farm had planned what they were going to grow next season by December and had already purchased seeds the following January to ensure that they had access to what is usually a limited supply of organic seeds. This meant that pre-COVID, they had already purchased 80% of their seeds, enabling them to still operate despite the shipping delays that eventually occurred. They used leftover seed reserves from last year’s season to cover the remaining 20% of seedstock.

The Food Pantry

The Department of Public Health visited the food pantry in January 2020 and recommended they use a pink surface cleaner, commonly used in food service establishments, instead of bleach as a disinfectant. This switch isolated the food pantry from the shortage of bleach that occurred during panic buying. In another instance, when the Pantry Coordinator started hearing news about a new coronavirus outbreak in China in February 2020, they put out hand sanitizer for everyone to use, and then a week later required all volunteers and visitors to wear gloves. They enacted these precautionary steps weeks before anything of the sort was advised by public health officials.

Campus Dining

As outlined in the university’s emergency management plan, university dining services was able to receive a majority of its food supply because it had contracts with national wholesale distributors that guaranteed an uninterrupted delivery of food and supplies. If a product was unavailable, the wholesale distributor was responsible for providing a substitution.

**ADAPTATIONS TO LABOR DISRUPTIONS**

Businesses and organizations employed four strategies to adapt to the disruptions in the labor force (see [Figure 7](#)). The vertical axis lists these adaptations along a scale with the adaptation used by the greatest number of food suppliers at the top to the least number at the bottom. The horizontal axis lists the sectors that adapted to each disruption in the order that food flows from production to disposal. Below the figure are detailed descriptions of the four strategies

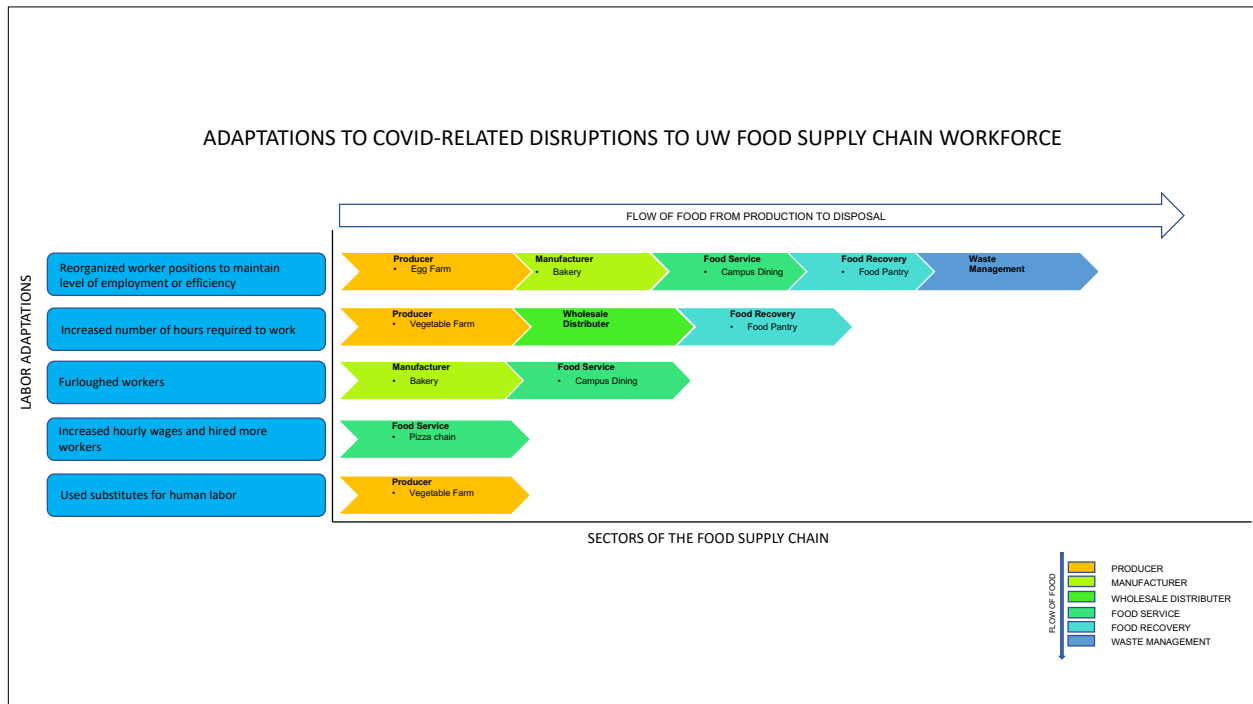


Figure 6. Adaptive strategies employed by UW supply chain suppliers in response to COVID-related disruptions

### **Reorganized Worker Positions to Maintain Level of Employment or Efficiency**

Businesses and organizations in the food supply chain reorganized their labor force to maintain a level of employment or efficiency (see the first adaptation listed in [Figure 6](#)). The following examples highlight some of the particular adaptive strategies used by food suppliers.

#### The Egg Farm

The egg farm had to move many of their employees around for the health and safety of their workers and to continue operating. For example, they tried to protect employees with high-risk medical conditions by letting them stay at home. Although these employees could no longer work, the egg farm still kept them on payroll with the help of a business loan from the Federal Small Business Administration's Paycheck Protection Program. To make up for the temporary absence of these employees, they reassigned workers to new departments.

Employees that worked in departments where they had to stand side-by-side and could not be protected by a plexiglass barrier were required to wear respirators and face shields instead. The use of such cumbersome personal protective equipment made working in an already crowded

environment even more uncomfortable. To alleviate the stress and fatigue of these workers, the egg farm rotated them in and out of the close-quartered environments more frequently than usual.

### The Bakery

The bakery also had to reorganize their staff structure to replace the workers that were absent or furloughed:

*We also have changed our shifts. One, to help accommodate for social distancing that is required now through state guidelines for essential workers. And two, to help redefine or better capture the efficiencies of labor.*

### Campus Dining

University dining services had to keep their unionized workers employed as part of their contract with the union. They placed them in new departments and reorganized their staffing structure to replace the workers that were absent or furloughed.

Workforce restructuring was possible largely because of the assembly line manufacturing process. In this system, products are assembled through a series of sequential steps, and often these steps are completed by different workers. Here, workers are generalists, and can complete an array of small or simple tasks. This makes it possible to replace one worker for another. This is in contrast to a specialized manufacturing process which requires workers to have the knowledge and ability to complete a series of large or complicated tasks. In this instance when a major disruption occurred, the interchangeability of workers helped to maintain a level of operational resilience.

### **Increased the Number of Hours Required to Work**

The rapid switch in demand from food service to retail compounded by panic buying required food suppliers to extend the amount of their time employees worked (see the second adaptation in [Figure 6](#)).

### The Vegetable Farm

The two full-time staff at the vegetable farm had to work 80 hours a week, 7 days a week, for six weeks straight because they lost thousands of volunteer hours when classes became remote. Despite the shortfall of workers, the vegetable farm was still able to operate because “the timing (of COVID) actually was not too bad”. Since university dining service, which was the primary buyer for the vegetable farm, had dramatically reduced their operations and were no longer purchasing produce from them, the staff were able to reduce what would have been an even greater workload by focusing their efforts on maintenance rather than production or distribution. In addition, because the switch to remote learning had happened early enough in the growing season, there wasn’t as much work that needed to be done compared to if the switch happened sometime later in the season.

### **Furloughed workers**

When the Governor shutdown restaurants and bars for dine-in service and then shortly followed that emergency proclamation with a Stay-At-Home order, many food service and retail businesses could not keep all of their employees on payroll and had to furlough some of their workers.

#### The Bakery

A week after the Governor issued a Stay-At-Home order, the salaried staff were furloughed and could only work part-time so that the hourly staff could continue to work at an hourly rate. With the reduced workforce, everyone had to work even more hours. Being paid at the same rate for working more hours meant that workers were being paid less. The company promised their employees that if they agreed to work for less pay during that temporary period, they would be financially compensated for their lost wages after business rebounded (see the third adaptation in [Figure 6](#)).

### **Increased hourly wages and hired more workers**

#### The Pizza Chain

Unlike other food suppliers that had to furlough workers or reduce worker pay, the pizza chain had to hire more workers, and gave them bonuses as a result of increased business. Although the company had to close down their stores on campus, they were still taking in record profits. When people were confined to their homes, the demand for food take-out and home-delivery “sky-rocketed.”

### **Used substitutes for human labor**

#### The Vegetable Farm

In place of hundreds of volunteers working on the vegetable farm, the staff had to devise alternative methods to do tasks that would have ordinarily been done by hand (see the fourth adaptation in [Figure 6](#)). For example, the staff laid reams of black plastic down between rows of crops to act as a weed suppressant, a task normally completed by hundreds of volunteers.

## **ADDITIONAL CONSIDERATIONS FOR LABOR RESPONSES**

Businesses and organizations had other responses to COVID that could not be categorized as adaptations. These responses still affected the labor force and may provide important information to note. An example of this is listed below:

### **Change the operation function**

## The Vegetable Farm

Businesses and organizations were confronted with an abundance of food waste as a result of food service establishments closing or reducing their operations. When the vegetable farm no longer had volunteers, the Manager did not want to throw away hundreds of pounds of unharvested vegetables while a growing number of students were at risk of food insecurity. Faced with this dilemma, they had to find a different way to recruit a workforce other than the model of utilizing service-learning volunteers. Their solution was to shift their operation from a sales model to a donation model and appeal to the university administration's obligation to provide food to students:

*If you shut the farm down, there will be no supply to the pantry. And also, you know, how do I put this? The farm food should feed everybody, not just people who can pay. And during COVID-19 there were real discussions about who our university farm feeds, and the budget, and during a pandemic how do you balance revenue with the population that needs food the most? So, for whatever product you're producing, any university is producing, how do you direct your focus to those people that need it the most?*

The vegetable farm created a Memorandum of Understanding with the food pantry that designated its produce for direct student use. After signing this agreement, the university administration declared the vegetable farm an essential operation, and it was permitted to hire more staff and have a limited number of volunteers.

## II. Survey of UW Food Consumer Population

Consumer experiences were collected using surveys and then analyzed using quantitative methods. There was a total of 725 surveys included in the analysis<sup>1</sup>. The raw data was downloaded from the Qualtrics online survey platform and then analyzed in matrices using Microsoft Excel 365.

### Descriptive Statistics

Respondents' demographic characteristics such as age, gender, ethnicity, race, international status were collected along with information about dependents (see Table 4).

Table 4. Demographic descriptive statistics

Demographic Characteristics	Response Categories								
<b>Age</b>	<b>18-22</b>	<b>23-26</b>	<b>27-30</b>	<b>31-40</b>	<b>41-50</b>	<b>51-60</b>	<b>61-64</b>	<b>65 and older</b>	<b>Prefer not to answer</b>
n = 528	261 (49.4%)	73 (13.8%)	60 (11.4%)	72 (13.6%)	36 (6.8%)	14 (2.7%)	6 (1.1%)	4 (0.8%)	2 (0.4%)
<b>Gender</b>	<b>Female</b>	<b>Male</b>	<b>Trans</b>	<b>Non-binary</b>	<b>Gender non-conforming</b>	<b>Prefer not to answer</b>	<b>Prefer to self-describe</b>		
n=504	379 (75.2%)	97 (19.3%)	4 (0.8%)	14 (2.8%)	7 (1.4%)	1 (0.2%)	2 (0.4%)		
<b>Hispanic or Latinx</b>	<b>Yes</b>	<b>No</b>	<b>Prefer not to answer</b>						
n = 531	57 (10.7%)	469 (88.3%)	5 (0.9%)						
<b>Race</b>	<b>White</b>	<b>African American or Black</b>	<b>Asian</b>	<b>American Indian or Alaska Native</b>	<b>Native Hawaiian or Pacific Islander</b>	<b>Other</b>	<b>Prefer not to answer</b>		
n = 529	308 (58.2%)	3 (0.6%)	148 (28%)	6 (1.1%)	3 (0.6%)	45 (8.5%)	16 (3%)		
<b>International student</b>	<b>Yes</b>	<b>No</b>	<b>Prefer not to answer</b>						
n = 526	47 (8.9%)	478 (90.9%)	1 (0.2%)						
<b>Have Dependents</b>	<b>Yes</b>	<b>No</b>	<b>Prefer not to answer</b>						
n = 517	64 (12.4%)	452 (87.4%)	1 (0.2%)						

Note: Data compiled from 725 surveys. n is the number of respondents per question.

Respondents' employment and student enrollment status was collected (see Table 5). Employment levels did not significantly change for non-students. Unemployment increased significantly by 10.6% among students during COVID. Part-time student status decreased significantly by 11.1% during COVID.

Table 5. Employment and student enrollment status pre-COVID and COVID

Period	Employment/ Student Enrollment Status							
	Unemployed/ Not a student	Unemployed/ Student	Part-time/ Not a student	Full-time/ Not a student	Part-time/ Student	Full-time/ Student	Other	Prefer not to answer
	7 (1.3%)	150 (28.8%)	18 (3.5%)	88 (16.9%)	201 (38.6%)	46 (8.8%)	9 (1.7%)	2 (0.4%)

<sup>1</sup> There were 774 survey submissions. Surveys that answered question 3, "SINCE January 1, 2020, have you ever eaten food from any on-campus food sources? (Select all that apply)", were determined to be included in the analysis. Excluded from this analysis were 49 survey submissions that did not meet this criterion. Each survey question was optional, therefore the response rate varied per question.

pre-COVID n = 521									
COVID n =	521	10 (1.9%)	202 (39.4%)	20 (3.9%)	85 (16.6%)	141 (27.5%)	42 (8.2%)	11 (2.1%)	2 (0.4%)
<i>p-value</i>		0.44	<.001	0.71	0.89	<.001	0.71	0.63	0.99

Note: A two sample T-Test was computed to determine if the changes in employment/student status between pre-COVID and COVID were significant. Data compiled from 725 surveys. n is the number of respondents per question.

Respondents' housing characteristics such as residence, household composition, and change in residence were collected (see Table 6). The decrease in respondents living on-campus and increase in respondents living with parents/guardians during COVID can possibly be attributed to: 1) the Governor declaring a Stay-At-Home order during the middle of Spring Break when students could have been visiting their relatives/guardians and thereafter had to stay with them 2) because classes in the Spring Quarter were all conducted remotely, students possibly felt safer or more comfortable living elsewhere and decided to move.

