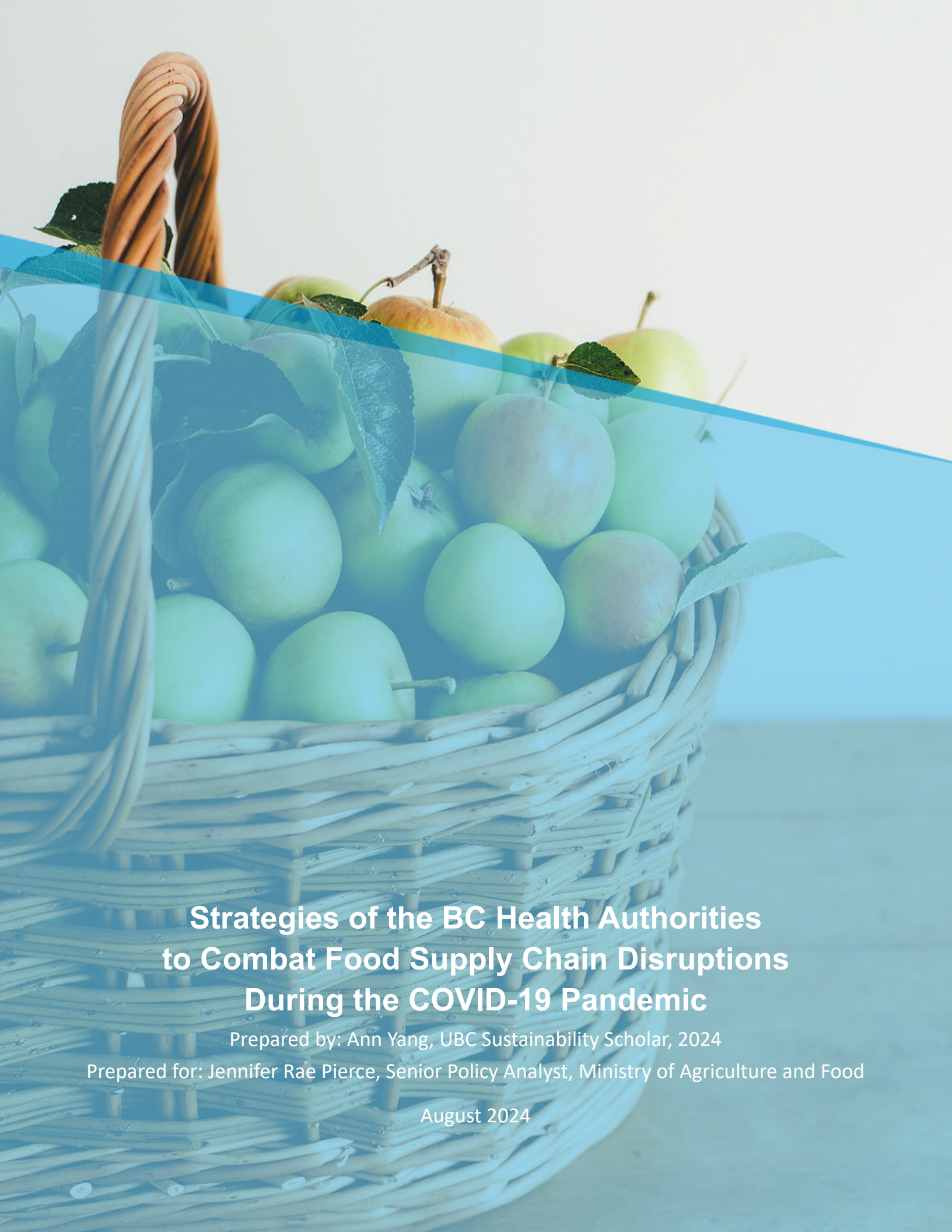

Strategies of the BC Health Authorities to Combat Food Supply Chain Disruptions During the COVID-19 Pandemic

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Disclaimer

This report was produced as part of the UBC Sustainability Scholars Program, a partnership between the University of British Columbia and various local governments and organizations in support of providing graduate students with opportunities to do applied research on projects that advance sustainability across the region.

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Although this project did not specifically examine Indigenous foods within BC due to time and resource constraints, the author recognizes that traditional foods are an essential aspect of the Indigenous communities' cultural heritage, identity, and well-being. The Canadian government has the responsibility of honouring and supporting Indigenous food sovereignty and cultural resiliency.

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Executive Summary

Background & Purpose

The COVID-19 pandemic highlighted significant vulnerabilities within global and local food systems, particularly impacting critical environments such as hospitals where a reliable food supply is essential for patient care and overall hospital operation.

This report aims to document and analyze the strategies employed by selected BC health authorities and healthcare facilities to cope with the food supply challenges and disruptions during the COVID-19 pandemic. In addition, the role of local foods during these disruptions is reviewed. By examining these responses, the report generates findings that may be used to fortify hospital food systems against future crises.

Methods

The study utilizes a combination of interviews, case studies, and document reviews to gather data. Key representatives from Fraser Health, Interior Health, and Northern Health were interviewed. Subsequently, representatives from the University Hospital of Northern British Columbia (UHNBC), Vanderhoof and Fort St. James area, and Kelowna long-term care homes were interviewed. The data collection process includes virtual one-on-one interviews, email correspondence, and follow-up communications to clarify and gather detailed information. Jurisdictional reports, academic publications, and other relevant documents were also reviewed to support the findings.

Results

Overall, the findings reveal challenges occurring throughout the supply chain. Healthcare facility challenges with food supply issues often stem from vulnerabilities in the early stages of the supply chain, such as production and distribution, which are not sufficiently mitigated. The findings also highlight the unique experiences and responses of each health authority and hospital. Challenges include staffing shortages, transportation and delivery barriers, food product shortages, increased costs, complexities when seeking substitutions, and limited formal documentation.

However, innovative and adaptive strategies are employed to navigate these challenges. Three common strategies that stand out across all case studies include utilizing product substitutions, practicing regular, transparent communication with distributors and other relevant members of

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the team, and relying on established relationships with vendors. Unique approaches include developing supportive protocols and tools, leveraging regional facilities, implementing staffing strategies, and utilizing local resources during emergencies.

Overall, local foods are not identified to be a major facilitator or barrier in navigating the food system disruptions. Seeking local foods was not a priority for health authorities and hospitals during the COVID-19 pandemic. However, local producers are highly appreciated as they are additional sources of food procurement that healthcare facilities may rely on.

Identified challenges include the local product not matching the healthcare needs, producers needing to be GAP certified, the reliance on the transportation system once integrated into the distributor's system, not producing enough product volumes, and difficulty in naturally competing against large, established vendors.

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Introduction

The COVID-19 pandemic, which started in 2020, highlighted the vulnerabilities within global and local food systems, particularly in critical environments such as hospitals, where food security is essential for patient care and overall hospital operation. During these times of uncertainty, British Columbia (BC) hospitals experienced major food system disruptions during the COVID-19 pandemic with lasting impacts. To mitigate these impacts, the BC provincial regional health authorities and hospitals relied on various methods to cope with unprecedented food system emergencies. However, there are limited records of these experiences during the crisis.

By examining the challenges and strategies to combat food system disruptions in healthcare settings, this project aims to partially fill the gap in the documentation and provide an analysis of the lessons learned by selected hospitals and their associated health authorities during the COVID-19 pandemic.

In addition, this project is particularly significant in the context of climate change. As climate change continues to pose increasing threats to food security, the importance of developing resilient and sustainable food systems becomes ever more critical. This study will provide valuable insights into how hospitals and their associated food systems can become more resilient against future emergencies, ensuring they can maintain continuous patient care and overall functionality.

Background

The COVID-19 Pandemic and the Food System

COVID-19 was declared a pandemic by WHO on March 11, 2020 (de Faye, 2022). Since then, several waves featuring multiple virus variants have occurred within BC, leading to viral peaks that repeatedly impacted the population. Provincial and federal measures were launched to ensure public safety, such as restricting gatherings, limiting travel, encouraging quarantine, and launching vaccination mandates and passports. By May 2022, many restrictions were relaxed or removed; instead, protective measures were largely performed and managed by individuals (de Faye, 2022).

In May 2023, WHO declared the end of COVID-19 as a “global health emergency” but continued to recognize it as a threat, as variants of the COVID-19 coronavirus with different levels of transmissibility and severity continued to impact the public (Wise, 2023). Reviewing the most

recent trends in July 2024, there are signs of small increases in COVID-19 incidence within the BC population, indicating potential viral peaks (*COVID-19 Epidemiology Update: Summary*, 2024).

The impact of the COVID-19 pandemic is profound. One of which is major disruptions of the food system. The disruption was due to several factors, which accumulated and created shocks to the food chain. Hobbs (2020) identified three stressors from the supply-side, and two demand-side shocks.

Production vulnerabilities include working with labor shortages due to adverse health outcomes experienced by workers, regional safety measures, and travel restrictions (Hobbs, 2020). Transportation networks, especially long-haul trucking, experienced challenges due to labor shortages as well as travel restrictions. In addition, protests, such as the Freedom Convoy that began in the fall of 2021, created additional burden on the transportation system. In terms of US-to-Canada transport lines, there was a "thickening" of the border which slowed down the cross-country product import and export process (Hobbs, 2020).

On the consumer side, panic purchasing and stockpiling have led to a sudden increase in product demands, resulting in immediate, short-term shortages near the start of the COVID-19 pandemic (Hobbs, 2020). Due to public health recommendations and the closure of food service establishments, there was also a shift in the consumer pattern to move away from eating out to preparing meals at home. This shift increased pressure in the food retailing sector designed for individual, commercial use (Hobbs, 2020).

The Role of Local Foods

In general, there is no globally agreed-upon definition for what is considered to be "local" for local foods (Enthoven & Van den Broeck, 2021). For this project, Feed BC's definition of local foods is used: foods that are produced and/or processed within the BC region (*Feed BC Program Standards: Definitions of B.C. Food*, n.d.).

Local foods are widely known for their ability to create a more resilient food system, as they reduce the need to rely on long supply chains. In addition, these products can support the local economy and community through the creation and reinforcement of jobs, partnerships, and in some cases, green landscapes (Weinkauf & Everitt, 2023). Additional benefits include the potential to reduce carbon footprint due to the shortened transportation system in comparison to global food chains (Weinkauf & Everitt, 2023).

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There has been an increasing trend in the interest to promote the production and purchase of local foods both at the public and the governmental level (Enthoven & Van den Broeck, 2021; Faulkner et al., 2023). In 2023, most Canadians indicated that they "sometimes or always" sought out local foods (*Survey on Consumer Perceptions of Food - Wave VI*, 2024). The most common reason behind purchasing local foods is the desire to support the local economy, followed by product freshness (*Survey on Consumer Perceptions of Food - Wave VI*, 2024). At the governmental level, initiatives are in place to support the production and utilization of local foods in Canada. For example, the Local Food Infrastructure Fund is available to support the development of local food infrastructure in alignment to create a sustainable food system (*Local Food Infrastructure Fund Updates for 2024*, 2024).

However, during the COVID-19 pandemic, micro, small, and medium enterprises (SMEs) were greatly impacted (Carducci et al., 2021). These producers, common in local and domestic food chains, faced challenges including "longer lead time (due to social distancing protocols) among distributors, reduced labor capacity, increased inspections and quarantine measures, and rising operating costs." As a result, SMEs struggled during the pandemic, some experiencing restrictions or closures (Carducci et al., 2021).

