Calgary Zone Medical Officers of Health and
Provincial Population & Public Health

Shiga Toxin-Producing *Escherichia coli* (STEC) Outbreak in Calgary Zone Childcare Facilities Linked to a Central Kitchen:

OUTBREAK INVESTIGATION REPORT

June 28th, 2024

Alberta Health Services

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Nature of Report

This report reflects Alberta Health Services' (AHS) knowledge as of June 18th, 2024 of the public health response to, and investigation of, the Shiga toxin-producing *Escherichia coli* (STEC) outbreak in Calgary Zone childcare facilities linked to a common kitchen that was declared open September 4th, 2023 and declared closed October 24th, 2023.

AHS is a custodian of health information under the *Health Information Act*, RSA 2000 c H-5 ("HIA") and a public body under the *Freedom of Information and Protection of Privacy Act*, RSA 2000 c F-25 ("FOIP"), and subject to the legislative requirements in HIA and FOIP and regulations thereunder. AHS is responsible for enforcing the *Public Health Act* ("PHA"), RSA 200, c P-37, which in some circumstances prevails over the HIA and FOIP. This Report was prepared by AHS as part of AHS' due diligence under the PHA. This Report is being disclosed to the Chief Medical Officer of Health ("CMOH") in accordance with the CMOH's direction and in compliance with the PHA, HIA and FOIP.

Public Health Issue

On September 4th, 2023, a Shiga toxin-producing *Escherichia coli* (STEC) outbreak was declared in AHS' Calgary Zone, affecting multiple childcare facilities and a central kitchen. The outbreak involved a higher number of cases over a more prolonged period than any gastrointestinal illness outbreak in AHS history. A total of 448 people were diagnosed with STEC, of which 359 were laboratory confirmed by polymerase chain reaction (PCR) and/or culture and 89 were probable cases who did not have an STEC positive stool test but who had gastrointestinal symptoms and were epidemiologically linked to the outbreak. The probable cases included people who did not have a stool test (n=4) and people who had one or more stool tests that were all negative (n=85)). Of the 359 lab-confirmed cases, 326 (90.8%) attended or worked at eight of 11 childcare facilities served by the central kitchen or worked in the central kitchen itself, including 273 childcare facility attendees, 44 childcare facility workers, and nine members of the central kitchen staff. The 33 confirmed secondary cases included household contacts, children attending other childcare facilities, and other non-household contacts.

In terms of severe cases, 38 children and one adult were hospitalized, which represented 10.9% of confirmed cases and 8.7% of total cases. Of the severe cases, 23 patients were diagnosed with hemolytic uremic syndrome (HUS) and eight received peritoneal dialysis. There were no deaths.

Key strategic objectives of the STEC outbreak response included ensuring access to care and appropriate clinical follow-up, immediate stemming of transmission, and investigating the source.

This report provides background information about the STEC outbreak declared in 11 Calgary Zone childcare facilities linked to a common kitchen and describes the outbreak investigation that was undertaken concurrently with extensive immediate response measures designed to limit spread within childcare facilities and the broader community. The report outlines the investigations undertaken by AHS to determine the source of the outbreak and how it was spread, and it describes activities to identify a link to genetically matched sporadic cases. The purpose of this work was to inform immediate control measures, prevent additional cases within childcare facility settings and the community beyond, and gather learnings to help avoid future outbreaks.

A Food Safety and Licensed Facility-Based Child Care Review Panel was established by Alberta's government to examine food safety in kitchens that provide food in licensed child-care facilities across Alberta and make recommendations on how to better protect children. Panel members includes representation from the for-profit and not-for-profit childcare sectors, food service industry, and experts in food safety and in public health. The panel's recommendations will inform decisions to enhance or strengthen Alberta's food safety regulations, standards and/or procedures to improve food safety in licensed childcare facilities. As such, reviews and recommendations in these areas are out of scope for the current report.

This outbreak was declared against the backdrop of possible genetic relatedness between three known Calgary Zone sporadic cases occurring between June and August 2023, and four cases in another province occurring between November 2022 and February 2023. A national public health laboratory surveillance system identified the match, based on whole genome sequencing. The Calgary Zone Environmental Public Health team started an investigation into this cluster on August 15th, 2023. Subsequently, more cases were added to the national cluster by both the other province (the other province totaled five genetically linked cases) and Alberta (Alberta totaled 11 genetically linked cases). While none of the 16 cases in this cluster had a known epidemiological link to the central kitchen or any of the childcare facilities involved in the Calgary Zone outbreak, whole genome sequencing of all 339 childcare facility outbreak isolates that were sequenced matched this national cluster. (Of the 359 confirmed cases in the childcare facility outbreak, samples from 20 cases could not be sequenced: 12 were PCR positive but culture negative, four were culture positive but the strain could not be isolated to perform sequencing, and four were tested in external laboratories and the specimens were not available for sequencing.)

Background

Shiga toxin-producing *Escherichia coli* (STEC)

Escherichia coli (*E. coli*) are a group of bacteria that live inside the intestines of animals and humans[1]. While most strains of *E. coli* are harmless or cause mild diarrhea, others produce toxins capable of causing serious illness by damaging the cells lining the small intestines, kidneys, and occasionally the brain[1]. Infections with the most common toxin-producing strain, Shiga toxin-producing *E. coli* (STEC), can result in diarrhea, bloody diarrhea, renal failure, and even death, particularly among young children and the elderly[2].

Cattle are the major reservoir for STEC[3]. These bacteria can be transferred through animal and human feces into nearby soil and water systems resulting in contamination of crops[4]. STEC infections in humans can occur by drinking contaminated water or eating contaminated food such as undercooked meat, unpasteurized milk or juices, or raw fruit or vegetables. Food items can become contaminated with *E. coli* during production, through cross-contamination from contaminated foods via improper food handling, or after an infected person handles food using inadequate hand hygiene[1]. Other modes of transmission can include contact with infected farm animals, direct person-to-person contact with inadequately washed hands, or through touching surfaces that were not cleaned adequately before being touched by others[1].

Proper food processing and handling practices and robust hand hygiene are critical to preventing human STEC infections and outbreaks.

STEC has an incubation period (the time between exposure and the development of symptoms) of 1-10 days, typically 3 to 4 days[5]. Outbreaks involving mostly children and those with high attack rates (likely a proxy for virulence of the strain, infectious dose, and host susceptibility) tend to have shorter incubation periods[6]. Individuals with STEC are deemed communicable (infectious) while they are shedding bacteria that can be grown in culture. According to the Alberta Public Health Disease Management Guidelines, communicability begins with symptom onset and typically continues for a week or less in adults and for about three weeks in one-third of children[5]. Prolonged carriage is uncommon, although asymptomatic infections have been reported[5,7].

Epidemiology of *E. coli* in Alberta and the Calgary Zone

STEC infections, also known as verotoxigenic *E. coli* (VTEC), constitute a notifiable disease in Alberta, requiring all confirmed and probable cases to be reported to the AHS Zone Medical Officer of Health[5]. This includes the specific *E. coli* serotype linked to the outbreak reported here: Shiga toxin 1 (Stx1) and Shiga toxin 2 (Stx2) producing *E. coli* O157:H7.

E. coli O157:H7 is the most common STEC in Canada[8]. The annual rate of laboratory confirmed cases over the past 9 years in Alberta and the Calgary Zone specifically are indicated in Figure 1. Rates vary seasonally and tend to be highest in summer months. With the Public Health Agency of Canada's (PHAC) permission, AHS adapted for use at the AHS Zone level the PHAC algorithm used for its National Enteric Surveillance Program's (NESP) heads up table. According to this calculation, Calgary Zone would have expected a median of approximately two, and an average of approximately three cases of laboratory confirmed *E. coli* O157:H7 per week in September 2023 in the absence of an outbreak. This algorithm relies on the most recent five years of data. (This may be an underestimate because of low case counts associated with public health measures in place during the first years of the COVID-19 pandemic.)

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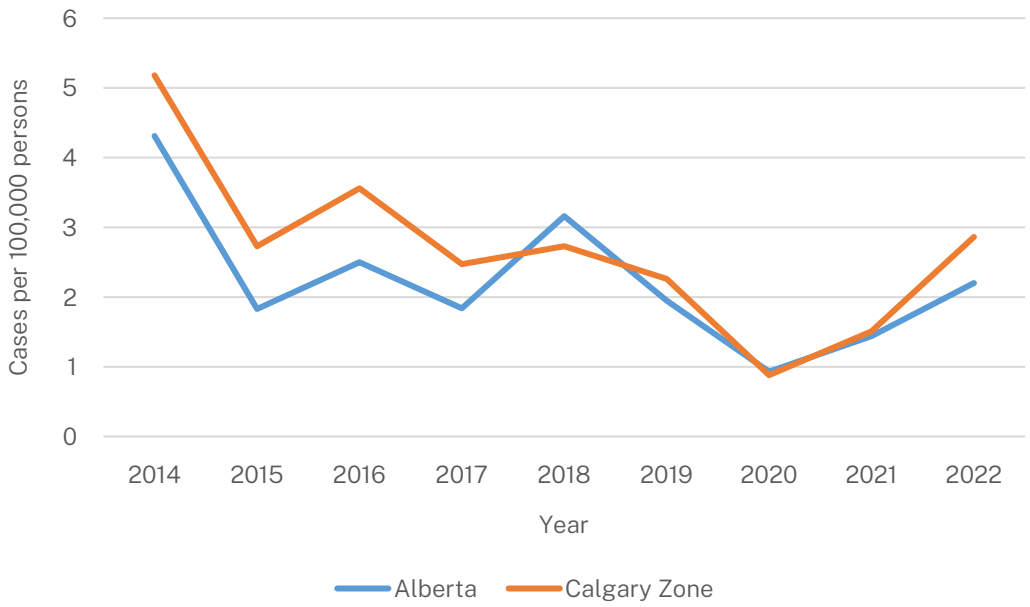


Figure 1
Annual E. coli O157:H7 cases per 100,000 population in Calgary Zone and Alberta, 2014-2022

Cluster of *E. coli* Involving Calgary Zone and Another Province

PulseNet Canada is a PHAC-led network of public health laboratories across Canada linked by databases[9]. This national surveillance system tracks all reported cases of illness caused by specified pathogens that cause foodborne illness including *E. coli*. The PulseNet Canada team at the National Microbiology Laboratory in Winnipeg, Manitoba houses and manages the national databases. Data assets include new laboratory confirmed national cases of *E. coli* submitted by each provincial public health laboratory through the PHAC-led National Enteric Surveillance Program (NESP). Alberta Precision Laboratories: Public Health Laboratory (APL-ProvLab) participates in the PulseNet Canada network that uses advanced genomic science to detect commonalities between cases across the country and internationally. Close matches in genetic sequencing may indicate a common source between seemingly unrelated cases.

On August 11th, 2023, APL-ProvLab notified AHS Environmental Public Health (EPH) of an *E. coli* cluster involving three genetically linked sporadic cases in the Calgary Zone detected between June and August 2023, and four cases in another province detected between November 2022 and February 2023. On August 15th, EPH Calgary Zone initiated an investigation and requested Alberta Health to contact the other province to enquire about the likely source for their cases. On August 17th, EPH Calgary Zone declared an outbreak based on the laboratory data.

More cases were added to the cluster by both the other province (n=5) and Alberta (n=11), eventually bringing the total to 16. A national Outbreak Investigation Coordinating Committee (OICC) was activated on September 20th by PHAC Outbreak Management Division, as this was a multijurisdictional cluster. The OICC partners agreed to collaboratively investigate the non-childcare facility related cases while AHS led the response to the childcare facility outbreak declared in the Calgary Zone. Epidemiological links were explored between the cluster of 16 Alberta and other province cases and the cases in the childcare facility outbreak, and genetic linkage between the cluster and cases in the childcare facility outbreak were investigated. (See 'Whole Genome Sequencing' and 'National Outbreak Investigation Coordination Committee (OICC) for Interprovincial *E. coli* Cluster' sections in the Investigative Methods and Results section for more details).

Role of Operators and AHS Public Health in Preventing, Identifying, and Responding to Gastrointestinal Illness Outbreaks in Childcare Facilities

AHS public health teams (including Medical Officers of Health, Environmental Public Health officers, and Communicable Disease Control nurses) support licensed childcare facilities to implement practices to prevent and stop the spread of communicable diseases. These facilities are subject to requirements under the *Public Health Act* and related Regulations and Standards. As such, they undergo regular public health inspection for compliance, to identify deficiencies, to ensure that corrective actions are taken, and to direct the implementation of control measures when illnesses are suspected or confirmed. AHS has also authored the AHS Health and Safety Guide for Operators of Child Care Facilities[10], available to all facility operators, which outlines requirements and recommendations to help protect children from getting hurt or sick in childcare settings. Specific to outbreak prevention and response, AHS has developed the Guide for Outbreak Prevention & Control in Child Care Facilities[11] that outlines practices to prevent outbreaks as well as to reduce the risk of spreading disease once an outbreak has been declared. Both Guides include advice for helping identify outbreaks and for reporting to AHS for further assessment and support. If an outbreak is declared, the AHS Public Health Outbreak Team immediately supports the site to follow recommendations to prevent further spread of illness, such as enhanced site cleaning and disinfection and other outbreak control measures. Both Guides can be made enforceable by applying a particular section of a Regulation or by a Public Health Inspector applying Section 62 of the *Public Health Act* and issuing an executive officer order.

Gastrointestinal illness (GI) outbreaks occur regularly in childcare facilities in Alberta throughout the year, especially during winter months. There were 313 GI outbreaks declared in childcare facilities across the province between September 2022 and August 2023, according to the AHS Alberta Outbreak Surveillance Dashboard accessed November 15th, 2023. In contrast to the outbreak described in this report, most of these outbreaks involve relatively mild illness and most are caused by viruses. These outbreaks tend to be short lived but can result in a sizable percentage of attendees and staff developing diarrhea and/or vomiting over a brief period. Most people get better within one to three days with no long-term health effects related to their illness. Childcare facility closures are generally not required although enhanced control measures are implemented for these mostly seasonal viral GI outbreaks.

The strain of STEC bacteria that caused the outbreak described here can lead to the severe outcome of hemolytic uremic syndrome (HUS) in about 15-20% of infected children and HUS can also occur in adults, particularly the elderly[2]. HUS affects blood clotting and vasculature, which can precipitate renal failure and other severe complications such as neurologic sequelae (e.g., seizures). Among children with STEC who develop HUS, the case-fatality rate is about 3% and among adults it can be up to 20%[2].

By the end of the outbreak, 359 cases had been laboratory confirmed (PCR and/or culture positive) and there was a total of 448 cases including probable cases. (Probable cases include people with gastrointestinal symptoms who were epidemiologically linked to the outbreak but who did not have an STEC positive stool test. These 89 probable cases included people who did not have a stool test (n=4) and people who had one or more stool tests that were all negative (n=85)). As expected, this outbreak resulted in a higher proportion of severe cases than one related to a typical viral pathogen, with 75 of the total cases (16.7%) developing hemorrhagic diarrhea. Thirty-eight children and one adult were hospitalized, representing 10.9% of confirmed cases and 8.7% of total cases. Of the severe cases, 23 patients were diagnosed with HUS and eight received peritoneal dialysis. There were no deaths.

Before the STEC outbreak was declared in Calgary Zone childcare facilities and central kitchen in September 2023, three previous STEC outbreaks had been declared in Alberta childcare facilities dating back to 2018, all involving single sites according to the AHS Alberta Outbreak Surveillance Dashboard accessed November 15th, 2023. Two were in the Calgary Zone (2018 outbreak with two cases, 2022 outbreak with seven cases) and one was in the Edmonton Zone (2019 outbreak with three cases.)

Gastrointestinal Illness Reporting Criteria for Childcare Facilities

The AHS Public Health Disease Control Team identifies outbreaks by assessing patterns and symptoms of illness. Childcare facilities are responsible for monitoring the number of ill children and their symptoms and for reporting to the AHS Population Public Health Support Team (PPHST) when reporting criteria are met. For gastrointestinal illness (GI) as per the Guide for Outbreak Prevention & Control in Child Care Facilities, this includes reporting when two or more children with new onset of symptoms within a 48-hour period meet the GI case definition as follows:

- Two or more episodes of diarrhea in a 24-hour period OR
- Two or more episodes of vomiting in a 24-hour period OR
- One or more episodes of vomiting AND diarrhea in a 24-hour period

OR

- One episode of bloody diarrhea OR
- Laboratory confirmation of a known enteric pathogen.
- Note: sites are also asked to report to AHS an unusual increase in staff with GI symptoms (above the baseline of what would be expected), regardless of whether the staff were present at work with symptoms, as this could also be an indicator of a GI outbreak.

The Calgary Zone Childcare Facilities STEC Outbreak: Detection, and Immediate Source Identification and Control Measures

August 30th, 2023 was the initial date where cases of GI in a licensed childcare facility that ultimately became included in the STEC outbreak in Calgary Zone childcare facilities were reported to the AHS Population Public Health Support Team (PPHST). Subsequent notifications to and discovery of cases in other childcare facilities, identification of the connection to the common kitchen, and immediate control measures are outlined below:

- *Wednesday, August 30th*: Non-bloody diarrhea and/or vomiting cases meeting the GI reporting criteria were reported to AHS Public Health by a childcare facility with six cases (four of 169 children and two of 45 staff). A GI outbreak was declared, and routine outbreak measures were recommended as per the outbreak guidelines referenced in the Background section. The pathogen was unknown at the time of outbreak declaration, and no cases of bloody diarrhea or more serious illness were reported.
- *Thursday, August 31st*: A second childcare facility met the reporting threshold for GI symptoms, this time with nine cases of non-bloody diarrhea and/or vomiting (nine of 155 children and zero of 40 staff). A GI outbreak was declared at this site, again with recommendations to follow routine outbreak guidelines and again without knowledge of the pathogen.
- *Saturday, September 2nd:* Pediatric Emergency Department physicians first notified the on-call Calgary Zone Medical Officer of Health (MOH) of a cluster of bloody diarrheal illness cases linked to three childcare facilities, all of which were not open for the Labour Day long weekend. Two of the childcare facilities were the ones where GI outbreaks had been declared earlier in the week. This notification was consistent with requirements under both the Alberta *Public Health Act* and Notifiable Disease Regulations for any health practitioner to notify the MOH when they know of or have reason to suspect the existence of a communicable disease in epidemic form or another illness or health condition occurring at an unusually high rate. (The roll out of a provincewide electronic health record will allow for this notification process to be protocolized as public health content is introduced into Connect Care in 2024-25.)

- *Sunday, September 3rd:* 14 cases identified in Emergency Departments by noon were all among children attending three childcare facilities. The MOH, in consultation with Calgary Zone Environmental Public Health, sent letters to childcare facility operators for them to send to all staff and parents at the three impacted childcare facilities. Staff and parents were told there was an outbreak at their childcare facility, to monitor for symptoms, and if symptomatic to present to emergency / urgent care for assessment. By 2100h, the MOH team was aware of 33 cases and one STEC culture positive result.
- *Monday, September 4th:* Once stool samples collected by the Emergency Department pediatricians confirmed STEC to be the causative agent, the MOH took additional immediate action. Effective collaboration between the Emergency Department pediatricians and the Calgary Zone MOH helped ascertain rapidly that all affected childcare facilities received meals and snacks from one central kitchen. With the childcare facilities and central kitchen still closed for the long weekend, an outbreak was declared affecting the central kitchen and all 11 childcare facilities that received food from it.
    - All impacted childcare facility operators and the central kitchen were promptly notified and the MOH provided verbal Closure Orders, using authorities under the *Public Health Act*, with formal written Closure Orders subsequently issued.
    - An AHS health advisory was issued to the public through Calgary-area media during the afternoon of September 4th. The advisory was also posted to the AHS website and social media accounts to ensure maximum awareness among those potentially affected by the outbreak.
    - The childcare licensing team under Children and Family Services was also notified so they could begin preparing for the outbreak.
- *Monday, September 4th to Wednesday, September 6th:* Rapidly increasing case counts reinforced that many children and childcare staff in affected facilities may have been exposed to a common source of infection and may have been ill with, or incubating, STEC. These people posed a risk of transmitting STEC to others. At this point, cases had been identified in seven of the 11 childcare facilities served by the central kitchen and it was not known whether the other four sites served by the central kitchen were affected. (Later in September, one of the remaining four childcare facilities served by the central kitchen had two confirmed secondary cases.) Besides closing all the childcare facilities to minimize spread to children and childcare staff who may not already have been exposed, it was important to establish parameters that would make it sufficiently safe to return. It was also important to minimize the risk of parents sending their children to other childcare facilities in the meantime. The following actions were undertaken to achieve these objectives:
    - Central kitchen staff and staff and parents from all affected sites with confirmed cases were informed their site was linked to an STEC outbreak connected to the central kitchen and they were issued facility wide MOH Exclusion Orders. For the four childcare facilities where no one had yet tested STEC positive, Exclusion Orders were issued for anyone with gastrointestinal symptoms. The instructions disallowed kitchen staff, childcare facility staff, and children younger than 5 years of age by December 2023 from returning to any sensitive situation or occupation (SSO) until they received a letter from AHS rescinding their Exclusion Order. This included any work handling food; childcare and certain healthcare positions; and for children, attendance at a childcare facility or similar facilities.
    - Information about STEC was given to childcare facility operators, affected staff and families, and central kitchen staff including details about associated symptoms, potential health consequences, recommendations for when and where to seek medical assessment and testing, and measures to reduce the risk of spreading infection to others.

- Stool testing was required for everyone who had been on location at the central kitchen or any of the seven childcare facilities at which someone had already tested STEC-positive. For the four childcare facilities where no one had tested STEC positive yet, stool samples were required for anyone with GI symptoms.
- While closed and then again upon reopening, all 11 childcare facilities were asked to report daily to AHS all illness among their staff and child attendees. Through mandatory testing at the seven sites that had confirmed cases, and symptom screening, further cases were identified.
- For those who did not develop GI symptoms, their Exclusion Order could be rescinded once they had one STEC-negative stool test and once an incubation period (10 days) had passed since their last possible exposure to STEC at the childcare facility or central kitchen.
- For those who tested STEC-positive (i.e. confirmed case), or who developed GI symptoms within 10 days of possible exposure to contaminated food or another person with STEC illness (i.e. probable case), their Exclusion Order could be rescinded once they had the required number of STEC-negative stool tests collected after their symptoms resolved, in keeping with the Alberta Public Health Disease Management Guideline (*Escherichia coli* Verotoxigenic Infections)[5].
- For those from one of the childcare facilities with confirmed cases who were not confirmed or probable cases but developed symptoms while their specific facility was still on outbreak (i.e., suspect case), their Exclusion Order could be rescinded once it had been 48 hours after their symptoms resolved and after they received the result of one STEC-negative stool test.
- Stool collection kits were provided for staff and parents at sites with facility-wide Exclusion Orders. Kits were sent directly to the kitchen and childcare facilities and were available for pickup at the APL-ProvLab during business and off hours.
- Detailed case investigation and contact tracing were undertaken for each confirmed and probable case, including source investigation and the identification and exclusion of close contacts involved in sensitive situations or occupations. Approximately 40 investigators were re-assigned to this work. The investigators were public health inspectors, all with bachelor's degrees in environmental health or equivalent, trained in enteric disease follow up, and Certified through the Canadian Institute of Public Health Inspectors. In addition, the surge team consisted of Communicable Disease Control (CDC) staff that included Assistant Health Nurses and Registered Nurses from the Notifiable Disease and Outbreak teams. The CDC staff all had prior experience with respiratory illness investigations and were provided additional orientation for enteric contact management and exclusions. Administrative support staff from CDC and MOH teams in other AHS Zones were also reassigned to support the outbreak. Surge capacity was provided over a nine-week period.

- *Tuesday, September 5th and throughout the week:* Public Health Inspectors (PHI) were on-site on September 5th to inspect the central kitchen, ensure it was closed, and collect prioritized food samples, particularly food leftover from meals that had recently been prepared and served. Throughout the week, PHIs also attended each of the 11 childcare facilities to post closure orders and coordinate and/or conduct inspections. (Please see further details of inspections in the Methods section.)
    - (Attempts were made to inspect the central kitchen on September 4th, however, this was not possible due to the kitchen operator's availability. Being a statutory holiday, neither the kitchen nor the childcare facilities were expected to be open.)
- *Wednesday, September 6th:* A public facing website (www.ahs.ca/ecoli) was launched with information for impacted staff, parents, families, and all interested Albertans. This was kept up to date as the outbreak progressed. A Calgary Zone MOH participated in an AHS media availability and addressed questions regarding the STEC outbreak.

- Childcare facilities across the Calgary Zone were alerted to the outbreak and asked to familiarize themselves with the list of childcare facilities with Closure and/or Exclusion Orders available online. They were requested to ask families of new children about attendance at the facilities listed and take note of the requirements for a rescind letter from AHS before an Exclusion Order for a child was lifted and the child was permitted to return to licensed childcare settings.

Outbreak Location and Setting: Childcare Facilities and Central Kitchen

Fueling Brains Academy (FBA) is a Calgary based childcare operator that had a central kitchen at the time of the outbreak. FBA has eight childcare sites in and around Calgary that provide childcare and early childhood education programs, with youngest enrollment eligibility per location ranging from six weeks to 19 months.

The central kitchen was operated under the name Fueling Minds Inc. and was co-located at the Centennial FBA campus. The kitchen prepared and delivered snacks and catered meals to six FBA campuses, including Centennial, and five other childcare facilities not operated by FBA. Table 1 lists FBA facilities according to whether they received central kitchen service, along with the other childcare facilities serviced by the Fueling Minds Inc. central kitchen.