Table 6. Consumers' housing situations pre-COVID and COVID

Period	Categories	Options					
		Residence hall	Sorority/fraternity house	On-campus apartment	Off-campus	Other	Prefer not to answer
pre-COVID	<i>Residence</i> n = 536	87 (16.2%)	22 (4.1%)	29 (5.4%)	380 (70.9%)	17 (3.2%)	1 (0.2%)
COVID	n = 215	6 (2.8%)	4 (1.9%)	6 (2.8%)	167 (77.7%)	32 (14.9%)	0 (0%)
	<i>Household composition</i>	<b>Roommates/ Housemates</b>	<b>Parents/Guardians</b>	<b>Lived alone</b>	<b>Prefer not to answer</b>		
pre-COVID	n = 514	383 (74.5%)	52 (10.1%)	66 (12.8%)	13 (2.5%)		
COVID	n = 203	47 (23.2%)	144 (70.9%)	10 (4.9%)	2 (1%)		
	<i>Moved during COVID</i>	<b>Moved</b>	<b>Stayed</b>	<b>Prefer not to answer</b>			
	n = 519	203 (39.1%)	310 (59.7%)	6 (1.2%)			

Note: Data compiled from 725 surveys. n is the number of respondents per question.

Respondents' food security status and benefits such as the UW Food Security Grant and Supplemental Nutrition Assistance Program (SNAP) were collected (see Table 7). The percentage of respondents that identified as food insecure pre-COVID (21%) was about twice the 2019 national average of 10.5% (Coleman-Jensen et al., 2019) and slightly than the 26% found to be food insecure on UW tri-campuses in a (2019) study by Fyall et al. The percentage of respondents that reported as being culturally food insecure was about 25% more than the percentage of respondents that were food insecure both pre-COVID and during COVID. Consumer food security status and benefits did not significantly change between pre-COVID and COVID.

Table 7. Consumers' food security status and benefits pre-COVID and COVID

Period	Food Security Status			
	Food insecure	Culturally food insecure	UW Food Security Grant recipient	SNAP recipient
Pre-COVID	113 (21.4%) n = 529	243 (46%) n = 528	8 (1.5%) n = 520	12 (2.3%) n = 518
COVID	133 (25.3%) n = 526	273 (50.1%) n = 545	8 (1.6%) n = 509	18 (3.5%) n = 513
<i>p-value</i>	.13	.86	.97	.26

Note: A two sample T-Test was computed to determine if food security status and benefits changed significantly between pre-COVID and COVID. UW Food Security Grant is \$100 grants for emergency assistance to purchase food at any HFS dining hall and on-campus market. Data compiled from 725 surveys. n is the number of respondents per question.

**CHANGES IN FREQUENCY OF RETAIL AND FOOD SERVICE PURCHASES**

**Frequency of Food Service and Food Retail Purchase Visits**

Respondents identified how many times per week (0-21) they purchased prepared food at specific campus food service establishments (see Table 8). Only the food service establishments in operation during both Winter and Spring Quarters of 2020 were listed on the survey. Respondents visited restaurants on campus significantly less (Center Table, Local Point, and the Rotunda). Respondents visited two of the coffee shops at the center of main campus significantly less (Husky Grind at District Market and Nook). Although the average number of visits did decrease at all establishments, some of the changes were not significant. Respondents did not significantly change the frequency of visits to the following establishments: 1) Café 815, which is located at UW Medicine in South Lake Union, which services the working professionals from the surrounding business district. 2) District Market, a campus grocery store with a full-service deli. 3) Pagliacci, a local pizza chain 4) The Starbucks Coffee Truck. 5) Tower Café, located adjacent to the main campus, and serves primarily the university faculty and staff working in that building.

Table 8. Average number of reported purchase visits per week at a UW food service location pre-COVID vs. COVID

Time Period	UW Food Service Locations										
	Café 815	Center Table	Dawg Bites	District Market	Husky Grind @ District Market	Local Point	Pagliacci @ Willow Hall	Rotunda	Starbucks Coffee Truck	Nook	Tower Cafe
Pre-COVID (n)	0.9 (152)	3.2 (181)	N/A	3.3 (280)	2.3 (199)	2.8 (182)	1.6 (145)	2.1 (153)	1.5 (121)	2.8 (129)	1 (105)
COVID (n)	0.7 (111)	1.2 (128)	0.7 (112)	2 (152)	1 (127)	1.6 (126)	0.9 (118)	0.7 (112)	0.9 (116)	1.4 (119)	0.6 (105)
<i>p-value</i>	0.52	<.001		0.05	<.001	0.04	0.06	<.001	0.08	0.01	0.2

Note: A two sample T-Test was computed to determine if the changes in purchase visits between pre-COVID and COVID was significant. No respondents visited Dawg Bites pre-COVID, therefore a p-value could not be calculated. Data compiled from 725 surveys. n is the number of respondents per question.

Respondents identified how many times per month (0-8) they purchased unprepared food at specific campus food retail establishments (Table 9). Respondents visited District Market and Bean Basket (a student food cooperative that sells bulk dry goods) significantly less. Although the average number of food purchases did decrease at the UW Pantry (free self-stable food, dry-goods, and produce from UW Farm) and at the UW Farm (in the form of CSA subscriptions or food from the UW Pantry), the changes were not significant.

Table 9. Average number of reported purchase visits per month at UW food retail pre-COVID vs. COVID

Time Period	UW Food Retail Locations			
	District Market	UW Pantry	UW Farm	Bean Basket
Pre-COVID (n)	3.1 (234)	1 (95)	0.7 (85)	0.7 (88)
COVID (n)	1.7 (126)	0.7 (84)	0.4 (80)	0.2 (79)
<i>p-value</i>	<.001	0.29	0.19	<.001

Note: A two sample T-Test was computed to determine if the changes in purchase visits between pre-COVID and COVID was significant. Data compiled from 725 surveys. n is the number of respondents per question.

Respondents identified how many times per week (0-21) they purchased prepared food from off-campus food service locations (see Table 10). Similar to campus food service locations, there

was a significant decrease in visits to restaurants and cafés & espresso bars and not a significant change in visits to grocery stores/food markets and food trucks/mobile dining units.

Table 10. Average number of reported purchase visits to off-campus sources for prepared food during an average week

Time Period	Off-Campus Food Service Categories			
	Restaurants	Cafés & Espresso Bars	Grocery Stores or Food Markets (prepared food)	Food Trucks & Mobile Dining Units
Pre-COVID (n)	2.9 (505)	3 (402)	2.6 (423)	1.3 (211)
COVID (n)	2.2 (400)	1.9 (255)	2.5 (347)	0.9 (167)
<i>p-value</i>	.002	0.01	0.77	0.48

Note: A two sample T-Test was computed to determine if the changes in purchase visits between pre-COVID and COVID was significant. Data compiled from 725 surveys. n is the number of respondents per question.

Respondents identified how many times (0-8) they purchased unprepared food from off-campus food retail location (see Table 11). Similar to campus food retail, there was a significant decrease in visits to grocery stores/food markets and no significant change in visits to food banks/food pantries. There was a significant increase in CSA subscriptions.

Table 11. Average number of reported purchase visits to off-campus sources for unprepared food during an average month

Time Period	Off-Campus Food Retail Categories			
	Grocery Stores or Food Markets	Food Banks/Pantries	Farmers Market	CSA
Pre-COVID (n)	4.1 (505)	0.5 (185)	1 (257)	0.5 (176)
COVID (n)	3.5 (493)	0.5 (170)	0.6 (189)	0.8 (188)
<i>p-value</i>	0.03	0.99	<.001	0.03

Note: A two sample T-Test was computed to determine if the changes in purchase visits between pre-COVID and COVID was significant. Data compiled from 725 surveys. n is the number of respondents per question.

## CHANGES IN FOOD ACCESS

Changes in food access to on-campus food service and retail locations was assessed using different questions. The first survey question asked:

*How have changes due to COVID-19 affected your access to food from the following on-campus food sources?*

The answer choices were eight categories of food service and food retail establishments on campus. Changes in food access differed depending on where the food came from. For example, 48% of respondents were negatively impacted by changes to cafés/coffee shops. Whereas 26% of respondents were negatively impacted by changes to mobile dining units (see Figure 7).

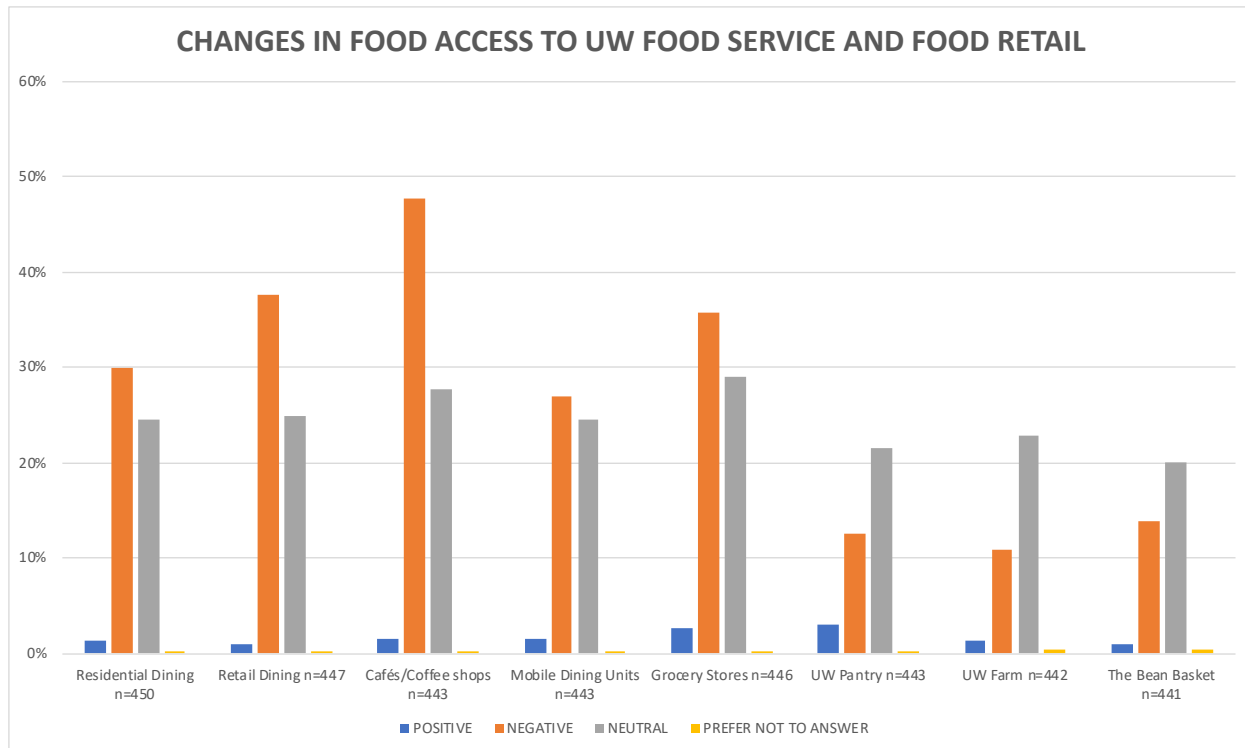


Figure 7. Changes in food access to on-campus food sources

Note: Respondents that selected the option “N/A” are not represented in this figure. Data compiled from 725 surveys. n is the number of respondents per question.

### FACTORS IMPACTING CHANGES TO FOOD ACCESS

Following the response option of “negative impact” in the previous question, respondents were asked:

*Which of the following reasons negatively affected your access to on-campus food sources?*

Respondents could answer with any of the 11 options provided. The majority of respondents answering this question were living off campus (see Figure 8). Health concerns, unit location, unit adjusted hours of operation, and lack of transportation were the four predominate factors that negatively affected consumer food access (see Figure 9). Stratifying this data by food security status, a significantly greater percentage of food insecure respondents were shown to be negatively impacted by three of the aforementioned factors. The availability of culturally appropriate food, of fresh produce, and the affordability of food did not affect the two populations differently in a significant way.

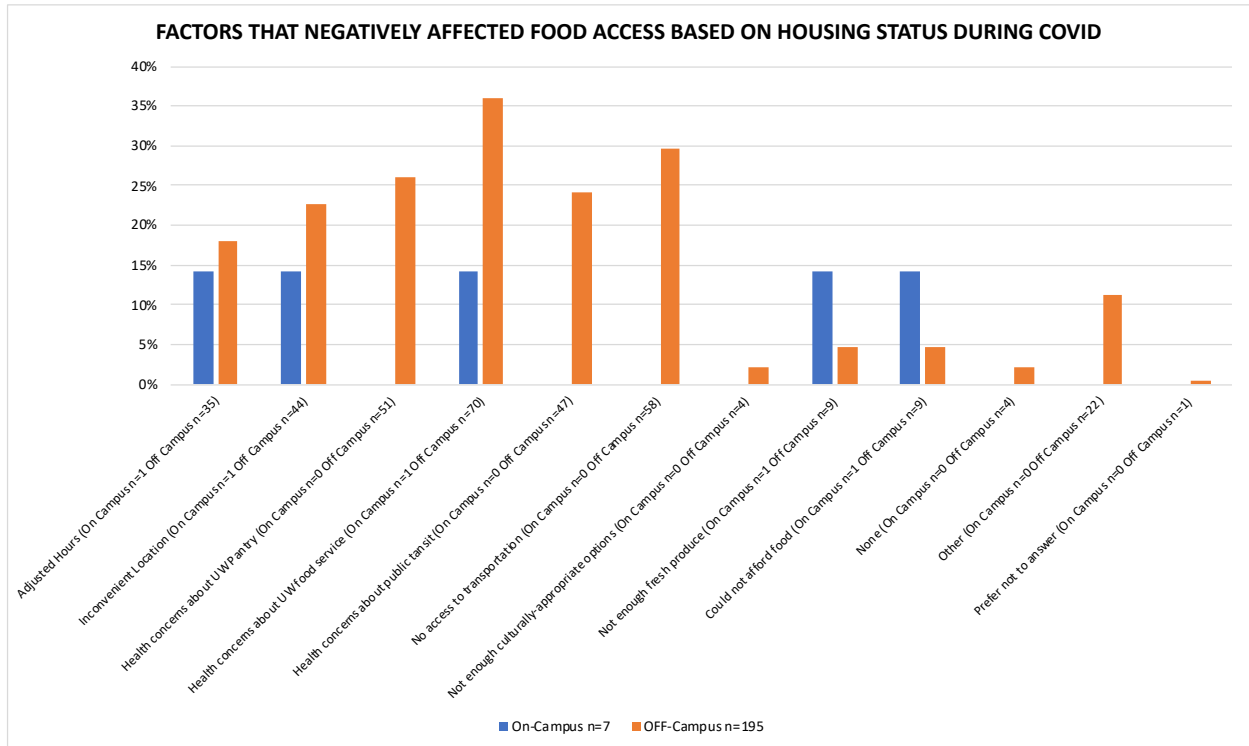


Figure 8. Factors that negatively affected food access based on housing status during COVID. n is the number of respondents per question.