While local foods have the potential to strengthen food systems and provide economic and environmental benefits, the pandemic exposed significant challenges and limitations. Moreover, the impact of local foods largely depends on the specific characteristics of the product, the supply chain, and the regional context it operates in (Enthoven & Van den Broeck, 2021). Thus, it remains unclear the exact role and impact of local foods within the healthcare system during crises.

Feed BC

One of the major provincial initiatives in supporting local food systems is Feed BC. It is led by the Ministry of Agriculture and Food to increase the use of local foods in public institutions, such as schools and healthcare facilities *(Feed BC Partner Guide for Public Institutions, n.d.)*. Specifically, Feed BC in healthcare is a partnership between the Ministry of Agriculture and Food, the Ministry of Health, and the provincial and regional health authorities in BC (*B.C. food expenditures in health care: 2022/2023*, n.d.). Since 2018/2019, health authorities have publicly reported their local food purchases as a percentage of their total annual food expenditures (*Feed BC in Health Care*, 2024). Health Authorities are working towards an aspirational target of 30% B.C. food of total food expenditures (*Feed BC in Health Care*, 2024). The most recent report for the

2022/2023 fiscal year showed that local foods comprised 27.5% of the total food purchases in BC healthcare facilities (*B.C. food expenditures in health care: 2022/2023*, n.d.).

To support the institutional use of local products, Feed BC provides various resources and services. For example, Feed BC developed the Feed BC Directory, which helps users search for and source local food products (*Feed BC Directory*, 2024). Users can directly connect with local businesses listed in the Directory to learn more about local product options (*Feed BC Directory*, 2024).

British Columbia Healthcare Infrastructure

In BC, five regional health authorities oversee healthcare services: Fraser Health, Interior Health, Island Health, Northern Health, and Vancouver Coastal Health (*Health Authorities*, 2021). The Provincial Health Services Authority works with the regional health authorities to deliver provincial initiatives and services, as well as governing relevant provincial healthcare organizations. The First Nations Health Authority represents and manages First Nations health programs and services in BC. Unlike the health authorities, the Provincial Health Services Authority and the First Nations Health Authority do not have unique, distinct geographic areas of operation. Instead, they operate province-wide (*Health Authorities*, 2021).

Healthcare Food System

The BC regional health authorities, along with the Provincial Health Services Authority, are responsible for the operation of 170 hospitals and residential care facilities; responsibilities include food services provided within these institutions (*Feed BC*, 2024). The food supply chains involved with hospitals can generally be described as a linear movement of food products. Producers and processors manufacture food products, which are then transported to distributors, who handle the logistics of fulfilling healthcare institution orders and delivery. Sysco is one of the key distributors that healthcare facilities in BC rely on. Other examples of food service providers and distributors partnered with BC health authorities include Aramark, Canada Bread, and Island Farm. Hospitals are the final step in the food supply chain, receiving the products, preparing meal items, and feeding their patients and staff.

Most health authorities have a centralized diet management software, CBORD. It provides the ability to set up menus, plan recipes, and support inventories. Patients and residents can also directly access the menu and order from the virtual CBORD application. Interior Health currently

has not set up the system yet, but a plan to shift into a diet management system is scheduled for 2024.

Methodology

This project aimed to primarily collect data from BC regional health authorities and hospitals. Additional input from other healthcare facilities was not purposefully sought out, but welcomed. Hospitals were pre-defined to be facilities identified as hospitals by name and listed by the regional health authority.

Data was primarily collected through virtual one-on-one interviews in June and July 2024. Key representatives were selected based on recommendations from government authorities and interviewee referrals, which provided information on their relevant experience and knowledge about the healthcare food system during the pandemic. Contacts were reached via email. A structured interview guide was used to ensure consistency across all interviews, focusing on topics such as the impact of COVID-19 on healthcare food systems, strategies to mitigate disruptions, and the role of local foods. Additional data was collected through email correspondence with representatives who provided supplementary information and insights that were not captured during the interviews. Follow-up emails were sent to clarify any ambiguous responses and to gather more detailed information when necessary. When relevant, interviewees were encouraged to provide further contact points to support the triangulation and enrichment of the data collected.

For this project, three health authorities were interviewed: Fraser Health, Interior Health, and Northern Health. Interior Health and Northern Health were selected due to their relatively higher proportion of hospitals in comparison to other health authorities, with Interior Health overlooking 28% of the hospitals within BC and Northern Health at 23% (Canadian Hospitals Rated by CBC, n.d.). Fraser Health was selected based on the recommendations from Feed BC. Subsequently, representatives from the University Hospital of Northern British Columbia (UHNBC), Vanderhoof and Fort St. James area, and Kelowna long-term care homes were interviewed.

To complement the information gathered through interviews, a documentation review was conducted in tandem. Jurisdictional reviews, a literature review of gray and white papers, and an investigation through academic publications were conducted. In addition, regional reports from Canada, the USA, Europe, Japan, and China, and formal websites from the global top 30 hospitals in 2024 were explored for records about hospitals' responses to food system disruptions during the COVID-19 pandemic. The global hospital ranking was developed by Newsweek and Statista

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through outcomes from large-scale online surveys involving medical professionals, publicly available data on patient satisfaction surveys and quality metrics, and PROMs Implementation surveys (World's Best Hospitals 2024, n.d.). Additional documents were sourced from interviewees, including internal reports and policy documents, to provide additional context, validate findings, and uncover insights that might not have been fully captured during interviews.

Free, informed, prior consent was obtained from all interviewees through email correspondence and/or verbally through interviews. Interview recordings and transcripts were gathered for the sole purpose of note-taking by the project scholar. All records of the raw interview and transcript records were destroyed after the completion of this project.

Findings: Provincial Regional Health Authorities

Representatives from Fraser Health, Interior Health, and Northern Health include dietitians, Culinary Support Managers, and Support Services Managers. Interviews with these key representatives provide critical insights into the challenges and strategies associated with maintaining hospital food systems during the COVID-19 pandemic. These findings highlight the unique experiences, responses, and lessons learned by health authorities in their efforts to ensure food security in hospital settings.

Overall, all three health authorities reported major disruptions during the peak of the COVID-19 pandemic. The disruption in the supply chain resulted in products becoming unavailable to order (often described as 'being shorted on an order'). Common strategies to combat shortages include frequent communications with the distributor through virtual meetings, seeking alternative food products for purchase, and reliance on relationships with vendors.

In addition, health authorities noted continuous and ongoing disruptions as an impact of the pandemic. Staff shortages and increased product pricing continue to stress the hospital system. Some producers permanently removed certain food products from the shelf, resulting in indefinite modifications to the original purchase list.

Fraser Health

Fraser Health retains two common menus for all hospitals under the health authority: a prepared menu involving readily made products and a production menu which requires food preparation from scratch. While a few sites may have site-specific items for a prepared menu, the broad menu design is similar across all locations to ensure consistency and efficiency in food service

operations. Thus, implementing major menu changes is challenging as changes must be applied consistently across all hospitals within the health authority.

During the COVID-19 pandemic, Fraser Health did not fundamentally change its operations but adopted different strategies to cope with immediate challenges as they arose. Significant supply chain challenges were encountered, such as difficulties in sourcing large quantities of food items due to companies prioritizing retail over food service. For example, producers focused on retail-sized cans of soup instead of the larger-sized versions that the health authority frequently purchased.

Another challenge is the removal of certain products from the market. During the pandemic, several producers downsized or closed due to financial or operational hardships. As a result, some companies chose to sacrifice the products that were not in popular demand and shift the production priority to fast-selling items. Thus, substitutions were critical when Fraser Health's original choice of purchase was removed, sometimes permanently, from the food production lines.

However, finding appropriate, alternative products is a complex process. Since the Fraser Health menu design cannot undergo major changes, substitutions must meet the requirement of having similar nutritional values compared to the original product to adhere to the Canada Food Guide's recommendations and meet the patients' needs. Similarly, allergens must be examined and coded to ensure safety. Additional considerations of food textures further elevate the challenge. For example, patients may have specific dietary needs or restrictions due to medical conditions, such as difficulty swallowing or digesting certain textures.

Secondly, Fraser Health has established relationships with certain vendors through signed contracts. One example is Campbell's, which has a three-year contract, which indicates that Fraser Health is obligated to purchase from the company, unless a significant change has occurred from Campbell, from the hospital's operation or menu, or from the product makeup. With these two barriers, the use of local foods as food product substitutions was especially difficult.

However, local foods are not impossible to incorporate given enough time. One example of a successful shift into local foods during the COVID-19 pandemic is the use of local soup. Fraser Health was introduced to a local soup vendor prior to the pandemic and began negotiating to design a product that meets healthcare needs. It took two years to design a soup recipe that met the consistency requirements, and an additional four to six months to fine-tune the product. In

the end, Fraser Health was able to successfully replace its frozen soup with fresh local soup made from retail waste-diverted produce.

Aside from readily available products, purchases can also involve Special Orders. These orders refer to the purchase of products that are not consistently stocked in a distributor's warehouse, but can be produced according to an order. One example is Greek yogurt from Gordon Food Services. While this type of order provides more product options, it also has a unique drawback of production time. It takes between two to four weeks to prepare and deliver these specialty items. This extended lead time can be problematic, especially in a rapidly changing and uncertain environment like a pandemic. Thus, successful planning and forecasting are crucial for these orders.

At the peak of the COVID-19 pandemic, Fraser Health met virtually with representatives from the distributor and vendor on a daily basis to review the status of regularly ordered food products. The Provincial Health Service Authority may also be involved when appropriate. In these meetings, immediate and forecasted shortages are discussed as well as areas of collaboration to create mitigation strategies. For example, Fraser Health used the opportunity to inform distributors of essential products that cannot be shorted in the coming weeks. In turn, the distributor may commit to keeping a four-week emergency stock of these items to ensure that hospitals are prioritized and have a reliable supply of critical food products, even during disruptions. These frequent and structured meetings are a significant facilitating factor in managing food system disruptions. Currently, these meetings are held weekly with the distributor and biweekly with the managers to monitor supply chain status, identify potential issues, and develop timely plans to address any emerging shortages.

Reviewing potential strategies, detailed, long-term guidelines are not strongly favored. The high complexity, unique characteristics, and evolving nature of the emergencies required flexible and adaptive actions rather than rigid, pre-defined protocols. The unpredictability and variety of issues encountered made it difficult to rely on simplistic, static plans. For example, during times of driver shortages, Fraser Health saw that delivered products were not dropped off at the back of the kitchens, but at the loading bay. Even within food system disruptions, the type of food product shorted and the situation that emerged required different mitigation strategies.

As a part of Feed BC's initiative to increase local foods in institutions, Fraser Health has been continuously examining the Feed BC directory for local products to be included in the menu since 2018/2019. Novel products are also introduced through vendor and distributor connections, as

well as product shows. At times, Fraser Health has reached out to Feed BC and the Ministry for Agriculture and Food to seek specific products.

Interior Health

During the initial stages of the COVID-19 pandemic, Interior Health experienced a shift towards more prepackaged food items. In hospital cafeterias, all food offerings had to be pre-portioned and available as grab-and-go options. This adjustment aims to minimize contact and reduce the risk of COVID-19 transmission. Following this, numerous vendors began to close down, and Interior Health started to select alternative products from other vendors. This transition came with increased costs. Following these initial closures and delays, numerous vendors who resumed operations communicated their decision to downsize operations and remove low-demand items from production. This created challenges in providing specialized diets that originally depended on the removed products. Navigating this gap in the food system chain, Interior Health had to revert to in-house preparation for these items if substitutions were not found.