For the remainder of this report, the 11 childcare facilities that received meals from the central kitchen will be coded as A1, A2, A3, A4, A5, A6, A7, A8, B1, B2, & B3. Facilities with confirmed STEC cases are indicated by 'A' and those without confirmed cases are indicated by 'B.'

Table *1*
Fueling Brains Academy Sites (by whether they received food from the Fueling Minds Inc. central kitchen) and Other Childcare Facilities that Received Food from the Central Kitchen

Fueling Brains Academy (FBA) Sites	Other Sites that Received Food from the Central Kitchen
FBA Sites that Received Food from the Central Kitchen • Braeside (administrative office co-located) (A3) • Bridgeland (A8) • Centennial (central kitchen co-located) (A7) • McKnight (A6) • New Brighton (A1) • West 85th (A2) **FBA Sites that Did Not Receive Food from the Central Kitchen** • Strathmore • Walden	• Braineer Academy (B2) • Kidz Space (A5) • VIK Academy (Okotoks) (A4) • Little Oak Early Education (B1) • Almond Branch (B3)

Menu Selection and Meals

The central kitchen published two monthly food menus. The Special Menu provided set meals that were dairy free, gluten free, and vegan. The Regular Menu provided set meals that may or may not have been dairy free, gluten free, or vegan. The menus provided for August 16th to 31st are provided in Appendix 1.

There were four set meals available for childcare facilities to order each day for both the Regular and Special Menus: Breakfast, AM Snack, Lunch, and PM Snack. The Special and Regular Menu options may have been the same for some set meals on some days.

Parents declared at the time of childcare enrollment whether their child required a special diet because of allergies (dairy or gluten) or restrictions (vegan or vegetarian). Based on this enrollment information, childcare facilities provided the central kitchen with a monthly or weekly Campus Population Report that included a nominal list of children who required the Special Menu options and a non-nominal count for the Regular Menu

options. The nominal list and the non-nominal count specified which of the four set meals were required each day. Campus Population Reports for all sites for August were provided to investigators.

While staff meals were not ordered through the Campus Population Reports, childcare facility operators at most sites reported that staff were encouraged to eat with the children. It was reported that some staff chose to bring their own food while others regularly or occasionally ate extra meals that were ordered for children but were not consumed, usually because of absences on a given day.

All meals at all childcare facilities were served at designated hours. The hours at which these meals were served were facility specific and not all meals were offered at all sites. Childcare facility operators reported that most typically, children were not served a meal if they were not present during the specified mealtime.

Central kitchen meals offered at each childcare facility are indicated in Table 2.

Table 2
Central kitchen meal options by childcare facility

Chlldcare Facility	Breakfast	AM Snack	Lunch	PM Snack
A1	Y	Y-infant only	Y	Y
A2	Y	Y-infant only	Y	Y
A3	Y	N	Y	Y
A4	N	Y	Y	Y
A5	N	Y	Y	Y
A6	Y	N	Y	Y
A7	Y	N	Y	Y
A8	Y	Y	Y	Y
B1	N	Y	Y	N
B2	N	N	Y	N
B3	N	N	Y	N

Central Kitchen Environmental Public Health Inspection History

The central kitchen was subject to routine food facility inspections by public health inspectors prior to the outbreak to determine compliance with regulations and standards under Alberta's *Public Health Act*. Between July 2021 and April 2023, four comprehensive monitoring inspections were conducted without advanced notice to the operator, and six risk management inspections were conducted to ensure unsafe practices and violations noted in previous inspections had been corrected. Details of violations found during those inspections can be found in Appendix 2. Also included in Appendix 2 is a list of violations identified during the inspection on September 5th, 2023, one day after the childcare and central kitchen STEC outbreak was declared and the central kitchen was closed.

The inspection reports detailed in Appendix 2 indicate that several critical violations, such as the dishwasher not sanitizing adequately and small kitchen appliances not being cleaned and sanitized properly, that had been of concern over repeat inspections were resolved by April 26, 2023. A critical violation is a violation under the *Public Health Act* that potentially poses increased risk to public health. However, during this inspection in April 2023, a new critical violation was noted in that the sanitizing solution for equipment, utensils, and surfaces had an undetectable level of sanitizer (zero parts per million). This was corrected during the inspection. When the central kitchen was inspected on September 5th, the day after closure, the sanitizing dispenser again had undetectable levels of sanitizer (zero parts per million), indicating ongoing issues with monitoring and maintaining sanitizer concentrations. In addition, two new critical violations were identified on September 5th: 1) the operator indicated their practice had been to transport cold food to other locations for longer than 90 minutes without temperature control, and 2) a cockroach infestation was observed.

Outbreak Control Methods

Outbreak Case Definitions

Confirmed case	A person who tests positive for STEC using Nucleic Acid Amplification Technique (NAT), which includes the Polymerase Chain Reaction (PCR) method, or culture, AND with an epidemiologic link to the outbreak.
Probable case	A person with new onset gastrointestinal symptoms (diarrhea AND/OR bloody stool AND/OR nausea AND/OR stomach cramps AND/OR vomiting AND/OR fever without respiratory symptoms) AND a symptom onset date (SOD) on or after August 25th AND epidemiologically linked to an exposure within the 10 days prior to SOD to a confirmed case or the source (potentially contaminated food items from the central kitchen) AND without a positive STEC test using PCR/NAT or culture. (August 25th was deemed likely the earliest day contaminated food could have been served based on the epicurve and the connection with a central kitchen source). If a person had onset of gastrointestinal symptoms between August 25th to 28th inclusive (August 29th is the earliest symptom onset date for a confirmed case), they are not a probable case if they tested STEC negative and tested positive for another pathogen that can cause gastrointestinal symptoms.
Primary case	A technical definition of a primary case would be a confirmed or probable case that is infected because of direct exposure to food items from the central kitchen and not through contact with another confirmed or probable case. Given our inability to definitively know who got sick from food versus contact with a case or contaminated surface among those who were on location at one of the 11 childcare facilities or central kitchen during the 10 days from when the food was likely served, the following is the operationalized definition: Exposure to food from the central kitchen on or before August 31st and SOD or first STEC positive stool collection (for symptomatic confirmed cases) between August 25th and September 8th inclusive OR exposure to food from the central kitchen after August 31st and SOD or first STEC positive stool collection within 10 days after exposure and no known exposure to a case during the incubation period. For asymptomatic confirmed cases with first STEC positive stool collection after Sept 8th, they are considered primary if exposure to food from central kitchen between August 25th to 29th inclusive and they had no known exposure to a case between September 9th and their first STEC positive stool collection.
Secondary case	A technical definition of a secondary case would be a confirmed or probable case that is believed to have contracted the illness through exposure to a primary case, rather than from a food item from the central kitchen (e.g., household contacts who become infected with no exposure to food from the central kitchen). The operationalized definition is any individual with a confirmed or probable STEC infection who did not meet primary case definition and who has an epidemiological link to a primary case or secondary case in the 10 days prior to SOD OR their STEC is clonally-matched to this outbreak via whole genome sequencing (WGS) and they were on location at a childcare facility epidemiologically-linked to this outbreak during their incubation period.

Case Finding

Case finding was a critical component of the Calgary Zone STEC childcare facility outbreak response. Case finding in the context of an STEC outbreak is important for two reasons: a) to help prevent additional exposures and forward transmission, and b) to ensure early and appropriate medical follow-up for severe outcomes, including HUS. As such, multiple overlapping strategies were employed to identify all cases linked to this outbreak as follows:

Childcare Facility Level Interventions

- From the central kitchen and from all 11 childcare facilities served by the central kitchen and included in the outbreak declared on September 4th, attendee and staff lists were obtained from operators. To enhance the ability to link to laboratory and other clinical records accurately, each attendee and childcare facility staff member's Alberta Personal Health Number (PHN) was requested. PHNs are used in electronic health records for all people in the province eligible for the Alberta Health Care Insurance Plan.
- Before PHNs were accessible for each person, a collaboration with AHS Health Information Management (HIM) and Public Health Surveillance and Informatics (PHSI) enabled probabilistic PHN matching. Probabilistic matching used a combination of first name, last name, date of birth (when available), and AHS Zone of residence.
- Upon re-opening, all childcare facility operators under outbreak were required to screen child attendees and childcare workers for symptoms daily and report all symptoms to a designated Environmental Public Health officer. The symptom list was adapted from the probable case definition as follows: diarrhea AND/OR bloody stool AND/OR nausea AND/OR stomach cramps AND/OR vomiting AND/OR fever without respiratory symptoms. For all seven childcare facilities linked to the central kitchen with confirmed cases during the first incubation period following the first confirmed case in the outbreak, at least one negative stool culture was required to rescind the site-wide Exclusion Order. Stool collection kits with prefilled data fields and a unique Exposure Investigation (EI) number were provided to affected sites with cases, and they were made available for pick up off hours at APL-ProvLab South (located at Foothills Medical Centre).

Monitoring and Linking Laboratory Data

- The unique EI number generated for the outbreak facilitated identification of relevant laboratory results and helped with categorizing confirmed and probable cases.
- Daily checks were made of the Connect Care electronic health record for laboratory results of all *E. coli* stool specimen results in the Calgary Zone and periodic checks were made of *E. coli* results province-wide. These results were cross-referenced with childcare facility attendee lists and childcare facility and kitchen staff lists to capture any results not ordered under the EI number, such as tests ordered by physicians in the community including unlinked cases.

Community Case Finding

- On September 4th, the day STEC was determined to be the causative agent, an internal memo was sent to Calgary Zone physicians and staff with information about the outbreak and affected childcare facilities. In a follow-up letter on September 7th that included all primary care and other community physicians in the Calgary Zone, these health care providers were requested to maintain a high index of suspicion for STEC and to use the designated EI number when ordering stool testing.
- A similar approach was undertaken with the Alberta Children's Hospital team to co-create letters for hospital-based pediatricians including those in all Calgary Zone Emergency Departments with similar messaging.
- A Calgary Zone MOH undertook daily cross-checking of a list received from clinical operations of cases being seen for follow-up at acute care sites within the Calgary Zone. Any cases not known to the outbreak team were investigated.

- Health Link 811 is a telephone service that provides free of charge, around-the-clock nursing advice and general health information for Albertans. Health Link co-developed an incoming and outgoing call process with Public Health and the MOH team. Health Link managers trained administrative staff on these algorithms and Health Link leadership participated in a daily quality improvement process review. Health Link staff systematically conducted interviews with close contact childcare facility attendees and staff to ensure eligibility for having their exclusions rescinded. For those eligible, a rescindment letter from the MOH was emailed and a hard copy mailed. If any symptoms were identified, the caller was transferred to the Health Link nursing team for clinical guidance and to the Public Health team for follow-up. Information was also provided to Health Link for sharing with incoming callers. All incoming callers reporting severe symptoms such as bloody diarrhea, regardless of their connection to the outbreak, were referred to the Health Link nurses for clinical guidance and to the Public Health team for follow-up. For callers who were identified as requiring a stool test, Public Health was notified for follow-up.

Public Health Measures

- Case investigation and contact tracing were core elements of the public health response to the outbreak. All laboratory confirmed and probable cases received a phone call from the Environmental Public Health's Disease Control Team (DCT). DCT collected exposure histories including food histories, childcare, and travel histories. They also identified symptomatic close contacts and determined whether they met the case definition for probable cases and/or encouraged follow-up care and testing.
- As part of routine outbreak management and surveillance, the Zone DCT receives results of all positive enteric panels ordered under the MOH as well as those ordered by any physician within the Calgary Zone. All positive results were followed up as per Environmental Public Health standard processes.
- For this outbreak, the case definition included polymerase-chain reaction (PCR) / nucleic acid test (NAT) positivity in addition to stool culture positivity for greater sensitivity and faster case identification.

Clinical Laboratory Methods for Shiga Toxin-Producing *E. coli* (STEC)

In Alberta, human stool testing for Shiga toxin-producing *E. coli* (STEC) is performed if ordered for diagnostic purposes by a clinician, as part of the enteric pathogen panel, or for public health purposes by an MOH to support their legislative duties to break chains of transmission and prevent spread of the disease. MOHs also order STEC testing to determine whether someone excluded from a sensitive setting (e.g., childcare facility) or occupation (e.g., food handler or health care provider) can return to the setting. Once collected, the stool sample is sent to the laboratory.

In Calgary Zone during the STEC childcare facility outbreak, stool samples were tested for STEC using nucleic acid testing (e.g., PCR). In a brief period during the outbreak, some stool samples were initially screened by culture only and not by PCR. If the stool was positive for STEC by PCR, the laboratory attempted to culture the bacteria from the stool. For stool that was culture positive for STEC, the laboratory determined if the STEC produced Shiga toxin 1 (Stx1) and/or Shiga toxin 2 (Stx2). Shiga toxin testing provides prognostic information insomuch as STEC infection with Stx2 is much more likely to cause hemolytic uremic syndrome[2]. If the culture was positive for STEC, the isolate was sent for whole genome sequencing to assist with public health surveillance and investigations.

Stool Collection Kits

Stool specimen collection kits were provided for all individuals at sites with confirmed cases to help with case finding and facilitate lifting of Exclusion Orders. Between September 5th and 8th, 3,275 stool collection kits were issued by APL-ProvLab.

As AHS Public Health continued surveillance for secondary cases, an additional 2,145 kits were issued between September 15th and October 21st. In total, the APL-ProvLab provided 5,420 stool collection kits to individuals

impacted by this outbreak. Over the course of the outbreak, laboratories undertook more than 7,340 tests on stool samples to support outbreak management and source investigation as follows:

- 736 Bacterial Enteric Panels (Diagnostic and Scientific Centre/DL)
- 276 Extended Bacterial Panels (Diagnostic and Scientific Centre/DL)
- 1,297 Public Health Stool Cultures (APL-ProvLab)
- 4,367 Shiga Toxin NAT tests (APL-ProvLab)
- 332 Serotyping tests completed (APL-ProvLab)
- 339 Whole genome sequences (APL-ProvLab)

Descriptive Epidemiology

Recent STEC Cases in Alberta Not Epidemiologically Linked to the Calgary Childcare Facility Outbreak

- *Cases Included in the National E. coli Cluster:* As alluded to earlier, *E. coli* isolates from 11 STEC cases in Alberta, 10 of which were in the Calgary Zone, were matched genetically to five STEC cases in another province. None of these 16 interprovincial cluster cases could be linked epidemiologically to any of the confirmed or probable childcare facility outbreak cases. The childcare facility outbreak cases were, however, highly related genetically to each other and matched the whole genome sequences of the 16 cases in the interprovincial cluster. The 11 Alberta cases from the interprovincial cluster were not included in this descriptive epidemiology section, but they are described in the Investigative Methods and Results sections entitled 'Whole Genome Sequencing', 'National Outbreak Investigation Coordinating Committee (OICC) for Interprovincial *E. coli* Cluster', and 'Alberta Foodborne Illness and Risk Investigation Protocol (FIRIP)'.
- *Sporadic Cases:* Aggressive case finding as part of the outbreak response identified 16 additional Alberta *E. coli* O157:H7 cases diagnosed between August 25th and September 24th, nine of which were diagnosed within the Calgary Zone. This count is consistent with the background rate of *E. coli* O157:H7 expected for these two geographies at this time of year, as described in the Background section. These 16 cases were prioritized for case investigation to explore epidemiological links to the childcare facility outbreak and were prioritized for WGS to determine whether they were part of the national cluster. No epidemiological link to the childcare facility outbreak was identified for any of these 16 sporadic cases and the WGS profile did not match that of the national cluster.

Tracking and monitoring these epidemiologically unrelated cases was important because the findings provided reassurance there was not an ongoing common source of infection causing widespread illness.

All Primary and Secondary STEC Cases Linked to the Calgary Zone Childcare Facility Outbreak

This section of the report presents descriptive epidemiology for all primary and secondary cases in the Calgary Zone childcare facility STEC outbreak. We identified 359 confirmed and 89 probable cases for a total of 448 cases. These include primary cases who were exposed to food from the central kitchen including kitchen staff, childcare facility attendees, childcare facility workers, and family and friends of childcare facility workers who ate leftover food brought home by a worker. Of the 11 childcare facilities served by the central kitchen, eight had confirmed cases (A1, A2, A3, A4, A5, A6, A7, & A8). The other three childcare facilities served by the central kitchen had no associated cases. Secondary cases are also reported here including household and non-household close contacts and the secondary cases that impacted other childcare facilities. (See Outbreak Case Definitions.)

Included in this section is a description of primary and secondary cases with respect to:

- Distribution by Time
- Distribution by Confirmed and Probable Case Status
- Distribution of Confirmed Cases Only by Symptom Status
- Distribution of Secondary Confirmed and Probable Cases by their Epidemiological Link

Also included in this section are case demographics plus a description of the impact this outbreak had on childcare facilities that did not receive meals from the central kitchen.

Distribution of Primary and Secondary Cases by Time

Figure 2 presents the epidemiological curve (epicurve) for primary and secondary cases. Note that for asymptomatic confirmed cases, the sample collection date is used as a proxy for the symptom onset date (SOD).

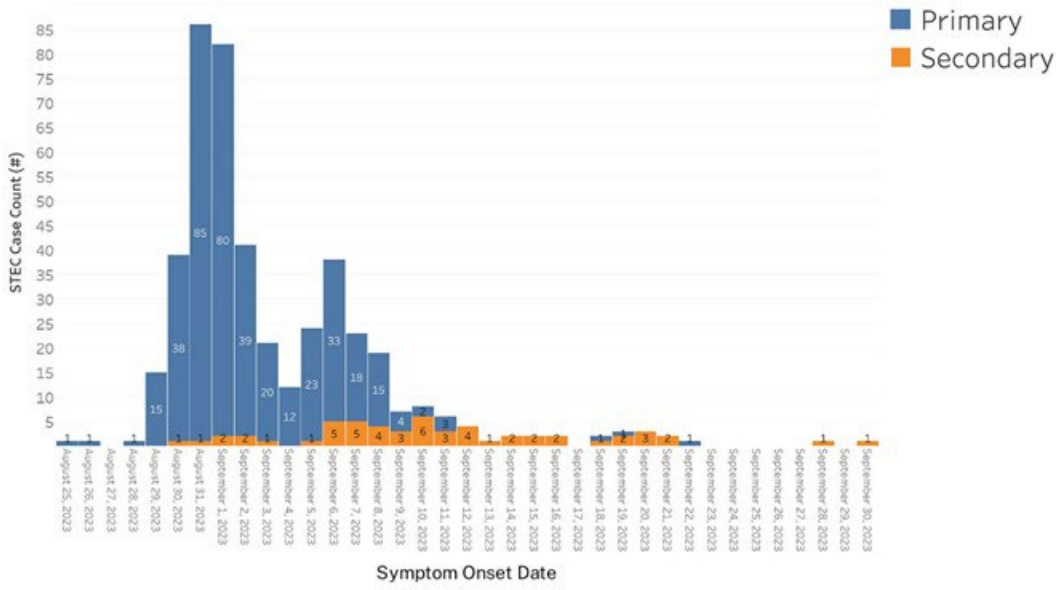


Figure 2
Epicurve of primary and secondary cases by date of onset (n=448)

The SOD or sample collection date (for asymptomatic cases) for probable and confirmed cases are presented in Figure 3. For probable cases, the SOD ranged from August 25th to September 22nd while for confirmed cases, SOD ranged from August 29th to September 30th.

Distribution by Confirmed and Probable Case Status

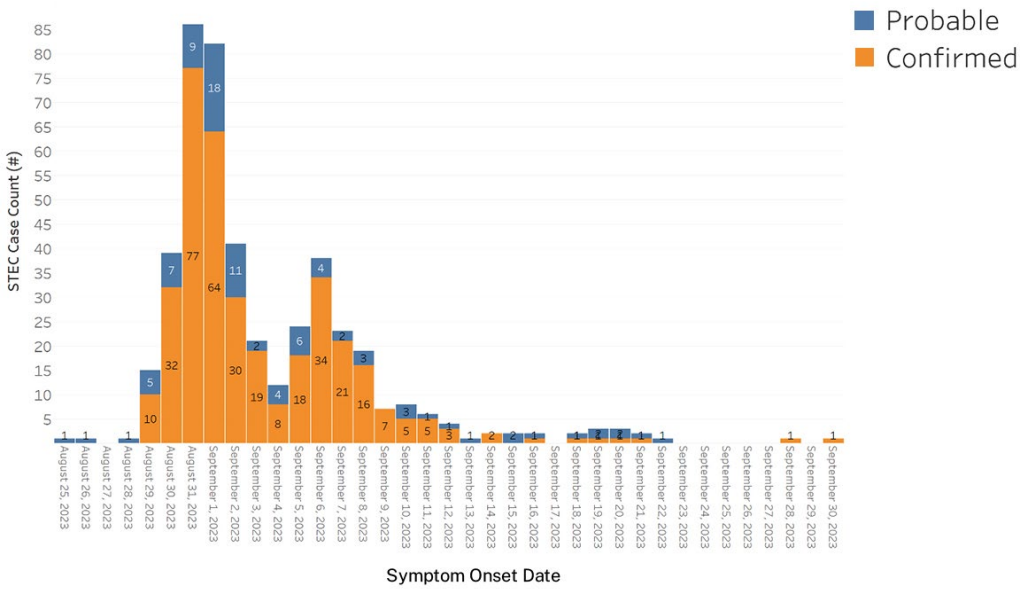


Figure 3
Epicurve of confirmed and probable cases by date of onset (n=448)

Early probable cases

Three probable cases had SODs that preceded the SOD for all confirmed cases. These probable cases were identified at childcare facilities A4, A6, & A7 with SODs of August 25th, August 26th, and August 28th, 2023 respectively (Figure 3). Stool test results for all three cases were negative on gastroenteritis viral panels and negative for *E. coli* by PCR. Despite the negative *E. coli* test results, these cases were retained as probable cases given their epidemiological link to food items in the central kitchen and the inability to attribute them to another known pathogen, as per the outbreak case definitions.

First confirmed cases in sites served food by the central kitchen

Fifteen childcare facility-related cases reported onset of GI symptoms on August 29th, 2023. These included 10 cases that were later laboratory confirmed and five cases that remained probable. These cases were associated with five childcare facilities (A1, A2, A3, A5, & A6), and included both childcare facility staff (n=3) and children (n=12).

The first A4 and A7 cases had SOD of August 30th and August 31st, respectively. The earliest SOD for confirmed symptomatic central kitchen staff cases was August 30th.

Childcare facility A8 had a total of two confirmed cases and these had SODs of September 21st and 30th, both of which were more than 10 days after the last meal was provided by the central kitchen. The case investigation identified a common alternate possible source of infection (untreated water) that occurred within 10 days of their SOD. The genetic profile of the STEC isolates, however, matched that of the other childcare facility outbreak cases. So, although the investigation found no epidemiologic link to any childcare facility-related confirmed or probable cases and no exposure to food from the central kitchen during the incubation period, these two cases were classified as secondary with the assumption the primary case(s) in this childcare facility were most likely undetected. While there had been probable cases at the A8 childcare facility within 10 days of the last meal being provided by the central kitchen, none were lab confirmed so testing of all asymptomatic attendees and workers was not required. It is possible transmission occurred from a probable symptomatic case or from an undetected asymptomatic case.

First Case from Outside the Central Kitchen or Childcare Facility Community Who Was Exposed to Leftover Food from the Central Kitchen

One confirmed case (a staff member from A3) reported taking meatloaf leftovers from the August 29th lunch home and consuming them with the case's partner on August 30th. Both developed symptoms very early the next morning and both were subsequently confirmed STEC positive with WGS that matched the outbreak. The partner was initially considered a secondary case given the association with an STEC positive childcare facility worker but was subsequently assigned as a primary case due to the history of consuming food served by the central kitchen, as per the outbreak case definitions.

Second Case from Outside the Central Kitchen or Childcare Facility Community Who Was Exposed to Leftover Food from the Central Kitchen

A teenager whose mother is friends with a childcare facility worker from one of the facilities that received food from the central kitchen became a confirmed case after being exposed directly to food from the central kitchen.

The family related that a few days before September 11th, 2023, the friend brought leftover beef meatloaf and chicken stir fry from their home refrigerator that had originally been obtained from the worker's childcare facility. They chose not to reveal the name of the friend or the name of the childcare facility, except to say it was a Fueling Brains Academy childcare facility. Both meals were refrigerated again when they arrived at the family's home.

The teenager ate only one food item, and it was eaten cold: a small piece of beef meatloaf. The case's mother ate the remainder of the beef meatloaf and the chicken stir fry after reheating both by microwave. The mother did not become ill and did not undergo stool testing. The teenager developed symptoms and was STEC positive based on stool culture, with a WGS profile that matched other cases in the childcare facility outbreak. The teenager had no other known exposures to a primary or secondary STEC case and was considered a primary case in the childcare facility outbreak.

Case count progression

The daily case count across sites continued to rise after the first confirmed case on August 29th and reached a peak two days later on August 31st, 2023. Daily case counts decreased from September 1st to 4th, after which a second increase associated with secondary cases (see Figure 2) and asymptomatic testing (see Figure 6) was observed. A total of 87.7% of cases (n=393) were classified as primary and 12.3% (n=55) were classified as secondary.

As outlined in Table 3, approximately 80% of cases (n=359) were laboratory confirmed with an epidemiological link to the central kitchen. The remaining 20% (n=89) with new onset of GI symptoms who were epidemiologically linked to the central kitchen, but who did not have a positive STEC stool test result, were deemed probable cases as per the outbreak case definitions. Probable cases include people who did not have a stool test (n=4) and people who had one or more stool tests that were all negative (n=85).