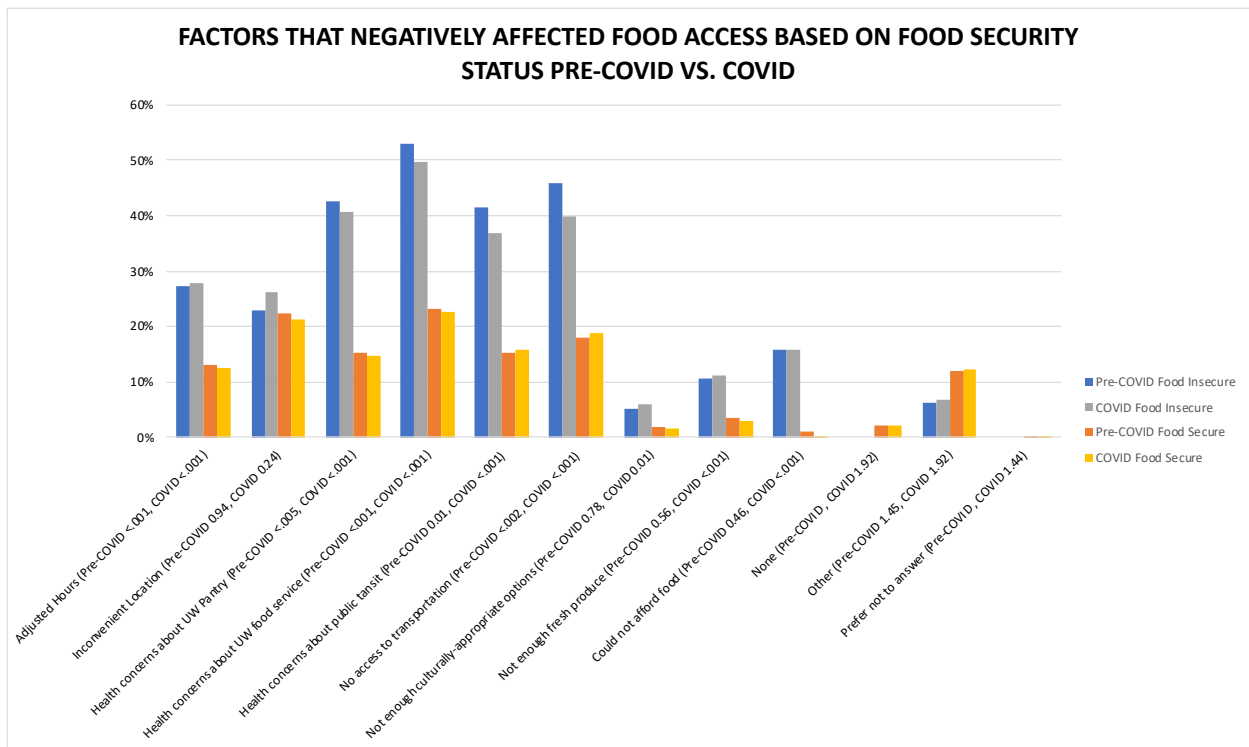


Figure 9. Factors that negatively affected food access based on food security status. Note: A two proportion Z-test was computed to determine if each food access factor affected the food insecure significantly different than the food secure. P-values are noted in the parentheses following each factor label. Refer to Table 12 for the number of respondents per time period, food security status, and negative food access factor. Data compiled from 725 surveys. n is the number of respondents per question.

Table 12. Number of respondents per time period, food security status, and negative food access factor

	Adjusted Hours	Inconvenient Location	Health concerns about UW Pantry	Health concerns about UW food service	Health concerns about public transit	No access to transportation	Not enough culturally-appropriate options	Not enough fresh produce	Could not afford food	None	Other	Prefer not to answer	Adjusted Hours
Pre-COVID Food insecure	31	26	48	60	47	52	6	12	18	0	7	0	31
COVID Food Insecure	37	35	54	66	49	53	8	15	21	0	9	0	37
Pre-COVID Food secure	55	93	64	96	64	75	8	15	4	9	50	1	55
COVID Food Secure	49	84	58	89	62	74	6	12	1	9	48	1	49

The demographic section of the survey questionnaire asked consumers if they had an underlying medical condition or lived with someone with an underlying medical condition that put them at an increased risk for severe illness from COVID-19. Table 12 presents the findings.

Table 13. Consumers with reported underlying medical condition(s) that put them at increased risk of severe illness

	Response Options			
	Individuals with an increased risk for severe illness due to underlying medical condition	Individuals that share a household with someone at increased risk for severe illness due to underlying medical condition	Other	Prefer not to answer
n = 341	58 (17%)	142 (41.6%)	109 (32%)	32(9.4%)

Note: Data compiled from 725 surveys. n is the number of respondents per question.

To determine if there was a significant relationship between health risk and food access, the survey included a question which asked:

*Which set of health risks affected your decision or ability to access food?*

Using a two proportion z-test, there was no significant difference between the pre-COVID food secure and the food insecure populations in terms of the health risks that affected their ability to access food (see Table 13). However, there was a significant difference between the COVID food secure and the food insecure populations in terms of the health risks that affected their ability to access food (see Table 14).

Table 14. Health risks affecting respondent’s decision or ability to access food based on pre-COVID food security status

Status	Response Options				
	"I have an underlying medical condition that puts me at an increased risk for severe illness from COVID-19"	"Someone else in my household has an underlying medical condition that puts them at an increased risk for severe illness from COVID-19"	"I did not feel that the facility was implementing strategies to reduce the spread of COVID-19 such as social distancing guidance or a supply of alcohol-based hand sanitizers for customer use"	Other	Prefer not to answer
Food Insecure n=84	12 (14.3%)	34 (40.5%)	29 (34.5%)	6 (7.1%)	3 (3.6%)
Food Secure n=110	13 (11.8%)	30 (27.3%)	31 (28.2%)	24 (21.8%)	12 (10.9%)
p-value	0.54	0.05	0.11	1.04	1.02

Note: A two proportion z-test was computed to determine if differences between food insecure and food secure populations were significant. The food insecure population had 113 observations. The food secure population had 416 observations. Data was compiled from 725 surveys. n is the number of respondents per question.

Table 15. Health risks affecting respondent’s decision or ability to access food based on COVID food security status

Status	Response Options
--------	------------------

	"I have an underlying medical condition that puts me at an increased risk for severe illness from COVID-19"	"Someone else in my household has an underlying medical condition that puts them at an increased risk for severe illness from COVID-19"	"I did not feel that the facility was implementing strategies to reduce the spread of COVID-19 such as social distancing guidance or a supply of alcohol-based hand sanitizers for customer use"	Other	Prefer not to answer
Food Insecure n=89	14 (15.7%)	34 (38.2%)	31 (34.8%)	7 (7.9%)	3 (3.4%)
Food Secure n=104	11 (10.6%)	29 (27.9%)	29 (27.9%)	23 (22.1%)	12 (11.5%)
<i>p-value</i>	<.001	<.001	<.001	1.2	1.37

Note: A two proportion z-test was computed to determine if differences between food insecure and food secure populations were significant. The food insecure population had 133 observations. The food secure population had 393 observations. Data was compiled from 725 surveys. n is the number of respondents per question.

## CHANGES IN FOOD PREPARATION AND CONSUMPTION BEHAVIOR

The average number of home prepared meals eaten during an average week increased from approximately 13 (n=518) meals pre-COVID to 16 (n=524) meals during COVID. Different factors affected how respondents prepared food during the pandemic. When asked:

*How did the following factors affect your ability to prepare your own food from March 9 to June 12, 2020 compared to the time from January 1 to March 8?*

respondents reported that they benefitted from having time during COVID to prepare meals. Respondents also reported that a lack of access to ingredients was the greatest challenge when preparing meals (see Table 14).

Table 16. Factors affecting food preparation

Effect	Food Preparation Factors				
	Amount of time (n=529)	Experience/knowledge (n=527)	Access to kitchen facilities (n=528)	Access to cooking equipment (n=527)	Access to ingredients (n=527)
<b>Positive</b>	61%	33%	38%	39%	31%
<b>Negative</b>	13%	5%	5%	5%	27%
<b>Neutral</b>	26%	61%	55%	56%	29%

Data compiled from 725 surveys. n is the number of respondents per question.

Stratifying this data by food security status, a significantly greater proportion of food insecure respondents reported that their ability to prepare food was impeded by a lack of access to ingredients, access to cooking equipment, and a lack of time (see Figure 10).

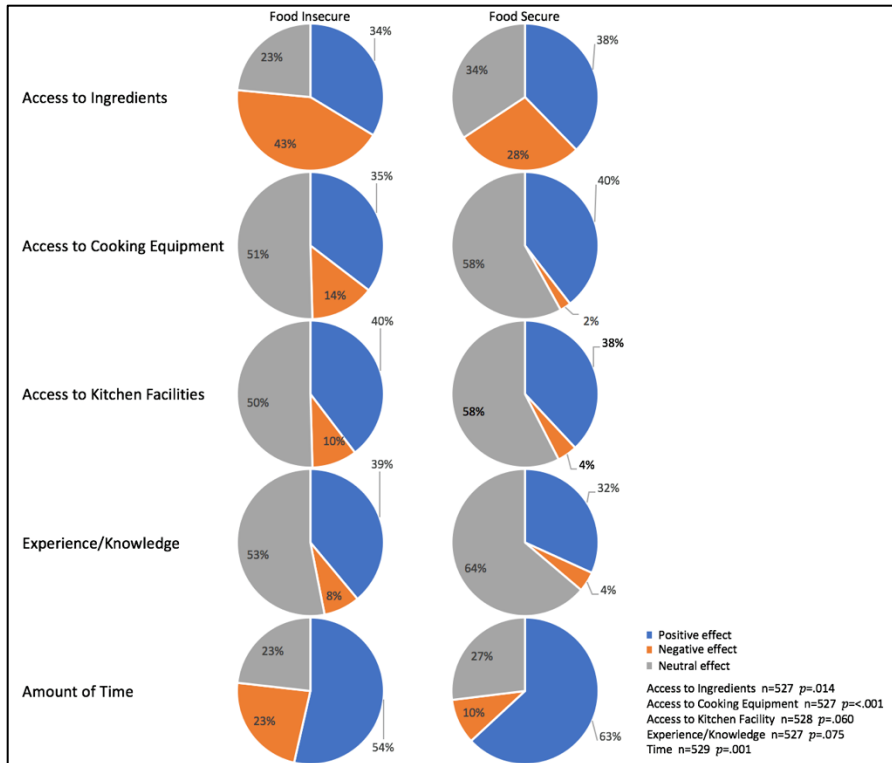


Figure 10. Factors affecting food preparation based on food security status

Note: A chi-squared test was computed to determine if each food access factor affected the food insecure significantly different than the food secure. Data compiled from 725 surveys. n is the number of respondents per question.

# Discussion

## Summary of Key Findings: Disruptions and Adaptations in the UW Food Supply Chain

Interviews with UW food suppliers revealed four disruptions to operations:

1. A switch in consumer demand from food service to retail
2. Shortages of input supplies
3. Reduced or ceased operations
4. Consumer panic buying

Businesses and organizations adapted to these disruptions by producing more retail or take-out oriented products and used similar items as substitutes when products were not available.

COVID also affected the UW food supply chain labor force. Food suppliers experienced a decreased workforce and had to quarantine workers as a matter of public health. Businesses and organizations used different strategies to adapt to these disruptions:

1. Reorganized their staff structure
2. Increased the number of work hours
3. Furloughed workers
4. Used inanimate materials as a substitute for human labor

## Summary of Key Findings: Impacts on UW Campus Food Consumers

The food consumer survey found that purchase visits for both prepared and unprepared food had similar trends at food service and retail establishments on-campus and off-campus. Consumers visited restaurants and cafés/coffee shops significantly less while there was no significant change in visits to grocery stores/food markets or food trucks/mobile dining units. Consumers visited grocery stores significantly less frequently, while there was no significant change in reported visits to food banks/food pantries. There was not a significant change in reported CSA subscriptions to the UW Farm, but there was a significant increase in reported CSA subscriptions to other farms.

The survey indicated that health concerns, unit location, unit adjusted hours of operation, and lack of transportation were the four predominate factors that negatively affect consumer food access. Respondents ate an average of three more home-prepared meals a week during COVID. The food insecurity prevalence of the sampled population pre-COVID was higher than that the 2019 national average, but did not change significantly during COVID. The prevalence of cultural food insecurity was nearly twice as high as the prevalence of food insecurity in the sampled population. These two rates of food security status did not increase significantly during COVID. A significantly greater percentage of food insecure consumer survey respondents reported that their ability to prepare food was impeded by a lack of access to ingredients, access to cooking equipment, and a lack of time.

## Summary of COVID's Impact on the UW Food System

The combined analysis of interview and survey data illustrates how COVID impacted the UW food system. There were major disruptions where COVID resulted in cascading negative impacts. Two of these occurred upstream in the food supply chain and one occurred at the consumer level. The first was a public health disruption that resulted from safety precautions and responses undertaken to prevent and slow the spread of the virus. Actors along the food supply chain shutdown operations, closed facilities, and reorganized their workforce. The university closed a majority of food service and retail establishments, reducing food options for campus consumers. The second was an economic disruption caused from 1) the Governor's emergency proclamation temporarily shutting down dine-in service for restaurants and bars followed by the state-wide Stay-at-Home order (see [Figure 2](#) for a timeline of events) 2) the resulting wave of unemployment that left certain individuals with less income. The was consumer related and resulted in large part because of the first two disruptions. The combination of food service closures, self-isolation, and the desire for control in an uncertain time motivated consumers to go on a panic buying spree, emptying selves at retail establishments ([Altstedter & Hong, 2020](#); [Peck, 2006](#); [Vo and Thiel, 2006](#)). Panic buying became a positive feedback loop with food shortages spurring on more uncertainty that reinforced more panic buying behavior. The disruptions that occurred within the UW food system mirrored events that also occurred in other food systems at different scales and geographic locations.

The case study analysis adds to existing literature on the impacts of COVID on food systems. This section focuses on three areas: **1) Food Supply Chain Disruptions and Adaptations 2) Food Access and Food Consumption 3) Timeline of COVID Events.**

### Food Supply Chain Disruptions and Adaptations

Interviews with suppliers demonstrated how outcomes in the UW food supply chain followed some of the predictions made concerning business continuity management during a pandemic ([Hobbs, 2020](#); [Peck, 2006](#)):

- 1) COVID's public health disruption caused labor shortages and high levels of absenteeism
- 2) As a result of the just-in-time model of food retail, consumer panic buying created a slow recovery of inventory after the initial disruption
- 3) The economic and public health disruptions caused food suppliers to reduce the number of product lines for sale
- 4) The economic and public health disruptions caused a sharp rise in demand for home delivery services
- 5) The economic and public health disruptions caused store closures.