Interior Health noted that staff shortages were exacerbated by the pandemic due to fear of COVID-19 transmission and mandatory vaccination policy. Additionally, trucking companies faced a significant shortage of drivers, leading to delays and rescheduling of deliveries. Aside from the COVID-19 pandemic, major flooding and fire weather events resulted in the disruption of transportation routes. For example, when flooding washed out all routes between Vancouver and the Interior region, transportation of food products relied on the railway system from Ontario and Alberta to deliver to Calgary, and then subsequently to healthcare sites through trucks, resulting in severe delays.

At the same time as the COVID-19 pandemic, several severe weather conditions exacerbated food supply chain challenges faced by hospital food services. Spring floods, summer heatwaves/heat domes, and winter cold snaps with low snowpacks led to poor crop yields and significant damage to vegetables. These adverse weather events affected not only local foods but also imported fruits and vegetables. The decreased availability of crops extended to a variety of produce, including lettuce, root vegetables, berries, apples, and stone fruits. The disruptions in traditional supply chains forced Interior Health to source these items from new areas, often at higher costs.

Facing these challenges, Interior Health increased the volume of entrees produced by the two production centers: Penticton Regional Hospital and Vernon Jubilee Hospital.[1] The service style

[1] Please refer to Appendix A which provides further information on the production centers.

for producing entrees was also streamlined to support staff adjustments. However, this shift placed significant demand on the production centers. Staff had to scale up operations quickly, accommodating the surge in demand while maintaining high standards of food safety and quality. Even so, the production centers experienced major successes responding to these pressures. As the centers used raw ingredients to create meals, they were able to stay on track and continue the provision of food. Another benefit of the production centers is their ability to reserve products for healthcare institutions freely, which sustains the menu during shortages.

Echoing the communication strategies utilized by other health authorities, Interior Health regularly met with their distribution and food service partners, Sysco and Aramark, to discuss expected product shortages days in advance, such as a milk shortage due to a COVID-19 lockdown occurring at a dairy plant. Then, alternative vendors were contacted to request an increase in product volume, ensuring a smooth transition to the substitute.

Common to the other health authorities, substitutions are used when products are shorted. To prepare in advance, Interior Health ensured that menus have built-in functions that allow the selection of alternative product options. All sites also have access to a list of approved substitutions to ensure efficiency and consistency when seeking replacements for unavailable items. Likewise, Interior Health's supplier, Sysco, has integrated a streamlined system that flags any missing items and provides recommended substitute options. In cases where all channels fail, the final option is to purchase the necessary items directly from local grocery stores.

One challenge exacerbated by the pandemic but successfully resolved by Interior Health is the internal product ordering operation. In the past, site managers could order for their sites without pre-approval or review of the purchase list from Interior Health, but this resulted in a lack of standardization. For example, different facilities may order varying products from multiple brands. Over the past few years, an ongoing process of refining and optimizing food procurement and ordering practices was launched to achieve better efficiency rates and cost-effectiveness. Sites' past and current ordering data were reviewed to identify areas of improvement. By highlighting the preferred products and educating staff on the benefits of standardized ordering practices, significant savings were achieved.

Preferred products to order are identified through collaboration with Sysco and Aramark. Preferred products usually have a signed contract that ensures a lower price in comparison to alternatives. For instance, if a new or renewed contract results in a lower price for a quality product compared to a previously preferred brand, this information is shared with site managers, supervisors, and cooks, to ensure the more economical option is chosen. This process of

optimizing food procurement and ordering practices is still actively maintained and conducted on a quarterly basis. Looking ahead, Interior Health anticipates further improvements with the implementation of its own diet management software program.

Following health authorities' commitments to increase the use of local products through the Feed BC partnership, Interior Health continues to seek local vendors to work with. However, integrating new vendors and their products across all 55 healthcare sites within Interior Health has proven to be a slow process due to complexities around ensuring the product's compatibility with the menu designs.

Additionally, local producers face difficulties in joining the healthcare food supply chains. The major hurdle is the Canada Good Agricultural Practices (GAP) certification process. Health authorities cannot directly purchase from any businesses that do not have the necessary certifications to ensure liability and compliance with health and safety regulations. For example, local farms in the Okanagan Valley are not currently set up to sell to the health authority due to a lack of certification. Aside from GAP certification, local vendors must also be HACCP certified to meet the distributor requirements and apply for a Sysco account.

For local producers moving into the Sysco system, building sufficient volume levels is another barrier. When a new product is introduced, it often starts as a Special Order, which can take weeks or even months before it gains enough volume to be regularly stocked. This issue is particularly problematic for seasonal items, such as local asparagus, which has a limited availability period. Since these products are grown only during specific months, they may remain as special orders throughout their entire season, never building enough volumes and continuing to face challenges around uncertainty in the delivery time. For instance, receiving a product from Sysco Vancouver can take anywhere from five to seven days for Interior Health, but sourcing from Calgary, Edmonton, and Ontario could take up to a month. When ordering in advance, logistical issues may occur, such as perishable products arriving earlier than anticipated.

In response to these challenges, Interior Health revealed that local groups are exploring the possibility of creating a collective hub. This hub will enable them to aggregate their products and better meet the requirements needed to sell directly to the health authority. This ongoing initiative may enhance local food integration within hospital food services, supporting local agriculture, and improving the community food system resilience.

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Northern Health

Northern Health uses a 28-day standardized menu across all facilities. With the Northern Health operation design, changes to the food products involved in the menu primarily occur at the health authority level. As such, individual facilities did not have to be highly involved with substitution selection but retains the ability to request or connect with the regional health authority to discuss product substitutions or menu modifications. Information on product changes is accessible through a tracking tool on Teams if any member of the food service staff desires to seek out the reasoning behind the use of alternative products. This design reduces the burden on healthcare facilities' staff to follow changes in food product shortages.

Due to the geographical location, Northern Health uses two distribution centers, Sysco Edmonton and Sysco Kelowna. The Edmonton center services the northeast part of BC, and the rest of the region relies on the Kelowna center. Thus, finding substitutions involves reviewing the recommended replacement and checking the product status for each center.

Another unique aspect of Northern Health is its low service volume. In comparison to an urban, large site like the Vancouver General Hospital equipping about a thousand beds, Northern Health has about five to six hundred acute care beds in total, serving only about 300,000 people. Thus, many small hospital sites did not experience major food-chain impacts during the COVID-19 pandemic. For instance, while larger facilities with approximately 300 beds may encounter difficulties during shortages due to high food product turnover, smaller sites with 10 to 20 beds often purchase cases of non-perishable food items that last for three to four months. This surplus inventory at smaller sites can be redistributed to support larger facilities when they face immediate shortages. This fragmented inventory capacity distributed across facilities is not a result of deliberate planning and not a part of a formal procedure, but has nonetheless served as a mechanism to buffer against food system disruptions.

Aside from proportionally higher inventory capacity, smaller sites also purchase at a much lower frequency. Certain sites only need to receive orders one or two times a month to meet the demands of their patients and staff. Thus, the effects of short-term shortages are not as imminent or severe. When needed, these sites can also directly shop from the grocery stores and supermarkets in the region, to fill any immediate gaps in food availability. However, this action is usually discouraged, as most products from these stores are not within Northern Health's digital system. Non-coded allergens become a potential risk for patients. Nonetheless, under severe shortages, such as a lack of milk from any of the usual sources, the facilities relied on site-specific menu changes and local producers to create meals.

Northern Health noted that while they have emergency preparedness plans in place in relation to food systems, these are mostly tailored to address staffing disruptions. Understaffing challenges and the loss of chefs and food service workers led to a limited ability to serve patients during the COVID-19 pandemic. In response, the health authority has designed emergency menus that require minimal or no cooking, ensuring that meals can still be provided during staff shortages. For instance, alternative ready-prepared meals are used, such as offering cereal instead of scrambled eggs for breakfast.

Northern Health also leveraged existing relationships with other health authorities to seek local foods. One of which is soup. The original preferred soup was specifically tailored for healthcare settings with lower sodium content. When the product was gone, Northern Health initially resorted to using non-healthcare versions of soup that contained higher sodium levels, simply to meet the requirement of having a soup on their menu. This was not an ideal strategy as the increased sodium content could potentially compromise patient health in the long term. Seeking appropriate alternatives, an established relationship between Fraser Health and Goodly Soup was expanded to Northern Health. Goodly soup is both local and fitting for healthcare needs, leading to a successful product replacement.

Reviewing communication strategies developed from the COVID-19 pandemic, Northern Health met with Sysco Kelowna and Sysco Edmonton monthly to review the status of food products, as well as any foreseeable challenges and mitigation strategies. These meetings continue to this day to support the effective management of food products within healthcare facilities.

Another creative development was a virtual product tracker. During the peak of the pandemic, product shortages were frequent and dynamic. Northern Health initially struggled to keep track of the types of shortages occurring and the resultant changes needed within the menu. Thus, the tool was designed to simplify the documentation and tracking process. This was especially helpful as every substitution could potentially introduce new allergens or dietary compliance issues that needed to be managed carefully. Additionally, the tool ensured a consistent procedure for a smoother bounce back from the use of a substitution product back to the original preferred choice. For more information on the product tracker, please refer to Appendix B which provides the original product tracking tool utilized by Northern Health, and Appendix C which provides a general tracking template for health authorities to modify and utilize.

Case Studies: BC Healthcare Facilities

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Three case studies were conducted through one-on-one interviews with representatives from each healthcare site. Representatives include food service supervisors and managers. These case studies revealed detailed insights into each location's experiences with the COVID-19 pandemic.

Case Study: University Hospital of Northern British Columbia (UHNBC) - Northern Health

UHNBC is the largest acute care site within the Northern Health region. It is also a teaching hospital. During the COVID-19 pandemic, this facility faced significant disruptions in food distribution as well as operational challenges. To ensure staff and patient safety, food service staff were not allowed to enter certain wards. Although this reduced the risk of viral transmission, it also shifted the burden of meal deliveries onto the shoulders of nurses, who were already stretched thin due to the pandemic. During the times when the restriction protocol was active, nurses were expected to deliver meals to patient rooms and collect empty trays on top of their busy workload. As a result, trays often were not able to be returned on time for sanitation and reuse.

To address the new logistical constraints, UHNBC introduced bagged lunches. These lunches include a sandwich, juice, a cookie, and a fruit. This approach simplified the meal distribution process by reducing the need for dish collection and minimizing direct contact between staff and patients. In addition, this allowed for extended periods of time in which the trays for breakfast could be collected before dinner. However, while effective in its goal, this strategy significantly increased the daily workload. UHNBC had to prepare roughly 300 lunch meals daily to meet the demands of the patients. This process was both labor-intensive and time-consuming, especially under the context of staff shortages due to quarantine measures.

To mitigate challenges around being short-staffed in the food service department, UHNBC was able to leverage staff from other locations. Notably, an on-site quick service restaurant was temporarily closed down due to the pandemic. Food service staff originally working there were immediately contacted and redeployed to assist with UHNBC's core kitchen operations. This transition of workers allowed for roughly an additional ten staff to fill in gaps in shifts. This creative cross-utilization of staff kept the hospital food services running.