Table 3
Cases by case definition and type

Case Definition	Primary versus Secondary	Case Type	Case Count (#)	Proportion
Confirmed	Primary	Child	271	60.49%
		Childcare Facility Worker	44	9.82%
		Central Kitchen Staff	9	2.01%
		Other	2	0.45%
		Total	**326**	**72.77%**
	Secondary	Parent	11	2.46%
		Childcare Facility Attendee	4	0.89%
		Sibling or Sibling/Attendee	10	2.23%
		Non-household Contact	3	0.67%
		Partner	2	0.45%
		Other	1	0.22%
		Household contact	1	0.22%
		Childcare Facility Worker	1	0.22%
		Total	**33**	**7.37%**
	Total		**359**	**80.13%**
Probable	Primary	Child	58	12.95%
		Childcare Facility Worker	9	2.01%
		Total	**67**	**14.96%**
	Secondary	Parent	4	0.89%
		Childcare Facility Attendee	4	0.89%
		Sibling	1	0.22%
		Non-household Contact	13	2.90%
		Total	**22**	**4.91%**
	Total		**89**	**19.87%**
Grand Total			**448**	**100.00%**

The distribution of primary and secondary cases by confirmed or probable case status is also included in Table 3. Primary cases comprised 91% (n=326) of all confirmed cases, 74% (n=67) of all probable cases, and 88% (n=393) of all cases overall. Secondary cases comprised 9% (n=32) of all confirmed cases, 26% (n=23) of all probable cases and 12% (n=55) of cases overall. Of the 55 total secondary cases, 29% (n=16) were non-household contacts including three confirmed and 13 probable cases, in addition to nine secondary cases among childcare facility attendees and workers.

Table 4 provides the number and proportion of child and staff confirmed and probable cases by childcare facility for facilities that received food from the central kitchen. Almost 49% (n=191) of all confirmed and probable cases in these childcare facilities attended just two facilities (A1 and A2). These two childcare facilities also had the highest count of probable and confirmed childcare facility worker cases.

Table 4

Number and proportion of child and staff cases by case definition and childcare facility for facilities receiving meals from the central kitchen (A1-A8)

Childcare Facility	Child versus Staff	Case Definition	Case Count (#)	Proportion
A1	Child	Confirmed	89	22.94%
		Probable	12	3.09%
	Staff	Confirmed	14	3.61%
		Probable	1	0.26%
		Total	116	29.90%
A2	Child	Confirmed	85	21.91%
		Probable	5	1.29%
	Staff	Confirmed	11	2.84%
		Probable	4	1.03%
		Total	105	27.06%
A3	Child	Confirmed	49	12.63%
		Probable	4	1.03%
	Staff	Confirmed	7	1.80%
		Probable	1	0.26%
		Total	61	15.72%
A4	Child	Confirmed	20	5.15%
		Probable	9	2.32%
	Staff	Confirmed	5	1.29%
		Probable	1	0.26%
		Total	35	9.02%
A5	Child	Confirmed	13	3.35%
		Probable	5	1.29%
		Total	18	4.64%
A6	Child	Confirmed	10	2.58%
		Probable	15	3.87%
	Staff	Confirmed	5	1.29%
		Probable	0	0.00%
		Total	30	7.73%
A7	Child	Confirmed	6	1.55%
		Probable	8	2.06%
	Staff	Confirmed	1	0.26%
		Probable	1	0.26%
		Total	16	4.12%
A8	Child	Confirmed	1	0.26%
		Probable	4	1.03%
	Staff	Confirmed	1	0.26%
		Probable	1	0.26%
		Total	7	1.80%
		Grand Total	388	100.00%

By August 31st, eight of the 11 childcare facilities that received food from the central kitchen had reported children and/or staff with symptoms (A1, A2, A3, A4, A5, A6, A7, & A8). The other three childcare facilities were investigated, but no cases were identified (B1, B2, & B3) despite these facilities having received meals from the central kitchen. Figure 4 shows the distribution of confirmed and probable cases by day per childcare facility.

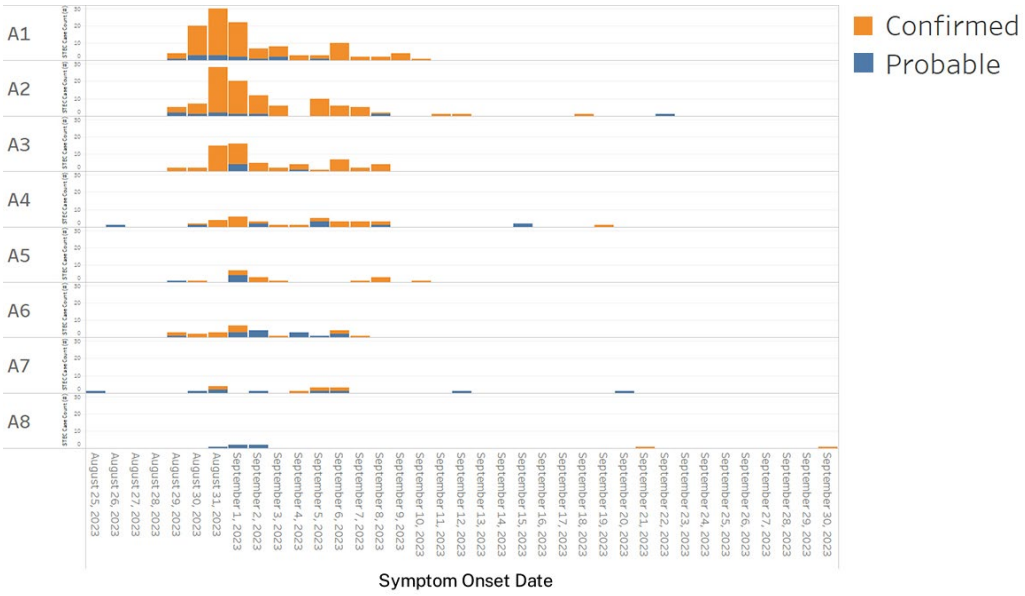


Figure 4
Epicurve of cases (confirmed and probable) for childcare facilities that received meals from the central kitchen (A1-A8) by onset date and facility (n=388)

Figure 5 shows the distribution of only confirmed staff and child cases by date of onset. The peak daily incidence of cases occurred one day earlier for children than for staff. The maximum daily case incidence based on SOD occurred on August 31st for children (n=75) and on September 1st for staff (n=9). (A second peak associated with asymptomatic staff cases (sample collection date) occurred on September 6th.)

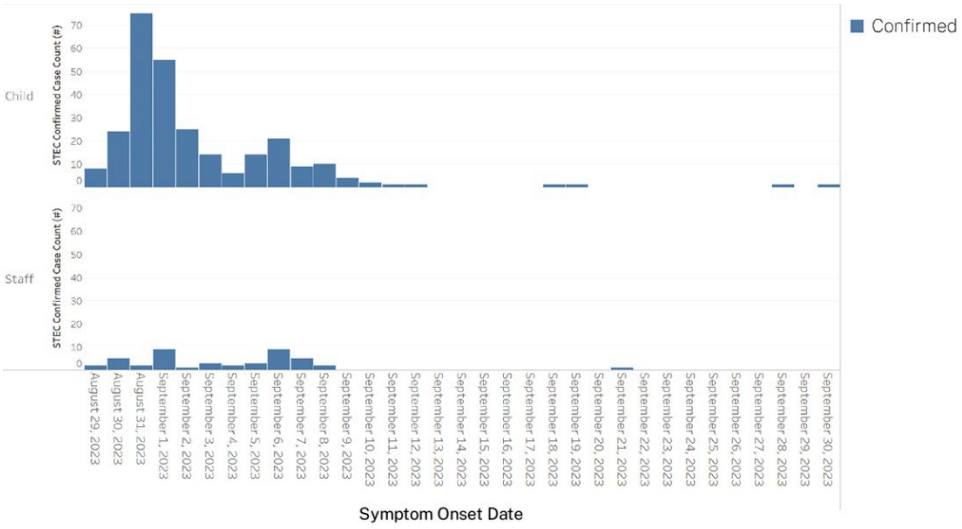
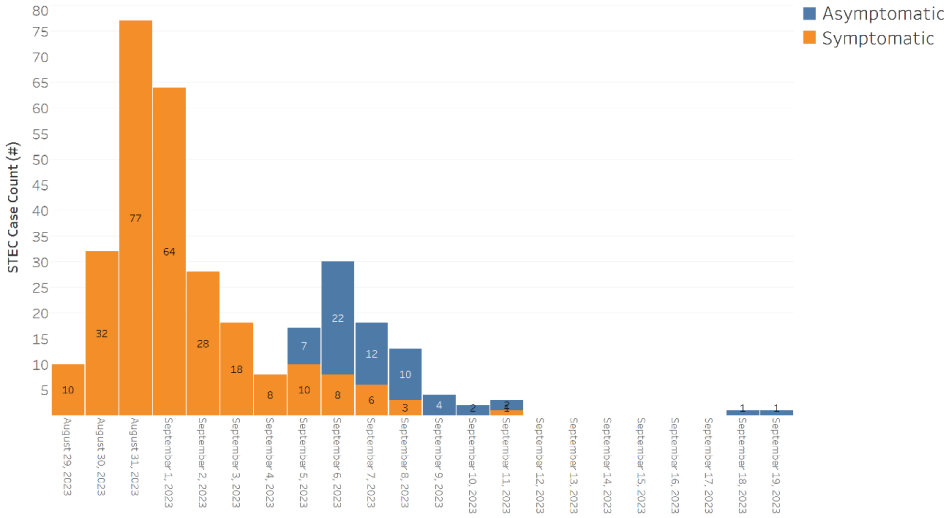


Figure 5
Epicurve of confirmed staff and child cases only for childcare facilities that received meals from the central kitchen (A1-A8) by onset date (n=317)

Distribution of Confirmed Primary Cases by Symptom Status

Figure 6 shows the distribution of SOD for confirmed primary cases by symptom status with a peak on August 31st, 2023. The second increase in daily case counts beginning on September 5th was clearly associated with testing asymptomatic individuals linked to the outbreak where the date of sample collection was used as a proxy for SOD.

Figure 6



Epicurve of confirmed primary cases by date of onset and symptom status (n=326)

Distribution of Secondary Confirmed and Probable Cases by Epidemiological Link

Figure 7 shows the distribution of the 55 secondary cases according to the type of epidemiologic link they had to a confirmed case. The three most common epidemiological links were non-household contacts (n=16), parents (n=15), and siblings (n=11).

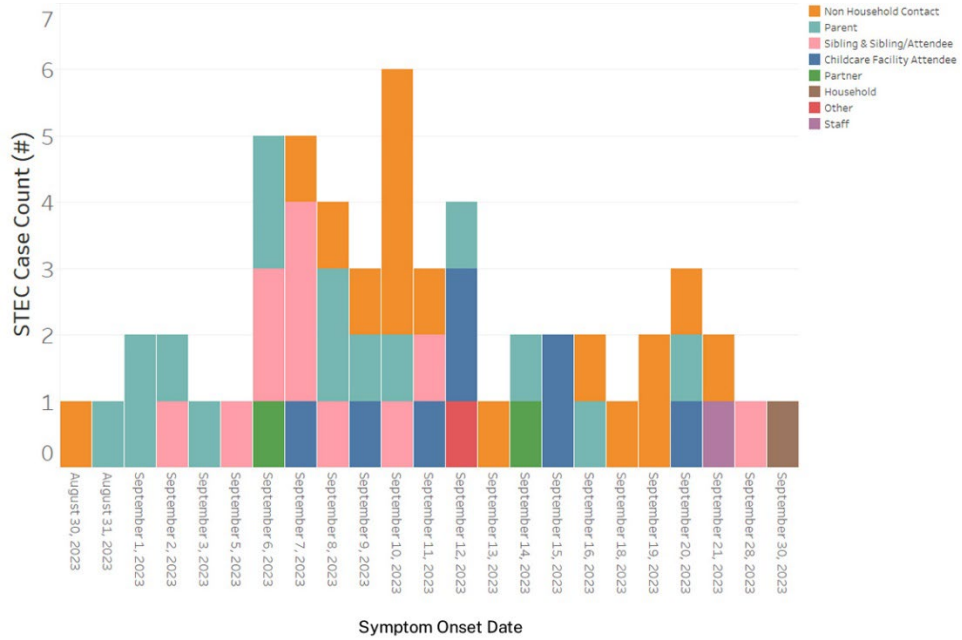


Figure 7

Epicurve of secondary cases by date of onset and relationship to primary case (n=55)

Impact on Other Childcare Facilities:

In addition to the 11 childcare facilities that received food from the central kitchen, six other childcare facilities were impacted by the outbreak:

- There were four occurrences where a child who was a confirmed case from one of the childcare facilities linked directly to the central kitchen attended another childcare facility while infectious.
- There was one occurrence where a child who was a confirmed case at one of the childcare facilities linked directly to the central kitchen infected a close contact who then attended another childcare facility while infectious.
- There was one occurrence in an Edmonton childcare facility where a close contact of a case from the Calgary childcare facilities outbreak developed symptoms but tested negative for STEC (e.g., a probable case).

The impact of confirmed cases in the outbreak on childcare facilities is illustrated in Figure 8, along with the attack rates for children in the 11 facilities connected directly to the central kitchen. The attack rate is the percentage of all children in each childcare facility who became a confirmed case. Attack rates for child attendees ranged from 0% to 47%.

For all six childcare facilities depicted on the right side of Figure 8, control measures of some type were implemented to prevent transmission within the facility. These measures ranged from individual Exclusion Orders, to universal Exclusion Orders and testing requirements, to Closure Orders, depending on the circumstances.

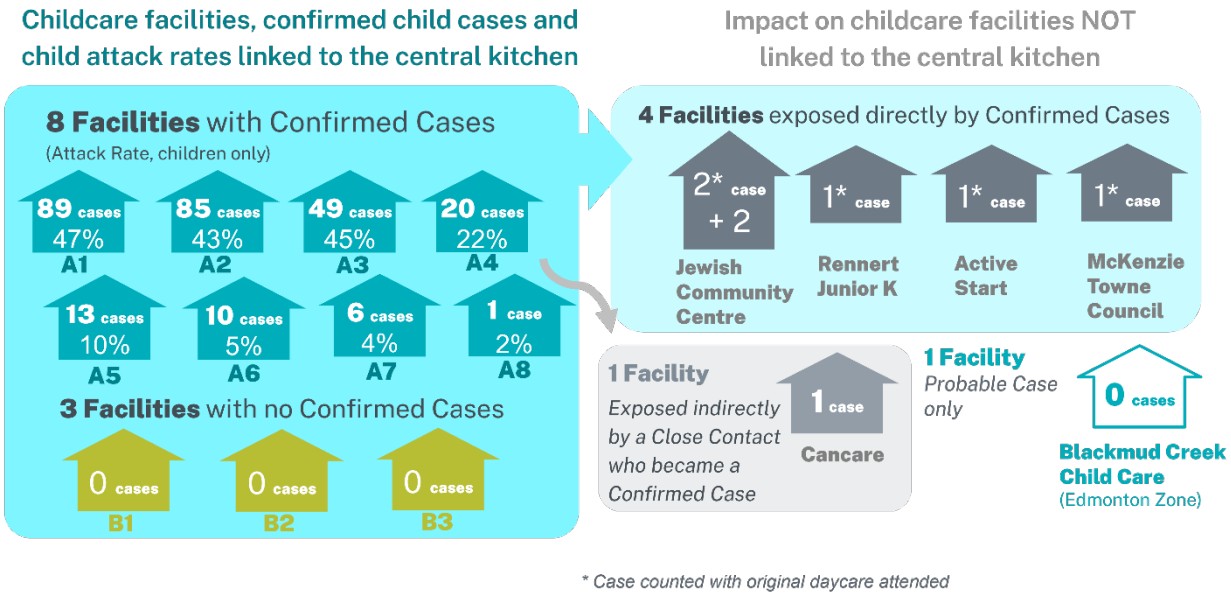


Figure 8
Childcare facilities that received food from the central kitchen, number of confirmed child cases and attack rates plus impact on childcare facilities that did not receive food from the central kitchen (n=276 confirmed cases)

Case Demographics

The age and sex demographic data for primary and secondary STEC cases linked to the Calgary childcare facilities outbreak are presented in Table 5. Cases ranged in age from younger than one to 71 years, with a mean and median of 10.4 and 3.6 years respectively. More than half the reported cases were female (55%). The highest proportion of cases was in the two-to-five-year age group for both sexes, followed by those younger than two years.

Table 5
Age and sex distribution of cases (n=448)

Sex	Age Group	Count (#)	Proportion	Mean Age	Median Age
Female	< 2 years	39	8.71%	1.5	1.4
	2-5 years	131	29.24%	3.6	3.7
	6-19 years	6	1.34%	10.8	8.2
	20-29 years	16	3.57%	25.8	26.1
	30-39 years	18	4.02%	35.7	36.0
	40+ years	35	7.81%	50.4	47.6
	Total	**245**	**54.69**	**13.9**	**4.0**
Male	< 2 years	43	9.60%	1.5	1.6
	2-5 years	138	30.80	3.5	3.4
	6-19 years	3	0.67%	7.5	8.0
	20-29 years	6	1.34%	26.3	25.7
	30-39 years	9	2.01%	35.8	35.3
	40+ years	4	0.89	54.4	53.7
	Total	**203**	**45.31%**	**6.2**	**3.2**
Grand Total		**448**	**100.00%**	**10.4**	**3.6**

Symptom Status of Confirmed Cases

All attendees and staff from the childcare facilities with confirmed cases during the first incubation period after the onset of the first confirmed case in the outbreak were required to get tested to help with additional case finding and to help ensure they were not infectious when returning to the childcare facility. Furthermore, before their Exclusion Orders could be rescinded (among other requirements), children younger than 5 years of age by December 2023 and all staff at these seven childcare facilities (A1 to A7) required testing. All cases identified through this testing were interviewed to determine SOD. The specimen collection date was recorded as the SOD for any newly identified asymptomatic cases.

The symptom status of all confirmed cases in the outbreak is presented in Table 6. The majority of cases (82%) reported symptoms.

Table 6
Number and proportion of confirmed cases by symptom status (n=359)

Symptom Status	Count (#)	Proportion
Asymptomatic	66	18.4%
Symptomatic	293	81.6%
Grand Total	**359**	**100.0%**

The number and percentage of confirmed STEC cases by age group reporting symptoms are presented in Figures 9. The proportion of confirmed cases reporting symptoms varied by age group, with children younger than six years being more likely to report symptoms compared to older confirmed cases. The age group with the highest proportion of symptomatic cases was the group younger than 2 years (91%), followed by those aged 2 to 5 years (85%).

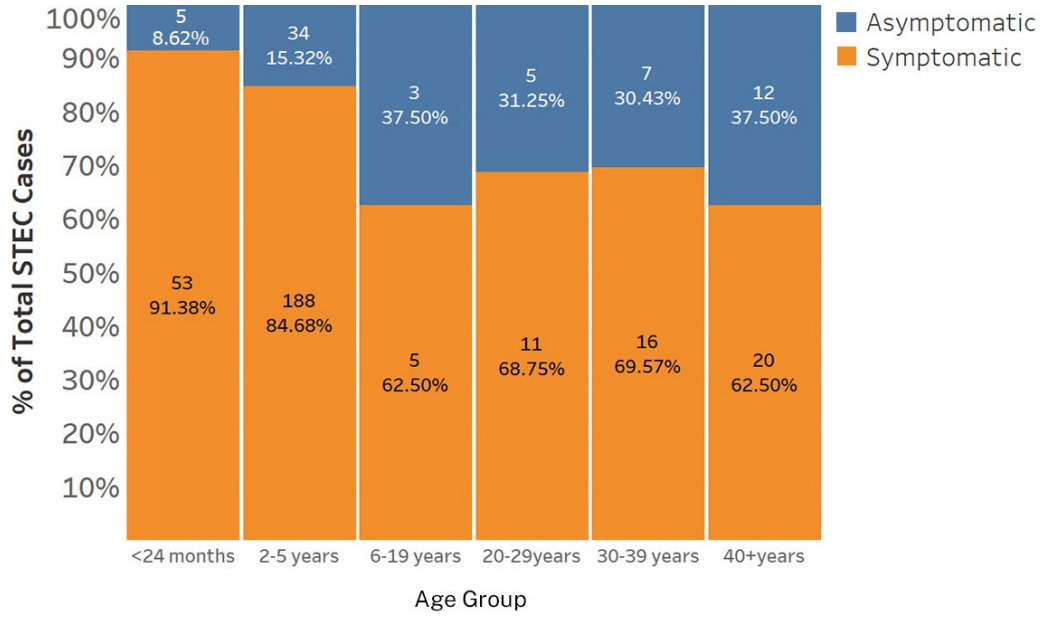


Figure 9
Number and percentage of symptomatic lab confirmed STEC cases by age group (n=359)

Figure 10 presents the proportion of all symptomatic confirmed and probable cases who experienced hemorrhagic diarrhea, which also varied by age group. Only one person aged 40 years or older reported hemorrhagic diarrhea (less than 5%) whereas among symptomatic children younger than two years it was 23.7% and among those two to five years who were symptomatic it was 20.6%. Overall, 19.8% (n=75) of symptomatic confirmed and probable cases reported hemorrhagic diarrhea, or 16.7% of all cases (symptomatic and asymptomatic, confirmed and probable cases.)

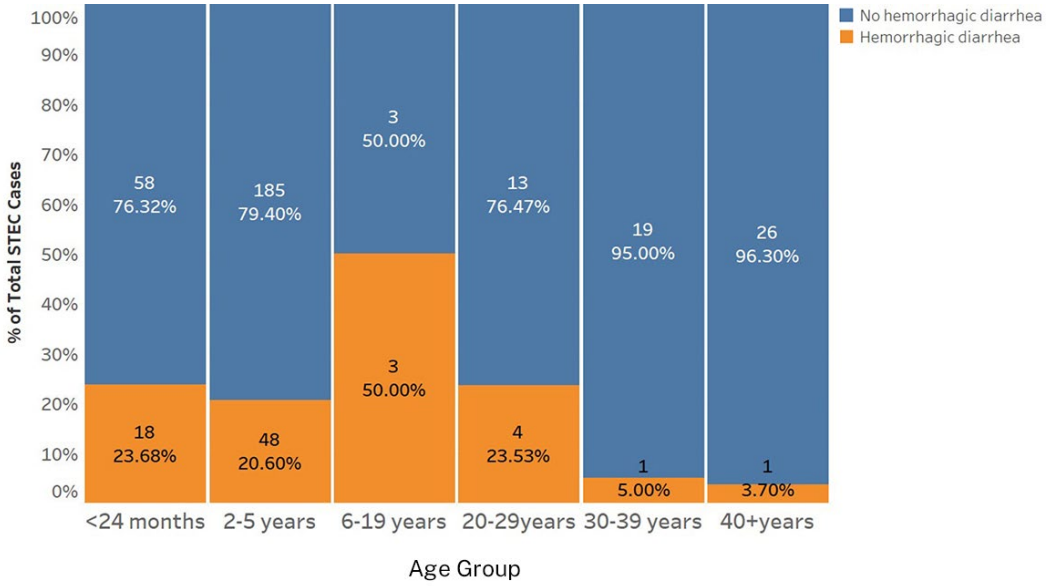


Figure 10
Number and percentage of confirmed and probable symptomatic STEC cases with hemorrhagic diarrhea by age group (n=379)

Investigative Methods and Results

A number of interlinked and coordinated investigations were undertaken to help determine the source of the outbreak and how it was spread, including a possible link to genetically matched sporadic cases in Alberta and elsewhere. These investigations included gathering evidence about meal preparation and temperature control processes in the central kitchen and childcare facilities, ingredient traceback / trace forward and food sampling, environmental swabbing, and food handler histories and practices. Two epidemiological studies (Childcare Facility Attendee and Childcare Facility Worker) were conducted to identify contaminated food item(s). WGS was also undertaken, which allowed for investigating links between the childcare facilities outbreak and sporadic cases in Alberta.

Childcare Facility Inspections

Following the issuance of verbal Closure Orders on September 4th for the 11 childcare facilities that received food from the central kitchen, Public Health Inspectors (PHIs) posted Notices of Closure, beginning on September 5th and throughout the week, on the exterior of each site. If there were staff/operators onsite, PHIs talked with them about cleaning and disinfection. Environmental Public Health followed up by telephone or email if no staff members were onsite.

Between September 6th and 10th, PHIs inspected childcare facilities A4, A5, B1, B2, & B3 and telephone and email conversations occurred between the operators and PHIs. The Safe Built Environments Manager, Coordinator, and DCT (Disease Control Team) Coordinator (Calgary Environmental Public Health team) communicated via email and telephone with the operators for childcare facilities A1, A2, A3, A6, A7, & A8. They were provided verbal advice on cleaning and disinfection, and information on their food service plans was requested.

On Sunday, September 10th, Closure Orders were lifted for childcare facilities B1, B2, & B3 (Table 7).

On Monday, September 11th, childcare facilities A1, A2, A3, A6, A7, & A8, along with A4 & A5, were inspected by PHIs as the operators hoped to reopen on September 12th. Based on the inspection results, three sites had their Closure Orders rescinded. However, there were some issues found at the remaining five sites, including the wrong type of disinfectant test strips, some cleaning still being required, and lack of a clear plan about which foods would be provided and how they would be prepared at the individual childcare facilities. For those five sites, clear requirements and additional information was provided verbally to the operators. When the PHIs reinspected them on the afternoon of September 12th, the required improvements had been made and the five remaining Closure Orders were rescinded.