The case study also reinforces findings from studies that focused on COVID's impact on singular aspects of the food system. As Aday & Aday, ([2020](#)) and Banerjee et al., ([2021](#)) had found, the UW food system also experienced a shift in the 50:50 balance between the retail and food service markets to 90:10 as a result of stay-at-home measures. There were job cuts and furloughs in every sector of the food supply chain as a result of public health measures. Consumer demand suddenly switched from the food service market to the retail market as shown

by Laborde et al., (2020). Like in Mittal and Grimm, (2020), the food pantry had also adopted the use of Google forms as a medium for their clients to access food while maintaining social distancing guidelines.

### **Food Access and Food Consumption**

The consumer surveys demonstrated that, like Niles et al. (2020), food security for consumers was more than a matter of affordability. Food security was also an issue of physical accessibility and the safety of purchasing food in person. The state-wide Stay-at-Home orders reduced an individual's ability to access food if they had to rely on public transit, which was still operational but to a more limited degree. Personal health and safety concerns potential affected food access for survey respondents who identified themselves as having an underlying health condition or they lived with someone with an underlying health condition. These sources of food insecurity are further reinforced by data on the changes in purchase visits. Respondents visited indoor retail and dining locations less frequently, while maintaining the same frequency of visits to food trucks/mobile dining units and increasing subscriptions to CSAs. Respondents did not identify the affordability of food as a major impediment to food access. The difference in visits to food banks (free food), which remained constant, and the number of subscriptions to CSAs (generally higher cost items than the same products sold at conventional markets), which increased, reinforces that affordability was not a major issue. Defeyter et al., (2020) also found that factors other than food affordability influenced a student's level of food insecurity during the pandemic. They found a relationship between mental health and level of food insecurity. Their survey, however, did not ask specifically about fear or concern of contracting COVID as a factor and more research on this issue needs to be done to further understand this relationship.

As identified by [Defeyter et al., 2020](#); [Dou et al., 2021](#); [Huber et al., 2020](#); [Gallo et al., 2020](#); [Jia et al., 2021](#); [Owens et al., 2020](#), analysis of consumer surveys also found that consumers increased the number of meals consumed per week, consumers benefitted by having more time to prepare meals at home, and they experienced an increase in food insecurity.

### **Timeline of COVID Events**

This case study illustrates that the food shortages experienced by different food suppliers coincided with a decrease in the campus consumer population. This may have been a fortunate event that lessened the impact of the disruptions related to COVID. Had the campus consumer population remained the same, the vegetable farm would not have been able to meet its production goals for university dining services. If university dining services laid off all 900 student employees while still having to serve the same pre-COVID population, there may have been a labor shortage that would render its operations severely hampered. There are several articles in the literature that studied the effect of lockdown measures on changes in students' diets and eating behaviors ([Defeyter et al., 2020](#); [Huber et al., 2020](#); [Gallo et al., 2020](#); [Jia et al., 2021](#); [Owens et al., 2020](#)). However, no published studies were found to date that examined the effect of a lockdown measure on a university's food system.

### **STRENGTHS AND LIMITATIONS**

UW food suppliers at every sector of the food supply chain were interviewed, presenting a snapshot into the flow of food from production to disposal during a major disruption. Although there was important data collected that reinforced findings from other studies, there were shortcomings to this methodology. For one, each sector of the food supply chain was represented by only one to two food suppliers. Because food suppliers within the same sector of the food supply chain can vary greatly, the perspectives provided through this case study cannot be generalized to represent the experiences that other food suppliers may have had. For example, although a local bakery and a multinational company like Nestle both produce baked goods for UW, the two companies most likely do not share the same successes and challenges during a major disruption. Second, due to limited time, the chaotic situation of events as a result of COVID, and overall lack of transparency of businesses in the food supply chain, a larger sample of food suppliers was not able to be recruited to participate in the study. According to HFS, UW has contracts with 38 food suppliers. Due to the small sample, data saturation was not reached, and the codes derived through qualitative analysis may not represent the experiences of all food system stakeholders.

For the consumer survey, although 725 surveys were analyzed, in comparison to the entire student body of over 43,000 students, plus the addition of faculty and staff, the study's sample size is relatively small and may not represent the university's consumer population. Second, the survey respondents' demographics were not proportional to the demographics of the enrolled student population during the Spring academic quarter that the survey questions referred to (See Table 17).

Table 17. Demographic comparison between survey respondents and total student population

Demographic Characteristics	Response Categories							
	18-22	23-26	27-30	31-40	41-50	51-60	61-64	65 and older
<b>Age</b>								
Survey n = 528	49.4%	13.8%	11.4%	13.6%	6.8%	2.7%	1.1%	0.8%
Population N =43617	Average age 23.7 years old							
<b>Gender</b>	<b>Female</b>	<b>Male</b>						
Survey n =504	75.2%	19.3%						
Population N =43617	54.6%	45.4%						
<b>Hispanic or Latinx</b>	<b>Yes</b>							
Survey n = 531	10.7%							
Population N =43617	8.3%							
<b>Race</b>	<b>White</b>	<b>African American or Black</b>	<b>Asian</b>	<b>American Indian or Alaska Native</b>	<b>Native Hawaiian or Pacific Islander</b>			
Survey n = 529	58.2%	0.6%	28%	1.1%	0.6%			
Population N =43617	40.5%	4.0%	26.0%	1.1%	0.9%			
<b>International student</b>	<b>Yes</b>							
Survey n = 526	8.9%							
Population N =43617	16.8%							

Population data from [UW Academic Data Management, 2020](#)

Third, the timing for the survey distribution from July 6, 2020 to August 24th, 2020 potentially resulted in less participation because students, faculty, and staff are less likely to actively respond to school related emails during summer break. Fourth, the survey was administered months after classes became remote and students left campus, increasing the chance of error in the data due to recall bias. Fifth, the wording of some survey questions may have been unclear, leaving respondents unsure of how to answer. This required omission of data collected from these ambiguous questions. Six, all survey questions were optional which resulted in an uneven response rate for each question. Lastly, the survey omitted online food service and online food retail as response options in questions referencing the frequency of consumer purchase visits.

# Considerations for Further Research and Exploration

The continuation of HFS operations during COVID appears, in isolation, to be a testament to the effectiveness of the emergency preparedness strategies outlined in the UW CEMP. This, however, is an incomplete conclusion. This case study showed that circumstances could have been far worse had the Governor not issued the Stay-At-Home order during Spring Break. Moreover, the sampled consumer population already had a high food insecurity rate before the pandemic, which increased even more during COVID. Results from this case study highlight current weakness of the UW food system and potential ways to better prepare for future disruptions. These areas require further research and exploration and include:

## Coordinate System-Wide Channels of Communication

UW does not currently have a documented strategy for creating a resilient food system, one that has the flexibility and capacity to retain the essential structures and functions of providing a reliable source of nutritious, safe, accessible food despite disruptions ([Candy et al., 2015](#); [Biehl et al., 2018](#); [Gunderson 2000](#)). If HFS focuses solely on the short-term, they can miss underlying dynamics that influence the food system over the long term ([Biehl et al., 2018](#); [Ericksen et al. 2010](#)). COVID has given them an opportunity to shift this perspective and develop a more resilient operation.

The contrasting experiences of the egg farm and the bakery during the first few weeks of COVID highlight the potential for UW to use its power and influence to improve the way the current system operates. The egg farm had a surplus of conventional liquid eggs that they could not find a demand for in the retail market. As a result, they donated a million servings of liquid eggs to food banks and composted whatever they could not give away. Simultaneously, consumer panic buying had created a shortage of liquid eggs in the food service market. When the egg farm started redirecting their products from food service to retail to meet the surge in demand, it created a shortfall of liquid egg production that affected the bakery. This situation follows a principle identified in [Knemeyer et al. \(2009\)](#)—a well-functioning food supply chain depends on the balance of supply and demand between its sectors. A mismatch of supply and demand triggers a food supply chain disruption that leads to the unavailability of supplies for downstream sectors. Had the egg farm known that the bakery had a shortage of liquid eggs, they would have been able to sell their surplus to them. HFS is a major buyer of products from both the egg farm and the bakery. Because of the buying power they have over upstream food suppliers, they influence the supply and demand in those markets. During future major disruptions, HFS can use their unique position to coordinate the supply of goods between their food suppliers.

UW Emergency Management (UWEM), an independent department of the university dedicated to ensuring the safety and well-being of the entire university community, can assist HFS in this endeavor. UWEM had developed emergency preparedness strategies for HFS in CEMP ([2020](#)). The UWEM Director can use the lessons learned from COVID to explore strategies that take into account the complex array of challenges that may arise during another major disruption. For example, they can develop a conceptual model of food system vulnerabilities in the UW food system, like the one developed by [Chodur et al., \(2018\)](#), helping to position HFS as an intermediary, communicating the needs of different suppliers throughout the food system. This

will most likely be difficult to coordinate, and not all parties will be willing to cooperate given that sharing information is not something all businesses are willing to do ([Norwood and Peel, 2020](#)). This, however, should not be a deterrent since a fault-tree model can outline the redundancies, resources, and possible avenues that can build resiliency in the food system.

### **Decentralize Food Sources to Increase Food Access**

In a future disruption where consumers are no longer congregating near the centers of food on campus, one way to potentially address the food security needs of some individuals is to decentralize food sources by distributing mobile dining units, a mobile pantry, and mobile farmers markets in neighborhoods where high concentrations of students live. COVID. Studies have shown that mobile food units can increase community food security ([Best and Johnson, 2016](#); [Hsiao et al., 2019](#)). The case study highlighted patterns of food accessibility and sources of food insecurity showing that respondents did not significantly change purchase visits to food sources that were more accessible by foot and/or were located in outdoor areas. The university can further investigate the benefits of decentralizing food sources such as:

1. UW Dining already has four mobile dining units (Hot Dawgs, Motosurf, Sunrise Griddle, and Starbucks Coffee Truck) that can operate in different neighborhoods. HFS can explore the feasibility and effectiveness of mobile dining units as food sources during a major disruption to food services on campus.
2. During COVID, the food pantry had utilized Google Forms to take client food orders. The Division of Student Life can explore the feasibility and effectiveness of delivering UW Pantry food orders to specific drop off points located in areas more convenient for students living off campus.
3. The CSA pick-up point for the UW Farm is located on site, far from the center of campus. The Center for Urban Horticulture can explore the feasibility and effectiveness of the UW Farm delivering food to specific drop off points located in areas more convenient for students living on and off campus.

### **Increase the Capacity of the UW Pantry**

During COVID, the food pantry was limited not by the supply of food, but by the capacity to store it. They had received so much prepared food from campus dining that they had to give away hundreds of pounds of it to a local food bank. They also relied on additional refrigerators from university dining services in order to store all the extra produce they were receiving from the vegetable farm.

HFS can explore the possibility of providing the UW Pantry with a permanent space in one of their walk-in refrigerators and also grant them an additional refrigerator on-site. This way, the UW Pantry can provide more ready-to-eat meals and fresh produce to their clients.

### **Provide Continual Access to Campus Facilities for Food Production**

The indoor farm was in the middle of a feasibility study when COVID happened, so when it shutdown it did not have a major impact on the university dining services' food supply. If the indoor farm succeeds in expanding its operation in the future, providing HFS with a year-round

supply of food, shutting it down would have a more consequential impact on the university's food supply.

UW Facilities can explore the feasibility and effectiveness of resuming indoor farming program operations during different scenarios as part of a business continuity management strategy for their contractors.

### **Ascertain and Address Issues of Food Insecurity**

This case study illustrated the complexities of determining food security status and its contributing factors. Survey respondents reported a prevalence of food insecurity higher than the 2019 national average, and a prevalence of cultural food insecurity twice that. Although these findings are important, they are limited. The sample size was small and not demographically representative of the larger student population. The presence of cultural food insecurity was only ascertained using one question and was not based on any former research. The Division of Student Life, HFS, and UW Dining can all explore the different contributing factors that lead to both food insecurity and cultural food insecurity.

### **Reallocate Labor Resources in Emergency Plans**

The case study showed that more time was required for workers in various food supply chain sectors to adapt to changes that required following safety protocols. For example, workers at the vegetable farm had to sanitize every tote for the CSA before and after each use. Some workers at the egg farm had to frequently rotate shifts to limit the discomfort of wearing PPE in a confined and crowded space. In both of these examples, adjustments to safety protocols slowed operations. Emergency management plans for businesses and organizations should include strategies for how to direct more workers to the essential tasks that may require additional time to complete due to safety protocols.

### **Use Web-based Communication Platforms**

Because the food pantry relied on volunteers working on different schedules and with different sets of responsibilities, coordinating a plan of action required synchronized input from multiple individuals. In order to organize this effort, the Pantry Coordinator used Google Docs, an open web-based word processing application, to keep all volunteers abreast during a chaotic time. Web-based applications, like this, allow for multiple authors from geographically different locations to collaborate on a collective project in real time. This can be a useful tool during a disruption when rapid communication from different sources is required. During a major disruption, food suppliers can upload their inventory onto Google Docs or Google Sheets to identify fluctuations in the food supply across different businesses.

The food pantry was able to shift their operation from in-store shopping to online ordering within a few days' time with the use of Google Forms, another web-based application. In the case of a future disruption that causes students living on campus to stay in their residences, UW Dining can use a web-based survey application, such as Google Forms, to provide students a way to select their food preferences safely.

UWEM can explore the possibility of working with UW IT to develop open online platforms or mobile-device applications for campus food suppliers to ensure a safe and continual supply of food during a major disruption.

## **Conclusion**

The UW food system is an intricate balance between food suppliers and consumers. COVID demonstrated some of the weaknesses in that system and also highlighted the resiliency of suppliers in the face of a major disruption.

Food suppliers in every sector of the food supply chain experienced a disruption to their operations and to their workforce. In most instances, however, businesses and organizations found ways of adapting to new, unfavorable, and challenging circumstances and were able to maintain an operational level of business continuity. Food consumers were hit harder by the pandemic, exacerbating an already existing problem of a high rate of food insecurity and cultural food insecurity. COVID magnified the disparity of food access between food insecure and food secure individuals. Health concerns, limited access to transportation, and inconvenient food source locations were food access factors that affected a greater percentage of food insecure individuals than food secure individuals.

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# APPENDIX I: Interview Guides

## INTERVIEW GUIDE: Food Providers (Farms, Distributors, Retail and Food Service)

Hello, my name is Jonathan Chen. I am a graduate student at the University of Washington. I am studying how COVID-19 is affecting the University's food system and would really like to learn about your experiences. Results from this study will help me understand how the university food system is dealing with the stresses of the current pandemic. Is this a good time to talk?