Overall, UHNBC noted that the COVID-19 pandemic led to the implementation of various strategies which evolved as the knowledge base on viral transmission expanded and resource constraints loosened. Initial initiatives launched included relying on single-use paper dishes to serve meals, reserving masks for nurses and doctors, and isolating "COVID-19 trays" by delivering them in garbage bags. These operations were later replaced by more effective means of

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protection, or abandoned, as the situation changed. These adaptations highlight the complexities in managing food services in times of uncertainty, as well as resilience, flexibility, innovation, and continuous improvement in healthcare food service operations moving forward through an ever-changing environment in emergencies.

Additional barriers include the product delivery process. In one case, during the height of the COVID-19 pandemic, bread was not delivered to the kitchen as usual. Instead, due to fear of contracting the disease, bread was left outside on the loading dock. During these times, staff had to collect the products themselves and carry them into the building, which resulted in an increased burden on the food service team.

Communication with the patient's meal management system, CBORD's office, as well as Northern Health, was identified as a facilitating factor for the hospital to stay informed, anticipate problems, and generate effective strategies. These conversations provide clarity and guidance in ways moving forward during times of crises.

Overall, the experience of UHNBC shows that although food procurement posed challenges during the COVID-19 pandemic, it is but one aspect of the broader hospital food system that required adaptation and resilience. Food product substitutions were frequently experienced, but the Northern Health Authority was able to share the burden and provide significant support in the relevant area when needed.

Case Study: Stuart Lake Hospital, Stuart Nechako Manor, and St. John Hospital - Northern Health

Stuart Lake Hospital, Stuart Nechako Manor, and St. John Hospital are located within the Vanderhoof and Fort St. James area. All three facilities are relatively small. Stuart Lake Hospital has 27 beds, including 18 long-term care beds (*Stuart Lake Hospital Replacement - Fort St. James, BC*, 2024). Stuart Nechako Manor is a long-term care facility with a total of 53 beds (*Stuart Nechako Manor*, n.d.). St. John Hospital is the largest of the three, with 44 acute care beds and 124 long-term care beds (*Vanderhoof Health Services at a Glance*, n.d.).

During the COVID-19 pandemic, there were some temporary changes to service delivery. Similar to UHNBC, there were initial practices that were later withdrawn. For example, returned trays were transported in plastic garbage bags. Over time, this practice was replaced with the isolation of food service workers from patient rooms that carried a risk of COVID-19 transmission. When needed, the food service team left meals in the hallway on a table, and nurses took over the deliveries of meals and empty trays in and out of the identified rooms.

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Aside from product substitutions, Stuart Lake Hospital, Stuart Nechako Manor, and St. John Hospital also explored ways to increase food storage in advance to cushion the impacts of product shortages. For example, the food service supervisor identified some perishable items that are vulnerable to immediate shortages, and purchased limited quantities shelf stable alternatives.

One example is a temporary shortage of dairy. A shelf-stable version of milk is selected for both storage and on-site use instead of more perishable formats of milk. Regular milk orders from the supplier are conducted twice a week for sites in Vanderhoof and weekly for sites in Fort St. James. To supply these facilities, around twelve flats of shelf stable milk products are purchased, with each flat containing 24 containers, and an additional one or two flats are kept in storage. Although storage space tends to be limited, this approach helps provide some flexibility in managing supply disruptions and relieve frustrations.

In urgent situations, local stores are relied upon as a final option to ensure that necessary food supplies are available. This approach provides an immediate, albeit temporary, strategy for unexpected shortages.

Casual on-call cooks are relied upon when navigating staffing challenges.,. However, this strategy is not applicable to all sites. Sites within Fort St. James are more remote, and thus experience significant challenges in recruiting casual workers. Potential hires are reluctant to wait around for phone calls. To address this, Stuart Lake Hospital, Stuart Nechako Manor, and St. John Hospital hire qualified cooks into dual roles, such as combining cooking with housekeeping duties, allowing staff to receive regular hours while being available on call for food service duties.

Aside from the COVID-19 pandemic, supply chain disruptions occurred due to forest fires caused delays in product deliveries, which were typically moved from Kelowna and distributed to Prince George, then later transported through trucks to healthcare facilities. These delays, while usually just hours, impacted on the timely availability of food supplies.

Case Study: Kelowna Long-Term Care Homes - Interior Health

Kelowna long-term care homes (LTCH) follow a standardized four-week. When products were shorted, it became difficult to maintain the level of care and meet the recommendations from Canada's food guide. Moreover, transportation issues amongst highways placed additional strain on the procurement of food products. As a result, the Kelowna LTCH encountered situations where 25 to 40 items from the standard menu were unavailable for ordering. In the cases where

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substitutions were not found, items were taken off the menu, leading to a reduction in the diversity of the meals offered.

LTCH identified that these challenges were further compounded by the facilities' reliance on a single distributor, limiting potential product options. Additionally, when large corporations faced production slowdowns during the pandemic, many of their product lines, particularly those not considered fast-selling, were discontinued. Thus, LTCH had to seek alternative products that weren't necessarily conducive to their operations. For example, the constant need to adapt often comes with the need to change the stock-keeping units (SKUs) or switch producers. These changes, while necessary to maintain supply, also had an impact on food costs, typically driving them up, and increasing the burden on staff.

Additional barriers occur when auditing substitutions. Product nutritional values, textures, prices, and pack designs must be taken into consideration. For example, when Kelowna LTCH's usual 975-millilitre containers of thickeners were unavailable, a bulk-sized version was purchased. However, this required staff to refill smaller containers, which became problematic if the small containers were discarded rather than reused. These changes became disruptive to the usual processes within sites.

Similarly, there was a period of time when peanut butter was in shortage, leading to a lack of small, individual packages typically purchased by Kelowna LTCH. Site-based strategies were implemented. While large facilities with hundreds of beds could handle bulk-sized peanut butter containers, smaller sites struggled due to limited storage space and the need for refrigeration once the peanut butter container was opened. This operational and capacity difference necessitated the use of smaller, shelf-stable packages for smaller sites. Ultimately, the decision-making process in seeking alternatives involves considering whether the available options meet the sites and the patient's unique needs.

Due to these contextual, case-by-case practices, the importance of clear and transparent communication is stressed. Staff are consistently informed when certain items become unavailable. In cases where a specific item is critical for a resident's care plan, such as a dementia patient who will only consume peanut butter and jam sandwiches, operational exceptions can be made by purchasing the necessary items from local grocery stores.

Echoing the critical need for communication, the culinary manager working at the health authority level has the responsibility of ensuring clarity in products that may be shorted and providing recommended substitutions through email communications with the staff. A complete product substitution list is also available for staff to review at any time. These internal support

systems provide a stable structure for staff to maintain service levels to the highest standard possible in the given context.

Examining beyond the COVID-19 pandemic, Kelowna LTCH experienced extreme weather events that also disrupted the food system. One of which is the atmospheric river in November 2021, which flooded the Coquihalla Highway. As a result, the transportation of food products was rerouted. There were weeks when the facilities had to rely on transportation from Alberta instead. To cope with severe shortages, a big box food supplier was used to source product. There were times when staff had to coordinate directly with the big box food supplier to ensure they could accommodate the facilities' bulk purchasing needs and deliver the items to the backdoor. Similarly, local independent grocers provided large quantities of food when the primary distribution chain failed. Although this is not the standard process and is generally not encouraged, this approach is an essential stopgap that maintains the food service operations during severe supply chain disruptions.

Another strategy to navigate around the disruptions includes finding alternative ways and partnerships to ensure the continuity of operations. This often involves making menu changes, simplifying meal options, and removing items that were too difficult to source or produce. When Kelowna LTCH's three primary distributors had insufficient production levels, alternative suppliers were sought out to fill the gaps. Under severe conditions, certain items may be removed from the menu.

In particular, Kelowna LTCH experienced a shift in supplier and producers' focus towards consumer goods during the COVID-19 pandemic, reducing the bulk products that healthcare facilities relied upon. Additionally, communication breakdowns occur occasionally, such as a lack of notification about delayed deliveries and missing key staff when sharing critical updates through emails, which led to frustrations and strain in relationships.

Reviewing the experiences over the pandemic, Kelowna LTCH stressed flexibility and adaptability as crucial characteristics of the healthcare team when facing unexpected challenges. The primary goal in food service operations is always to ensure that residents are fed and taken care of with a high level of service, regardless of the obstacles.

Potential areas of improvement are identified at the distributor level. Instead of relying solely on a few large suppliers, Kelowna LTCH suggested establishing backup alternatives with smaller local suppliers. This diversification can provide a safety net in case one of the primary suppliers experiences major emergencies. Developing additional relationships in advance and maintaining

them as part of the regular supply chain could ensure a more robust response to the food system crisis.

Examining local foods, Kelowna LTCH noted that navigating the internal processing system is a barrier to establishing and maintaining local partnerships. In the past, Kelowna LTCH relied on a local bread supplier in town, who provided specialty items, such as hot cross buns and cheese bread. However, operational issues, including navigation around the billing system and associated protocols, were challenging.

Moving forward, Kelowna LTCH suggested the creation of a guideline that highlights operational standards under emergencies where the system is under high stress. In normal circumstances, the standard of work was outlined through meeting specific demands in procedures and outputs. However, during emergencies, understanding the level of flexibility in meeting these requirements can ensure that while the site strives to meet the normal service standards, overexertion of resources and staff can be avoided.

Kelowna LTCH also suggested future research and advocacy efforts to hold suppliers accountable for meeting institutional needs. While consumer products generate higher volumes and profits for producers, they must also understand the importance of consistently providing core products required for healthcare institutions.

Challenges and Strategies from Other Countries

Challenges

Reviewing studies and reports from locations outside of BC, additional strategies are identified, with some locations utilizing similar approaches as the healthcare facilities in BC. In comparison, challenges experienced by global hospitals during the COVID-19 pandemic were largely the same. For example, a report produced in March and April of 2021 highlighted the experiences of healthcare food service members (Benita Gingerella, 2021). The report has identified staffing shortages/illnesses, difficulty with product procurement, and rising costs as the major challenges, each selected by 65% or more surveyed participants (Benita Gingerella, 2021). Following, some experienced a decline in sales (Benita Gingerella, 2021).

Strategies

At the beginning of the COVID-19 pandemic, Raytheon Mountain Hospital from China used a complete contactless food provision system to ensure patient and staff safety by relying on a

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third-party company for food services (Tan et al., 2020). Another strategy to ensure safety is similar to the dietary management system, CBORD, used across most healthcare facilities in BC, which allow patients to order meals virtually. However, instead of developing a healthcare application, WeChat, a communication application, was used to create groups, which allows group leaders to collect and deliver patient orders to the food service staff (Tan et al., 2020). Meals were then prepared, packed in insulated boxes, and transported through a restricted channel within the hospital (Tan et al., 2020).

At a healthcare facility in Forth Worth, Texas, USA, several modifications of the food service operation were implemented (*5 Ways Hospital Food Service Operations Have Adapted to the Pandemic*, 2021). Similar to UHNBC's use of bagged lunches, sites prepared pre-packaged, grab-and-go meals. While UHNBC aimed to ensure used meal trays could be collected for use before dinner, the facilities in Forth Worth utilized this strategy to reduce transmission risk during peak food service hours. Self-serving stations were also restructured into assembly lines, "such as those popularized by Chipotle or Subway" to avoid potential contamination from patients or staff (*5 Ways Hospital Food Service Operations Have Adapted to the Pandemic*, 2021).