Table 7
Closure and Exclusion Orders issue and rescind dates for childcare facilities that received food from the central kitchen

Childcare Facility	Closure Order Issued	Closure Order Rescinded	Site-Wide Exclusion Orders Issued	Exclusion Orders Rescinded
A1	Sept 4th	Sept 12th	Sept 4th	Once rescind criteria met by individual
A2	Sept 4th	Sept 12th	Sept 4th	Once rescind criteria met by individual
A3	Sept 4th	Sept 12th	Sept 4th	Once rescind criteria met by individual
A4	Sept 4th	Sept 11th	Sept 4th	Once rescind criteria met by individual
A5	Sept 4th	Sept 11th	Sept 4th	Once rescind criteria met by individual
A6	Sept 4th	Sept 12th	Sept 4th	Once rescind criteria met by individual
A7	Sept 4th	Sept 12th	Sept 4th	Once rescind criteria met by individual
A8	Sept 4th	Sept 11th	No site-wide Exclusion Orders issued	
B1	Sept 4th	Sept 10th	No site-wide Exclusion Orders issued	
B2	Sept 4th	Sept 10th	No site-wide Exclusion Orders issued	
B3	Sept 4th	Sept 10th	No site-wide Exclusion Orders issued	

According to the Alberta Food Regulation, "All high-risk food must be stored, displayed and transported at a temperature of (a) not more than 4° C or such higher temperature, or (b) not less than 60° C or such lower temperature" unless stipulated by an executive officer. The Food Retail and Food Services Code, which is referenced and forms part of the Food Regulation, states that records should be maintained, but maintaining temperature logs is not required under current food regulations. Four childcare facilities kept written log sheets of the food's temperature at some point after it arrived at the site. Some of these logs showed identical arrival times every day and probe temperatures that varied by only a few degrees, which at face value seems improbable and suggests the logs for some of the childcare facilities at least are not reliable. The information from the available logs is presented in Appendix 3.

Central Kitchen Site Investigations

Kitchen Inspections

As mentioned earlier, online inspection reports for the central kitchen for more than two years before the outbreak until the day after the kitchen was closed because of the outbreak are provided in Appendix 2.

On September 5th, two PHIs attended the central kitchen where they took food samples, conducted a full inspection, and reviewed the preparation steps of menu items with representatives onsite. Subsequently, the kitchen was visited more than 30 times by one or more PHIs to conduct additional sampling, investigate food preparation processes, review mitigation measures after a small flood that occurred while closed, and to check on progress the central kitchen operator had made towards correcting violations.

Meal Preparation and Distribution

AHS investigators completed multiple childcare facility operator interviews and kitchen staff interviews over several days following the onset of the outbreak to obtain an understanding of the food preparation and distribution processes. The information gathered is summarized here.

The staff arrived at the kitchen at approximately 0430h-0500h on weekdays.

Hot breakfast items were often prepared two days in advance, given the daily drop time for deliveries was after the breakfast mealtime at all facilities. For example, scrambled eggs on the Thursday breakfast menu would be made on Tuesday, delivered on Wednesday, stored in the childcare facility refrigerator, and then reheated by childcare staff on Thursday.

Lunch menu options typically were partially prepared the previous day and stored in the central kitchen refrigerator overnight. The partially prepared food items were retrieved in the morning and if necessary, underwent final food processing such as mixing, cooking, or baking before being placed into childcare facility-specific containers to be distributed to the designated sites.

The central kitchen Head Chef reported their policy (unwritten) was for hot menu item temperatures to be checked with a probe thermometer after cooking, but no logs were maintained. Maintaining temperature logs is not required under current food regulations. The Head Chef also reported that lunch menu items were placed into insulated containers in the delivery trucks. The Head Chef also reported that non-electric insulated containers were used to transport hot food to childcare facility locations with less than one hour delivery time, and that electric insulated containers were used to transport hot food items to childcare facilities with greater than one hour delivery time. These electric insulated containers were reportedly plugged in at the central kitchen to allow them to get hot prior to items being placed into them. They were then unplugged and placed into the delivery trucks and remained unplugged during transport.

An AHS PHI checked the temperature of the two powered insulated containers on September 15th after they were plugged in by central kitchen staff for about 30 to 60 minutes. The temperature of both insulated containers was 70° C which, according to manufacturer's instructions, should maintain food temperatures for up to four hours once they are unplugged if they remain closed.

Cold items were transported in childcare facility-specific plastic containers. The delivery trucks were not refrigerated.

Interviews with the central kitchen Head Chef confirmed that some menu items, such as cut vegetables and fruit, were usually prepared the day prior to delivery. Items such as cucumbers were trimmed and then sliced by a food slicer. Items such as oranges were sliced by hand with the skin left on. Sliced items were placed into bags or containers situated on a weigh scale. Sliced items were added until the pre-specified weight for a single childcare facility was reached. The bag or container was then removed and placed into the refrigerator for storage if it was to be shipped the next day. Otherwise, it was immediately placed into the childcare facility-specific container for same day delivery.

All the childcare facilities have their own kitchens on-site. The central kitchen Head Chef reported that upon receipt at a childcare facility kitchen, hot food was placed into warming trays if it was to be consumed the same day. As stated above, breakfast meals were delivered the day before they were to be consumed, so hot breakfast items were cooled at the central kitchen and transferred into the childcare facility refrigerators immediately after delivery. Cold foods were placed into the childcare facility refrigerator by the drivers and/or the facility staff. The central kitchen Head Chef reported that childcare facility staff were responsible for portioning the food into individual servings.

There was a Northern and Southern delivery route for distributing the central kitchen prepared meals to the childcare facilities. The Southern route delivered meals to childcare facilities A8, B3, A3, A4, & A1. The Northern route delivered meals to childcare facilities A2, B1, B2, A5, & A6. Childcare facility A7 is situated at the same location as the Central Kitchen.

Table 8 lists the childcare facilities with the number of attendees (children recorded as attending at least once between August 15th and 31st), case counts and approximate distribution drop time for the delivery of food items.

Table 8
Food Distribution Timing

Southern Route (Departs at 0745)				Northern Route (Departs at 0800)			
Childcare Facility	**Attendees**	**Confirmed Case Count (Attack Rate)**	**Drop Time**	**Childcare Facility**	**Attendees**	**Confirmed Case Count (Attack Rate)**	**Drop Time**
A8	59	1 (2%)	0755-0800	A2	199	85 (43%)	0820
B3	23	0 (0%)	0815-0830	B1	36	0 (0%)	0840-0850
A3	109	49 (45%)	0850-0900	B2	83	0 (0%)	0910-0920
A4	92	20 (22%)	0930-0940	A5	129	13 (10%)	0945-0950
A1	188	89 (47%)	1015-1030	A6	188	10 (5%)	1015-1030

Note that the central kitchen managers reported three delivery trucks were used on August 29th and 30th. The third truck delivered menu items to A6 on both days with an 0815h departure time from the central kitchen. Drop times for this location were not provided, but the A6 childcare facility logbook indicated the temperature of the food was taken at 1045h on August 29th and 1000h on August 30th.

A map of the routine Southern and Northern delivery routes is provided in Figure 11.

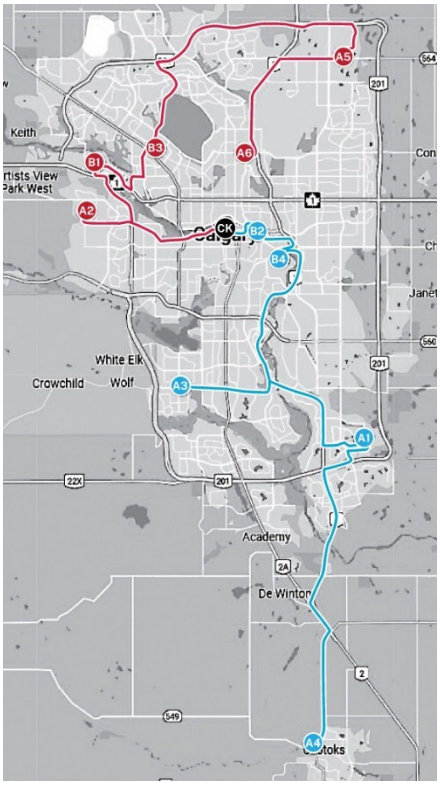


Figure 11
Delivery Routes and Schedules from Fueling Minds Inc. Kitchen to Childcare Facilities

Food Sampling

AHS PHI inspectors collected food and drink samples from the central kitchen and leftover samples from several of the childcare facilities starting on September 5th. The priority for sampling was food leftover from meals served during the incubation period. The food samples were sent to APL-ProvLab for culture and PCR testing. The drink samples were sent to the Canadian Food Inspection Agency (CFIA) due to the need for specialized equipment. Given their state of decomposition, the cucumbers were tested at both APL-ProvLab and at a Health Canada, Bureau of Microbiological Hazards laboratory in Ottawa.

The collection date, sampling location, and sampled items are listed in Table 9.

Table 9
Food and Drink Items Sampled and Sampling Locations

Sampling Date	Sampling Location	Items Sampled
September 5th	Central Kitchen	Sliced cantaloupe, sliced pineapple, sliced honeydew, chicken nuggets, fish sticks, chicken alfredo, beef gravy, beef salami, diced chicken, ground turkey, frozen mixed vegetables.
September 7th	Childcare Facility A2	Apple slices, apple sauce.
September 7th	Central Kitchen	Raw ground beef, cooked beef burgers, applesauce.
September 7th	Childcare Facility A1	Chopped vegetables, spinach dip, vanilla square.
September 12th	Central Kitchen	Zucchini loaf, vanilla squares gluten free, brownies, blueberry muffin, blueberry muffin gluten free, maple cinnamon muffin, pizza cheese, daiya (vegan) cheese, Swiss cheese, coconut tart, coconut tart gluten free, blueberries, vanilla rice pudding, white tortilla shell, brown rice tortillas, meatballs.
September 14th	Central Kitchen	Ground beef (5 sealed packages)
September 14th	Childcare Facility A6	Apple slices, blueberries, applesauce.
September 15th	Central Kitchen	Cow's milk (five samples), oat milk (five samples).
September 26th	Central Kitchen	Long cucumbers, flour, oven ready potatoes, oats, whole wheat flour, gluten free flour, Greek yogurt, oat yogurt, rice flour
October 4th	Central Kitchen	Italian spice mix, pepper

Canadian Food Inspection Agency (CFIA) Processes

The Canadian Food Inspection Agency (CFIA) is responsible for enforcing federal food safety regulations for both domestic and imported food. The responsibility for making sure purchased food is safe to eat rests with the individual or company selling the food[12].

On September 7th, 2023, Alberta Health Services (AHS) advised the CFIA that they had initiated an investigation into a central kitchen, Fueling Minds Inc., Calgary, that supplied the impacted childcare facilities with meals and snacks.

On September 12th, 2023, AHS provided invoices to the CFIA for food items supplied to Fueling Minds Inc. during the period of interest (July 31st to September 9th, 2023). CFIA reviewed the invoices and at that time, with the epidemiological investigation still in progress, developed a prioritized list of food items for further follow up. Based on previous *E. coli* O157:H7 outbreaks, CFIA considered ground beef, whole wheat flour, and lettuce to be foods of interest. After receiving confirmation from AHS that lettuce was not served during the exposure period now defined as August 15th to 31st, the focus was placed on ground beef. Flour was not excluded but was not the focus at the time.

On September 14th, 2023, Alberta Health Services (AHS) requested the assistance of CFIA's Laboratory Services in analysing two beverages for *E. coli* O157:H7. CFIA analysed 5 units (4 sealed and 1 open) of 3.25% homogenized milk with a best before date of 2023 SE 06, and 5 sealed units of oat milk (0 g of sugar) with a best before date of 23 OC 11.

On September 18th, 2023, CFIA initiated follow up with the distributor that supplied food items to Fueling Minds Inc. to traceback the ground beef that was used to prepare meals served during the exposure period. Trace forward was conducted to locate samples of the ground beef, and sampling activities were initiated by the CFIA on September 22nd, 2023. The ground beef samples originated from two licenced federal establishments. CFIA reviewed the records for the production timeframe of interest and no deficiencies were noted. CFIA's focus on

beef was further supported by information provided by the Public Health Agency of Canada on September 20th indicating that 2 historical Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS)/FoodNet Canada Farm Sampling Surveillance Program manure isolates from Alberta beef farms from 2020 and 2021 were within 10 alleles of the cluster of cases.

Following completion of the retrospective cohort studies and identification of the most likely day and meals when contaminated food was served, AHS provided CFIA with more specific menu items of interest. The results of the more focused CFIA initiated traceback and trace forward sampling are available in the Follow-up Investigations section under 'Further CFIA Food Traceback and Trace Forward'.

Food Sampling Results from the Central Kitchen and Childcare Facilities

The food samples obtained from the central kitchen and childcare facilities and listed in Table 9 were sent to the APL-ProvLab for testing. The laboratory processes for food sample testing at APL-ProvLab are described in Appendix 4. All food samples tested negative for *E. coli*. All 10 milk / oat milk samples sent to the CFIA laboratory also tested negative for *E. coli*. The 14 trace back samples of ground beef were analyzed by CFIA labs and reported as not detected for *E. coli* O157.

The cucumbers tested at a Health Canada, Bureau of Microbiological Hazards laboratory in Ottawa were also *E. coli* negative.

Retrospective Cohort Studies

The Medical Officer of Health and public health inspectors were able to determine the central kitchen was the likely source of the outbreak within hours of the first child presenting to hospital, and the kitchen and affected daycares were closed immediately to prevent further spread. Determining the specific food item(s) involved was important to establish whether the public was at risk of ongoing exposure to a contaminated food source higher up the food chain and whether broader control measures were needed to address an ongoing risk to the public. Two retrospective cohort studies described below were undertaken and results of both were available by September 22nd.

Children Attending Childcare Facilities Retrospective Cohort Study

Background

A retrospective cohort study involving all children attending childcare facilities served food from the central kitchen was undertaken to identify the day(s), and the meal(s), during which a contaminated food item(s) was most likely served. This study design did not allow for the identification of the contaminated food item(s) specifically, given that only proxy food histories based on meal attendance could be used, rather than actual food consumption histories, due to the young age of the children.

Childcare facilities B1, B2, & B3 did not have any confirmed STEC cases linked to the outbreak. Even though they received the same food items from the same central kitchen, the absence of confirmed cases for both attendees and workers suggests there were no exposures to contaminated food items at any of these three sites.

Inclusion Criteria

The Children Attending Childcare Facilities Retrospective Cohort Study included all children attending the seven childcare facilities that received food from the central kitchen and that had at least one confirmed primary STEC case by September 11th, which was one incubation period from the last meal served by the central kitchen (Childcare facilities A1, A2, A3, A4, A5, A6, & A7).

Exclusion Criteria

Children who attended any of the four childcare facilities (B1, B2, B3, & A8) that received food from the central kitchen but did not have primary confirmed cases by September 11th were excluded from the Children Attending Childcare Facilities Retrospective Cohort Study.

Also excluded were children who were on the childcare facility enrollment list for sites A1, A2, A3, A4, A5, A6, & A7 but were determined to be secondary cases, or they did not attend the childcare facility for at least one day between August 15th and 31st as then they would not have had an opportunity for exposure. Electronic attendance records were used to confirm attendance.

Also excluded were children who attended any of these seven childcare facilities (childcare facilities A1, A2, A3, A4, A5, A6, & A7) and who were symptomatic but who did not have at least one positive STEC stool test result by PCR or culture (probable cases).

Exposure Definition

A child was considered to have eaten a Regular Menu meal (exposed) if the electronic attendance record showed the child was present during the facility's designated mealtime and the child's name did not appear in the respective childcare facility Campus Population Report nominal list for Special Menu meals.

A child was considered to have eaten a Special Menu meal (exposed) if the electronic attendance record showed the child was present during the facility's designated mealtime and the child's name did appear in the respective childcare facility Campus Population Report nominal list for Special Menu meals.

The mealtimes of interest were any meals served from August 15th to 31st. (When this cohort study was designed, August 15th was one incubation period prior to the SOD of what was thought to be the first case. This case was subsequently identified as not part of the outbreak, so the study collected more data than was necessary.)

Methods (Childcare Facilities Attendee Retrospective Cohort Study)

Flowchart

The flowchart for the retrospective cohort study for Children Attending Childcare Facilities is shown in Figure 12.

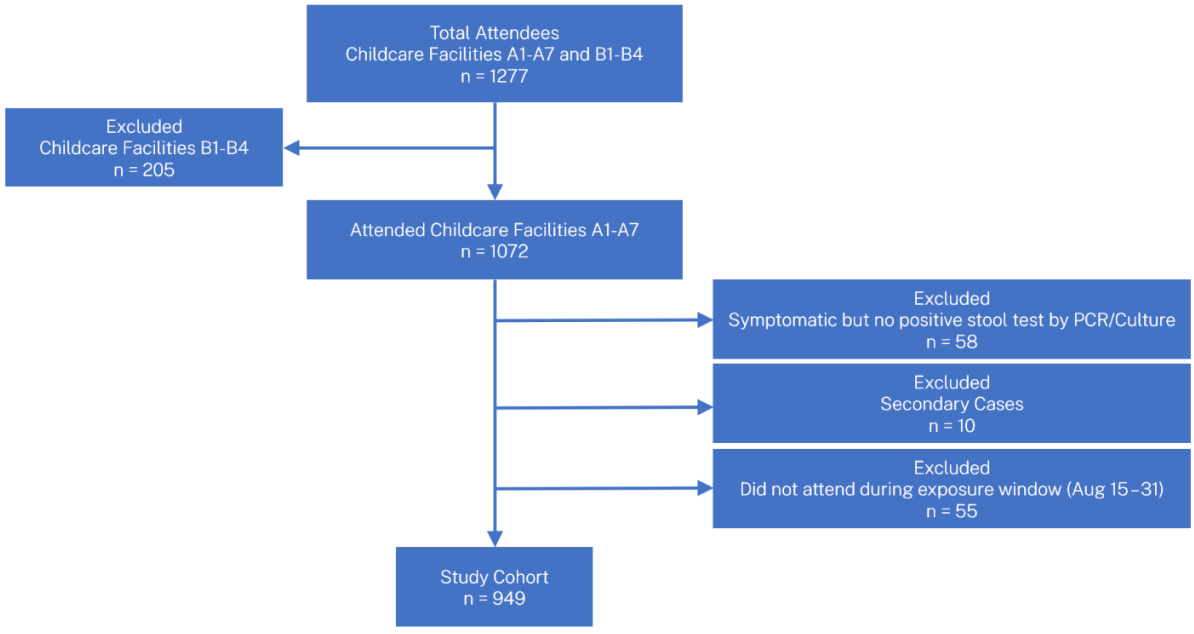


Figure 12
Retrospective Cohort Study Flowchart (Children Attending Childcare Facilities)

Outcome and exposure

In this study, the association was examined between the outcome (i.e., whether a child was a confirmed STEC case or not) and the exposure, defined as attendance at a meal. The meals of interest were the four daily meals offered at childcare facilities A1 to A7 between August 15th and 31st.

Data sources and data linkage

The retrospective cohort study required knowing three datapoints for each child:

- whether they were a confirmed case
- whether they were on the Special or Regular Menu, and
- whether they were in attendance for a specified meal

It should be acknowledged that dietary recall in a childcare facility-aged population is not feasible, and childcare facilities do not maintain records of which food items children are observed to have consumed. As stated in an earlier section of this report, the Campus Population Reports provide nominal lists of children registered as requiring Special Menu meals (dietary allergies or vegan) upon childcare facility enrollment. For this study, children were presumed to have been served the Special Menu for all meals for which they were present if their name appeared on the nominal list of the Campus Population Report. Children not on the nominal list were presumed to have been served the Regular Menu for all meals for which they were recorded as being in attendance.

Childcare facilities A1 to A7 all use an electronic attendance tracker to register the hour and minute a child enters a facility and when they leave. Printouts or spreadsheets generated from these electronic trackers were provided by all childcare facilities to the investigators.

Proxy food histories based on meal attendance were constructed for each child for each meal on each day by linking the Campus Population Report information to the electronic attendance records, as described in the 'Exposures' section above.

The attendee information (first name, last name, and sometimes PHN, date of birth, and/or sex) provided by each of the childcare facilities from the electronic attendance tracker was matched with administrative datasets by AHS Health Information Management to obtain any missing PHN, date of birth, and sex data where possible. The PHN was used to link the attendance record dataset to the communicable disease and outbreak management (CD/OM) database and APL-ProvLab database to identify whether a child was a confirmed case.

Analyses

Descriptive statistics (numbers, percentages) were reported per day and meal (i.e., breakfast, AM snack, lunch, and PM snack) for all children, as well as for children in each of the meal plans: Regular Menu and Special Menu.

Main analyses. A Fisher's Exact Test was conducted for children affiliated with all childcare facilities included in the cohort study to compare the probability of an STEC infection for two types of meal exposures. For each meal exposure, 2x2 tables were generated for each meal and day using the "not exposed" group as the reference group. There were many instances in which the non-exposed groups had very low counts. We used exact tests to attenuate this issue. The main analyses were stratified by childcare facilities.

We also estimated the risk, or the likelihood of an exposure-to-response relationship based on crude relative risk (RR) values, which quantify the ratio of the probability of an STEC infection in a group exposed to a specific meal and the probability of an STEC infection in a group that was not exposed to that specific meal. The relative risk values' corresponding 95% confidence intervals (CI) were determined by computing exact confidence limits in all instances. A confidence interval not containing the value of 1.0 was deemed statistically significant. Second, we employed stratified analyses for each meal and day, based on the children's meal plan: Regular Menu versus Special Menu.

Additional Analysis. Pearson's chi-square test was used to verify the association between childcare facility and age, sex, and meal type, through univariable actual analyses, where childcare facilities were dichotomized by outbreak attack rate. The childcare facilities with attack rates greater than or equal to 20% were grouped as "high attack rate (AR) childcare facilities" and those with less than 20% attack rates were grouped as "low attack rate (AR) childcare facilities". Relative risks were calculated to estimate the strength of the associations. In addition, the mean and median age of children for high attack rate and low attack rate childcare facilities

were tested for significance using a t-test (Satterthwaite's method used to calculate standard error of mean difference) and Mood's test, respectively. The statistical analyses were performed with SAS Enterprise Guide (version 8.3), with significance level at α=0.05.

Results (Childcare Facilities Attendee Retrospective Cohort Study)

Table 10 provides data by age group, sex, menu type, and case status for children in the cohort study by childcare facility.

Table 10

Descriptive statistics for Childcare Facilities Attendee Retrospective Cohort Study by childcare facility.

Childcare Facility	Total	A1		A2		A3		A4		A5		A6		A7	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%
Children	957	167		185		102		82		99		169		153	
[a] Age (year)															
Less than 2	158 (16.5%)	27	16.2%	32	17.4%	9	8.8%	16	19.5%	19	19.2%	39	23.2%	16	10.5%
2 and older	796 (83.2%)	140	83.8%	152	82.6%	93	91.2%	66	80.5%	80	80.8%	129	76.8%	136	89.5%
[b] Sex															
Male	500 (52.2%)	89	53.3%	95	51.6%	48	47.1%	46	56.1%	57	57.6%	86	51.2%	79	52.0%
Female	454 (47.4%)	78	46.7%	89	48.4%	54	52.9%	36	43.9%	42	42.4%	82	48.8%	73	48.0%
Menu															
Regular	770 (80.5%)	129	77.2%	149	80.5%	83	81.4%	77	93.9%	82	82.8%	129	76.3%	121	79.1%
Special	187 (19.5%)	38	22.8%	36	19.5%	19	18.6%	5	6.1%	17	17.2%	40	23.7%	32	20.9%
Cases															
Confirmed	270 (28.2%)	89	53.3%	84	45.4%	48	47.1%	20	24.4%	13	13.1%	10	5.9%	6	3.9%
Not a case	687 (71.8%)	78	46.7%	101	54.6%	54	52.9%	62	75.6%	86	86.9%	159	94.1%	147	96.1%

a Date of birth missing for three children.

b Sex missing for three children.

Demographic data and proportion of menu type were fairly uniform between childcare facilities; the percentage of exposed children who became cases (attack rate) was markedly different, ranging from 53.3% to 3.9%.

According to the univariable analyses in Table 11, there was a slightly higher proportion of children attending high attack rate childcare facilities (55.8%) compared to low attack rate childcare facilities (44.2%). Age group (p=0.23), sex (p=0.54) and menu type (p=.24) were not significantly associated with attack rate category.

Table 11
Univariable analysis of children who attended high and low attack rate childcare facilities, by sex, age group, and menu type (A1 to A7 childcare facilities, n=957).

		Low attack rate childcare facilities (N=421)		High attack rate childcare facilities (N=536)		Chi-square (*p*-value)	Relative risk (95% CI)
		n	%	n	%		
Sex [a]	Male	222	53.0%	278	52.0%	0.75	1.02 (0.90, 1.15)
	Female	197	47.0%	257	48.0%		
Age (in year) [b]	Less than 2	74	17.7%	84	15.7%	0.42	1.12 (0.85, 1.50)
	2 and older	345	82.3%	451	84.3%		
Menu type	Special diet	89	21.1%	98	18.3%	0.27	1.16 (0.89, 1.50)
	Regular diet	332	78.9%	438	81.7%		

a Sex missing for three children.
b Date of birth missing for three children.

Relative risks and 95% confidence intervals (CI) for developing confirmed STEC infection for each meal served between August 15th and August 31st are shown in Table 12 for both menus combined.