(If "no," try to schedule another time, if "yes," keep reading)

Thank you. I will now read a consent script. I am going through this so you will understand what it means to participate in this project and how I will be using the information you provide in this interview.

- Participation in this interview is completely voluntary, and you can decide to end it at any time.
- This interview will last approximately 30 minutes.
- The degree of risk is perceived as very minimal in this project, although you may be uncomfortable when asked certain questions. You are not required to answer the questions and may end the interview at any time.
- This interview will be audio recorded if that is okay with you. Recordings will be destroyed once contents have been transcribed-no later than September 2020. Your name will not be linked with your answers- all interview results will be combined so that your answers are not identifiable to you.
- If you have questions about your rights as a research subject, you may call the Human Subjects Division at (206) 543-0098.

Do you have any questions about this project?

Do you consent to participating in this interview?

(If "yes," continue with the interview. If "no," thank them for his/her time)

In-depth interview guide for businesses/companies/organizations involved in supplying and distributing food: A vegetable farm, contracted farms, contracted food distributors, University Housing and Food Services restaurants and grocery retail, and A waste management organization

### **PART 1: INTERVIEWEE PROFILE**

I am going to begin this interview with a few background questions:

1. Can you tell me briefly about your current role in your business/organization?
2. How long have you worked in that role?
3. To what extent are you involved in planning for emergencies?

### **PART 2: ASSESSMENT OF THE CURRENT SITUATION**

These next set of questions will focus on how the COVID-19 pandemic has disrupted your operations in regard to supply chains, labor, transportation, economy, food safety, and food loss.

#### **Food Supply Chain**

1. Please take me through the flow of food in your business/operation and highlight any disruption you've had to this system:

Prompts:

- Has the loss/failure of any class of supplier(s)' operations halted yours? If so, which ones?
- What was the recovery time/replenishment lead time for the stocks that ran out?
- Were there any food items that ran out? If so, which one ran out first?
- Has there been any change to the buyers that you normally supply? If so, please describe.
- How (in what ways) has your operation adapted to these changes?

## **Labor/Employment**

2. Please describe how COVID-19 has affected your workforce:

Prompts:

- Has your workforce changed in terms of employment, the number of staff, and responsibilities?
- Have there been any changes to ensure a healthy workforce?
- How have these changes affected your operations?

## **Transportation**

3. Have there been any transportation related impacts to your own organization? If so, please describe them:

## **Environmental Public Health**

4. How have your considerations around food safety and the prevention of food borne illness evolved given the COVID-19 related changes to your organization?

Prompts:

- Have you made any changes to safely transport food to consumers (i.e. modified type of foodservice system: conventional; centralized; ready-prepared; assembly-serve)?
- Have you been making food in different quantities?
- Is your supply adequate for the need?
- How have changing processes in the kitchen affected the considerations for food safety?
- Have you adapted new or different critical control points to ensure food safety?
- How have workers been interacting with customers in order to accommodate for social distancing?

## **Food Loss**

5. How has your typical waste stream been affected by COVID-19?

Prompts:

- Are there any changes in the amount of food lost, that is to say, the edible food thrown away or composted throughout your business/organization's operations (growing, transporting, or preparing it)?

**Economy**

6. How has COVID-19 affected the financial outlook of your business/operation?
- How has your business/operation adapted to improve your financial outlook?

**PART 3: FUTURE ASSESSMENT**

7. Taking the COVID-19 experience into consideration, what steps do you think campus administration should take to better prepare for or be more resilient to future a systemic shock?

**PART 4: ORGANIZATIONAL BACKGROUND** [Research the answers to these questions and do not ask if information is available.]

8. In terms of staff, how large is your company/organization?

9. Who are your customers? What is the demographic breakdown of your customers (students, faculty & staff, public)?

10. Is there anything else that you feel is important that has not been covered in this interview?

## **INTERVIEW GUIDE: Waste Management**

I will now read a consent script. I am going through this so you will understand what it means to participate in this project and how I will be using the information you provide in this interview. I am studying how COVID-19 is affecting the UW's food system and would really like to learn about your experiences. Results from this study will help me understand how the university food system is dealing with the stresses of the current pandemic.

- Participation in this interview is completely voluntary, and you can decide to end it at any time.
- This interview will last approximately 30 minutes.
- The degree of risk is perceived as very minimal in this project, although you may be uncomfortable when asked certain questions. You are not required to answer the questions and may end the interview at any time.
- This interview will be audio recorded if that is okay with you. Your name will not be linked with your answers- all interview results will be combined so that your answers are not identifiable to you.
- If you have questions about your rights as a research subject, you may call the Human Subjects Division at (206) 543-0098.

Do you have any questions about this project?

Do you consent to participating in this interview?

(If “yes,” continue with the interview. If “no,” thank them for his/her time)

In-depth interview guide for businesses/companies/organizations involved in supplying and distributing food: A vegetable farm, contracted farms, contracted food distributors, University Housing and Food Services restaurants and grocery retail, and a waste management organization

### **PART 1: INTERVIEWEE PROFILE**

I am going to begin this interview with a few background questions:

1. Can you tell me briefly about your current role in your business/organization?
2. How long have you worked in that role?
3. Prior to March 2020, to what extent were you involved in planning for emergencies?

### **PART 2: ASSESSMENT OF THE CURRENT SITUATION**

These next set of questions will focus on how the COVID-19 pandemic has disrupted your operations in regard to food waste stream, supply chains, labor, and transportation.

#### **Food Waste Stream**

4. Please take me through the flow of food waste in your business/operation, from the beginning till the end, and highlight any disruption you've had to this system:

Prompts:

- Was there any change in the food waste stream supply? If so, please elaborate.
- Was there any change in the output of the food waste stream to waste management companies? If so, please elaborate.
- How (in what ways) has your operation adapted to these changes?

#### **Supply Chain**

5. Was there a loss/failure of any class of supplier(s)' operations that halted yours? If so, which ones?
  - Were there any needed supplies that ran out? If so, which one ran out first?

- How (in what ways) has your operation adapted to these changes?

### **Labor/Employment**

6. Please describe how COVID-19 has affected your workforce:

Prompts:

- Has your workforce changed in terms of employment, the number of staff, and responsibilities?
- Have there been any changes to ensure a healthy workforce?
- How have these changes affected your operations?

### **Transportation**

7. Have there been any transportation related impacts to your own organization? If so, please describe them:

### **Environmental Public Health**

8. How have your considerations around collecting food waste evolved given the COVID-19 related changes to your organization?

Prompts:

- Have you made any changes to transport/store/dispose food waste?
- Has your supply of PPE been adequate for the need?

### **Economy**

9. How has COVID-19 affected the financial outlook of your business/operation?

- How has your business/operation adapted to improve your financial outlook?

### **PART 3: FUTURE ASSESSMENT**

10. Taking the COVID-19 experience into consideration, what steps do you think campus administration should take to better prepare for or be more resilient to future a systemic shock?

**PART 4: ORGANIZATIONAL BACKGROUND** [Research the answers to these questions and do not ask if information is available.]

11. In terms of staff, how large is your company/organization?

12. Is there anything else that you feel is important that has not been covered in this interview?

## **INTERVIEW GUIDE: Administration (Housing and Food Services, Student Life)**

Hello, my name is Jonathan Chen. I am a graduate student at the University of Washington. I am studying how COVID-19 is affecting the University's food system and would really like to learn about your experiences. Is this a good time to talk?

(If "no," try to schedule another time, if "yes," keep reading)

Thank you. I will now read you the consent script. I am going through this so you will understand what it means to participate in this project and how I will be using the information you provide in this interview.

This interview will last approximately 30 minutes.

- The degree of risk is perceived as very minimal in this project, although you may be uncomfortable when asked certain questions. You are not required to answer the questions and may end the interview at any time.
- Results from this project will help me understand how the university food system is dealing with the stresses of the current pandemic.
- This interview will be audio recorded if that is okay with you. Recordings will be destroyed once contents have been transcribed-no later than August 2020. Your name will not be linked with your answers- all interview results will be combined so that your answers are not identifiable to you.
- If you have questions about your rights as a research subject, you may call the Human Subjects Division at (206) 543-0098.
- Participation is voluntary.

Do you have any questions about this project?

Do you consent to participating in this interview?

(If "yes," continue with the interview. If "no," thank them for his/her time)

Open-ended interview guide for administrators in departments that oversee operations in the UW food system—Housing and Food Services and Student Life

### **PART 1: INTERVIEWEE PROFILE**

I am going to begin this interview with a few background questions:

1. Can you tell me briefly about your current role in your department?
  - a. How long have you worked in that role?
  - b. To what extent are you involved in planning for emergencies?

### **PART 2: EMERGENCY PREPAREDNESS PRE-ASSESSMENT**

The following first questions refer to February 2020, before the Washington stay-at-home orders:

2. Did [department] have mitigation/preparedness plans to provide a consistent and accessible food supply for students on campus during a disaster?
3. If so, what did the plans entail?

[probes]

  - a. In terms of staffing?
  - b. In terms of communication strategies?
  - c. In terms of equipment/supplies?

### **PART 3: ASSESSMENT OF THE CURRENT SITUATION**

These questions refer to the period beginning in March until now:

4. Has the current COVID-19 situation disrupted your department's ability to provide a consistent and accessible food supply for students on campus?
5. If so how?  
  
[probes]
  - d. In terms of staffing?
  - e. In terms of communication strategies?
  - f. In terms of equipment/supplies?
9. How is your department responding to the current situation?

### **PART 4: FUTURE PLANNING ASSESSMENT**

10. If the COVID-19 situation continues to worsen or at least does not improve, what will your department do to ensure that students have access to a constant supply of healthy and diverse food?

# APPENDIX II: Preliminary Codebook for Operations

Disruptions					
Producer Codes	Manufacturer Codes	Distributor Codes	Food Service Codes	Food Recovery Codes	Waste Management Codes
Shortage of input supply	Shortage of input supply	Shortage of input supply	Shortage of input supply	Shortage of input supply	Shortage of input supply
Operations shutdown	Operations shutdown	Supplied product substitutes	Operations shutdown	Increase of input supply	Operations reduced
Operation setback	Redirected operations to specific products	Change in product demand	Increase of input supply	Demand stayed constant	
Supply of inputs unaffected	Shift in sales from food service to retail		Supply of inputs unaffected	Increased purchases of input supplies	
Delay in shipment of supplies/materials	Change in product demand		Redirected operations to facilities	Incompatible donations	
Sufficient supply of operations equipment			Demand declined	Demand declined	
Shift in sales from food service to retail			Change in product demand	Successful product distribution to consumers	Decreased product output
Increased donations			Change in product supply		
Change in product demand					
Disruption Factors					
Producer Codes	Manufacturer Codes	Distributor Codes	Food Service Codes	Food Recovery Codes	Waste Management Codes
Shift in sales from food service to retail	Panic buying staples	Suppliers' facilities shutdown	Shift in sales from food service to retail	Shift in sales from food service to retail	Shift in sales from food service to retail
Panic buying staples	COVID safety response		Panic buying staples	Panic buying staples	Decrease in consumer population
Increase in retail demand	Contract guarantees inputs from supplier	Food service demand decreased	Contract guarantees inputs from supplier	Decrease in consumer population	Rescheduled staff operations
Pre-pandemic preparation	Facilities shutdown	Increasing demand for grab n go	Increasing demand for grab n go	Season in the year	
Government authorization for work	Shift in demand for products		COVID health and safety, social distancing guidelines	Increased awareness and increased demand of need	
Supplier overwhelmed by increased demand	Increasing demand for grab n go			Increase in food insecurity	
Local supply of inputs	UW purchasing power				
Facilities shutdown					
Food service demand decreased					
Shift in demand for products					
Food retail demand increased					
Decrease in campus consumer population					
Facility closed					
COVID safety response					
Adaptations					
Producer Code	Manufacturer Code	Distributor Code	Food Service Code	Food Recovery Code	Waste Management Code
Used substitutes for absent supplies	Used substitutes for absent supplies	Used substitutes for absent supplies	Used substitutes for absent supplies	Increase in donations	
Decreased demand from buyer		Interdivision transfer of product	Interdivision transfer of product	Increase in cash donations	
Decreased operation		Delay in stock recovery time	Increase grab n go products	Increase in food donations	
Operation stopped		Source product from different suppliers	Marketed and sold surplus and available food in non-traditional fashion		
Increased direct home customer sales		Increase grab n go products	No more self-service		
Educate older population about non-traditional sales platform			Changed completely to cooked to order		
Product using non-traditional packaging					
Increase donations					
Increased sales to retail					

# APPENDIX III: Preliminary Codebook for Labor

Disruptions					
Producer Code	Manufacturer Code	Distributor Code	Food Service Code	Food Recovery Code	Waste Management Code
No more volunteers	Workers furloughed	Workers furloughed	Workers furloughed	Amount of work/person increased	Workers furloughed
Amount of work/person increased	Hours worked decreased	Amount of work/person increased	Student workers stopped	remote working	remote working
No lost jobs	Overtime prohibited		No lost jobs	Volunteers decreased	
Reduced staff due to COVID quarantine	Decreases in salary		Increase workforce	Volunteers increased	
Reorganized laborforce to maintain employment level	Reorganized work schedules to capture labor efficiencies		Increase salaries		
remote working			Reorganized laborforce to maintain employment level		
COVID health and safety response reduced work force efficiency			Slow communication from administration to front line workers		
PPP loan kept people employed			Nervous/concerned about health and safety a work		
			Loss of motivation with decrease in workload		
Distruption Factors					
Producer Code	Manufacturer Code	Distributor Code	Food Service Code	Food Recovery Code	Waste Management Code
COVID public safety protocol	COVID public safety protocol	More work required to adjust to changes in supply chain	Increase in consumer demand for take-out	Students left campus	
Delayed designation of critical status	Decrease in consumer market sales		Food service facilities shutdown	volunteers had more time to spend	
Full employment valued over work efficiency			Worker furloughed to save money	More work required to adjust to changes in supply chain	
Students left campus			Disconnected communication between front-line and remote workers	Remote and in-person work allowed distribution of jobs	
			Union protected workers with guaranteed hours		
Adaptations					
Producer Codes	Manufacturer Codes	Distributor Codes	Food Service Codes	Food Recovery Codes	Waste Management Codes
Reorganized labor to other sectors	Increased number of hours per working shift		Reorganized labor to other sectors	Reorganized labor to other sectors	
Increased number of hours per working shift	SBA PPP loan helped continue payroll		Increased business profits	Increased number of hours per working shift	
Work declared essential			Union protected workers with guaranteed hours		
Able to recruit workers					
Kept all employees					
Students still could not be on-campus so operation shutdown					

# APPENDIX IV: Survey Questionnaire

## UW FOOD SYSTEM COVID-19 SURVEY

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### Start of Block: 1) Introduction

Q1 Hello! My name is Jonathan Chen. I am a graduate student at the University of Washington and I am studying how COVID-19 is affecting the students, faculty and staff of the UW Seattle campus. This is a 15-20 minute survey about how this pandemic has affected your access to food. By better understanding the university's systemic weaknesses, we can identify what structural and financial resources are needed to improve it.