Based on the experiences during COVID-19, Fraser Health suggested that maintaining simple recipes and menus will reduce the risk of encountering product shortages. This strategy is also echoed by the hospitals within Forth Worth, Texas (*5 Ways Hospital Food Service Operations Have Adapted to the Pandemic*, 2021). Due to shortages, hospitals have temporarily reduced the number of food options on the menu and "taken a more need-based approach". As a result, hospitals found that daily operations, such as ordering and inventory, were more efficient (*5 Ways Hospital Food Service Operations Have Adapted to the Pandemic*, 2021).

Cook and Collins (2022) found that major staffing challenges were exacerbated by the pandemic due to challenges with recruitment, transfers, and an increase in workers taking sick leaves. One of the hospitals in Victoria involved in the study used the same approach as Northern Health, developing a contingency plan for situations where cooks were not available (Cook et al., 2022).

In Japan, the Nerima Hikarigaoka Hospital is one of the acute-care hospitals that shifted its food provision system during the COVID-19 pandemic (Keiko Hirose et al., 2020). An external food supply system was used to combat staffing challenges, taking kitchen staff's mental health into account. This change comes with alterations to the menu, which all healthcare staff were made aware of. Meals were also adjusted in the software used by the hospital (Keiko Hirose et al., 2020).

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Local Foods

Local producers' involvement during the COVID-19 pandemic is not a direct strategy implemented by the healthcare industry. Instead, they may be involved by third party organizations in combatting food system disruptions as additional contributions. In one case, a sponsoring company aimed to provide bento boxes as meals to feed all the healthcare workers in the Kanto, Japan area (Kondo & Lichten, 2020). The company sought out a Chiba farmer in Japan as a source of raw products, tapping into the local food production market and supporting the local community during the pandemic (Kondo & Lichten, 2020).

Outside of the COVID-19 pandemic, increasing focus is being placed on leveraging the large purchasing power of the healthcare industry to support the local food system (Faulkner et al., 2023). However, barriers were identified with local food procurement. Reviewing nine hospitals, Faulkner et al. (2023) identified three key barriers hospitals face in sourcing local products: limited access to local producers, limited food service resources, and the inability to trace purchases which restrict the ability to evaluate outcomes. In comparison, facilitating factors include "organizational support, passionate champions and opportunistic, incremental change" (Faulkner et al., 2023).

One of the key findings by Faulkner et al. (2023), echoing this project, was limited investigation and documentation on the hospitals' local food procurement practices and outcomes, which hinders the ability to assess the impact and develop effective strategies. Reviewing academic papers, regional reports, and formal hospital websites, existing food system-related records mostly focused on sustainability in the context of food waste, instead of local food procurement. For example, the Universitätsspital Zürich from Zurich, Switzerland primarily centered the information on food procurement sustainability through measurements of waste and greenhouse gas emissions (Sustainability Report 2022, 2022).

Summary

The COVID-19 pandemic exposed significant vulnerabilities in the food distribution systems of hospitals in British Columbia. Various strategies were adopted by health authorities to maintain care and service for both patients and staff during the pandemic.

Overall, interviews and case studies with health authorities and hospitals revealed challenges throughout the supply chain. Healthcare facility challenges with food supply issues often stem from vulnerabilities in the early stages of the supply chain, such as production and distribution, which are not sufficiently mitigated. As such, the food provisioning and management strategies

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utilized within the healthcare facilities are innovative and adaptive. Though some strategies are common across institutions, many strategies are highly context-specific. identifying and leveraging relationships, technologies, and creating new protocols to navigate food system disruptions. Throughout this project, two qualities are highlighted, flexibility and adaptability, which help hospitals and staff navigate novel challenges.

Challenges Experienced

Staffing shortages within hospitals were a challenge long before the COVID-19 pandemic. However, the onset of the pandemic exacerbated this issue. With staff members falling ill or required to quarantine, the reduced workforce led to increased workloads and stress for the remaining employees. In the context of the food system, this issue may impact the hospital's capacity to maintain the systems in place to deliver high-quality food services for patients and staff.

The pandemic caused widespread disruptions in the food supply chain, leading to shortages of essential food products. Many producers had to downsize or close operations, significantly reducing the availability of various items. In some cases, products were temporarily or permanently removed from the supply chain. Some of these items are essential for specific healthcare needs, such as products using lower-sodium recipes, and losing them requires finding alternatives to continue meeting the facility's requirements.

However, the use of substitution products in times of emergencies often came with higher prices. In addition, this rise in costs was not only tied to ongoing supply chain disruptions but also reflects broader economic shifts occurring as a result of the pandemic. Thus, health authorities had to navigate the dual challenges of managing increased costs with a limited budget while ensuring the continuity and quality of patient care.

Likewise, before the pandemic, the cafeterias within healthcare sites regularly served visitors and staff members, generating income. However, since the pandemic, not all cafeterias have reopened, and those that have experienced a significant decline in revenue due to staffing challenges and reduced patronage. As a result, most health authorities are now focused on covering operational costs for their cafeterias rather than generating additional revenue.

Seeking appropriate products also required complex considerations. For example, the ideal substitution would be a close, if not complete, match for the preferred product. However, in reality, there were often differences between the nutritional profile, textual quality, allergen, or packaging sizes of the usual product and the substitute.

Transportation system disruptions occurred during emergencies as well. These disruptions were caused by extreme weather events, trucking staff shortages, and other events such as protests causing road shutdowns. These events resulted in delays in food deliveries, affecting meal planning and preparation in hospitals.

Overall, there was limited formal documentation of the strategies implemented by health authorities and hospitals due to the urgency and rapid evolution of the COVID-19 pandemic. While some documentation exists, a number of immediate, food-related strategies were implemented without complete records for future reference. This challenge was further exacerbated by high staff turnover, which compounded the difficulties in maintaining continuity and institutional knowledge.

One unique challenge reported by UHNBC was disruptive delivery practices over the pandemic due to fear of viral transmissions. Instead of transporting orders to the kitchen, deliveries were left at the unloading bay, creating an additional workload for food service staff to transport the products.

Facilitating Factors and Strategies Explored

Facing food product shortages, healthcare facilities sought appropriate product substitutions to maintain their meal programs. This often involved using different brands, sizes, or types of products that could still meet nutritional and dietary requirements. Distributors also provide recommendations on substitutions when products are shorted. However, these recommendations may not be suitable for healthcare needs. Some health authorities prepared pre-approved substitution listings to support the selection of commonly shorted food products.

Another common mitigation strategy that was highly effective was frequent, transparent communication with distributors and relevant members of the team. During the peak of the COVID-19 pandemic, meetings were held daily. Currently, the frequency has dropped to weekly or monthly. These virtual gatherings allowed healthcare teams to receive updates on product status, forecast potential concerns, and create collaborative solutions.

During the pandemic, healthcare institutions relied on established relationships with vendors. For example, while Feed BC's role was primarily a supportive one during the pandemic, its resources allowed health authorities to create relationships with local food producers. Fraser Health reported that the product shows hosted by Feed BC provide many connections to local vendors. Although vendors, such as Goodly Soups, tend to focus on retail and not food services, the health

authority was able to engage in conversation with the vendor and, in some cases, successfully open a new production line that meets the needs of the hospitals.

Similarly, Interior Health noted that their staff often select around 10 to 12 vendors who participated in Feed BC's Pitch & Plate to begin dialogues around collaboration. As the food system began to stabilize after the peak of the COVID-19 pandemic, Interior Health saw a resurgence of smaller businesses, which has been particularly beneficial in recovering from the food chain disruptions. Smaller businesses often specialize in niche products, which can be tailored to meet specific dietary requirements that larger, more generalized suppliers may not be able to accommodate.

Other strategies that emerged were more unique and context-specific. One example is Northern Health, which designed a new product tracking tool to keep track of the frequent use of substitutions.

Another example is Northern Health's garden policy, which was refined and launched due to food product shortages during the COVID-19 pandemic. Many Northern Health facilities have access to gardens to grow fruits and vegetables. With the newest version of the policy, these harvests are allowed to be used in the on-site kitchen to prepare meals. Although it wasn't enough to fully sustain the patients, it provided some support to the facilities.

The unique qualities of healthcare facilities were leveraged to cushion the effects of food system disruptions as well. For Interior Health, production centers at Penticton Regional Hospital and Vernon Jubilee Hospital produced large volumes of meals dedicated to healthcare facilities. This additional level of flexibility and control created breathing space and alleviated the burdens of product shortages.

For Northern Health, the smaller healthcare sites have a proportionally higher inventory space per facility. As such, the proportionally larger non-perishable food stocks mitigated burdens from temporary product shortages. However, this strategy is not feasible for all sites. For example, Fraser Health hospitals did not practice food product storage within hospitals due to its larger sites. Although the hospitals do retain the 72-hour emergency food supply, strategies to expand storage are expected to lead to challenges around purchasing, storage, and utilization. For example, one barrier is the lack of infrastructure to maintain stored foods. In addition, larger hospitals are expected to face challenges, especially due to excess workload, in storing and managing greater quantities of food supplies before they expire.

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Reviewing experiences navigating staff shortages, innovative staffing strategies were utilized. As the quick service restaurant attached to the UHNBC hospital closed, UHNBC grasped the opportunity to hire the food service staff working from that location and transfer them to support the hospital's kitchen. Stuart Lake Hospital, Stuart Nechako Manor, and St. John Hospital tackled their low casual staff count by encouraging dual roles, such as combining cooking and housekeeping duties, which made employment opportunities more consistent and attractive.

In urgent situations, hospitals reported that they depended on local resources. Both Northern Health and Interior Health healthcare facilities used grocery and supermarkets, such as big box stores, to quickly procure essential food items when regular supply chains were disrupted. Although this strategy may not be a sustainable formal practice in many locations, it provided a critical stopgap, allowing hospitals to maintain their meal programs without significant interruptions.

One of the positive outcomes of the pandemic was stronger trust and adaptability among the healthcare staff. Northern Health observed that over time, staff became increasingly familiar with change. Disruptions were seen as a normal part of day-to-day operations, and staff were able to comfortably seek alternative, creative solutions to challenges. Similarly, frontline staff have built stronger trust in health authorities' decisions. For instance, the transition from using dry mixes to frozen soups for meal preparation was initially stressful for hospital staff. However, they have now adapted to such changes so well that they no longer require explicit notifications for substitutions. They simply adjust to the new products as they arrive. This increased resilience, adaptability, and flexibility may be the core qualities that allow staff to adapt to current and future emergencies as they arise.

The Role of Local Foods

Overall, local foods are not identified to be a major facilitator or barrier in navigating the food system disruptions. The use of local foods was not a priority of health authorities and hospitals during the COVID-19 pandemic and other times of emergencies. Health authorities and healthcare facilities instead shifted focus to meeting the needs of the patients and staff to the best of their ability given their capacity.

In addition, new and currently on-the-market local products face similar challenges as their non-local counterparts. Local foods, during times of emergencies, did not prove to be inherently more reliable than other products in maintaining consistent supply. However, they are still valued as a viable option for procurement.

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Challenges

One of the challenges with using local products as substitutions for the preferred food product in healthcare facilities is the complexity of the product profile. Local food alternatives often have different ingredients, nutrition, textures, and other qualities compared to the preferred product, which complicated their integration into hospital meal programs. Additional considerations include the packaging and costs of these items.

The major challenge for any producer who wants to sell to healthcare lies in the barriers to working with the distributors. One of which is becoming GAP (Good Agricultural Practices) certified, which places the responsibility of certification administration and cost on the producer. Once certified, the producer must navigate the process of getting their product listed with the distributor, which presents its own set of difficulties. For instance, it is challenging for smaller producers to compete with larger, established vendors that may produce higher volumes and sell at a lower price.