Table 12
Attack rates and relative risk for meal attendance for all eligible children in eligible childcare facilities between August 15th and August 31st (Statistically significant associations highlighted in yellow.)

		Relative risks for meals at all sites, August 15th to 31st								
		Total served meal	Cases among those served meal	Attack rate among those served meal	Total not served meal	Cases among those who were not served meal	Attack rate among those who were not served meal	Relative Risk	95% Lower CI	95% Upper CI
15-Aug-23	Breakfast	321	127	39.6%	636	143	22.5%	**1.76**	**[1.44,**	**2.14]**
	Morning Snack	108	26	24.1%	849	244	28.7%	0.84	[0.59,	1.19]
	Lunch	706	219	31.0%	251	51	20.3%	**1.53**	**[1.17,**	**2.00]**
	Afternoon Snack	669	213	31.8%	288	57	19.8%	**1.61**	**[1.24,**	**2.08]**
16-Aug-23	Breakfast	346	129	37.3%	611	141	23.1%	**1.62**	**[1.32,**	**1.97]**
	Morning Snack	112	28	25.0%	845	242	28.6%	0.87	[0.62,	1.22]
	Lunch	709	211	29.8%	248	59	23.8%	1.25	[0.97,	1.61]
	Afternoon Snack	667	201	30.1%	290	69	23.8%	**1.27**	[1.00,	1.60]
17-Aug-23	Breakfast	305	122	40.0%	652	148	22.7%	**1.76**	**[1.45,**	**2.15]**
	Morning Snack	109	27	24.8%	848	243	28.7%	0.86	[0.61,	1.22]
	Lunch	676	207	30.6%	281	63	22.4%	**1.37**	**[1.07,**	**1.75]**
	Afternoon Snack	622	192	30.9%	335	78	23.3%	**1.33**	**[1.06,**	**1.66]**
18-Aug-23	Breakfast	267	103	38.6%	690	167	24.2%	**1.59**	**[1.30,**	**1.95]**
	Morning Snack	99	28	28.3%	858	242	28.2%	1.00	[0.72,	1.40]
	Lunch	569	180	31.6%	388	90	23.2%	**1.36**	**[1.10,**	**1.70]**
	Afternoon Snack	516	160	31.0%	441	110	24.9%	**1.24**	**[1.01,**	**1.53]**
21-Aug-23	Breakfast	314	117	37.3%	643	153	23.8%	**1.57**	**[1.28,**	**1.91]**
	Morning Snack	91	22	24.2%	866	248	28.6%	0.84	[0.58,	1.23]
	Lunch	641	200	31.2%	316	70	22.2%	**1.41**	**[1.11,**	**1.78]**
	Afternoon Snack	608	192	31.6%	349	78	22.3%	**1.41**	**[1.13,**	**1.77]**
22-Aug-23	Breakfast	311	122	39.2%	646	148	22.9%	**1.71**	**[1.40,**	**2.09]**
	Morning Snack	102	30	29.4%	855	240	28.1%	1.05	[0.76,	1.44]
	Lunch	697	227	32.6%	260	43	16.5%	**1.97**	**[1.47,**	**2.64]**
	Afternoon Snack	668	214	32.0%	289	56	19.4%	**1.65**	**[1.27,**	**2.14]**
23-Aug-23	Breakfast	327	120	36.7%	630	150	23.8%	**1.54**	**[1.26,**	**1.88]**
	Morning Snack	114	29	25.4%	843	241	28.6%	0.89	[0.64,	1.24]
	Lunch	722	220	30.5%	235	50	21.3%	**1.43**	**[1.09,**	**1.88]**
	Afternoon Snack	681	207	30.4%	276	63	22.8%	**1.33**	**[1.04,**	**1.70]**
24-Aug-23	Breakfast	298	115	38.6%	659	155	23.5%	**1.64**	**[1.35,**	**2.00]**
	Morning Snack	114	30	26.3%	843	240	28.5%	0.92	[0.67,	1.28]
	Lunch	674	207	30.7%	283	63	22.3%	**1.38**	**[1.08,**	**1.76]**
	Afternoon Snack	641	195	30.4%	316	75	23.7%	**1.28**	**[1.02,**	**1.61]**
25-Aug-23	Breakfast	261	93	35.6%	696	177	25.4%	**1.40**	**[1.14,**	**1.72]**
	Morning Snack	104	25	24.0%	853	245	28.7%	0.84	[0.59,	1.20]
	Lunch	609	182	29.9%	348	88	25.3%	1.18	[0.95,	1.47]
	Afternoon Snack	554	169	30.5%	403	101	25.1%	1.22	[0.99,	1.50]
28-Aug-23	Breakfast	304	116	38.2%	653	154	23.6%	**1.62**	**[1.33,**	**1.97]**
	Morning Snack	102	33	32.4%	855	237	27.7%	1.17	[0.86,	1.58]
	Lunch	664	227	34.2%	293	43	14.7%	**2.33**	**[1.73,**	**3.13]**
	Afternoon Snack	615	214	34.8%	342	56	16.4%	**2.13**	**[1.63,**	**2.76]**
29-Aug-23	Breakfast	341	156	45.7%	616	114	18.5%	**2.47**	**[2.02,**	**3.03]**
	Morning Snack	112	38	33.9%	845	232	27.5%	1.24	[0.93,	1.64]
	Lunch	**707**	**266**	**37.6%**	**250**	**4**	**1.6%**	**23.51**	**[8.85,**	**62.45]**
	Afternoon Snack	672	251	37.4%	285	19	6.7%	**5.60**	**[3.59,**	**8.75]**
30-Aug-23	Breakfast	343	133	38.8%	614	137	22.3%	**1.74**	**[1.42,**	**2.12]**
	Morning Snack	125	36	28.8%	832	234	28.1%	1.02	[0.76,	1.38]
	Lunch	740	239	32.3%	217	31	14.3%	**2.26**	**[1.61,**	**3.18]**
	Afternoon Snack	698	229	32.8%	259	41	15.8%	**2.07**	**[1.54,**	**2.80]**
31-Aug-23	Breakfast	258	100	38.8%	699	170	24.3%	**1.59**	**[1.30,**	**1.95]**
	Morning Snack	113	27	23.9%	844	243	28.8%	0.83	[0.59,	1.17]
	Lunch	587	177	30.2%	370	93	25.1%	1.20	[0.97,	1.49]
	Afternoon Snack	566	161	28.4%	391	109	27.9%	1.02	[0.83,	1.25]

The August 29th lunch, with a Relative Risk of 23.51, showed by far the highest risk for developing STEC infection by attendance at a meal. (See Table 12 and Figure 13.) Children who attended that meal were 23 times more likely to develop a confirmed STEC infection compared to those who did not attend that meal. Of the 274

total confirmed cases among children attending these childcare facilities, only four had not been recorded as attending that meal. All four of these children had an epidemiological link connecting them to the August 29th lunch as follows:

- Two of the children had siblings who attended lunch at the childcare facility on August 29th, and both of the siblings became symptomatic STEC confirmed cases after eating the lunch. In both instances, the sibling who ate the lunch became symptomatic first (August 29th and August 31st), with the child not in attendance for lunch on August 29th becoming symptomatic three and eight days later, respectively.
- One child arrived at the childcare facility on August 29th, but the attendance records indicated the child checked in at 1225h and the childcare facility's usual lunch time meal was served from 1100h to 1130h. It is possible the child was served leftover food from the lunchtime meal. The child also attended the childcare facility on August 30th and 31st, so it is also possible the child was secondarily infected within the childcare facility during the two days following August 29th, especially because the childcare facility (A4) had several cases among children with symptom onset date of August 29th to 31st, in addition to cases among childcare facility staff.
- One child did not attend the childcare facility on August 29th but did attend on August 31st and may have become secondarily infected then.

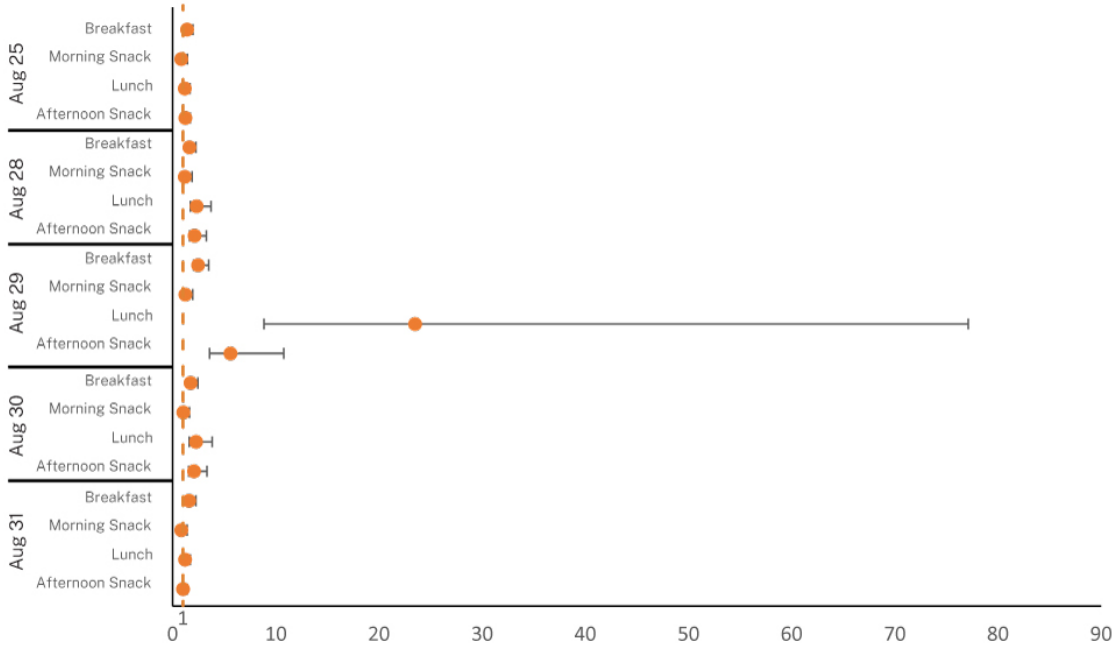


Figure 13
Relative risk for meal attendance for all eligible children in eligible childcare facilities between August 25th and August 31st

The August 29th PM Snack had a Relative Risk of 5.60, which was the second highest Relative Risk recorded for all meals served between August 15th and 31st. Of the 274 total confirmed cases among children attending these childcare facilities, 19 had not been recorded as attending the August 29th PM Snack. Five of these children had no epidemiological link that connects them to the August 29th PM Snack in any way. For this reason, the August 29th PM Snack cannot account for all confirmed cases.

Table 13 shows for each childcare facility and for all sites combined the Relative Risk of becoming a confirmed STEC case associated with being in attendance for the August 29th lunch for children on the Regular Menu list.

Table 113

Relative Risk of becoming a confirmed STEC case associated with being in attendance for the August 29th lunch for children on the Regular Menu list, by childcare facility. (Statistically significant associations highlighted in yellow.)

		Regular Meal Type								
		Total served meal	Cases among those served meal	Attack rate among those served meal	Total who were not served meal	Cases among those who were not served meal	Attack rate among those who were not served meal	Relative Risk	95% Lower CI	95% Upper CI
29-Aug-23	**Site A1**									
	Breakfast	64	47	73.4%	65	23	35.4%	**2.08**	[1.45,	2.97]
	Morning Snack	8	7	87.5%	121	63	52.1%	**1.68**	[1.23,	2.30]
	Lunch	99	69	69.7%	30	1	3.3%	**20.91**	[3.03,	144.25]
	Afternoon Snack	96	66	68.8%	33	4	12.1%	**5.67**	[2.24,	14.35]
29-Aug-23	Site A2									
	Breakfast	80	48	60.0%	69	20	29.0%	**2.07**	[1.37,	3.12]
	Morning Snack	9	4	44.4%	140	64	45.7%	0.97	[0.46,	2.06]
	Lunch	116	67	57.8%	33	1	3.0%	**19.06**	[2.75,	132.15]
	Afternoon Snack	110	65	59.1%	39	3	7.7%	**7.68**	[2.56,	23.04]
29-Aug-23	Site A3									
	Breakfast	40	27	67.5%	43	15	34.9%	**1.94**	[1.22,	3.07]
	Morning Snack	0	0	0.0%	83	42	50.1%	**0**	.	.
	Lunch	58	41	70.7%	25	1	4.0%	**17.67**	[2.57,	121.45]
	Afternoon Snack	45	32	71.1%	38	10	26.3%	**2.70**	[1.54,	4.75]
29-Aug-23	Site A4									
	Breakfast	0	0	0.0%	77	20	26.0%	**0**	.	.
	Morning Snack	38	15	39.5%	39	5	12.8%	**3.08**	[1.24,	7.64]
	Lunch	57	19	33.3%	20	1	5.0%	6.67	[0.95,	46.64]
	Afternoon Snack	61	20	32.8%	16	0	0.0%	Infinity	Infinity	Infinity
29-Aug-23	Site A5									
	Breakfast	0	0	0.0%	82	12	14.6%	0	.	.
	Morning Snack	45	9	20.0%	37	3	8.1%	2.47	[0.72,	8.46]
	Lunch	62	12	19.4%	20	0	0.0%	Infinity	Infinity	Infinity
	Afternoon Snack	61	12	19.7%	21	0	0.0%	Infinity	Infinity	Infinity
29-Aug-23	**Site A6**									
	Breakfast	37	6	16.2%	92	4	4.3%	**3.73**	[1.12,	12.46]
	Morning Snack	0	0	0.0%	129	10	7.7%	0	.	.
	Lunch	81	10	12.3%	48	0	0.0%	Infinity	Infinity	Infinity
	Afternoon Snack	82	10	12.2%	47	0	0.0%	Infinity	Infinity	Infinity
29-Aug-23	**Site A7**									
	Breakfast	64	5	7.8%	57	1	1.8%	4.45	[0.54,	36.99]
	Morning Snack	0	0	0,0%	121	6	5.0%	0	.	.
	Lunch	100	6	6.0%	21	0	0.0%	Infinity	Infinity	Infinity
	Afternoon Snack	94	6	6.4%	27	0	0.0%	Infinity	Infinity	Infinity
29-Aug-23	**Childcare Facility A1-A7**									
	Breakfast	285	133	46.7%	485	95	19.3%	**2.38**	[1.91,	2.96]
	Morning Snack	100	35	35.0%	670	193	40.1%	1.21	[0.90,	1.62]
	Lunch	573	224	39.1%	197	4	2.0%	**19.25**	[7.25,	51.06]
	Afternoon Snack	549	211	38.4%	221	17	7.7%	**5.00**	[3.13,	7.98]

Infinity: no cases reported in control group. ND: not done (relative risk not calculated unless an event occurred in one group).

The Relative Risk for the Regular Menu lunch on August 29th for all childcare facility sites combined was 19.25 (95% CI 7.26-51.06) indicating that children on the Regular Menu who attended lunch on August 29th were 19 times more likely to develop confirmed STEC than children on the Regular Menu who did not attend that lunch.

The Relative Risk for the Regular Menu lunch served on August 29th for each childcare facility ranged from 6.67 to infinity. A Relative Risk of infinity happened in this situation when there were zero cases among those children who were not in attendance for that meal.

Table 14 shows for each childcare facility the Relative Risk of becoming a confirmed STEC case associated with being in attendance for the August 29th lunch for children on the Special Menu list.

Table 124

Relative Risk of becoming a confirmed STEC case associated with being in attendance for the August 29th lunch for children on the Special Menu list, by childcare facility. (Statistically significant associations highlighted in yellow.)

		Special Meal Type								
		Total served meal	Cases among those served meal	Attack rate among those served meal	Total not served meal	Cases among those not served meal	Attack rate among those not served meal	Relative Risk	95% Lower CI	95% Upper CI
29-Aug-23	**Site A1**									
	Breakfast	13	10	76.9%	25	9	36.0%	2.14	[1.17,	3.90]
	Morning Snack	2	2	100.0%	36	17	47.2%	2.12	[1.50,	2.99]
	Lunch	28	19	67.9%	10	0	0.0%	Infinity	Infinity	Infinity
	Afternoon Snack	28	18	64.3%	10	1	10.0%	6.43	[0.98,	42.12]
29-Aug-23	**Site A2**									
	Breakfast	15	8	53.3%	21	8	38.1%	1.40	[0.68,	2.88]
	Morning Snack	0	0	0.0%	36	16	0%	ND	ND	ND
	Lunch	29	16	55.2%	7	0	0.0%	Infinity	Infinity	Infinity
	Afternoon Snack	26	15	57.7%	10	1	10.0%	5.77	[0.87,	38.12]
29-Aug-23	**Site A3**									
	Breakfast	7	5	71.4%	12	1	8.3%	8.57	[1.24,	59.30]
	Morning Snack	0	0	0.0%	19	6	31.6%	0	.	.
	Lunch	12	6	50.0%	7	0	0.0%	Infinity	Infinity	Infinity
	Afternoon Snack	9	6	66.7%	10	0	0.0%	Infinity	Infinity	Infinity
29-Aug-23	**Site A4**									
	Breakfast	0	0	0.0%	5	0	0%	0	.	.
	Morning Snack	3	0	0.0%	2	0	0.0%	ND	ND	ND
	Lunch	4	0	0.0%	1	0	0.0%	ND	ND	ND
	Afternoon Snack	4	0	0.0%	1	0	0.0%	ND	ND	ND
29-Aug-23	**Site A5**									
	Breakfast	0	0	0.0%	17	1	6.0%	0	.	.
	Morning Snack	7	1	14.3%	10	0	0.0%	Infinity	Infinity	Infinity
	Lunch	14	1	7.1%	3	0	0.0%	Infinity	Infinity	Infinity
	Afternoon Snack	14	1	7.1%	3	0	0.0%	Infinity	Infinity	Infinity
29-Aug-23	**Site A6**									
	Breakfast	10	0	0.0%	30	0	0.0%	ND	ND	ND
	Morning Snack	0	0	0.0%	40	0	0.0%	0	,	,
	Lunch	24	0	0.0%	16	0	0.0%	ND	ND	ND
	Afternoon Snack	25	0	0.0%	15	0	0.0%	ND	ND	ND
29-Aug-23	**Site A7**									
	Breakfast	11	0	0.0%	21	0	0.0%	ND	ND	ND
	Morning Snack	0	0	0.0%	32	0	0.0%	0	.	.
	Lunch	23	0	0.0%	9	0	0.0%	ND	ND	ND
	Afternoon Snack	17	0	0.0%	15	0	0.0%	ND	ND	ND
29-Aug-23	**Childcare Facility A1-A7**									
	Breakfast	56	23	41.1%	131	19	14.5%	2.83	[1.68	4.77]
	Morning Snack	12	3	25.0%	175	39	22.3%	1.12	[0.41	3.11]
	Lunch	134	42	31.3%	53	0	0.0%	Infinity	Infinity	Infinity
	Afternoon Snack	123	40	32.5%	64	2	3.1%	10.41	[2.60	41.68]

Infinity: no cases reported in control group. ND: not done (relative risk not calculated unless an event occurred in one group).

There were no confirmed cases among those on the Special Menu list who did not attend lunch on August 29th (Relative Risk of infinity).

Figure 14 shows the epicurves for the child attendees on the Regular and Special Menus. Both epicurves show a single day peak on August 31st.

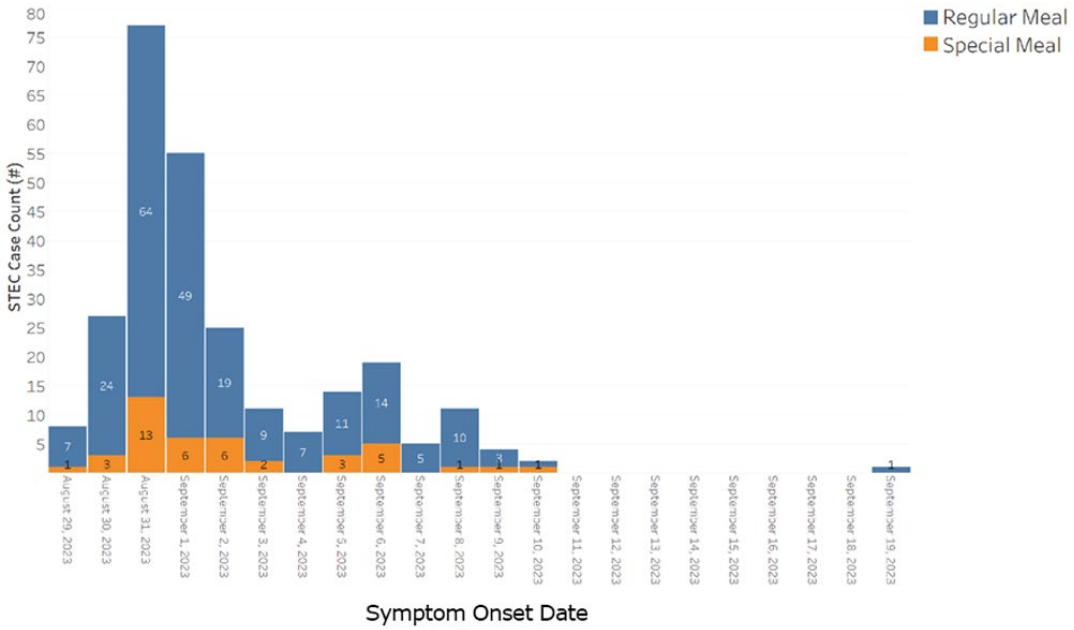


Figure 14
Epicurves for children on Regular and Special Menus (n=265)

As previously stated, this Children Attending Childcare Facilities Retrospective Cohort Study was not designed to determine the specific food item(s) that was/were the source of the outbreak since all that is known is whether a child attended a mealtime. This study does, however, point to the August 29th Regular and Special Menu lunches as the most likely day and meal when the contaminated item(s) was/were served.

Some other mealtimes over the two-week period resulted in small yet statistically significant Relative Risks, suggesting there could have been more than one day with a contaminated meal offering. None of those meals produced a Relative Risk greater than 2.5, and for all those, there were at least 30 STEC positive cases reported as not attending that meal.

The comparable findings for both the Regular and Special meals indicate there had to be either a contaminated shared food item on both lunch menus on August 29th or a cross contamination that occurred during the preparation of separate items on the Regular and Special menus.

The menu items served on August 29th are indicated in Table 15.

Table 15
Regular and Special Menus for August 29th

	Regular Menu	Special Menu
Breakfast	Acai Breakfast Bowl with Fresh Fruit*	Dairy Free Vanilla Yogurt with Gluten Free Granola and Fresh Fruit*
AM Snack	Honeydew Lassi with Vanilla Biscuit	Honeydew Lassi with Vanilla Wafer
Lunch	Meatloaf with Mashed Potatoes and Gravy with Fresh Vegetable*	Vegan loaf with Mashed Potatoes** with Fresh Vegetable *
PM Snack	Maple Cinnamon Muffin with Fresh Fruit*	Maple Cinnamon Muffin with Fresh Fruit*

* For both the Regular and Special Menus, the fresh fruit served with Breakfast was bananas, the fresh vegetable served with Lunch was cucumbers, and the fresh fruit served with PM Snack was oranges.

** Note that Table 15 shows the August 29th menu items distributed to childcare facility attendee parents at the beginning of August. The central kitchen reported they substituted oven ready potatoes for mashed potatoes for the Special Menu meal that was delivered to childcare facilities on August 29th.

Childcare Facilities Worker Retrospective Cohort Study

Background

A retrospective cohort study involving adults working at childcare facilities that received food from the central kitchen was undertaken to identify the menu item(s) provided by the kitchen that were most likely contaminated. Unlike the Children Attending Childcare Facilities Retrospective Cohort Study, the design of this study allowed for the identification of the contaminated food item(s), given that food histories for these adults were based on actual self-reported food consumption.

Childcare facility operators reported that workers were encouraged to eat with the children and in some childcare facilities, to eat the extra meals delivered to the site by the central kitchen. Depending on Regular and Special Menu item availability, childcare facility staff had the freedom to choose any of the items offered from either the Regular or Special Menu.

This retrospective cohort study included adults working at the seven childcare facilities that received food from the central kitchen and that had at least one confirmed primary STEC case during the first incubation period after the last day central kitchen food was served in any of the childcare facilities. The study was undertaken to identify the menu item(s) that were most likely contaminated.

Childcare Facility B1, B2, B3, & A8 did not have any primary confirmed STEC cases before September 11th. Even though they received food from the same central kitchen, at the time the cohort study was conducted it was assumed there were no exposures to contaminated food items at any of these sites. Childcare facility workers from these sites were excluded from the childcare facility worker retrospective cohort study.

Inclusion Criteria

Childcare facility workers who worked at least one shift between August 15th and 31st at any of the seven childcare facilities that had at least one confirmed primary STEC case reported by September 11th (childcare facilities A1, A2, A3, A4, A5, A6, & A7).

Exclusion Criteria

Childcare facility workers who worked at any of the four childcare facilities (B1, B2, B3, & A8) that received food from the central kitchen but that did not have at least one primary confirmed STEC case by September 11th were excluded from the Childcare Facilities Worker Retrospective Cohort Study.

Also excluded were childcare facility workers who worked at any of the seven childcare facilities with confirmed primary cases by September 11th (childcare facilities A1, A2, A3, A4, A5, A6, & A7) but who were determined to be secondary cases, or who were symptomatic but did not have at least one positive STEC stool test result by PCR or culture (probable cases.)

Exposure Definition

The childcare facility workers were asked if they ate each food item served on both the Regular Menu and Special Menu between August 21st and 31st. The recorded responses were either 'Yes, No, I Don't Remember.'