If you **COMPLETE** the survey, you will have the option to provide your UW email address to enter a drawing for a **\$50 gift card to the University Bookstore** (one of ten). This address will only be used for the drawing and you can still participate in the survey without providing this information. If you need to pause, your survey responses will automatically be saved. You can resume taking this survey anytime until it **closes on August 14, 2020**. You do not have to answer any questions you do not want to answer. This survey is anonymous, and you will not be identified in any way. If you have general questions or concerns, please email [UWCOVID19survey@gmail.com](mailto:UWCOVID19survey@gmail.com). If you have questions about your rights as a research respondent, you may call the Human Subjects Division at (206) 543-0098.

### End of Block: 1) Introduction

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### Start of Block: 2) Consent

Q2 Please note that you must be **18 years of age or older** and **affiliated with the UW Seattle campus** to participate in this survey. Would you like to participate in this survey?

- Yes, I am 18 years of age or older, have a UW NetID, and am interested in taking this survey (1)
  
- No, I am **NOT** 18 years of age or older, **DO NOT** have a UW NetID, or **AM NOT** interested in this survey (2)

### End of Block: 2) Consent

---

### Start of Block: 3) All On-Campus Options, Sources, and Effects

Q3 SINCE January 1, 2020, have you ever eaten food from any on-campus food sources? (Select all that apply)

**Residential Dining:** Center Table, Local Point, Pagliacci Pizza @ North Campus, @ The HUB, and @ West Campus (1)

**Retail Dining:** By George, Café 815 Mercer, Cultivate, Husky Den Food Court, Orin's Place, The Rotunda (2)

**Cafés & Espresso Bars:** Dawg Bites, Evolutionary Grounds, Husky Grind Café, Husky Grind, District Market, Mary Gates Hall Espresso, Microsoft Café, Overpass Espresso, Parnassus, Reboot, Starbucks Coffee @ HUB and @ Suzzallo, The Supreme Cup, Tower Café (3)

**Grocery Stores or Food Markets:** District Market, Etc., HUB, Etc., Magnuson Health Sciences, The Nook (4)

**Food Trucks & Mobile Dining Units:** Hot Dawgs, Motosurf, Starbucks Coffee Truck, Sunrise Griddle (5)

**Alternative food sources:** UW Pantry, UW Farm, The Bean Basket (6)

Other (9) \_\_\_\_\_

None of the above (7)

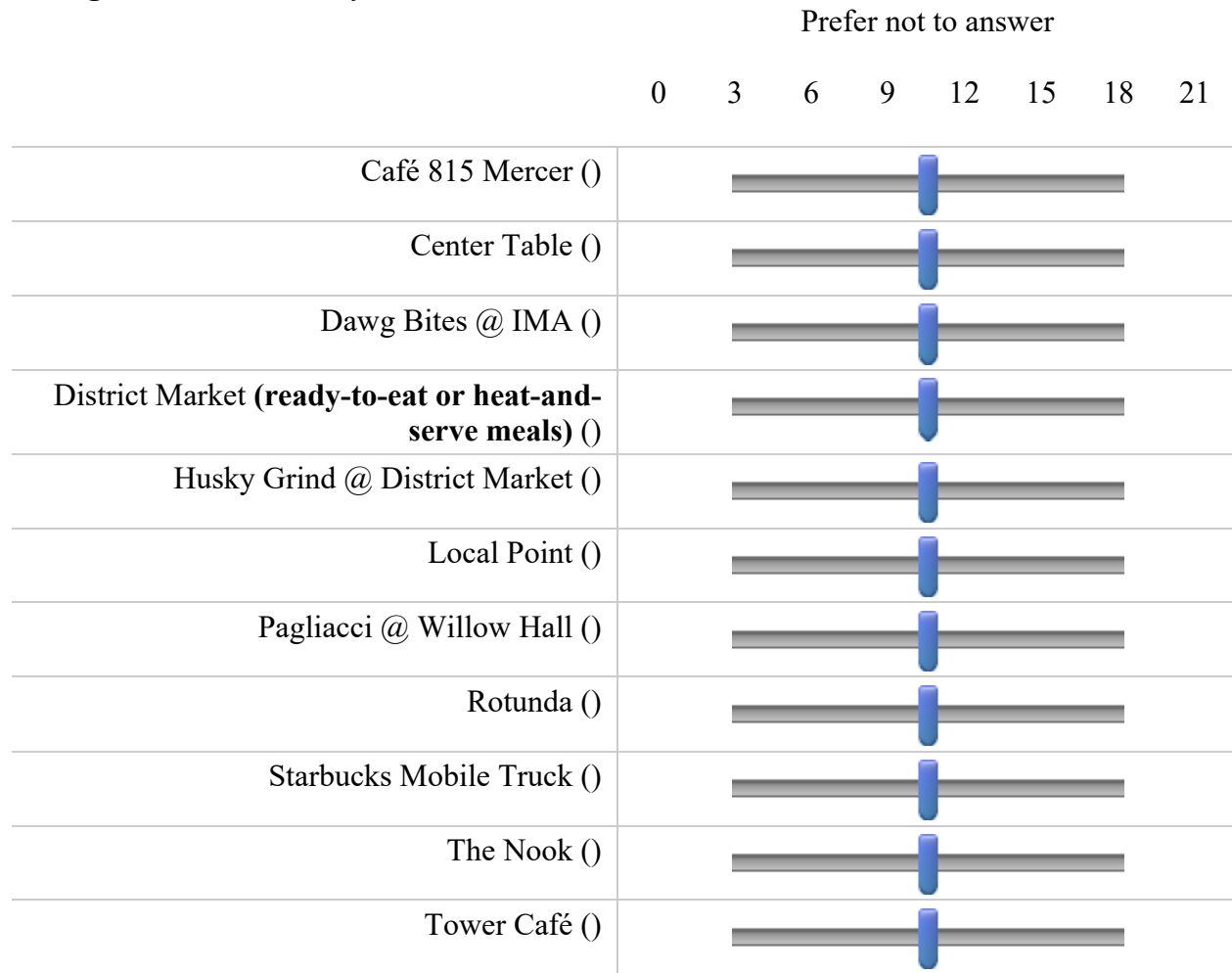
Prefer not to answer (8)

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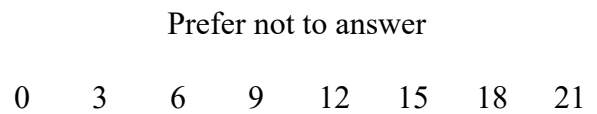
Q4 On March 9, 2020, all UW classes transitioned to virtual learning and Housing & Food Services (HFS) started closing many dining and food locations due to COVID-19. The following set of questions ask you to compare your access to food during an **average week** and an **average month** at the on-campus locations that remained open BEFORE and AFTER the transition to virtual learning.

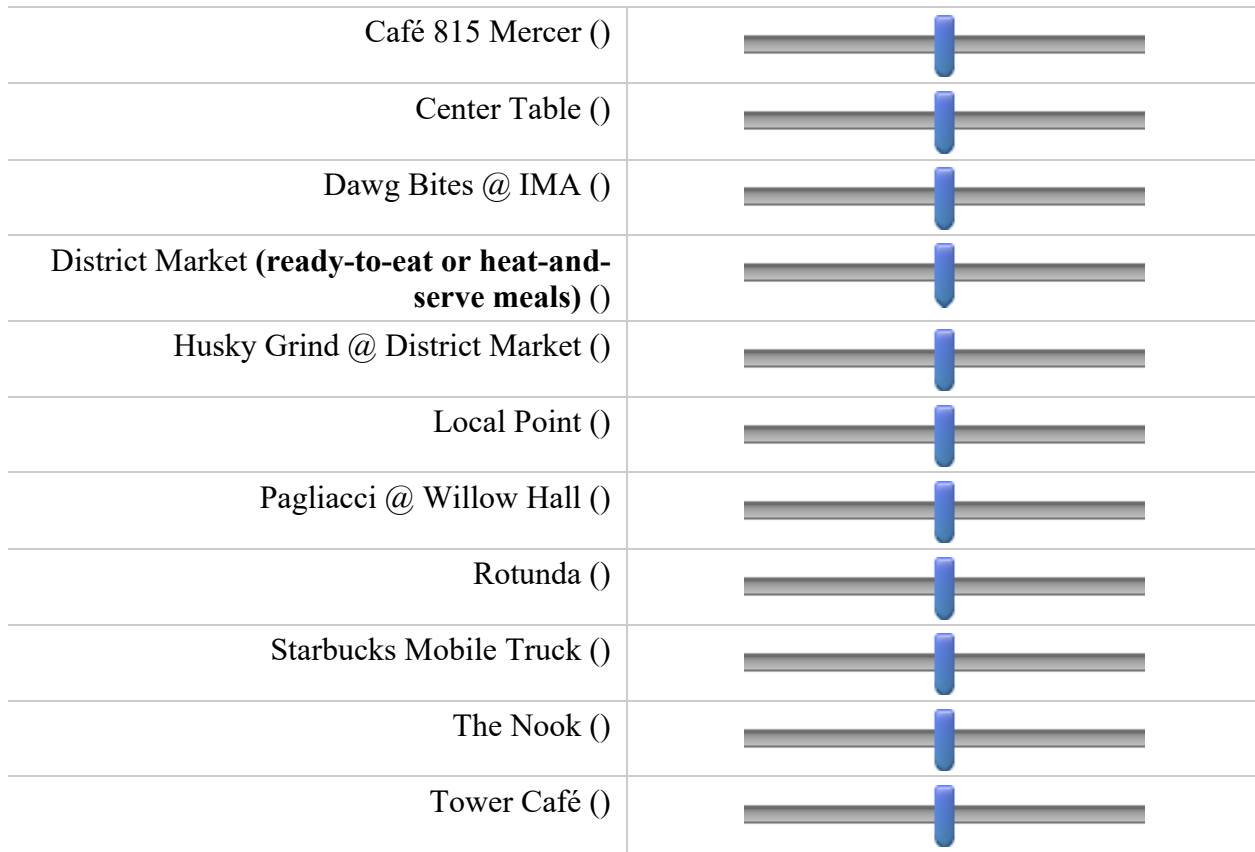
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Q5 How many times did you purchase food from the following on-campus sources\* during an average week from January 1 to March 8, 2020?

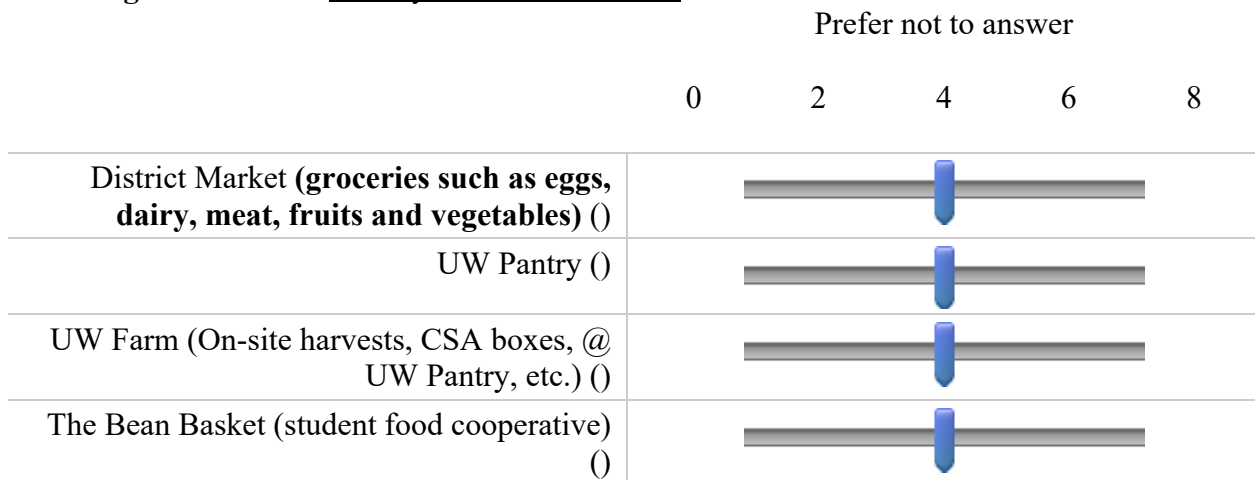


Q6 How many times did you purchase food from the following on-campus sources during an average week from March 9 to June 12, 2020?

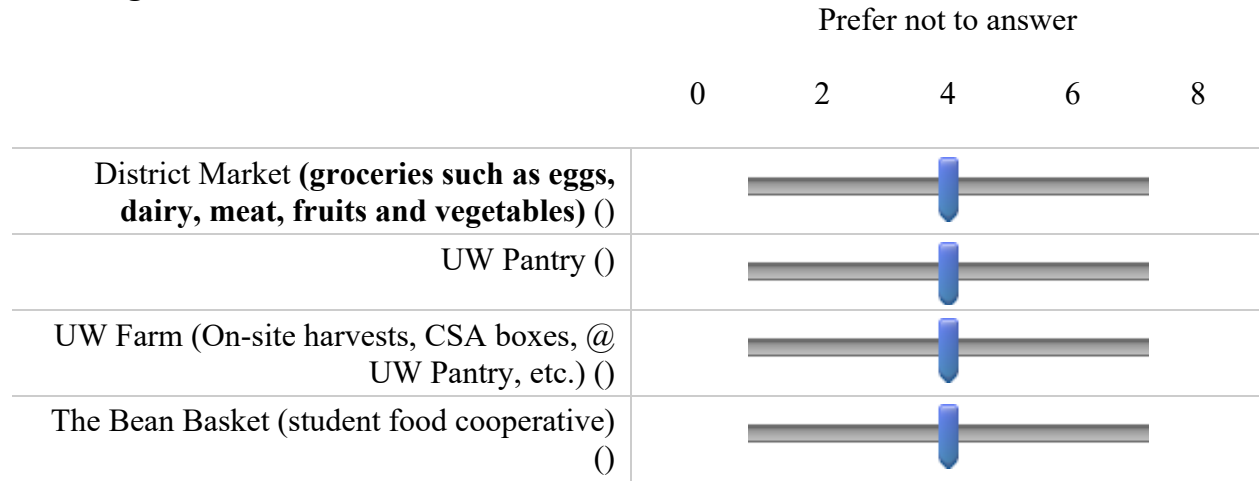




Q7 How many times did you purchase food from the following on-campus food sources during an **average month** from January 1 to March 8, 2020?