However, within BC, community initiatives are taking the lead in building a stronger regional food system. Land to Table is a case that is currently reviewing strategies to combat the GAP certification barrier. Through support from Feed BC and United Way, Land to Table has developed a stronger understanding of regional institutions' food service needs and is examining the potential to create a GAP certification module for local farmers. In addition, the possibility of building a new flash-freezing vegetable processing plant is being reviewed. If this initiative successfully becomes a reality in the future, Interior Health expects more local products within the Interior region to purchase from.

Another challenge is that local foods rely on the same transportation routes within BC as non-local products, moving from the distributor to the hospital. As such, local foods continue to be susceptible to disruptions on the transportation line. Moreover, processed local foods are also vulnerable to impacts on their base ingredients and production material.

For example, when Interior Health orders from Ready Fresh, its distributor in the Vancouver region, the products need to be processed, and then transported through the distributor's warehouses. Moving through this distribution chain takes about five days. Even if the item is produced nearby, the lead time can still be long due to processing in Vancouver, integration into the distribution system, and delivery to healthcare facilities. These long transportation routes are susceptible to vulnerabilities, including road blockage and extreme weather events.

In the context of Northern Health, local products face a geographical barrier, particularly for sites in the eastern part of the province, such as Fort Nelson, Fort St. John, and Dawson Creek. The

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distribution of local products to these areas is limited. Additionally, products available at the Kelowna distribution center may not be available at the Edmonton center, leading to a number of sites having limited access to certain local BC food products. Nevertheless, continuous conversation and collaboration with vendors, distributors, and other health authorities are underway to navigate around these barriers.

Lastly, new producers may experience challenges once integrated into the distribution system. First, new products not meeting enough volume flow may be listed as Special Orders by the distributor, which may not be preferred by healthcare facilities due to the longer lead time. Secondly, the producers may not produce sufficient volumes to meet the demands of large healthcare facilities. This limitation makes it challenging to rely on certain newer local food products as a primary source of supply. Thirdly, small producers may find it difficult to compete with large, established companies that can produce larger quantities at lower costs. These challenges make it difficult for establishing, or newly established, local producers to engage in healthcare.

Conclusion

The COVID-19 pandemic brought unprecedented challenges to healthcare food systems across BC. Despite these complexities, healthcare institutions demonstrated resilience by exploring innovative and adaptive strategies to maintain quality food services for patients and staff. This report examined three health authorities and three case studies to gather insights into the specific challenges encountered and mitigation strategies used during the pandemic.

Findings revealed common challenges occurring throughout the supply chain during the COVID-19 pandemic. However, healthcare facility challenges with food supply issues often stem from vulnerabilities in the early stages of the supply chain, such as production and distribution, which are not sufficiently mitigated. As such, the food provisioning and management strategies utilized within the healthcare facilities are innovative and adaptive. Though some strategies are common across institutions, such as seeking food product substitutions, many strategies are strongly highly context-specific.

Moving forward, the development of regional evaluations and tailored emergency plans will be beneficial for healthcare food system resiliency. By understanding and addressing the unique characteristics and challenges of each region, healthcare institutions can create more effective strategies that leverage local strengths and opportunities.

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Overall, hospitals and health authorities demonstrated flexibility and adaptability, navigating challenges and creating appropriate strategies during the COVID-19 pandemic. During emergencies, healthcare institutions demonstrated a significant capacity to leverage existing resources and forge strong collaborative relationships in dedication to continue meeting patient and staff needs. Working strategies may be continued to be practiced as a part of the healthcare operation, or re-established in future disruptions.

During the COVID-19 pandemic, local foods were not prioritized by health authorities and hospitals due to the immediate need to ensure food availability for patients and staff. In addition, local foods faced challenges both in attempting to engage with the healthcare food system and when used by healthcare facilities. Strategies to support local producers may help establish a larger local product pool within BC, providing additional sources of product procurement for healthcare facilities.

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Appendix A Interior Health Production Centers

The two production centers at the Penticton Regional Hospital (PRH) and the Vernon Jubilee Hospital (VJH) were built around 2005. VJH produces regular entrees, while PRH focuses on pureed entrees, proteins, vegetables, and "Dinners at Home'' meals. Examples of products made include chili, stew, and lasagnas in foil pans, which are then boxed and shipped out.

The initial reasoning behind the establishment of the processing centers is to create entrees specifically designed for healthcare. These entrees have limited ingredients to minimize potential allergens, contain low sodium levels, and are cheaper than most of the products on the market. In addition, the entrees offered are often unique and not within the Sysco system. Furthermore, unlike typical vendors who sell entrees in individual portions, the processing centers produce meals in bulk, catering to the operational requirements of large healthcare settings.

The VJH and PRH production kitchens produce about 1.7 million meals per year for Interior Health facilities. Currently, entrees are also supplied to Northern Health at a volume of around 5,760 entrees per month for their trayline services. Additionally, Northern Health purchases 30,000 to 40,000 "Dinners at Home" meals annually for use in their smaller rural areas. Overall, supplying healthcare facilities accounts for roughly 60% of the entrees offered through the menu system. The other 40% are individual options, such as burgers and pot pies, for consumers.

This infrastructure acted as an additional, manageable control point during the COVID-19 pandemic, as Interior Health did not need to rely heavily on external sources for many of their food products compared to other health authorities. While ingredients are still susceptible to transportation issues, the ability to produce their own entrees to fulfill their needs shielded Interior Health from many of the supply chain disruptions that affected other regions. For example, changes to the food product can be made relatively quicker and at a cheaper price compared to requesting external companies for specialty items or modifications to recipes.

During the COVID-19 pandemic, the production kitchens maintained production volumes, which met the demands of healthcare facilities. Even at the lowest point of production, about 2-3 weeks' worth of product was available for the most popular entrees. For higher volume entrees, the production facilities maintained about 7-10 weeks of supply. This strategy allowed Interior Health to regulate menus effectively and avoid running out of internal entrees or pureed products, providing an effective buffer against temporary market disruptions.

Other health authorities, such as Island Health, Northern Health, and Fraser Health, have toured the production centers at Interior Health and have similar plans to develop production kitchens

within their regions. The primary goal lies in producing hard-to-source products like items that are low sodium, low allergy, gluten-free, and/or vegan options. Costs may also be driven down.

However, starting a new production kitchen presents several challenges. Aside from the lengthy construction period, finding appropriate physical space is both limited and expensive, particularly in the Vancouver area. Since the construction of VHJ and PRH production kitchens, Interior Health has noticed that the cost of equipment, labor, and food supply has increased significantly. Additionally, establishing an effective transportation model to move goods between sites adds an additional layer of complexity.

Moving forward, Interior Health is considering expanding its production centers by moving them into a new separate facility. However, this will be a lengthy process that can take years to realize.

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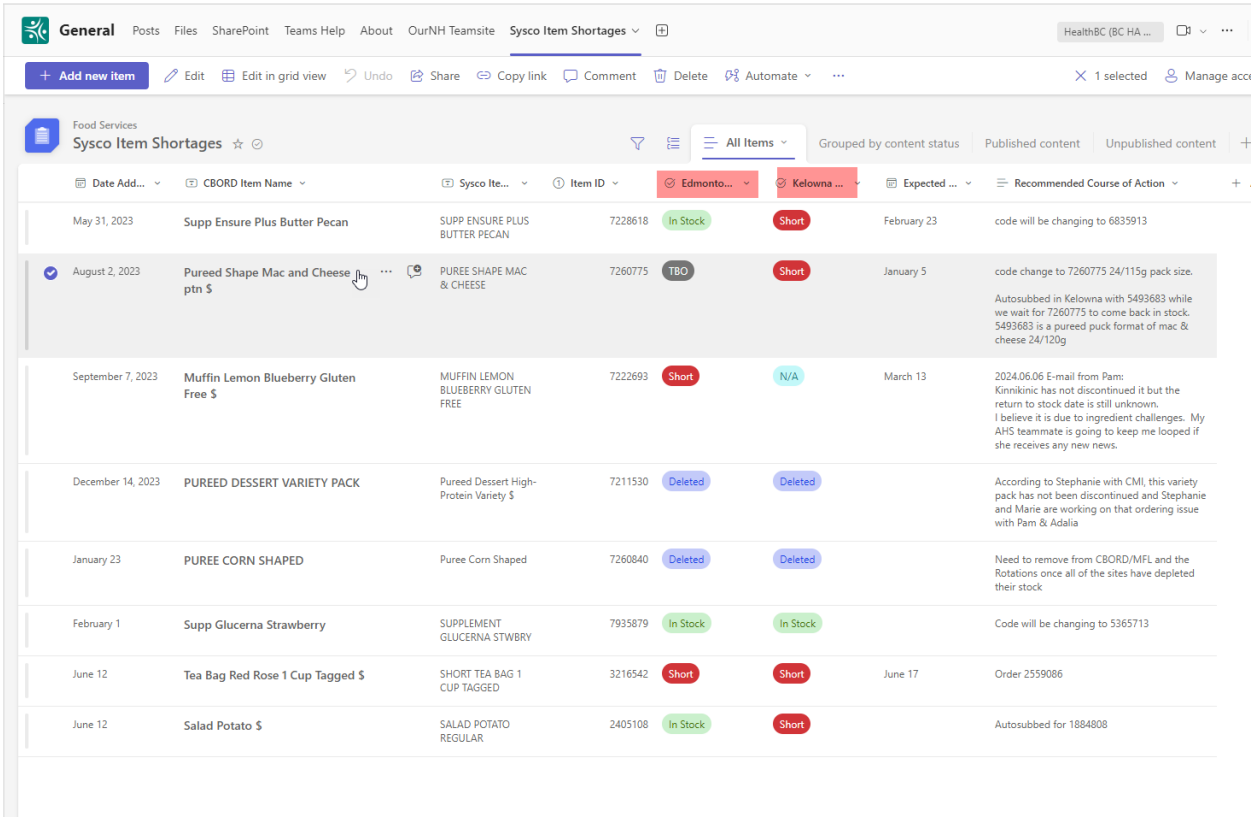
Appendix B Northern Health Product Tracking Tool

The product tracking tool was developed by Northern Health to manage product substitutions effectively during the COVID-19 pandemic. This tool played a crucial role in helping the health authority navigate the frequent shortages and substitutions. It was designed to track the availability of various products, ensuring that the food service team could make informed decisions about substitutions and plan for the return of preferred items.

The product tracking tool was created on Microsoft Teams, using the application Microsoft List, providing a centralized platform for transparency and accessibility. All food service team members within Northern Health could access the tool to see real-time updates on product availability. Additionally, email notifications were set up to alert the team when items were expected to be back in stock, allowing for a smooth transition back to preferred products as they became available.

At the peak of product shortages, Northern Health tracked 25-30 items daily using this tool. As the supply chain stabilized, the number of items tracked decreased to about ten. Now, the tool is checked and updated on a weekly basis.