Flowchart

The flowchart for the retrospective cohort study for childcare facility workers is shown in Figure 15.

Methods (Childcare Facilities Worker Retrospective Cohort Study)

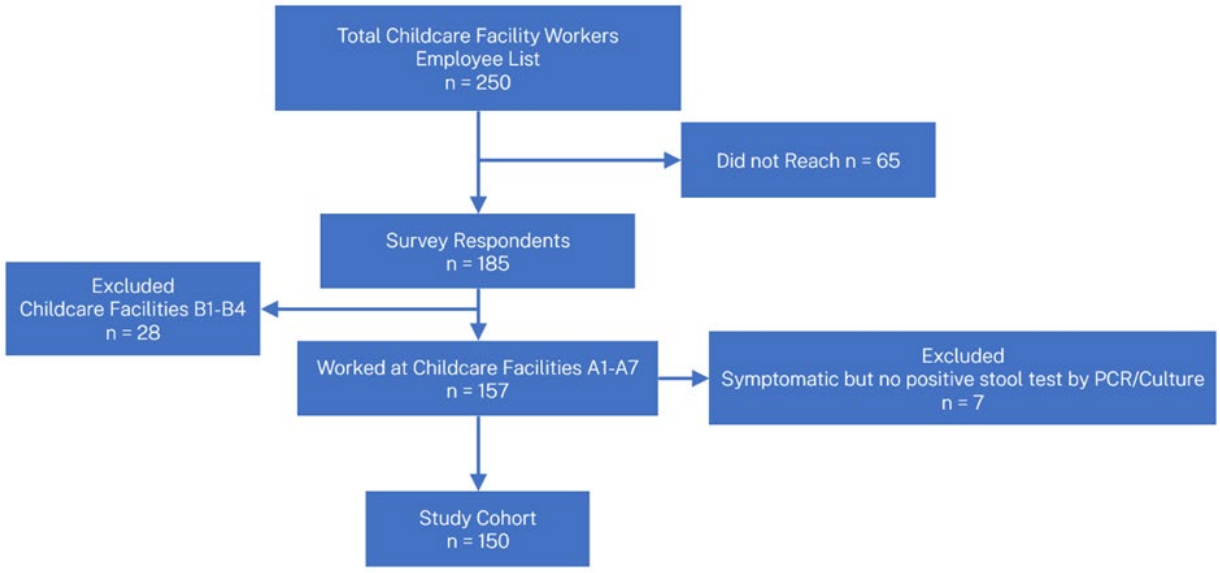


Figure 15
Retrospective Cohort Study Flowchart (Childcare Facilities Worker)

Childcare facility operators provided worker lists that included contact information. Three attempts were made from September 15th to 19th to contact each worker by telephone to administer a food history questionnaire. The questionnaire included itemized food items offered on both the Special and Regular Menus from August 21st to 31st.

An assumption was made based on anecdotal information that staff may consume leftover fruit and vegetables on the day following the day they were delivered. As such, the decision was made to add the previous day's fruits and vegetables onto the next day's list of available food items on the questionnaire. All other items including the breakfast and lunch hot items were listed on the food history questionnaire only for the day they were delivered.

It was discovered after the completion of the childcare facility worker food history questionnaire that cucumbers, which had been the fresh vegetable item for the August 29th Regular and Special lunch menu, had been included on the food history questionnaire for August 30th only. As noted above, it was also discovered from written communication with the central kitchen on September 25th that pre-sliced oven ready potatoes had been substituted for the mashed potatoes for the side dish on the August 29th Special Menu. This substitution had not been mentioned in any previous communication with the central kitchen staff.

Because of the omission of the cucumbers and pre-sliced oven ready potatoes on the August 29th portion of the food history questionnaire, a second round of telephone calls to the childcare facility workers who had previously responded to the original food history questionnaire was undertaken between September 27th and

28th. Workers who had indicated they never consume any of the menu items provided by the central kitchen were not included in this second round of questionnaires.

All items from the August 29th Regular and Special Menus were included in this second round of food history questioning. These questionnaires were administered after it had been announced publicly that the Regular Menu meatloaf and the Special lunch menu were the most likely items to have been contaminated, based on the retrospective cohort findings to date. The childcare facility workers were asked whether they ate the August 29th lunch items from the menus. The recorded responses for each item were either 'Yes, No, I Don't Remember.' Three attempts were made to reach each childcare facility worker. Figure 16 shows the flowchart for the second round of food history collection.

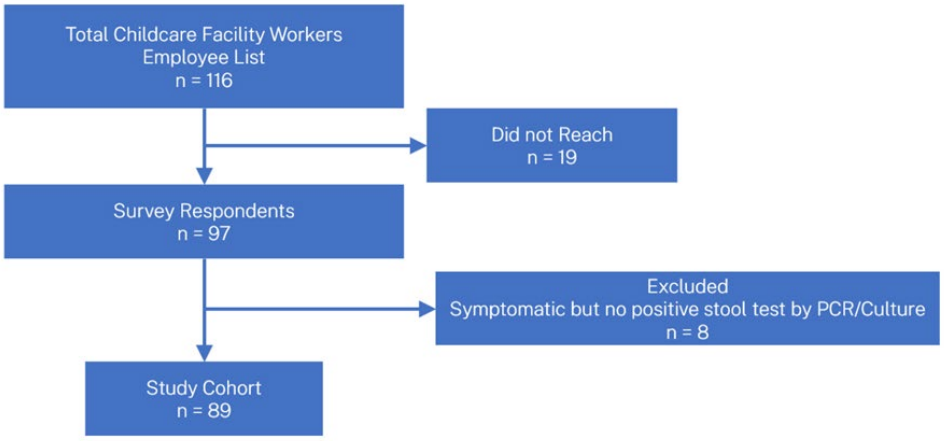


Figure 13
Childcare Facilities Worker Retrospective Cohort Study Repeat Food History Flow Chart

Outcome and exposure

In this study, the association was examined between the outcome (i.e., whether a participant was an STEC confirmed case) and various meal exposures, which were captured by up to 14 meal items specific to each daily meal (e.g., Lunch – Rice, PM Snack - Meat Cheese & Crackers, PM Snack - Strawberry Muffins, Fruit - Cantaloupe). Each meal exposure was then dichotomized into "exposed" versus "not exposed" categories.

Data sources and data linkage.

Data for n = 150 childcare facility workers who responded to a telephone food consumption questionnaire collected between September 15th and 19th were linked with a childcare facility worker attendance list and a master list of workers, which included demographic and basic epidemiological information on all known confirmed and probable cases, as well as data compiled from the CD/OM database and the APL-ProvLab database. From this, childcare facility workers were classified as cases or not cases. Those who worked at the four childcare facilities without confirmed primary cases by September 11th, workers who were classified as probable cases, and those who did not respond to the questionnaire were excluded from the analyses.

Data for 89 childcare facility workers who responded to a telephone food consumption questionnaire collected between September 27th and 28th were linked with a childcare facility worker attendance list and a master list of workers, which included demographic and basic epidemiological information on all known confirmed and probable cases, as well as data compiled from the CD/OM database and the APL-ProvLab database. From this, childcare facility workers were classified as cases or not cases. Those who worked at the four childcare facilities without confirmed primary cases by September 11th, workers who were classified as probable cases, and those who did not respond to the questionnaire were excluded from the analyses.

Although all items from the August 29th Regular and Special Menus were included in the second questionnaire, only the data pertaining to the missing cucumbers and oven ready potatoes were used in the risk exposure determinations. The data from the first questionnaire were used for all the other August 29th Regular and Special Menu items.

Descriptive statistics (numbers, percentages) were reported per day and meal item for participants in the exposed versus not exposed categories.

Univariable Analyses.

First, we conducted a Fisher's Exact Test for childcare facility workers affiliated with all examined childcare facilities. A set of 3x2 tables was generated using the "No" response as the reference group, based on participants' responses (i.e., "Yes", "No", "I don't remember") for each day and food item produced by the central kitchen for consumption from August 25th to 31st. We also estimated the risk, or the likelihood of an exposure-to-response relationship based on Relative Risk (RR) values, which quantify the ratio of the probability of an STEC infection in a group exposed to a specific meal and the probability of an STEC infection in a group that was not exposed to that specific meal. The Relative Risk values' corresponding 95% confidence intervals were determined by computing exact confidence limits for the Relative Risks; in all instances, a confidence interval not containing the value of 1.0 was deemed statistically significant.

Multivariable Analysis.

A multivariable analysis was conducted for the August 29th childcare facility workers' data to estimate the relative risk (RR) of being infected with STEC. The risk or the likelihood of an exposure-to-response relationship based on RR value quantifies the ratio of the probability of an STEC infection in a group of exposed to a specific meal item and the probability of an STEC infection in a group that was not exposed to that specific meal item. We used the group that was not exposed as the reference group. The RR values' corresponding 95% confidence intervals were reported; in all instances, a confidence interval not containing the value of 1.0 was deemed statistically significant.

First, we conducted a preliminary exploratory log-binomial regression analysis of each food exposure on August 29th estimated by the SAS GENMOD procedure[13]. We selected four lunch items that showed an association with being infected with STEC: meatloaf, mashed potatoes, potato wedges, and gravy. Specifically, a simple log-binomial regression was used to generate RRs of being infected with STEC for each of the four food items examined. Second, we employed a multivariable log-binomial regression, estimated by the SAS GENMOD procedure, to calculate the RR of being infected with STEC. This model failed to converge, a known issue associated with log-binomial regression analyses, which are less numerically stable than the logistic regression analyses[14,15]. To address this issue, a modified-Poisson method was adopted to estimate the RR using a robust error variance by adding a repeated subjects' statement and the subject identifier, which was the participant ID in the childcare facility worker survey, although only one observation per subject was recorded in the survey[13,16]. By adding the repeated subjects' statement while using the modified-Poisson method, we estimated the parameters and standard errors according to the Generalized Estimated Equations approach to account for the correlation among repeated observations. We used an unstructured within-subject correlation matrix. This new method uses a Poisson distribution but maintains the log link function. Therefore, we conducted a modified-Poisson regression model, which yields adjusted RRs for the four examined food items, with adjusting based on the effects of the other three food items examined). We also controlled for age and sex in the model, with similar results (not shown).

Univariable Analysis Results (Childcare Facility Worker Retrospective Cohort Study)

Table 16 provides the basic demographics of age group and sex, and the case status for the childcare facility workers in the cohort study by childcare facility.

Table 16

Basic demographics of age group and sex, and the case status for the childcare facility workers in the cohort study by childcare facility

Childcare Facility	Total	A1		A2		A3		A4		A5		A6		A7	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%
Staff/workers	150	20		34		17		11		22		27		19	
[a] **Age (year)**															
< 40	82 (54.7%)	10	52.6%	18	60.0%	9	56.3%	6	54.5%	14	63.6.4%	12	48.0%	13	72.2%
40 and older	59 (39.3%)	9	47.4%	12	40.0%	7	43.8%	5	45.5%	8	36.4%	13	52.0%	5	27.8%
[b] **Sex**															
Male	6 (4%)	1	5.3%	1	3.3%	2	12.5%	0	0.0%	0	0.0%	0	0.0%	2	11.1%
Female	135 (90%	18	94.7%	29	96.7%	14	87.5%	11	100.0%	22	100.0%	25	100.0%	16	88.9%
[c] **Cases**															
Confirmed	31 (20.7%)	10	50.0%	9	26.5%	6	35.3%	3	27.3%	0	0.0%	2	7.4%	1	5.3%
Not a case	119 (79.3%)	10	50.0%	25	73.5%	11	64.7%	8	72.7%	22	100.0%	25	92.6%	18	94.7%

a. DOB missing for nine staff/workers.
b. Sex missing for nine staff/workers.
c. Probable and secondary cases are excluded from staff/workers cohort study.
No meal plan available for staff/workers.

The demographics are fairly uniform across the childcare facilities for age group except for A7 which has a relatively larger proportion of staff under 40 years of age. The sex distribution across all childcare facilities consistently shows that the majority of staff are female. The percentage of childcare facility workers who became cases (Attack Rate) was markedly different with a high of 50.0% and a low of 5.3%. The childcare facility-specific Attack Rates for the childcare facility workers closely match the respective childcare facility-specific Attack Rates seen for child attendees.

Univariable Analysis

Table 17 shows the Relative Risk for menu items provided by the central kitchen for all meals served between August 25th and August 31st.

Table 17

Relative Risk for menu items provided by the central kitchen for all meals served between August 21st and August 31st (Statistically significant associations highlighted in yellow.)

		Childcare Facility Workers All Sites - Aug 21 - 31								
		Total who ate food items	Cases among those who ate food items	Attack rate among those who ate food items	Total who did not eat food items	Cases among those who did not eat food items	Attack rate among those who did not eat food items	Relative Risk	95% Lower CI	95% Upper CI
21-Aug	Breakfast - Whole Grain Cereal	3	2	66.7%	144	28	19.4%	**3.43**	**[1.44,**	**8.15]**
	Breakfast - Variety Cereal	3	2	66.7%	140	26	18.6%	**3.59**	**[1.50,**	**8.59]**
	AM Snack - Applesauce with digestive cookie	2	0	0.0%	139	27	19.4%	.	.	.
	Lunch - Teriyaki Meatballs	35	15	42.9%	104	13	12.5%	**3.43**	**[1.81,**	**6.48]**
	Lunch - Vegan Meatballs	8	5	62.5%	133	23	17.3%	**3.61**	**[1.88,**	**6.94]**
	Lunch - Rice	28	13	46.4%	113	15	13.3%	**3.50**	**[1.89,**	**6.48]**
	PM Snack - Meat Cheese & Crackers	27	9	33.3%	114	21	18.4%	1.81	[0.94,	3.50]
	PM Snack - Vegan Meat Cheese & Crackers	7	3	42.9%	138	27	19.6%	2.19	[0.87,	5.50]
	Fruit - Cantaloupe	18	6	33.3%	124	23	18.5%	1.80	[0.85,	3.81]
	Fruit - Banana	9	2	22.2%	132	27	20.5%	1.09	[0.31,	3.86]
	Vegetable - Carrots	12	5	41.7%	132	25	18.9%	**2.20**	**[1.03,**	**4.69]**
22-Aug	Breakfast - Blueberry Yogurt	11	5	45.5%	134	25	18.7%	**2.44**	**[1.17,**	**5.09]**
	AM Snack - Cheese Scones	3	2	66.7%	139	28	20.1%	**3.31**	**[1.39,**	**7.87]**
	Lunch - Chicken Quesadilla	36	15	41.7%	110	15	13.6%	**3.06**	**[1.66,**	**5.62]**
	Lunch - Vegan Quesadilla	5	3	60.0%	138	27	19.6%	**3.07**	**[1.39,**	**6.77]**
	PM Snack - Strawberry Muffins	10	3	30.0%	137	27	19.7%	1.52	[0.56,	4.16]
	Fruit - Cantaloupe	16	6	37.5%	126	23	18.3%	2.05	[0.99,	4.27]
	Fruit - Banana	9	3	33.3%	130	25	19.2%	1.73	[0.64,	4.66]
	Fruit - Papaya	3	2	66.7%	140	27	19.3%	**3.46**	**[1.45,**	**8.24]**
	Vegetable - Carrots	8	2	25.0%	131	27	20.6%	1.21	[0.35,	4.22]
	Vegetable - Cucumber	14	3	21.4%	128	25	19.5%	1.10	[0.38,	3.18]
23-Aug	Breakfast - Watermelon Smoothie with Crackers	7	3	42.9%	137	26	19.0%	2.26	[0.90,	5.68]
	AM Snack - Chocolate Pudding	2	1	50.0%	140	28	20.0%	2.50	[0.60,	10.39]
	Lunch - Butter Chicken	31	17	54.8%	115	14	12.2%	**4.50**	**[2.51,**	**8.09]**
	Lunch - Vegan Butter Chicken	4	4	100.0%	138	26	18.8%	**5.31**	**[3.75,**	**7.50]**
	Lunch - Rice	28	15	53.6%	118	16	13.6%	**3.95**	**[2.23,**	**7.00]**
	PM Snack - Wow Butter Blossom	9	6	66.7%	131	24	18.3%	**3.64**	**[2.02,**	**6.54]**
	Fruit - Strawberries	5	2	40.0%	132	27	20.5%	1.96	[0.63,	6.02]
	Fruit - Honeydew	12	4	33.3%	127	24	18.9%	1.76	[0.73,	4.24]
	Fruit - Orange	6	3	50.0%	130	26	20.0%	**2.50**	**[1.05,**	**5.97]**
	Fruit - Banana	8	3	37.5%	131	26	19.8%	1.89	[0.72,	4.93]
	Fruit - Cantaloupe	13	6	46.2%	127	23	18.1%	**2.55**	**[1.27,**	**5.10]**
	Vegetable - Steamed vegetables	8	3	37.5%	133	26	19.5%	1.92	[0.74,	5.00]
	Vegetable - Cucumber	7	2	28.6%	133	27	20.3%	1.41	[0.42,	4.76]
24-Aug	Breakfast - Turkey Sausage	12	7	58.3%	131	22	16.8%	**3.47**	**[1.88,**	**6.40]**
	Breakfast - Hashbrowns	16	7	43.8%	127	21	16.5%	**2.65**	**[1.34,**	**5.22]**
	AM Snack - Smoothie bowl	3	1	33.3%	140	29	20.7%	1.61	[0.31,	8.24]
	Lunch - Lazy Chef Lasagna	29	16	55.2%	114	14	12.3%	**4.49**	**[2.49,**	**8.11]**
	PM Snack - Fruit Tart	23	8	34.8%	120	23	19.2%	1.81	[0.93,	3.54]
	Fruit - Honeydew	16	6	37.5%	126	24	19.0%	1.97	[0.95,	4.08]
	Fruit - Pineapple	13	5	38.5%	126	25	19.8%	1.94	[0.90,	4.19]
	Fruit - Strawberries	7	3	42.9%	135	26	19.3%	2.23	[0.88,	5.60]
	Fruit - Orange	8	3	37.5%	135	27	20.0%	1.88	[0.72,	4.88]
	Vegetable - Peas	10	4	40.0%	134	26	19.4%	2.06	[0.90,	4.75]
	Vegetable - Steamed vegetables	6	2	33.3%	134	27	20.1%	1.65	[0.51,	5.39]
25-Aug	Breakfast - Pancakes with Strawberry and Fresh Cream	21	10	47.6%	120	17	14.2%	**3.36**	**[1.79,**	**6.30]**
	AM Snack - Coconut Cream Tart	7	2	28.6%	136	27	19.9%	1.44	[0.43,	4.87]
	Lunch - Fish Sticks	35	14	40.0%	109	17	15.6%	**2.56**	**[1.41,**	**4.66]**
	Lunch - Tofu Sticks	4	2	50.0%	141	29	20.6%	2.43	[0.87,	6.82]
	Lunch - Potato Wedges & Ketchup	32	9	28.1%	113	22	19.5%	1.44	[0.74,	2.82]
	PM Snack - Haystack Drops	8	4	50.0%	137	27	19.7%	**2.54**	**[1.17,**	**5.48]**
	Fruit - Orange	7	3	42.9%	130	26	20.0%	2.14	[0.85,	5.39]
	Fruit - Cantaloupe	11	4	36.4%	129	25	19.4%	1.88	[0.80,	4.42]
	Fruit - Pineapple	9	4	44.4%	131	25	19.1%	**2.33**	**[1.03,**	**5.24]**
	Fruit - Honeydew	8	3	37.5%	132	26	19.7%	1.90	[0.73,	4.97]
28-Aug	Breakfast - Whole Grain Cereal	4	3	75.0%	139	26	18.7%	**4.01**	**[2.07,**	**7.78]**
	Breakfast - Variety Cereal	1	1	100.0%	142	28	19.7%	**5.07**	**[3.64,**	**7.07]**
	AM Snack - Cheese with Crackers	6	3	50.0%	135	27	20.0%	2.50	[1.05,	5.96]
	AM Snack - Dairy Free Cheese with Rice Crackers	1	1	100.0%	142	29	20.4%	**4.90**	**[3.54,**	**6.77]**
	Lunch - Chicken Stir Fry	32	15	46.9%	111	13	11.7%	**4.00**	**[2.13,**	**7.52]**
	Lunch - Vegan Chicken Stir Fry	5	2	40.0%	140	27	19.3%	2.07	[0.67,	6.39]
	Lunch - Rice	26	13	50.0%	119	17	14.3%	**3.50**	**[1.95,**	**6.28]**
	PM Snack - Blueberry Muffin	16	7	43.8%	130	23	17.7%	**2.47**	**[1.27,**	**4.82]**
	Fruit - Cantaloupe	16	6	37.5%	123	24	19.5%	1.92	[0.93,	3.98]
	Fruit - Honeydew	9	3	33.3%	136	27	19.9%	1.68	[0.63,	4.49]
29-Aug	Breakfast - Acai Breakfast Bowl	2	1	50.0%	142	28	19.7%	2.54	[0.61,	10.54]
	Breakfast - Dairy Free Vanilla Yogurt w Gluten Free Granola	3	1	33.3%	142	28	19.7%	1.69	[0.33,	8.67]
	Lunch - Meatloaf	**41**	**27**	**65.9%**	**105**	**3**	**2.9%**	**23.05**	**[7.39,**	**71.84]**
	Lunch - Vegan Loaf	2	1	50.0%	142	28	19.7%	2.54	[0.61,	10.54]
	Lunch - Mashed Potatoes	32	17	53.1%	111	14	12.6%	**4.21**	**[2.34,**	**7.58]**
	Lunch - Potato Wedges	7	4	57.1%	122	20	16.4%	**3.49**	**[1.64,**	**7.43]**

	Lunch - Gravy	13	5	38.5%	130	24	18.5%	2.08	[0.96,	4.53]
	PM Snack - Maple Cinnamon Muffin	10	4	40.0%	132	26	19.7%	2.03	[0.88,	4.67]
	Fruit - Orange	9	4	44.4%	134	26	19.4%	**2.29**	**[1.02,**	**5.14]**
	Fruit - Banana	10	4	40.0%	131	26	19.8%	2.02	[0.88,	4.64]
	Fruit - Cantaloupe	11	5	45.5%	130	24	18.5%	**2.46**	**[1.17,**	**5.17]**
	Fruit - Honeydew	10	5	50.0%	132	24	18.2%	**2.75**	**[1.34,**	**5.64]**
	Vegetable - Cucumber	11	4	36.4%	118	20	16.9%	2.15	[0.89,	5.16]
30-Aug	Breakfast - Strawberry Banana Smoothie	4	2	50.0%	139	27	19.4%	2.57	[0.91,	7.26]
	Breakfast - Cookie	4	2	50.0%	137	25	18.2%	2.74	[0.97,	7.77]
	AM Snack - Vanilla Orange Muffin	1	0	0.0%	144	30	20.8%	.	.	.
	Lunch - Chicken Pasta Alfredo	28	15	53.6%	115	16	13.9%	**3.85**	**[2.18,**	**6.81]**
	Lunch - Vegan Chicken Alfredo	2	0	0.0%	144	30	20.8%	.	.	.
	PM Snack - Naan Bites with Yogurt	17	7	41.2%	130	24	18.5%	**2.23**	**[1.14,**	**4.37]**
	Fruit - Banana	14	4	28.6%	125	26	20.8%	1.37	[0.56,	3.37]
	Fruit - Orange	10	5	50.0%	133	25	18.8%	**2.66**	**[1.30,**	**5.43]**
	Vegetable - Carrot	6	3	50.0%	130	26	20.0%	**2.50**	**[1.05,**	**5.97]**
	Vegetable - Cucumber	11	4	36.4%	131	26	19.8%	1.83	[0.78,	4.30]
31-Aug	Breakfast - Scrambled Eggs	14	6	42.9%	128	23	18.0%	**2.39**	**[1.17,**	**4.85]**
	Breakfast - Hashbrowns	16	7	43.8%	127	22	17.3%	**2.53**	**[1.29,**	**4.95]**
	Lunch - Vegan Dan Dan	11	7	63.6%	128	22	17.2%	**3.70**	**[2.06,**	**6.66]**
	Lunch - Vanilla Squares	10	3	30.0%	136	27	19.9%	1.51	[0.55,	4.13]
	Fruit - Banana	9	3	33.3%	127	26	20.5%	1.63	[0.61,	4.36]
	Fruit - Cantaloupe	9	2	22.2%	132	27	20.5%	1.09	[0.31,	3.86]
	Fruit - Honeydew	6	2	33.3%	135	27	20.0%	1.67	[0.51,	5.43]
	Vegetable - Mixed vegetables	7	3	42.9%	134	26	19.4%	2.21	[0.88,	5.56]
	Vegetable - Carrot	4	2	50.0%	138	27	19.6%	2.56	[0.91,	7.21]

The beef meatloaf served during the August 29th lunch, with a Relative Risk of 23.05, showed by far the highest risk for developing an STEC infection in childcare facility workers compared with any other item. The childcare facility workers who consumed that item had a 23 times greater risk of becoming STEC infected as compared to those who did not consume the beef meatloaf. No other food item had a Relative Risk greater than five. Of the 30 confirmed cases in childcare facility workers who completed the questionnaire, only three had not reported eating this item.

Figure 17 shows the Relative Risk for items served at the August 29th lunch from the Childcare Facility Worker Retrospective Cohort Study.