Q8 How many times did you purchase food from the following on-campus food sources during an **average month** from March 9 to June 12, 2020?



Q9 How have changes due to COVID-19 affected your access to food from the following on-campus food sources?

	Negative effect (3)	Neutral (2)	Positive effect (1)	N/A (6)	Prefer not to answer (7)
<b>Residential Dining</b> (e.g., Local Point, Center Table) (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Retail Dining</b> (e.g., Husky Den, By George, Rotunda) (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Cafés/Coffee shops</b> (e.g., Starbucks, Husky Grind) (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Food Trucks &amp; Mobile Dining Units</b> (e.g., Motosurf, Sunrise Griddle) (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Grocery Stores and Food Markets</b> (e.g., District Market) (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>UW Pantry</b> (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>UW Farm</b> (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>The Bean Basket</b> (ASUW Student Food Cooperative) (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Q10 Which of the following reasons **negatively** affected your access to on-campus food sources?  
(Select all that apply)

- Newly adjusted hours due to COVID-19 did not work with my schedule (12)
  - Food source locations were inconvenient to get to (11)
  - Concerned for health risks related to COVID-19 while shopping for groceries at an on-campus market or the UW Pantry (13)
  - Concerned for health risks related to COVID-19 from eating food at on-campus restaurants, cafés, or food trucks (14)
  - Concerned for health risks related to COVID-19 while taking public transportation (3)
  - Did not have transportation (1)
  - Food source lacked an adequate amount of culturally-appropriate options (4)
  - Food source lacked an adequate amount of fresh fruits or vegetables (8)
  - Could not afford food (6)
  - None of the above (18)
  - Other (Please specify) (19)
- 
- Prefer not to answer (17)
-

Q11 To what degree did reduced hours **negatively** affect your access to food from the following on-campus food sources?

	No effect (5)	Minor effect (1)	Moderate effect (2)	Major effect (3)	N/A (6)	Prefer not to answer (4)
Center Table (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
District Market (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Husky Grind @ District Market (27)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local Point (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pagliacci at Willow Hall (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rotunda (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Starbucks Mobile Truck (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Nook (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tower Café (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
UW Pantry (25)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
UW Farm (26)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q12 To what degree did closures negatively affect your access to food from the following on-campus food sources?

	No effect (1)	Minor effect (2)	Moderate effect (3)	Major effect (4)	N/A (6)	Prefer not to answer (5)
By George (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Café 815 Mercer (14)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cultivate (15)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dawg Bites (16)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Etc. at UW Medical Center (17)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Evolutionary Grounds (18)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hot Dawgs (19)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Husky Den (HUB) (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Husky Grind at Mercer Court (20)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mary Gates Espresso (21)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Microsoft Café (22)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Motosurf (23)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overpass Espresso (24)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Parnassus (29)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Public Grounds (25)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reboot (26)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Starbucks @ Suzzallo (30)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sunrise Griddle (27)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supreme Cup (28)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Bean Basket (ASUW Student Food Cooperative) (34)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Q13 To what degree did location **negatively** affect your access to food from the following on-campus food sources?

	No effect (1)	Minor effect (2)	Moderate effect (3)	Major effect (4)	N/A (6)	Prefer not to answer (5)
Center Table (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
District Market (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Husky Grind @ District Market (27)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local Point (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pagliacci at Willow Hall (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rotunda (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Starbucks Mobile Truck (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Nook (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tower Café (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
UW Pantry (25)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
UW Farm (26)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q14 Which set of health risks affected your decision or ability to access food? (Select all that apply)

I have an underlying medical condition that puts me at an increased risk for severe illness from COVID-19. (1)

Someone else in my household has an underlying medical conditions that puts them at an increased risk for severe illness from COVID-19. (2)

I did not feel that the facility was implementing strategies to reduce the spread of COVID-19 such as social distancing guidance or a supply of alcohol based hand sanitizers for customer use. (3)

Other (4) \_\_\_\_\_

Prefer not to answer (5)

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Q15 To what degree did you avoid shopping or dining at the following on-campus food sources because you did not feel that the facility was implementing strategies to reduce the spread of COVID-19?

	No effect (2)	Minor effect (3)	Moderate effect (4)	Major effect (5)	N/A (7)	Prefer not to answer (6)
Center Table (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
District Market (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Husky Grind @ District Market (27)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local Point (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pagliacci at Willow Hall (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Starbucks Mobile Truck (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rotunda (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Nook (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tower Café (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
UW Pantry (25)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
UW Farm (26)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q16 To what degree did the lack of culturally-appropriate options negatively affected your access to food from the following on-campus food sources?

	No effect (1)	Minor effect (2)	Moderate effect (3)	Major effect (4)	N/A (6)	Prefer not to answer (5)
Center Table (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
District Market (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Husky Grind @ District Market (27)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local Point (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pagliacci at Willow Hall (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rotunda (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Starbucks Mobile Truck (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Nook (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tower Café (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
UW Pantry (25)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
UW Farm (26)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q17 To what degree did the lack of fresh fruits and vegetables negatively affect your access to food from the following on-campus food sources?

	No effect (1)	Minor effect (2)	Moderate effect (3)	Major effect (4)	N/A (6)	Prefer not to answer (5)
Center Table (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
District Market (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Husky Grind @ District Market (27)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local Point (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pagliacci at Willow Hall (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rotunda (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Starbucks Mobile Truck (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Nook (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tower Café (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
UW Pantry (25)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
UW Farm (26)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q18 To what degree did price negatively affect your access to food from the following on-campus food sources?

	No effect (1)	Minor effect (2)	Moderate effect (3)	Major effect (4)	N/A (6)	Prefer not to answer (5)
Center Table (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
District Market (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Husky Grind @ District Market (27)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local Point (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pagliacci at Willow Hall (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rotunda (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Starbucks Mobile Truck (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Nook (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tower Café (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
UW Pantry (25)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
UW Farm (26)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

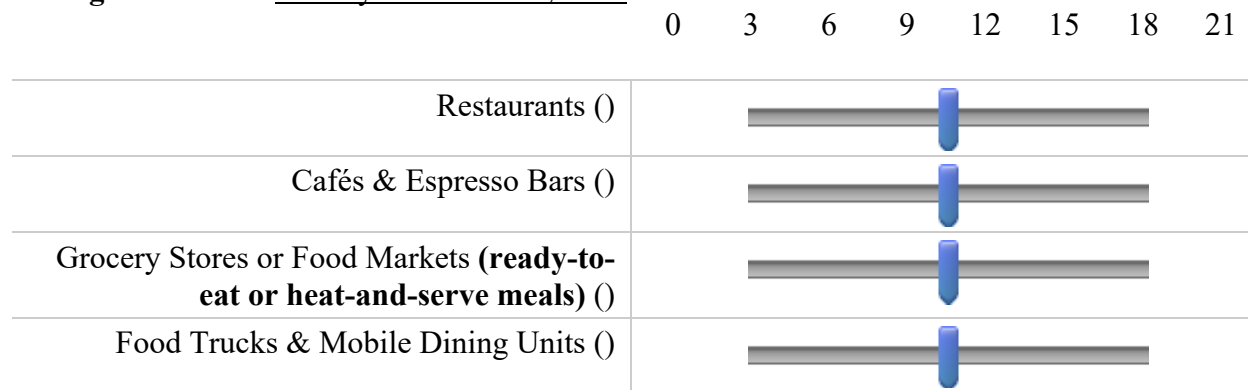
End of Block: 3) All On-Campus Options, Sources, and Effects

Start of Block: 4) OFF-CAMPUS Food Sources "None of the above"

Q19 Although you have not eaten from any on-campus food sources since January 1, 2020, recording your access to other food sources is still very important for this study. The next set of questions will focus on off-campus food sources and home prepared meals.

Q20 You are more than half way there! In order to capture a more complete picture of how COVID-19 has affected your access to food, the next set of questions will focus on **off-campus** food sources and home prepared meals.

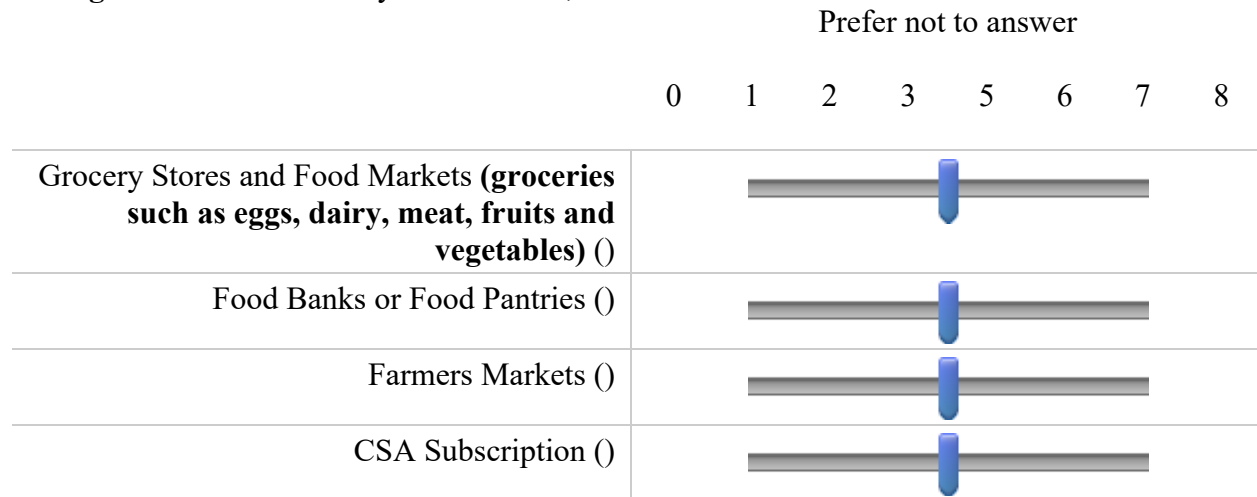
Q21 How many times did you purchase food from the following off-campus sources during an **average week** from January 1 to March 8, 2020?



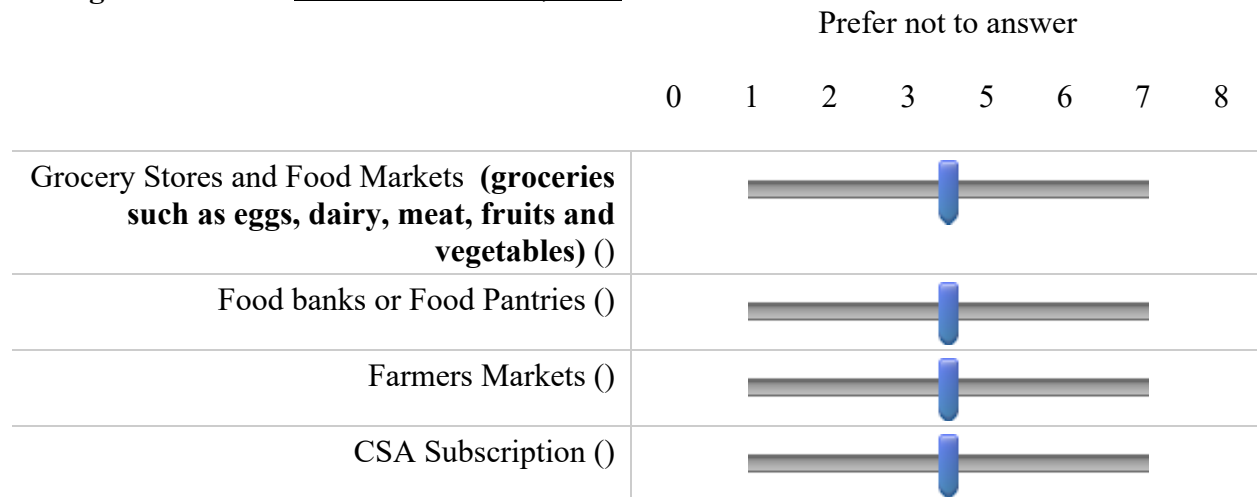
Q22 How many times did you purchase food from the following off-campus sources during an **average week** from March 9 to June 12, 2020?



Q23 How many times did you purchase food from the following off-campus sources during an **average month** from January 1 to March 8, 2020?



Q24 How many times did you purchase from the following off-campus sources during an **average month** from March 9 to June 12, 2020?



End of Block: 4) OFF-CAMPUS Food Sources "None of the above"

Start of Block: 8) Home meals

Q25 How many times did you eat a meal (breakfast, lunch, dinner) prepared by you or someone in your household during an **average week** from January 1 to March 8, 2020?

Prefer not to answer

0 2 4 6 8 11 13 15 17 19 21



Q26 How many times did you eat a meal (breakfast, lunch, dinner) prepared by you or someone in your household during an **average week** from March 9 to June 12, 2020?

Prefer not to answer

0 2 4 6 8 11 13 15 17 19 21



Q27 How did the following factors affect your ability to prepare your own food from March 9 to June 12, 2020 **compared** to the time from January 1 to March 8?

	Negatively (1)	Neutral (3)	Positively (4)	Prefer not to answer (5)
Amount of time (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Experience/knowledge (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Access kitchen facility (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Access to cooking equipment (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Access to ingredients (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: 8) Home meals

---

Start of Block: 9) Food security

Q28 Please mark whether the following statements were **never true**, **sometimes true**, or **often true** for your household from January 1 to March 8, 2020:

	Never true (1)	Sometimes true (2)	Often true (3)	Prefer not to answer (4)
"We worried whether our food would run out before we got money to buy more." (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"The food we bought just didn't last, and we didn't have money to get more." (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"We had access to culturally relevant foods." (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

---

Q29 Please mark whether the following statements were **never true**, **sometimes true**, or **often true** for your household from March 8 to June 12, 2020:

	Never true (1)	Sometimes true (2)	Often true (3)	Prefer not to answer (4)
"We worried whether our food would run out before we got money to buy more." (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"The food we bought just didn't last, and we didn't have money to get more." (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"We had access to culturally relevant foods." (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: 9) Food security

---

Start of Block: 11) Demographic questions

Q31 To help convey the breadth of impact on different demographics, we request that you answer the following questions.

---

Q32 How old are you?

- 18-22 (1)
  - 23-26 (2)
  - 27-30 (3)
  - 31-40 (4)
  - 41-50 (5)
  - 51-60 (6)
  - 61-64 (7)
  - 65 and older (8)
  - Prefer not to answer (9)
- 

Q33 How do you identify

- Female (1)
  - Male (2)
  - Trans (3)
  - Non-binary (4)
  - Gender non-conforming (5)
  - Prefer to self-describe (7)
  - Prefer not to answer (6)
-

Q34 Do you identify as Hispanic or Latino/Latinx?