Date Add...	CBORD Item Name	Sysco Ite...	Item ID	Edmonto...	Kelowna ...	Expected ...	Recommended Course of Action
May 31, 2023	Supp Ensure Plus Butter Pecan	SUPP ENSURE PLUS BUTTER PECAN	7228618	In Stock	Short	February 23	code will be changing to 6835913
August 2, 2023	Pureed Shape Mac and Cheese ptn $	PUREE SHAPE MAC & CHEESE	7260775	TBO	Short	January 5	code change to 7260775 24/115g pack size. Autosubbed in Kelowna with 5493683 while we wait for 7260775 to come back in stock. 5493683 is a pureed puck format of mac & cheese 24/120g
September 7, 2023	Muffin Lemon Blueberry Gluten Free $	MUFFIN LEMON BLUEBERRY GLUTEN FREE	7222693	Short	N/A	March 13	2024.06.06 E-mail from Pam: Kinnikinic has not discontinued it but the return to stock date is still unknown. I believe it is due to ingredient challenges. My AHS teammate is going to keep me looped if she receives any new news.
December 14, 2023	PUREED DESSERT VARIETY PACK	Pureed Dessert High-Protein Variety $	7211530	Deleted	Deleted		According to Stephanie with CMI, this variety pack has not been discontinued and Stephanie and Marie are working on that ordering issue with Pam & Adalia
January 23	PUREE CORN SHAPED	Puree Corn Shaped	7260840	Deleted	Deleted		Need to remove from CBORD/MFL and the Rotations once all of the sites have depleted their stock
February 1	Supp Glucerna Strawberry	SUPPLEMENT GLUCERNA STWBRY	7935879	In Stock	In Stock		Code will be changing to 5365713
June 12	Tea Bag Red Rose 1 Cup Tagged $	SHORT TEA BAG 1 CUP TAGGED	3216542	Short	Short	June 17	Order 2559086
June 12	Salad Potato $	SALAD POTATO REGULAR	2405108	In Stock	Short		Autosubbed for 1884808

A screen capture of the Northern Health product tracking tool on Teams. Photo provided by Northern Health.

As a part of the onboarding process, Northern Health offered live training that walked staff through the tool to showcase what each data point represented. An overview of each column included in this tool is noted below:

- Date added: when the row was added (automated by Teams).
- CBORD item name: the product name in CBORD, Northern Health's dietary management system.
- Sysco item name: the product name in the Sysco system.
- Item ID: the related purchase code.
- Edmonton Sysco item status: the status of the item in the Edmonton Sysco system, which can be:
    - Short: item shorted;
    - In stock: item stocked;
    - Watching for depletion: the item is in stock, but the purchase code will change soon;
    - TBO: to be ordered (used to identify special order product);
    - NA: not applicable.
- Kelowna Sysco item status: the status of the item in the Kelowna Sysco system.
- Expected availability: when the item is expected to be back in stock.
- Recommended course of action: notes on what needs to be done and other miscellaneous notes (e.g., product size differences).

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Appendix C Product Tracking Tool (Generalized)

Product Tracking Tool

Date added	CBORD item name	Distributor item name	Subsitution item name	Item ID	Substitution item ID	Distributor item status	Expected availability	Notes
4-Aug-24	Sample	Sample item	New item	000000	000001	Short	4-Sep-24	Subsitution is not gluten-free
5-Aug-24	Sample2	Sample item2	New item2	000001	000002	Watching for depletion	5-Sep-24	Order code changing to 000003 once depleted

A photo of the general product tracking tool in Excel.

Based on Northern Health's product tracking tool, a generalized version is developed for health authorities and hospitals.

Two versions are available. The Excel version can be used directly after downloading. The Teams version allows the user to upload the template into Microsoft List and host it within Microsoft Teams, which has the benefit of being accessible by other team members and staying up to date with any changes made. Hosting the tool on Teams also allows the user to code automatic email notifications when a product is expected to be back. Instructions to set up the tool on Teams are included at the bottom of this appendix.

Product information tracked in this tool includes:

- Date added: when the row was added.
- CBORD item name: the product name in CBORD.
- Distributor item name: the name of the preferred product in the distributor system.
- Substitution item name: the name of the substitute product in the distributor system.
- Item ID: the related purchase code for the preferred product.
- Substitution item ID: the related purchase code for the substitute product.
- Distributor item status: the status of the item in the distributor system, which can be:
    - Short: item shorted;
    - In stock: item stocked;
    - Watching for depletion: the item is in stock, but the purchase code will change soon;
    - TBO: to be ordered (used to identify special order product);
    - NA: not applicable.
- Expected availability: when the item is expected to be back in stock.
- Notes: notes on what needs to be done and other miscellaneous notes (e.g., product size differences).

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Under the conditions where a preferred product is back in stock, a product is permanently removed from the system, or a substitution becomes the preferred product, the information can be deleted to ensure the list only reflects products that are being tracked.

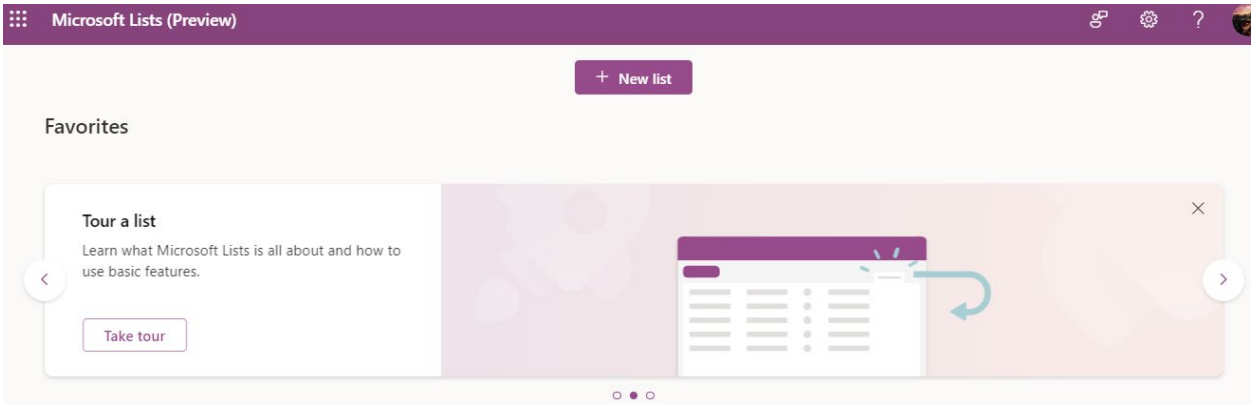
Further adoption and refinement are recommended to ensure the tool is comfortable to use and tailored to the practices at the facility. For example, CBORD, the diet management system, is currently not being utilized by Interior Health. Thus, the column "CBORD item name" can be replaced or removed. Another example is Northern Health's dual distributor system, where an additional column is used to distinguish the item status between Sysco Edmonton and Sysco Kelowna.

Some sites may prefer to create backups of the data by duplicating the Excel version of the tool or exporting the data from Microsoft Lists. A direction to export the data is included as a part of the setup instructions below.

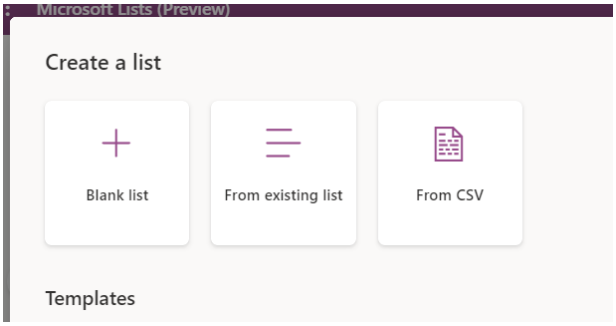
How to Set Up the Tool in Microsoft Teams

Download the CSV file "Product Tracking Tool- Teams".

From Microsoft Teams, access the application "Microsoft List" or go to https://lists.live.com/ with your organization's access.

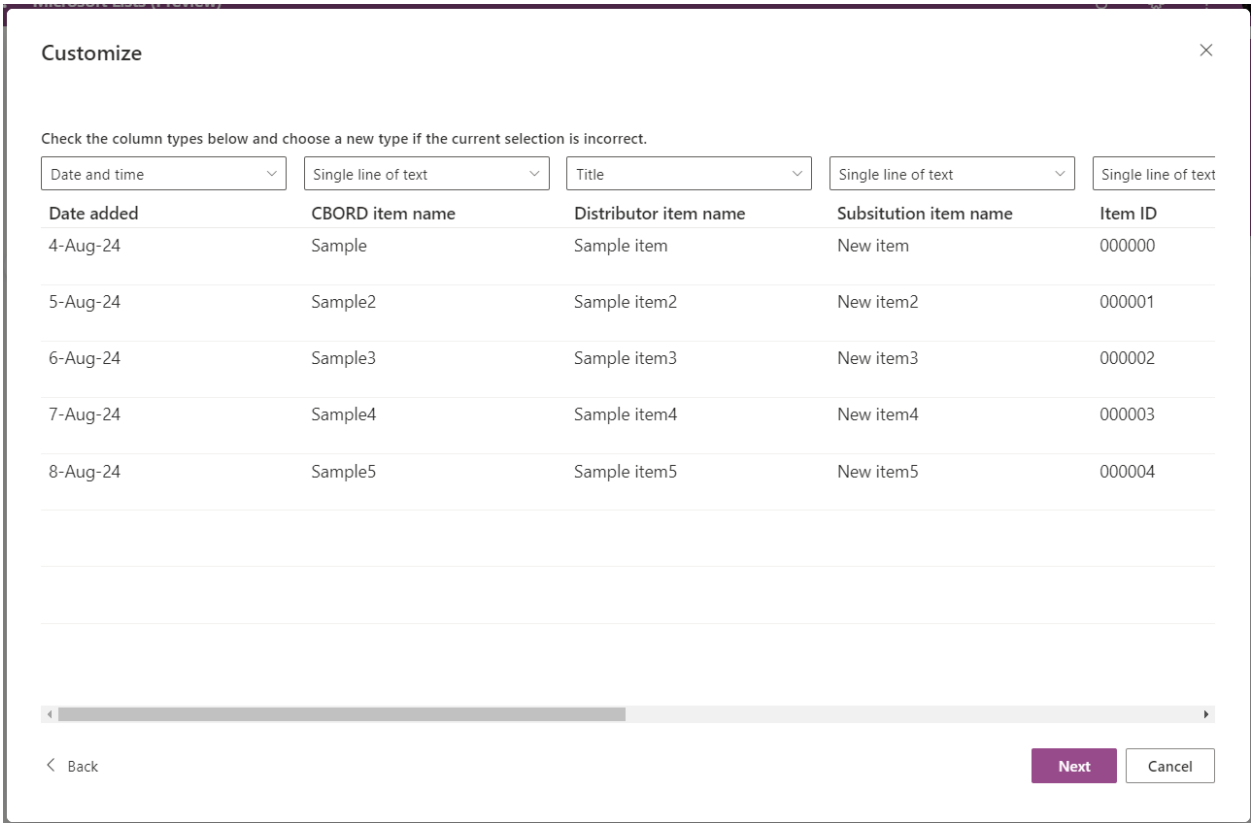


Select "New list" near the top of the webpage.



Select “From CSV”.

Select the file “Product Tracking Tool- Teams” from your downloads folder.