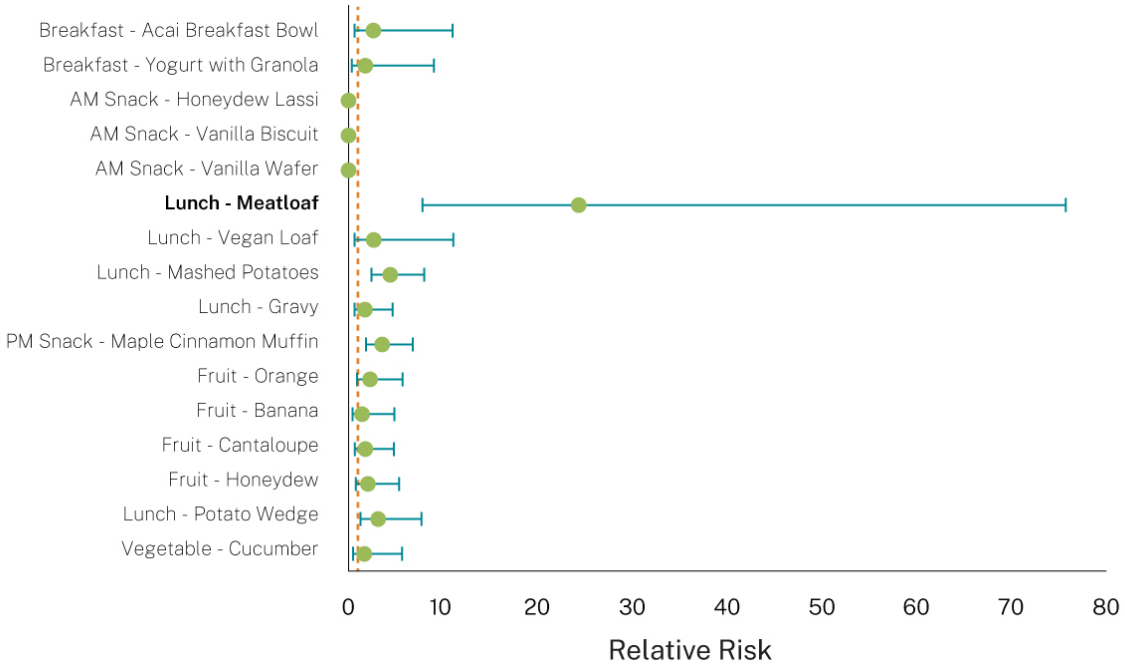


Figure 14
Relative Risk for items served at the August 29th lunch from the Childcare Facility Worker Retrospective Cohort Study

There was a significant finding from the Childcare Facility Attendee Retrospective Cohort Study that a food item served on the August 29th Regular Menu lunch was STEC contaminated, but that study was unable to identify the food item on the menu that was contaminated because of the inability of the childcare attendees to recall exact food items consumed. The Childcare Facility Worker retrospective cohort study strongly implicated the beef meatloaf from that menu as being that item. Only 17 STEC positive childcare facility workers reported eating the mashed potatoes served with the August 29th beef meatloaf, only five reported eating the gravy, and four reported eating the cucumbers. While the Relative Risk for the mashed potatoes was 4.21, significantly fewer of the cases ate this item compared to the beef meatloaf, and likely the Relative Risk for the mashed potatoes was confounded by the fact they were served with the beef meatloaf.

Multivariable Analysis Results (Childcare Facility Worker Retrospective Cohort Study)

Table 18 presents the results from the log-binomial regression. The unadjusted RRs suggest those exposed to meatloaf, mashed potatoes, and potato wedges were RR = 23.04 (95% CI 7.39, 71.84), RR = 4.21 (95% CI 2.34, 7.58), RR = 3.48 (95% CI 1.63, 7.42), and RR = 2.08 (95% CI 0.95, 4.52) times as likely to be infected with STEC, respectively, when compared with those not exposed to these food items. The adjusted RRs from the multivariable regression analysis indicated that only meatloaf was significantly associated with being infected with STEC, when adjusting for the effects of the other three food items examined (RR = 36.9, 95% CI 9.19, 148.09).

Table 18

Adjusted Relative Risk for menu items provided by the central kitchen for menu items served on August 29th

	Relative Risk	95% Lower CI	95% Upper CI	Adjusted Relative Risk	95% Lower CI	95% Upper CI
Meatloaf	23.04	[7.39,	71.84]	36.9	[9.19,	148.09]
Mashed potatoes	4.21	[2.34,	7.58]	1.18	[0.81,	1.73]
Potato wedges	3.48	[1.63,	7.42]	0.98	[0.66,	1.43]
Gravy	2.08	[0.95,	4.52]	0.41	[0.16,	1.01]

The Childcare Facility Attendee Retrospective Cohort Study strongly suggests the Regular Menu and Special Menu lunches on August 29th were the meals during which the contaminated food was most likely served. Figure 16 shows all items served and available to the childcare facility workers on August 29th although as mentioned in the methods section, fruit items listed on the menu for August 28th were included in the questionnaire for August 29th under the assumption that leftover fruit and vegetables may be consumed the following day by childcare facility workers.

While there was a very significant finding from the Childcare Facility Attendee Retrospective Cohort Study that a food item served on the August 29th Special Menu lunch was STEC contaminated, there was only one STEC positive childcare facility worker who reported eating the vegan loaf served at the August 29th lunch, there were only four STEC positive childcare facility workers who reported eating the potato wedges that had been substituted for the mashed potatoes on the Special Menu for that day, and only four of the childcare facility workers reported eating the cucumbers. **The Childcare Facility Worker Retrospective Cohort Study was able to provide a strong indication that meatloaf was the contaminated item on the Regular Menu lunch on August 29th, but it did not find any item on the August 29th Special Menu to be implicated as the contaminated food item that caused illness in the child attendees who were listed as receiving the Special Menu.**

Kitchen Staff Investigation

Kitchen Staff Illness

Eleven staff were employed in the central kitchen when the first confirmed case was identified. All 11 kitchen staff were tested for STEC after the kitchen was ordered closed and nine tested positive and became confirmed STEC cases. (Eight kitchen staff tested positive by culture and PCR, while one was negative by culture but STEC positive by PCR.) Five of the STEC positive kitchen staff reported no symptoms. Two of the four who reported symptoms had SOD of August 30th while the other two reported a September 2nd SOD.

Kitchen Staff Food Consumption Validation

A telephone questionnaire was administered to kitchen staff between September 18th and 19th to validate the food history information previously collected by PHIs in the initial follow-up of the STEC positive kitchen staff cases.

The items included in the telephone questionnaire food histories were limited to Regular and Special Menu items prepared in the kitchen for distribution to the 11 childcare facilities from August 25th to 31st. Two of the kitchen workers could not be reached, both of whom were confirmed cases who reported no symptoms.

Appendix 5 provides kitchen staff food histories including the count and percentage of staff who ate each food item prepared by the central kitchen from August 25th to 31st. None of the menu items were reported to have been eaten by all seven of the kitchen workers who were STEC positive and responded to the questionnaire. Items from the August 29th menu were eaten by six out of seven of the STEC positive kitchen workers.

Table 19 provides the count and percentage of central kitchen prepared food items reportedly eaten by cases and non-cases from the August 29th menu.

Table 19
Food items eaten by kitchen staff, cases versus non-cases, for August 29th (n=9)

	Cases (n=7)		Non-Cases (n=2)	
Item	**Ate Item**	**Percent**	**Ate Item**	**Percent**
Acai breakfast bowl	1	14.3%	1	50.0%
Dairy free vanilla yogurt	0	0.0%	0	0.0%
Gluten free granola	2	28.6%	0	0.0%
Honeydew lassi	0	0.0%	0	0.0%
Vanilla biscuit	1	14.3%	0	0.0%
Vanilla wafer	0	0.0%	0	0.0%
Meatloaf	6	85.7%	0	0.0%
Vegan loaf	1	14.3%	0	0.0%
Mashed potatoes	6	85.7%	0	0.0%
Gravy	6	85.7%	0	0.0%
Maple cinnamon muffin	2	28.6%	1	50.0%
Orange	2	28.6%	0	0.0%
Banana	1	14.3%	0	0.0%
Cucumber	1	14.3%	0	0.0%

Kitchen Staff Food Preparation Roles

There were three sources of data available regarding the roles taken by each central kitchen staff member in the preparation of menu items served on August 29th.

The first source was the information entered into CD/OM by PHIs in the immediate follow up of STEC positive test results. This information was collected prior to the start of the two cohort studies. The self-reported information included details on specific kitchen roles plus individual food histories for menu items prepared by the central kitchen that were consumed by the respective kitchen staff member.

The second source of data regarding food preparation roles was from the September 18th to 19th phone questionnaire administered to all kitchen staff to obtain food histories regarding food that was prepared at the central kitchen. This information was also collected prior to the results being available from the two cohort studies.

The third source of data regarding the food preparation roles for each kitchen staff member was from a follow up interview conducted with three kitchen staff plus the owner on October 4th. This information was collected after the preliminary results were available from the two cohort studies indicating the Regular Menu meatloaf and Special Menu meal served on August 29th were the most likely to have included contaminated food items. These findings are included in the next section of the report under Follow Up Investigations.

The kitchen staff included a kitchen manager/head chef, one chef, one sous chef, four cooks, one baker, a dishwasher and two delivery drivers. In general, the chef, sous chef, and cooks had defined roles with respect to preparing and portioning the breakfast, snacks, and lunches although any of the kitchen staff except for the delivery drivers could be asked to help complete a task if required.

The information from all three data sources was consistent in identifying that three kitchen staff prepared the beef and vegan meatloaves served on August 29th. All three subsequently tested positive for STEC; two reported no symptoms and one reported symptoms starting on September 2nd.

On August 28th, one cook used ground beef leftover from the preparation of the meatloaves served for the August 29th Regular Menu lunch to prepare hamburgers for kitchen colleagues. This staff member reported no symptoms and assisted in portioning the prepared meatloaves on August 29th. All four of the kitchen staff who reported eating these hamburgers on August 28th ultimately tested positive for STEC. Two kitchen staff members who ate these hamburgers remained asymptomatic, one developed symptoms on August 30th and one developed symptoms on September 2nd.

Detailed Food Preparation Processes

Two virtual and one on-site interviews were conducted with kitchen management and staff over three days to understand the kitchen processes used for preparing the childcare facility meals. The first two meetings were virtual and were held before the results from the two retrospective cohort studies were internally available and did not focus on any specific day or meal. The third interview was in person after the results of the two cohort studies were internally available. Because of the retrospective cohort study findings, the third interview focused specifically on preparation of the August 29th menu items.

The first virtual interview held on September 19th was with the two owners of the central kitchen, the Kitchen Manager/Head Chef, the executive assistant to the owners, and a corporate legal counsel representing Fueling Minds Inc. The second interview was with the two owners of the central kitchen plus the Kitchen Manager/Head Chef and was held on September 21st. The third interview was with one of the central kitchen owners, corporate legal counsel for Fueling Minds Inc., and three kitchen staff and was held on October 4th.

The information gathered from the first two meetings was summarized and sent back to the kitchen management for validation and corrections, if required. A statement of corrections was received by AHS on September 23rd.

Similarly, the information gathered from the third in-person meeting was summarized and sent back to the kitchen for validation and correction. Corrections were received by AHS on October 16th.

The information provided by the kitchen staff in the September 19th and 21st interviews that is relevant to the Regular and Special Menu meals served on August 29th is as follows, noting they had the opportunity to review and provide corrections to the summary of interviews:

- The kitchen had one long stainless-steel counter and another smaller counter that was used for food preparation. The long counter was across from the ovens and divided into four functional sections with no physical barrier between each section. Counter section 1 was used by two kitchen staff for cold food preparation for items including fruit and vegetables, yogurt, and smoothies. Counter sections 2 and 3 were used for lunch item preparation. Counter section 4 was used for baked item preparation. The additional counter (Counter 5) was located across from the Hobart mixer and was used as needed, primarily for the preparation of allergy-free menu items.
- The August 29th breakfast menu item was prepared on August 25th and included the ingredients yogurt, blueberries, and gluten free oats. This breakfast item was processed in one to three large containers and was mixed using an immersion blender. The immersion blender was reportedly not used to mix meat products. A dairy free version was also prepared on August 25th.
- The August 29th AM Snack was prepared on August 28th and included the ingredients honeydew melon, water, and syrup.
- The August 29th Regular Menu lunch was prepared using three batches of raw ground beef mixed with mirepoix (finely chopped celery, onions, and carrots) and salt and pepper to complete the beef meatloaf orders. Each batch required 12 tubes of raw beef. The mixing took place on August 28th, commencing at 1100h. Each batch was prepared using a Hobart mixer. The raw beef and mirepoix mixture was pressed into a mold, placed on a baking sheet, and then cut into three pieces after the removal of the mold. This process was repeated until the mixture was used up. The Hobart bowl and paddle were not cleaned between batches. The baking sheets were stored overnight in the refrigerator on a rack and roll. One kitchen staff member turned on the ovens the morning of August 29th and the baking sheets were transferred to the ovens for cooking. Two kitchen staff members removed the cooked meatloaves from the oven and sliced them for portioning.
- The preparation of the vegan loaf was started on August 28th with the gloved hand mixing of vegan product with the mirepoix and pepper. One baking sheet of vegan loaf was prepared using vegan hamburger (not logs) and vegan sausage. No equipment was shared in the preparation of the meat and vegan loaves. The vegan loaves were stored overnight in the refrigerator on a separate rack and roll and then cooked on the morning of August 29th in the Oven Under Grill.
- The mashed potatoes served with the meatloaves were prepared on the morning of August 29th using six bags of McCain frozen mashed potatoes. The unopened bags were cooked in the oven and then opened and portioned out on a scale once cooked.
- The wedge potatoes served with the vegan loaves were prepared on the morning of August 29th using six bags of McCain frozen oven ready potatoes.
- Stafford's gluten free meat base was used to make the gravy served with the beef meatloaves. The gravy was prepared on August 28th at approximately noon. It was cooled, stored in the refrigerator overnight, and then boiled the next day in two large pots. Gravy was not provided with vegan loaves.
- The cucumbers served with the August 29th lunch came individually wrapped and ready to use. The wrapping was removed, and the cucumbers were sliced into thin rounds using a Robocoupe slicer, placed into plastic bins, and then portioned into bags. The cucumbers were not washed in the sink prior to slicing. The portioning took place at approximately 0930h on August 29th.

- Two trucks were used to deliver childcare facility meals on August 28th, 31st and September 1st. The first truck left the main kitchen at 0800h and delivered meals to childcare facilities in the following order: A2, B1, B2, A5, A6. The second truck left the main kitchen at 0745h and delivered meals to childcare facilities in the following order: A8, B3, A3, A4, & A1.
- Three trucks were used to deliver childcare facility meals on August 29th and 30th. The first truck left the main kitchen at 0800h and delivered meals to childcare facilities in the following order: A2, B1, B2, and A5. The second truck left the main kitchen at 0815 and delivered meals to childcare facilities in the following order: A8, B3, A3, A1, & A4. The third truck left the main kitchen at 0745h and delivered meals to childcare facility A6 only.

The corrected information obtained during the October 4th on-site interview, conducted after the retrospective cohort studies indicated the Regular and Special Menu meals served during lunch on August 29th were of most interest, can be found in the Follow Up Investigations section under 'Food Preparation Follow Up Interviews'.

Follow Up Investigations

More narrowly focused follow-up investigations were prompted by the indication from the retrospective cohort studies that the Regular Menu meatloaf and Special Menu meal served on August 29th were the most likely to have included contaminated food items. These follow up investigations included further food sampling, food preparation follow-up interviews, kitchen oven temperature testing, environmental sampling, kitchen worker inquiries, and childcare facility operator queries specific to August 29th.

Focused CFIA Food Traceback and Trace Forward

On September 29th, 2023, AHS advised CFIA that the beef meatloaf and vegan loaf meals served at the affected Calgary childcare facilities on August 29th, 2023, and made by Fueling Minds Inc. central kitchen, were considered the most likely to have been contaminated with STEC. As beef samples were already under analysis, CFIA initiated traceback and trace forward on the other main ingredients used to prepare the beef meatloaves and vegan loaves. The beef meatloaves were made with ground beef and a frozen mirepoix mix. The vegan loaves were made with plant-based patties, plant-based sausages, and the frozen mirepoix mix. Although both recipes included Italian seasoning as an ingredient, central kitchen management informed AHS this ingredient was not used in the preparation of the beef and vegan loaves served on August 29th.

No raw ground beef, vegan plant-based patties or ground round sausage, or mirepoix used in the preparation of the items served on August 29th were available for testing. As such, CFIA used lot codes to trace samples of each product that were from the same lots.

In summary, CFIA obtained traceback / trace forward samples of ground beef, plant-based patties and sausages, and the mirepoix mix. The lot codes of all the samples corresponded to those that were likely used to prepare the respective meatloaves and vegan loaves that were served by the central kitchen on August 29th. As best as could be determined by CFIA, the amounts of ingredients ordered by the central kitchen corresponded to the amounts required to prepare the volume of loaves sent to the childcare facilities on August 29th. AHS was advised that Fueling Minds Inc. did not keep track of which lots of ingredients were used in each batch of food produced and poor inventory rotation practices were observed for frozen products. The samples collected by the CFIA were either from the same distribution company that supplied Fueling Minds Inc, or from other clients of the distributor. Two traceback / trace forward samples of plant-based meat alternatives, and one sample of mirepoix were analyzed by CFIA labs and reported as not detected for *E. coli* O157. This is in addition to the 14 traceback / trace forward samples of ground beef that previously tested negative.

Food Preparation Follow Up Interviews

After the retrospective cohort studies indicated the contaminated food was most likely served at lunch on August 29th, further on-site food preparation interviews took place that focused exclusively on meal preparation

for the beef meatloaf and the vegan loaf meal. The information provided by the central kitchen owners, corporate legal counsel for Fueling Minds Inc, and three kitchen staff obtained during the October 4th interviews is described below, noting they had the opportunity to review and provide corrections to the summary of interviews.

Regular Menu beef meatloaf, raw preparation

- Fresh ground beef used for the beef meatloaf arrived on August 28th, ordered through Gordon Food Services.
- The ground beef was mixed with the mirepoix, put onto separate carts, and then wheeled to the Hobbart mixer. One kitchen staff member cut the beef tubes with a paring knife, changed gloves, and opened mirepoix to pour into the mixer. Each batch included approximately five tubes (respondents were uncertain about this number) of raw beef plus two bags of mirepoix. Salt and pepper were added to the mix. Although Italian seasoning was listed as an ingredient, it was reportedly not used in this preparation of meatloaves.
- Counter sections three and four were used for preparing the beef meatloaves. The kitchen staff member who had prepared the raw beef mixture scooped it into hotel pans using a mixing bowl. The hotel pans lined with parchment served as molds. Using gloved hands, another kitchen staff member pressed the mixture into the hotel pans to form the loaves, then flipped them over onto parchment lined baking sheets. The molded raw beef mixture was then cut vertically into three sections using a 'scraper'. The baking sheets were then placed onto a rack and roll. This kitchen staff member reported that the rack and roll was almost full by the end of the preparation process, but they did not know how many baking sheets were used. A disposable rack cover was then placed over the rack and roll which was then rolled into the walk-in refrigerator.
- Respondents said counter sections one and two could have been used for breakfast item preparation while the beef meatloaves were being prepared on counter sections three and four.
- A third kitchen staff member arrived the next morning, changed into work clothes, made a sanitizer bucket for surfaces and equipment using the manual dispenser, sanitized workstations, turned on ovens (about 30 minutes to preheat; a light on the panel indicated when the oven was ready), then started cooking the meatloaf that had been removed from the walk-in refrigerator.
- The two kitchen staff members who had prepared the raw beef mixture and molded them on pans the day before reported that they tested the concentration of sanitizer from the manual dispenser each day and that it had been working on August 28th and 29th.
- The two Vulcan ovens that could hold four to five baking sheets each were used for cooking the beef meatloaves. A kitchen staff member reported that it took about 45 minutes to cook the meatloaves. No temperature checks were taken during the cooking. This same kitchen staff member reported temperature-checking each of the three meatloaf sections on every baking sheet after they were taken out of the Vulcan ovens. The worker stated the meatloaves needed to be at least 175° F and that all meatloaves were at that temperature when they came out of the ovens. They also reported using a personal digital probe thermometer to check temperatures. The worker said it was at home at the time of the October 4th interview. The worker also reported calibrating the thermometer with ice at home daily before coming to work, but this could not be verified by investigators.
- The cooked beef meatloaves were cut and portioned on counter sections two and three. Meatloaves were placed onto cutting boards to cut. (No cutting boards were found onsite during the October 4th inspection).
- All three kitchen staff workers mentioned above, and possibly a fourth, helped to cut the beef meatloaves using gloved hands and a chef's knife.

- Kitchen staff reported that after a batch of meatloaf came out of the oven, the next batch was put in. The cooked batch was portioned into hotel pans, wrapped with plastic wrap and foil, and then put into insulated containers. Counter sections one to four were used during the portioning of the beef meatloaves. The counters were cleaned and sanitized once portioning was completed and were then used for breakfast item preparation.
- The portioning was completed first for the South route.
- Each delivery truck had only one powered insulated unit. The powered insulated containers were plugged in at the kitchen and then remained unplugged in the trucks. The powered and unpowered insulated containers held four hotel pans each. No temperatures were taken after the initial temperature check was done when the meatloaves were removed from the ovens.
- No dedicated utensils or cutting boards were used for the beef meatloaf preparations.

Vegan loaf preparation

- One of the kitchen staff members who had assisted in preparing the Regular Menu beef meatloaf also prepared the vegan loaves, unaided, using Counter five, which is where all dietary restricted food items were prepared. This kitchen staff member was unable to specify the time the vegan loaf preparation occurred or what other food preparation was happening at the same time.
- The mixture of vegan ground round, vegan sausage, mirepoix, salt, and pepper were mixed by hand and spatula. No Italian seasoning was used in the mixture. As with the beef meatloaves, the vegan mixture was pressed into a hotel pan and then flipped onto a baking pan.
- The baking pans were removed from refrigeration the morning of August 29th and placed into the Oven Under the Grill.
- This kitchen staff member did not recall whether anyone assisted in portioning the cooked vegan loaves. No other kitchen staff reported helping with portioning the vegan loaf.
- The cooked and portioned vegan loaf was placed into insulated delivery bags.

AHS submitted clarification questions to the central kitchen management at various points during the investigation. The submitted AHS questions and responses from the kitchen management were as follows:

September 25th:

Were mashed potatoes served to the Special Menu clients (for the August 29th lunch)?

> **Response:** "No the mashed potatoes were not served to Special Menu clients. The Special Menu was served pre-sliced and oven ready potatoes."

September 26th:

What was the full ingredient list for the vegan loaf?

> **Response:** "The ingredients for the vegan loaf served that week were a blend of Beyond Meat vegan bratwurst and Beyond Meat veggie burgers, mirepoix mix, salt and pepper."

September 29th:

Was any frozen/thawed beef used in the preparation of the beef meatloaf, or is the Head Chef certain that only fresh beef was used?

> **Response:** "Only fresh beef was used."

What temperature were they targeting for the regular and vegan loaves? If the temperature reading was less than the target, would they cook longer?

Response: "165 degrees Fahrenheit. The meatloaf and vegan loaf would not have been removed from the oven until it reached an internal temperature of 165 degrees."

With respect to washing equipment and utensils, was sanitizer used in the dishwasher on the day the meatloaves were prepared? Or was just hot water and detergent used? Were any utensils hand washed? If so, how was it done?

Response: "On the day the meatloaf and vegan loaf were prepared, a "three sink system" was used to handwash all equipment and utensils. The dishes would have been handwashed in hot soapy water, hand rinsed, then immersed in a sanitizer dip. They were air dried."

Oven Cold Zone Check

Although operators are responsible for ensuring that all foods are cooked to appropriate temperatures within appropriate timeframes, additional investigation into oven performance was conducted in this circumstance to determine any potential contribution to the outbreak.

Four ovens in the central kitchen were used to prepare hot meals and bakery items. A check for cold zones in the four ovens was undertaken to determine whether there were areas in any of the ovens that could have been cooler than the set oven temperature. Cold zones could result in some items not being cooked to the required safe temperatures.

AHS Environmental Public Health does not have a protocol for testing oven temperatures. As such, AHS Healthy Physical Environments (HPE) conducted a rapid review on September 28th to determine the best methodology for measuring the consistency of temperatures across the racks in the ovens used to bake hot breakfast and lunch menu items.

The rapid review found there is no standard procedure for testing oven temperatures. The most basic approach is placing a thermometer in the centre of an oven and averaging temperature measurements collected within a set amount of time. More advanced and accurate methods require placing products or loads at multiple locations in an oven and then monitoring and mapping temperatures over a set period. The latter approach was selected for this investigation.

PHIs made a site visit to the central kitchen on September 29th to undertake the assessment. Only two of the four ovens were tested as the gas had not been turned on for the other gas ovens. The Vulcan Top and Bottom ovens were tested on September 29th.

The assessment was conducted by having central kitchen staff first preheat the ovens to 375° F/190° C, the manufacturer-recommended baking temperature for the chicken pot pies used as the testing loads. The pies were to be cooked from frozen for 40-50 minutes at 375° F/190° C.

Each Vulcan oven had four racks. The placement of the frozen chicken pot pies in the Top Vulcan Oven was as follows:

- Pie 1 – top rack, back left corner
- Pie 2 – second rack from top, front left corner
- Pie 3 – second rack from top, middle
- Pie 4 – third rack from top, back right corner
- Pie 5 – fourth rack from top, front right corner

The placement of the frozen chicken pot pies in the Bottom Vulcan Oven that had four racks was as follows:

- Pie 1 – top rack, back left corner
- Pie 2 – second rack from top, front left corner
- Pie 3 – second rack from top, middle
- Pie 4 – third rack from top, front right corner
- Pie 5 – fourth rack from top, back right corner

The oven timer and timers on the PHI's phone were set for 40 minutes. Oven thermometers were placed in each oven: one at the top front and the other at the bottom towards the back.