- Yes (1)
  - No (2)
  - Prefer not to answer (3)
- 

Q35 Which one of the following would best represent your race?

- African American or Black (2)
  - American Indian or Alaska Native (4)
  - Asian (3)
  - Native Hawaiian or Pacific Islander (5)
  - White (1)
  - Other (Please specify) (10) \_\_\_\_\_
  - Prefer not to answer (11)
- 

Q36 Are you an international student?

- Yes (1)
  - No (16)
  - Prefer not to answer (17)
-

Q37 Where did you live from January 1 to March 8, 2020? (Select all that apply)

Residence hall (1)

Sorority/fraternity house (2)

On-campus apartment (3)

Off-campus (apartment, house, etc.) (4)

Other (5) \_\_\_\_\_

Prefer not to answer (6)



Q38 What neighborhood/district did you live in from January 1 to March 8, 2020?

- Outside Seattle (52)
- Atlantic (1)
- Ballard (2)
- Beacon Hill (3)
- Bitter Lake (32)
- Broadview (31)
- Bryant (40)
- Capitol Hill (4)
- Central Area/Central District (5)
- Chinatown/Industrial District (9)
- Columbia City (28)
- Crown Hill (33)
- Delridge (6)
- Downtown (7)
- First Hill (48)
- Fremont (44)
- Georgetown (21)
- Green Lake (43)
- Greenwood-Phinney Ridge (34)
- Judkins Park (8)

- Lake City (10)
- Lake Union (11)
- Laurelhurst (42)
- Madison Park (12)
- Madrona (13)
- Magnolia (14)
- Maple Leaf (30)
- Montlake (49)
- Mount Baker (29)
- Minor (15)
- North Seattle (16)
- Northgate (17)
- Othello (50)
- Phinney Ridge (45)
- Pinehurst (46)
- Queen Anne (18)
- Rainier Valley (19)
- Ravenna (39)
- Roosevelt (38)
- Sand Point (37)
- Seward Park (20)

- South Lake Union (22)
  - University District (27)
  - Wallingford (35)
  - West Seattle (23)
  - Not indicated (51)
  - Prefer not to answer (53)
- 

Q39 Who did you live with from January 1 to March 8, 2020?

- Lived alone (5)
  - Roommates/Housemates (1)
  - Parents/Guardians (2)
  - Prefer not to answer (4)
- 

Q40 Did you live somewhere different from March 9 to June 12, 2020?

- Yes (1)
  - No (2)
  - Prefer not to answer (3)
-

Q41 Where did you live from March 9 to June 12, 2020?

- Residence hall (1)
  - Sorority/fraternity house (2)
  - On-campus apartment (3)
  - Off-campus (apartment, house, etc.) (4)
  - Other (5) \_\_\_\_\_
  - Prefer not to answer (6)
-

Q42 What neighborhood/district did you live in from March 9 to June 12, 2020?

- Outside Seattle (52)
- Atlantic (1)
- Ballard (2)
- Beacon Hill (3)
- Bitter Lake (32)
- Broadview (31)
- Bryant (40)
- Capitol Hill (4)
- Central Area/Central District (5)
- Chinatown/Industrial District (9)
- Columbia City (28)
- Crown Hill (33)
- Delridge (6)
- Downtown (7)
- First Hill (48)
- Fremont (44)
- Georgetown (21)
- Green Lake (43)
- Greenwood-Phinney Ridge (34)
- Judkins Park (8)

- Lake City (10)
- Lake Union (11)
- Laurelhurst (42)
- Madison Park (12)
- Madrona (13)
- Magnolia (14)
- Maple Leaf (30)
- Montlake (49)
- Mount Baker (29)
- Minor (15)
- North Seattle (16)
- Northgate (17)
- Othello (50)
- Phinney Ridge (45)
- Pinehurst (46)
- Queen Anne (18)
- Rainier Valley (19)
- Ravenna (39)
- Roosevelt (38)
- Sand Point (37)
- Seward Park (20)

- South Lake Union (22)
  - University District (27)
  - Wallingford (35)
  - West Seattle (23)
  - Not indicated (51)
  - Prefer not to answer (53)
- 

Q43 Who did you live with from March 9 to June 12, 2020?

- Live alone (5)
  - Roommates/Housemates (1)
  - Parents/Guardians (2)
  - Prefer not to answer (4)
- 

Q44 Do you have any dependents?

- Yes (1)
  - No (2)
  - Prefer not to answer (5)
- 

Q45 What was your **total income**\* from January 1 to March 8, 2020?

\*Total income includes personal, family, and household income, both earned and unearned,

from specific sources (e.g., wages, tips, and salaries, dividends and interest, Social Security, unemployment insurance, disability income, etc.).

- Less than \$10,000 (1)
- \$10,000 - \$19,999 (2)
- \$20,000 - \$29,999 (3)
- \$30,000 - \$39,999 (4)
- \$40,000 - \$49,999 (5)
- \$50,000 - \$59,999 (6)
- \$60,000 - \$69,999 (7)
- \$70,000 - \$79,999 (8)
- \$80,000 - \$89,999 (9)
- \$90,000 - \$99,999 (10)
- \$100,000 - \$149,999 (11)
- More than \$150,000 (12)
- Prefer not to answer (13)

---

Q46 What was your **total income**\* from March 9 to June 12, 2020?

\*Total income includes personal, family, and household income, both earned and unearned,

from specific sources (e.g., wages, tips, and salaries, dividends and interest, Social Security, unemployment insurance, disability income, etc.).

- Less than \$10,000 (1)
  - \$10,000 - \$19,999 (2)
  - \$20,000 - \$29,999 (3)
  - \$30,000 - \$39,999 (4)
  - \$40,000 - \$49,999 (5)
  - \$50,000 - \$59,999 (6)
  - \$60,000 - \$69,999 (7)
  - \$70,000 - \$79,999 (8)
  - \$80,000 - \$89,999 (9)
  - \$90,000 - \$99,999 (10)
  - \$100,000 - \$149,999 (11)
  - More than \$150,000 (12)
- 

Q47 Did you ever receive a UW Food Security Grant (\$100 grants for emergency assistance to purchase food at any HFS dining hall and on-campus market) from January 1 to March 8, 2020?

- Yes (1)
  - No (2)
  - Prefer not to answer (3)
-

Q48 Did you ever receive a UW Food Security Grant (\$100 grants for emergency assistance to purchase food at any HFS dining hall and on-campus market) from March 9 to June 12, 2020?

- Yes (1)
  - No (2)
  - Prefer not to answer (3)
- 

Q49 Did you have SNAP benefits (also known as food stamps) from January 1 to March 8, 2020

- Yes (3)
  - No (4)
  - Prefer not to answer (5)
- 

Q50 Did you have SNAP benefits (also known as food stamps) from March 9 to June 12, 2020?

- Yes (3)
  - No (4)
  - Prefer not to answer (5)
-

Q51 What was your employment and student enrollment situation from January 1 to March 8, 2020?

- I was unemployed and NOT A STUDENT (1)
  - I was unemployed and enrolled as a student (2)
  - I was employed part-time and NOT A STUDENT (3)
  - I was employed part-time and enrolled as a student (5)
  - I was employed full-time and enrolled as a student (6)
  - I was employed full-time and NOT A STUDENT (4)
  - OTHER (7) \_\_\_\_\_
  - Prefer not to answer (8)
- 

Q52 What was your employment and student enrollment situation from March 9 to June 12, 2020?

- I was unemployed and NOT A STUDENT (1)
  - I was unemployed and enrolled as a student (2)
  - I was employed part-time and NOT A STUDENT (3)
  - I was employed part-time and enrolled as a student (5)
  - I was employed full-time and enrolled as a student (6)
  - I was employed full-time and NOT A STUDENT (4)
  - OTHER (7) \_\_\_\_\_
  - Prefer not to answer (8)
-

Q53 Do you (or someone else in your household) have an underlying medical condition that puts you (or them) at an increased risk for severe illness from COVID-19? (Select all that apply)

I have an underlying medical condition that puts me at an increased risk for severe illness from COVID-19. (1)

Someone else in my household has an underlying medical conditions that puts them at an increased risk for severe illness from COVID-19. (2)

Other (4) \_\_\_\_\_

Prefer not to answer (5)

End of Block: 11) Demographic questions

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Start of Block: 12) Concluding question

Q54 Is there anything else you would like to mention about how COVID-19 has affected your access and relationship to food?

Yes (4) \_\_\_\_\_

No (5)

End of Block: 12) Concluding question

---

Start of Block: 13) Gift card compensation

Q55 Are you interesting in entering a drawing for one of ten \$50 University Bookstore gift cards? If yes, please provide your **UW email address\***. If you are selected, you will receive an email on August 1, 2020.

\*Only the participants that complete the survey will be entered into the drawing. The email address will be kept confidential and will only be used for this drawing.

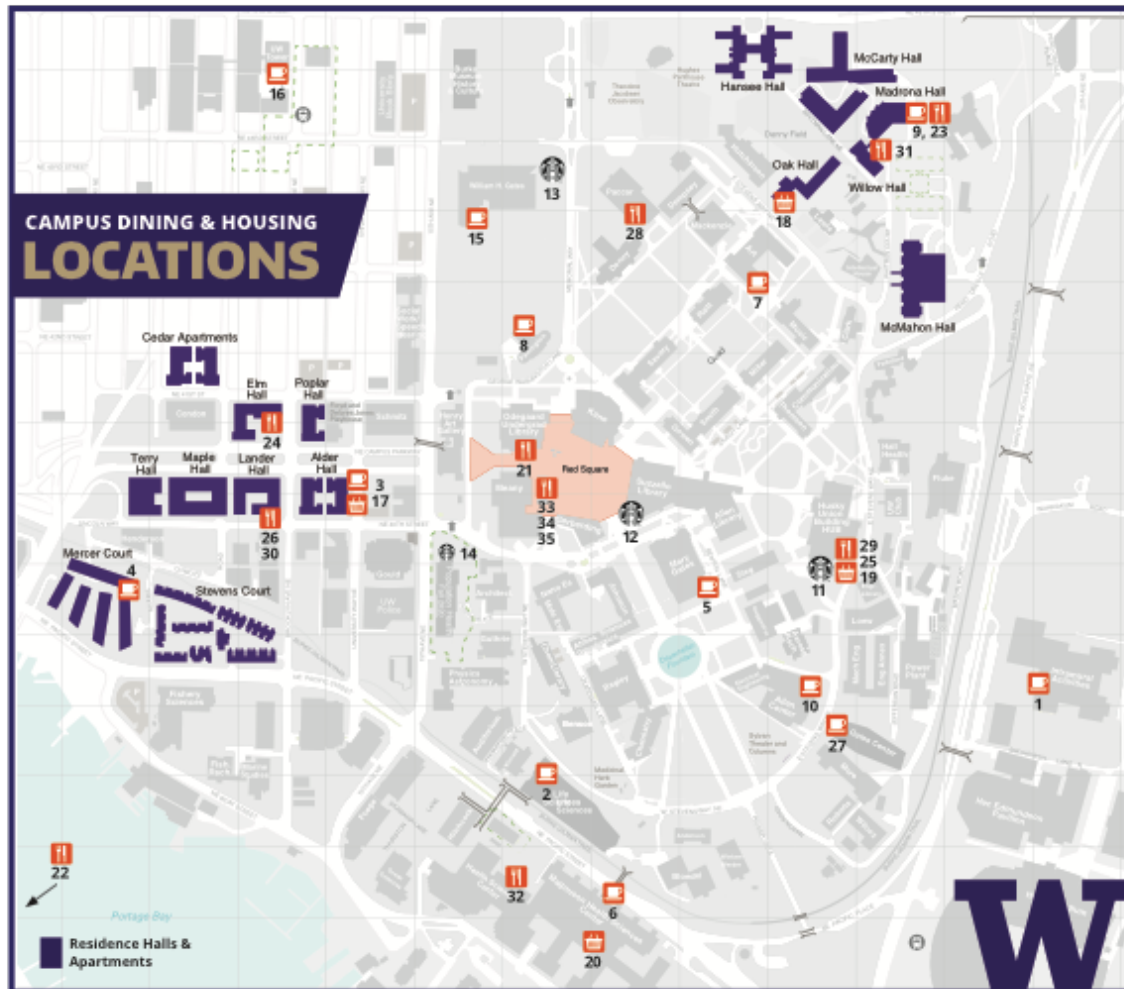
Yes (Please provide your UW email address in the text box) (4)

\_\_\_\_\_  
 No thank you (5)

End of Block: 13) Gift card compensation

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# APPENDIX V: MAP OF HFS OPERATION UNITS



## CAMPUS DINING & HOUSING LOCATIONS

### CAFÉS & ESPRESSO BARS ☞

1. Dawg Bites, Intramural Activities Building (IMA)
2. Evolutionary Grounds, Life Sciences Building
3. Husky Grind at District Market, Alder Hall
4. Husky Grind at Mercer Court, Mercer Court
5. Mary Gates Hall Espresso, Mary Gates Hall
6. Overpass Espresso, Magnuson Health Sciences Center T-wing
7. Parnassus, Art Building
8. Public Grounds, Parrington Hall
9. Quench, Willow Hall
10. Reboot, Paul G. Allen Center for Computer Science & Engineering
11. Starbucks® Coffee, Husky Union Building (HUB)
12. Starbucks® Coffee, Suzzallo Library
13. Starbucks® Espresso Truck, William H. Gates Hall
14. Starbucks® Coffee, Population Health
15. The Supreme Cup, William H. Gates Hall
16. Tower Café, UW Tower

### MARKETS ☞

17. District Market, Alder Hall
18. District Market, Oak Hall
19. Etc., Husky Union Building (HUB)
20. Etc., Magnuson Health Sciences Center E-court

### RESTAURANTS ☞

21. By George, Odegaard Undergraduate Library
22. Café 815 Mercer, UW Medicine at South Lake Union
23. Center Table, Willow Hall
24. Cultivate, Elm Hall
25. Husky Den, Husky Union Building (HUB)
26. Local Point, Lander Hall
27. Microsoft Café, Bill & Melinda Gates Center for CSE
28. Orin's Place, Paccar Hall
29. Pagliacci Pizza, Husky Union Building (HUB)
30. Pagliacci Pizza, Lander Hall
31. Pagliacci Pizza, Willow Hall
32. The Rotunda, Magnuson Health Sciences Center I-court

### STREET FOOD ☞

33. Sunrise Griddle moves to different locations on campus. ☞
34. Motosurf, Red Square
35. Hot Dawgs, Red Square

☞ Schedule/service varies. Scan the QR code for more information.