Change the column types to below:

- **Date added:** Date and time
- **CBORD item name:** Single line of text
- **Distributor item name:** Title
- **Substitution item name:** Single line of text
- **Item ID**: Single line of text

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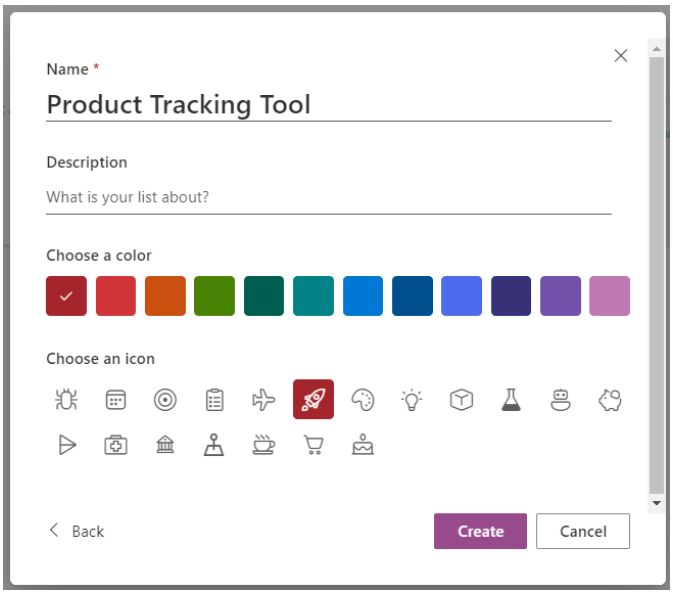
- **Substitution item ID**: Single line of text
- **Distributor item status:** Choice
- **Expected availability**: Date and time
- **Notes:** Multiple lines of text

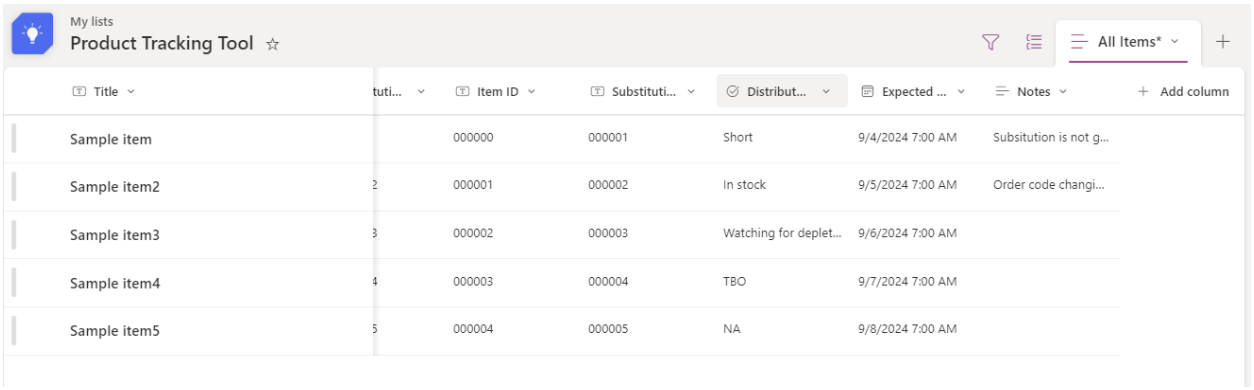
Select “Next”.



You may add a preferred name, description, and icon.

Select “Create”.

Scroll horizontally and select the column “ Distributor item status”.



Select “Column settings” and then select “Edit”.

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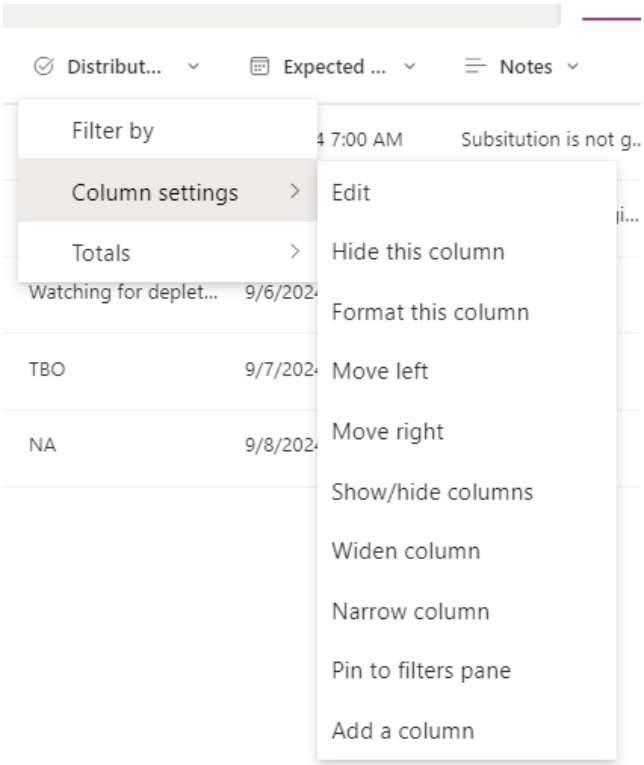

Select “Add choice” under “Choices*”.

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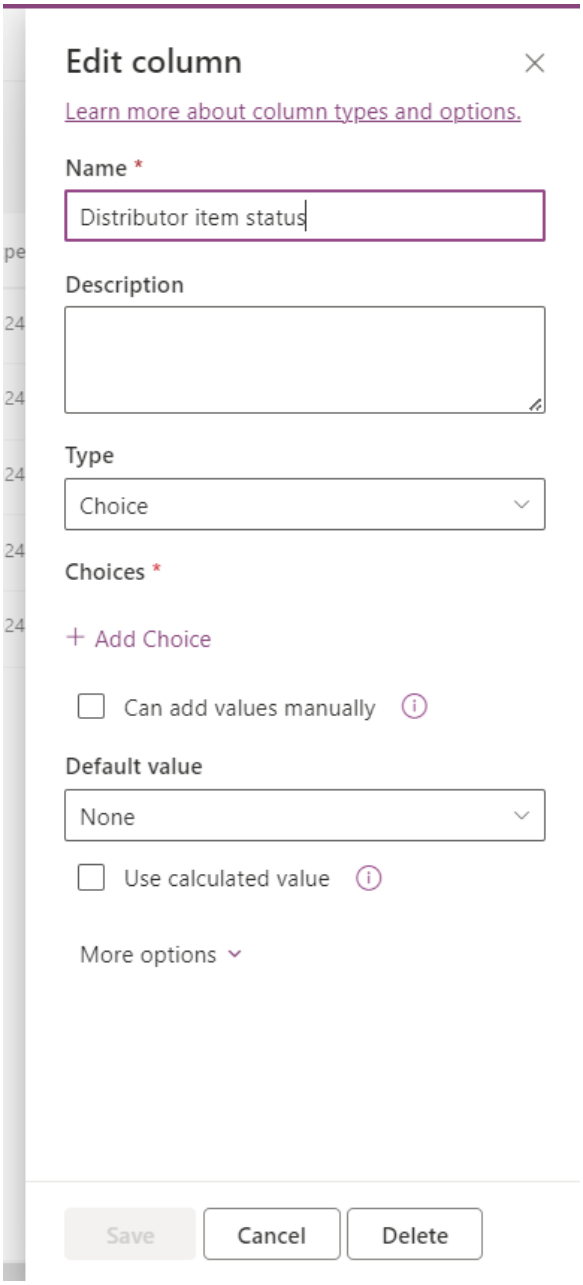

Input the following choices: “Short”, “In stock”, “Watching for depletion”, “TBO”, and “NA”. You may use the palette icon to select colors for each option.

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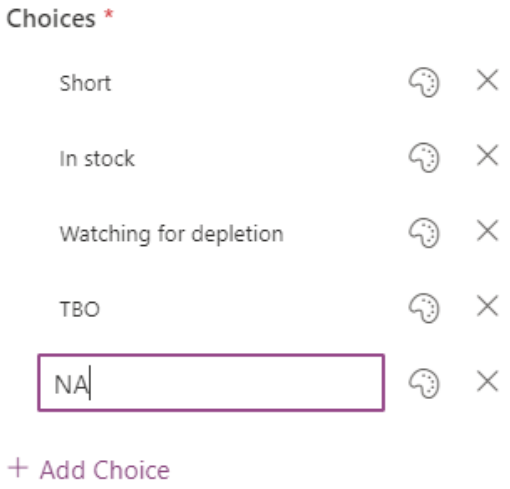
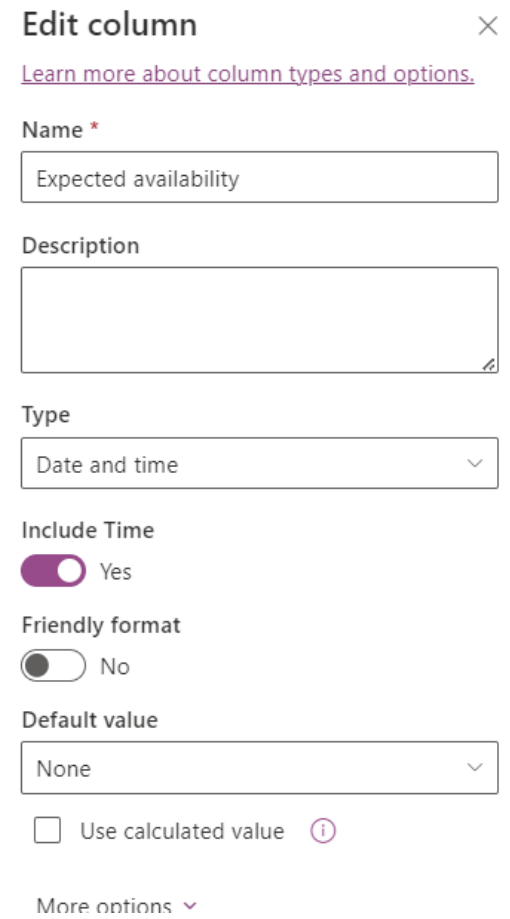


Select “Save”.

Similarly, access the column setting for “Date added” and “Expected availability”, and toggle “Include Time” to off (gray). Select “Save” when completed.



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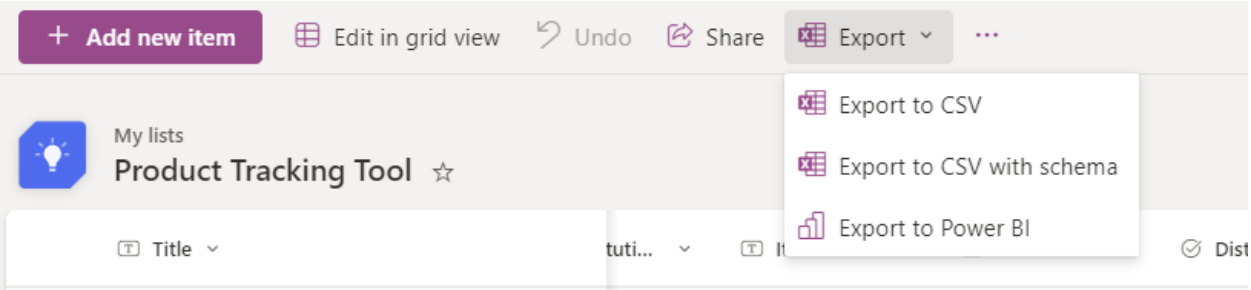
To download the data from Microsoft Lists, select “Export” on the top banner and select “Export to CSV”.



The following resources may be useful if the user is unfamiliar with Microsoft Lists.

- Create a list based on a spreadsheet- Microsoft Support
- Add or edit list items- Microsoft Support
- Create or change the view of a list- Microsoft Support
- Turn notifications on for list and list item changes- Microsoft Support
- Share a list or list items- Microsoft Support

To set up email notifications that notify the user when a product is expected to be back in stock, the application “Microsoft Power Automate” is required. This process is much more complex. Two resources are linked below to assist with the setup process. Additional support from IT is recommended.

- How to Send Emails Based on Dates in a SharePoint List with Power Automate- Power Tech Tips (text-based tutorial)
- How to Send Automated Emails on Specific Dates Using Power Automate and SharePoint | 2022 Tutorial (video tutorial)

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