After 40 minutes, the ovens' ambient air temperatures from the Vulcan oven thermometers were read through the oven door glass windows. The oven doors were then opened and the temperatures of the tops of the pies were taken using a Raytek infrared thermometer. The pies were then removed from the oven and a probe thermometer measurement of the pies was taken immediately.

PHIs returned to the central kitchen on October 4th to conduct the oven temperature check on the Oven Under Grill and the Baking Oven using the same method used to test the Vulcan ovens on September 29th.

The placement of the frozen chicken pot pies in the Baking Oven that had three racks was as follows:

- Pie 1 – top rack, front right corner
- Pie 2 – middle rack, back right corner
- Pie 3 – middle rack, back left corner
- Pie 4 – middle rack, middle
- Pie 5 – bottom rack, front left corner

The placement of the frozen chicken pot pies in the Oven Under Grill that had only one rack was as follows:

- Pie 1 – back left corner
- Pie 2 – back right corner
- Pie 3 – middle
- Pie 4 – front left corner
- Pie 5 – front right corner

The Oven Under Grill did not have glass windows so ambient temperature was checked by opening the oven door and recording the temperatures at the start and end of the cooking process. A single thermometer was used in both the Oven Under Grill and the Baking Oven to measure ambient temperature.

Ambient Temperature **Findings**

- The top Vulcan oven ambient air temperature was 420° F/216° C (top front) and 430° F/221° C (bottom back).
- The bottom Vulcan oven ambient air temperature measured 375° F/190° C (top front) and 375° F/190° C (bottom back).
- The Oven Under Grill ambient air temperature was 380° F/193° C (beginning) and 450° F/232° C (ending).
- The Baking Oven ambient air temperature measured 375° F/190° C (beginning) and 370° F/188° C (ending).

The results of the oven temperature checking with loads are shown in Table 20.

Table 20
Raytek and Probe Thermometer readings for central kitchen ovens

	Vulcan Top Oven		Vulcan Bottom Oven	
Pie Number	**Raytek Temperature**	**Probe Temperature**	**Raytek Temperature**	**Probe Temperature**
1	252° F/128° C	191° F/97.0° C	288° F/146° C	188° F/95.4° C
2	243° F/123° C	190° F/96.3° C	292° F/148° C	188° F/95.3° C
3	229° F/116° C	190° F/96.8° C	234° F/119° C	183° F/93.0° C
4	221° F/112° C	199° F/101.2° C	234° F/119° C	183° F/93.0° C
5	242° F/123° C	193° F/98.0° C	249° F/126° C	195° F/98.8° C

	Oven Under Grill		Baking Oven	
Pie Number	**Raytek Temperature**	**Probe Temperature**	**Raytek Temperature**	**Probe Temperature**
1	213° F/108.4° C	186° F/93.5° C	197° F/100.2° C	187° F/95.1° C
2	151° F/76.6° C	168° F/85.2° C	191°F/97.4° C	182° F/92.8° C
3	187° F/94.6° C	181° F/91.9° C	203° F/103.2° C	188° F/95.0° C
4	189° F/96.2° C	177° F/89.7° C	195° F/99.4° C	166° F/83.6° C
5	154° F/77.6° C	170° F/85.5° C	197° F/99.6° C	195° F/98.8° C

A meeting was held on October 12th between AHS investigators and food safety experts from Health Canada and the Canadian Food Inspection Agency (CFIA). The meeting's purpose was to interpret the findings of the oven cold zone check. Health Canada and CFIA provided technical advice and expertise on the verification of oven temperatures and cook times. The consensus of participants was that the probe temperatures achieved after the chicken pot pies were cooked at the manufacturer recommended oven temperature and cooking time would be high enough to kill *E. coli*. However, the density and water content of the chicken pot pies would not be the same as that of a beef meatloaf or vegan loaf, so it cannot be determined whether the loaves cooked on August 29th for reportedly the same duration and temperature would have achieved the same probe temperatures.

There was also a consensus that there were cooler zones in all the central kitchen ovens. This finding was considered typical for most commercial ovens. As such, obtaining probe temperatures on each cooked item may be necessary to ensure the required kill temperature of 160° F/71° C was achieved uniformly. Not taking a probe temperature of each item could result in some items not reaching the required kill temperature. Temperature differences in ovens could cause issues if every single item was not individually probed at the end of the cooking step.

Environmental Sampling

Environmental sampling of surfaces in the central kitchen was undertaken to ensure there was minimal chance of residual contamination of food preparation surfaces or equipment prior to allowing the central kitchen to reopen, should the central kitchen managers request to do so, and to try to identify possible mechanisms by which menu item contamination could have occurred.

Public Health Inspectors undertook environmental sampling under their Executive Officer authority under the *Public Health Act*. They were assisted by the AHS Infection Prevention and Control (IPC) lab that has extensive experience in conducting environmental sampling in the acute care setting. CFIA and Health Canada provided technical advice and expertise in environmental sampling and testing related particularly to kitchen environments.

AHS Executive Officers completed the task of environmental swabbing in partnership with the AHS IPC laboratory. Environmental surface swabbing was undertaken by Public Health Inspectors on October 6th and 11th and a complete list of surfaces swabbed is available in Appendix 6. AHS IPC laboratory undertook the testing and details of both the environmental sampling and testing methodologies are available in Appendix 7. All surfaces swabbed tested negative for STEC.

It was considered possible that kitchen sink U-trap biofilms could harbor STEC given they are constantly wet surfaces. Another visit to the Fueling Minds Inc. central kitchen took place the week of October 25th to remove and then take samples from the kitchen sink U-traps. Services of a specialized University of Calgary laboratory working on biofilms were secured for the testing. Despite extensive efforts using modified DNA extraction protocols, DNA could not be purified from the biofilm samples. DNA was extracted from grease balls in the drain system, but the results were negative for STEC targets.

Kitchen Worker Follow Up

Follow up interviews were conducted between October 10th to 11th. The interviews' main purpose was to further define food, environmental, animal, and social event exposures, and whether any of the kitchen staff had ingested or purchased any farm direct meat products or had been at an event where farm direct meat might have been served. Also of interest was validation of whether they had a role in preparing meat products in the central kitchen. The complete list of questions asked is provided in Appendix 8.

Only nine of 11 of the kitchen staff were available for interviews. Fueling Minds Inc. legal counsel was present for all interviews.

None of the kitchen staff reported purchasing meat from any source other than retail grocery chains. None reported having visited a farm or having any contact with farm animals or meat purchased directly from a farm.

Childcare Facility Operator Follow Up

Follow up interviews with Childcare Facility Operators were conducted between October 5th and 6th to obtain additional or corroborating information regarding the delivery and handling of the August 29th lunch menu items. The Childcare Facility Operators were also asked about the lunch items' consumption patterns by attendees and staff. The interest was to determine possible explanations for the widely varying attack rates for both attendees and staff across the childcare sites.

The responses for the seven childcare facilities that received food from the central kitchen and that had at least one confirmed primary case by September 11th are provided below:

A1 New Brighton (Attack Rate among children 47%)

- The delivery arrived at approximately 1100h.
- “It wasn’t really warm when it arrived” but the temperature was checked, and it was 165ºF.
- The meatloaves were placed in steam trays until serving time, which was 1130h. Lunch was served from 1130h-1230h.
- All children registered in attendance in the tracker were present for the lunch meal as there were no field trips that day.
- Few of the children ate the meatloaves because the slices were “too big.” The meatloaves looked a little ‘rosy colored, similar to medium rare’ steak. Many of the meatloaf meals were thrown away because attendees were not interested in eating them. The gravy was not popular.
- Central kitchen prepared AM Snack was ordered only for the infants. Older children may not eat much of the lunch menu because they have large AM Snacks brought from home.
- Any leftover food for all meals is discarded at the end of the respective meal.

A2 West 85th (Attack Rate among children 43%)

- The delivery arrived at approximately 0900h.
- The meatloaves were hot on arrival, but the temperature was not checked.
- The trays were placed in a food warmer or oven to maintain temperature until served at 1130h.
- All children registered in attendance in the tracker were present for the lunch meal as there were no field trips that day.
- About 75% of children ate the meatloaves. Approximately 5% of attendees do not like western food.
- Any leftover food for all meals is discarded at the end of the respective meal.

A3 Braeside (Attack Rate among children 45%)

- The delivery arrived at approximately 1000h.
- The meatloaves were hot on arrival, but the temperature was not checked.
- The trays were placed in an oven to maintain temperature until they were served.

- All children registered in attendance in the tracker were present for the lunch meal as there were no field trips that day.
- All but approximately four of the children ate the meatloaves.
- Any leftover food for all meals is discarded at the end of the respective meal.

A4 Thornhill – VIK Academy (Attack Rate among children 22%)

- The delivery time was not recorded.
- The delivery driver placed the meals into steam trays upon arrival.
- Temperature checks are not always done and are not logged.
- All children registered in attendance in the tracker were present for the lunch meal as there were no field trips that day.
- Most of the children ate the meatloaves that were served to them. The item was popular and there were no comments from staff regarding issues with quality.
- Any leftover food for all meals is discarded at the end of the respective meal.

A5 Kidz Space (Attack Rate among children 10%)

- The delivery usually arrived at approximately 0950h-1000h.
- The temperature taken on arrival was 142° F.
- The meatloaves were placed in steam trays until serving time which was 1120h.
- All children registered in attendance in the tracker were present for the lunch meal as there were no field trips that day.
- It was reported that the beef meatloaf was not popular, and little was eaten. There were many vegetarians in the enrolled population and the vegan loaf was popular and most was consumed.

A6 McKnight (Attack Rate among children 5%)

- The delivery usually arrived at approximately 1000h.
- The temperature check in the logbook recorded 150° F at 1045h.
- The trays were believed to have been put into steam trays immediately after arrival.
- All children registered in attendance in the tracker were present for the lunch meal as there were no field trips that day.
- Only infants were provided the AM Snack. Approximately 70-80% of older children brought AM Snack from home, and it can be quite large. The AM Snack was served at 1030h, and the lunch was served at 1130h. The lunch meal was never popular, and the Childcare Facility Operator did not think many children ate the meatloaf, the vegan loaf or the mashed potatoes.
- Any leftover food for all meals is discarded at the end of the respective meal.

A7 Centennial (Attack Rate among children 4%)

- The childcare facility is located at the site of the central kitchen.
- The meatloaves were kept in the oven until served at 1130h.
- All children registered in attendance in the tracker were present for the lunch meal as there were no field trips that day.
- Most of the children ate some of the meatloaves that were served to them.
  Any leftover food for all meals is discarded at the end of the respective meal.

The responses for the four childcare facilities that received food from the central kitchen and that had no confirmed primary cases by September 11th are provided below:

A8 Bridgeland

- This site only enrolled children 0-19 months.
- The person interviewed was not present when the meals were delivered and did not know the delivery time or whether the temperature was checked.
- All children registered in attendance in the tracker were present for the lunch meal as there were no field trips that day.
- It was reported that most children did not eat the meatloaf although most may have tried a bite. The potatoes served with the beef meatloaves were popular. A lot of the meatloaves were discarded uneaten.
- Any leftover food for all meals is discarded at the end of the respective meal.

B1 Little Oaks

- Nothing from the August 29th Regular or Special Menu was delivered. The Childcare Facility Operator was adamant that a chicken stir fry was delivered instead of either the beef meatloaf or vegan loaves. No cucumbers were delivered as there were vegetables in the stir fry.

B2 Braineer

- The delivery arrived at approximately 0830h-0900h.
- The meatloaves were hot on arrival, but the temperature was not checked.
- The meatloaves were placed into steam trays after arrival until lunch service at 1100h.
- All children registered in attendance in the tracker were present for the lunch meal as there were no field trips that day.
- It was reported that most children tasted the loaves.
- Any leftover food for all meals is discarded at the end of the respective meal.

B3 Almond Branch

- The delivery arrived at approximately 1000h.
- The loaves were warm on arrival, but the temperature was not checked.
- The loaves were placed into steam trays after arrival until lunch service at 1100h.

Whole Genome Sequencing

Whole genome sequencing (WGS) was used to determine the genetic profile of STEC strains associated with this childcare facility outbreak and to compare them to other STEC strains captured by Canada's national laboratory-based foodborne illness surveillance system, PulseNet Canada. Finding related strains can help detect outbreaks and identify common sources higher in the food supply chain, based on the premise that more closely related strains are more likely to have originated from a common source.

APL-ProvLab uses the WGS standardized protocol from PulseNet Canada, which is a national laboratory-based surveillance system for detecting outbreaks of foodborne and waterborne illnesses. The laboratory uses DNA to generate sequences from the bacteria and these sequences are uploaded to the PulseNet national database located at the Public Health Agency of Canada's National Microbiology Laboratory in Winnipeg. These sequences are compared with other STEC sequences in Canada that have been shared with the PulseNet Canada partner laboratories. PulseNet Canada also has a bilateral information exchange agreement with PulseNet USA, which allows each jurisdiction to exchange data to facilitate the identification of related isolates

in each country. APL-ProvLab also compares all sequences in the local database to match with other Alberta STEC sequences.

In this outbreak, the 339 isolates sequenced were highly related to each other. (Sequencing was not possible for 20 confirmed cases that were part of the childcare facility outbreak. Twelve confirmed cases were PCR positive but culture negative, four were culture positive but the strain could not be isolated to perform sequencing, and four were tested in external laboratories and the specimens were not available for sequencing.) The genome of these STEC cases connected to the outbreak also matched to sequences of 11 Alberta STEC strains previously typed since June 2023 and that were not connected to the childcare facility. The isolates were also highly related to strains typed in another province in 2022-2023. No source has been identified for these cases.

An additional three isolates from a third province that match the strain from this childcare facility outbreak have been identified with isolation dates of September 2nd, 3rd, and 4th, 2023. They are believed to be from cases included in the Calgary Zone childcare facilities outbreak who left Alberta for this province shortly after attending one of the childcare facilities in Calgary during the last week of August 2023.

National Outbreak Investigation Coordination Committee (OICC) for Interprovincial *E. coli* Cluster

The Public Health Agency of Canada (PHAC) set up an Assessment Call on September 20, 2023 to determine whether a national Outbreak Investigation Coordination Committee (OICC) ought to be activated to investigate a cluster of what was then 10 laboratory confirmed *E. coli* O157:H7 cases (cluster 2301ECWGS-1ON-MP) in Alberta (n=5) and another province (n=5) to assess whether they represented a multi-jurisdictional outbreak. Partners from PHAC, Health Canada, CFIA, ministries of Health from both provinces, and AHS agreed to establish an OICC on the same day. Under the national Foodborne Illness Outbreak Response Protocol (FIORP), an OICC provides a mechanism to enhance the collaboration and overall effectiveness of response to multi-jurisdictional foodborne illness outbreaks[17].

Whole genome sequencing for isolates from the Calgary Zone childcare outbreak had become available and were determined by PulseNet to be closely related to the cluster. As the childcare outbreak was under investigation by AHS, it was agreed the national OICC would include only the non-daycare related cases.

A Public Health Alert (PHA) was posted to the Canadian Network for Public Health Intelligence (CNPHI) on September 22, 2023 in English and French.

The national cluster ultimately comprised 16 cases with the following characteristics:

- Case distribution: Alberta= 11, other province = 5
- Age: Mean = 18 years; Median =16 years; Range 1-62 years
- Sex: 50% female (8 of 16)
- Hospitalization: 27% (4 of 15)
- Hemolytic Uremic Syndrome: 0
- Deaths: 0
- Onset Range: November 22, 2022 to September 18, 2023

For the 11 Alberta cases:

- None of the 8 children attend(ed) the 11 childcare facilities served by the central kitchen.
- None of the 3 adults had contact with the childcare facilities or central kitchen.
- Ten cases were in the Calgary Zone, one was in the South Zone.
- Case onset dates were between June 18th and September 18th, 2023.
- Four of the 11 cases (36.4%) in three households reported privately purchased beef:
    - Two of these cases were from the same household; two other cases were relatives living in separate households.

    - One leftover beef sample (frozen) from one case's home was obtained and tested by APL-ProvLab. The case's parent received the beef from a relative who had purchased the meat from a private source. The relative provided pieces of the beef to relatives in this household and one other, and one child in each household developed lab confirmed STEC.
    - The leftover sample of beef was positive for *E. coli* O157:H7 and the sample was a WGS profile match to the clinical cases in this cluster and the childcare facility outbreak.
    - Two other cases were identified as relatives (parent and child) residing in the same household. The household reported privately purchasing beef through a local advertisement. One case reported eating the beef, the other denied eating the beef but did prepare and handle it.
- For details of the investigation into these cases, see the Alberta Foodborne Illness and Risk Investigation Protocol section.

For the 5 cases from another province:

- All five cases matched by genetic fingerprint to the *E. coli* O157:H7 outbreak associated with childcare facilities in the Calgary Zone.
- These cases were initially discovered during winter 2022.

Findings:

- Exposure information was drawn from initial interviews of all 16 cases and re-interviews of 11 of 16 cases including six from Alberta. Grocery purchase records were collected from one consenting case. No significant commonalities were identified in terms of food items consumed, reported grocery stores, or reported restaurants.
- The National Microbiology Lab (NML) confirmed the 16 isolates were closely grouped genetically, within 0-9 wgMLST alleles.
- Based on the epidemiologic, microbiologic, and food safety investigations, OICC partners determined the cases from Alberta and the other province did not represent a multi-jurisdictional outbreak and the source could not be confirmed for cases from either province.

Alberta Foodborne Illness and Risk Investigation Protocol (FIRIP) Coordinating Committee

A meeting chaired by the Public Health Division, Alberta Health was held September 28th, 2023 to determine the need to activate the FIRIP Coordinating Committee (FIRIP CC)[18]. Meeting participants included representatives from Alberta Agriculture and Irrigation (AAI), Alberta Health (AH), AHS, CFIA, First Nations and Inuit Health Branch, and PHAC.

AHS provided an update on the Calgary childcare facilities-related *E. coli* outbreak. There was also a report on the cluster of *E. coli* with cases in Alberta and another province with the same WGS profile that was being investigated by the PHAC OICC referenced in the OICC section of this report. The WGS profile for these interprovincial cases matched the WGS profile for the Calgary childcare facilities-related outbreak. Other than matched WGS, there was no established connection between the interprovincial cluster and the childcare facility-related cases.

FIRIP partners all expressed interest in investigating the two Alberta cases in the interprovincialcluster that were likely connected to a private purchase of beef through a third-party vendor. This household reported purchasing what was likely uninspected beef after responding to a local advertisement. There was also interest in the source of beef that tested positive for STEC and likely infected one person in each of two households.

Based on the information provided at the FIRIP meeting, participants decided to activate the FIRIP CC for the following reasons:

- To provide a formalized structure for information sharing.
- To share information between the national *E. coli* cluster and the Calgary Zone childcare facility outbreak that shared a matched WGS profile, and coordinate activities between the investigations.
- To leverage partner learnings from past investigations.

Meetings were held approximately once to twice weekly from September 28th to October 20th. Key activities included finalizing a script for re-interview of childcare facility kitchen staff, testing of additional food samples, oven temperature checks and environmental swabbing at the childcare facility central kitchen, and collaborating on an investigation into the likely third-party vendor of privately sold meat that had likely infected two people in the cluster after they responded to a local advertisement.

AHS PHIs and partners determined that beef was being obtained directly from a farm and sold, unlabeled and at times with inadequate temperature control, to customers from a residential home. (On-Farm Slaughter Operations (OFSO) are regulated in Alberta under the *Meat Inspection Act*. Meat resulting from slaughter under an OFSO license is uninspected, is required to be labeled, "Uninspected – Not for Sale", and is for consumption of the customer and their family only. It cannot be sold, gifted, bartered, or otherwise transferred.) Samples of beef sold from this home were sent to APL-ProvLab for testing. Over the course of the investigation, PHIs provided education and issued a closure order under the Public Health Act instructing the operators to halt distributing uninspected meat and a notice was posted on the exterior of the residence and online. The meat samples were negative for STEC, although two STEC cases in the interprovincial cluster were linked to previous purchase of beef from this home.

Regarding the two other cases connected to the private sale of beef, where the beef had tested positive for STEC, the source of the beef is yet to be determined.

Findings

This section of the report provides the findings and the evidence to support those findings, derived from all methods used to determine the source of this outbreak.

Finding #1

This was a point source outbreak connected to the central kitchen that served multiple childcare facilities, with a single day exposure originating from a single source of contaminated food.

All 326 primary confirmed cases either attended or worked at a childcare facility that received meals from the same central kitchen, or they worked at the central kitchen and ate the meals prepared there, or they ate leftover food prepared by the central kitchen and brought home from a childcare facility. The *E. coli* strain that infected them all had the same whole genome sequence. **This evidence indicates the source of the outbreak was the food provided from the central kitchen.** The only competing explanation is simultaneous independent outbreaks with the same *E. coli* strain affecting only attendees and workers in these childcare facilities and the central kitchen. The likelihood of this occurring appears extremely unlikely.

The outbreak epicurve for the primary confirmed cases was limited to one incubation period and had a single day peak (Figure 6). This evidence strongly suggests the contaminated food item from this central kitchen was served on a single day. An epicurve with primary confirmed cases that extended beyond one incubation period and/or had sustained or multiple peaks would have indicated multiple days of exposure to a contaminated food item.

Finding #2

The most likely day of exposure, based on epidemiological data, was August 28th or 29th.

The incubation period for STEC ranges from 1 to 10 days but is typically 3 to 4 days[5]. Outbreaks like the current one involving mostly children and having a high attack rate tend to have shorter incubation periods, so we might expect a median incubation of 2 to 3 days for this outbreak[6]. The epicurve peaked on August 31st, so a 2- or 3-day incubation period would suggest August 28th or 29th as the most likely day of exposure (Figure 2). The reported symptom onset day for the first confirmed cases was August 29th so the source of exposure had to have occurred on or before August 29th (Figure 3). Accepting some vagaries in symptom presentation and recall, **the epidemiological information points to an exposure date of either August 28th or 29th.**

Finding #3

August 29th lunch was the meal most likely to have been contaminated.

The Childcare Facility Attendee Retrospective Cohort Study indicated that children who attended lunch on August 29th were 23 times more likely to develop STEC than children who did not attend lunch that day (relative risk (RR)=23.51, 95% CI 8.85-62.45) (Table 12, Figure 13).

The meal with the next highest relative risk was the August 29th PM Snack (RR=5.60, 95% CI 3.59 – 8.75), but this finding is likely confounded by the fact that most, but not all children attending the lunch would have been present for the PM Snack. The fact that only four children who were confirmed STEC positive did not attend the lunch, whereas 19 children who were confirmed STEC positive did not attend the PM Snack, strongly suggests that if only one meal was contaminated, it was lunch on August 29th.

All four of the children who became STEC positive but who were not in attendance for lunch on August 29th had an epidemiological link that connected them to the lunch. Two of the children had siblings who attended the same childcare facility, and the siblings attended lunch on August 29th and became confirmed cases. The other two children had opportunities for secondary exposure in the childcare facilities in the days immediately

following the lunch, when children and staff were becoming symptomatic and before the childcare facilities were closed.

In reviewing the case investigation records of the 19 children who developed confirmed STEC but who did not attend the PM Snack on August 29th, there were five with no epidemiological linkages to the PM snack. Based on this evidence, it remains a possibility that the PM Snack on August 29th was cross contaminated during preparation of the lunch, but it is unlikely the PM Snack was the only source of contaminated food because it cannot account for all the cases.

Findings from the Childcare Facility Worker Retrospective Cohort Study further suggest the PM Snack on August 29th was not the major source of contaminated food. This study provided estimates of the association between individual food items on the PM snack menus and becoming a confirmed STEC case (Table 17, Figure 17). The August 29th Regular and Special Menu PM Snack items were identical: maple cinnamon muffins with fresh fruit, and the kitchen staff reported the fresh fruit that day was sliced oranges. The association between eating the muffin and becoming ill was weak and not significant (RR=2.03, 95% CI 0.88-4.67) and the association for the oranges was only very marginally statistically significant (RR=2.29, 95% CI 1.02-5.14). **This combined evidence indicates the contaminated food that led to most of the cases in this outbreak was most likely served during the August 29th lunch, with an unlikely but possible cross-contamination of oranges from the August 29th PM snack.**

Finding #4

A contaminated food item on both the Regular and Special Menus was served during the August 29th lunch.

Evidence that children on the Regular Menu and Special Menu list were exposed to items contaminated with *E. coli* on the same day can be found in the epicurves for these two groups (Figure 14). The single day peak for both the Regular and Special Menu epicurves occurred on the same day (August 31st), which was two days after the August 29th lunch.

According to results from the Childcare Facility Attendee Retrospective Cohort Study, children served the Regular Menu who attended lunch on August 29th were 19 times more likely to develop confirmed STEC than children on the Regular Menu who did not attend that lunch (RR=19.25, 95% CI 7.25-51.06) (Table 13). All but four children on the Regular Menu list who were confirmed cases were in attendance for the August 29th lunch.

Every child on the Special Menu list who became a confirmed STEC case attended lunch on August 29th (Table 14). The corollary is there were no confirmed STEC cases among children on the Special Menu list who did not attend the August 29th lunch.

This combined evidence indicates contaminated food was served with both the Regular and Special Menu meals during the August 29th lunch.

Finding #5

The beef meatloaf served on August 29th was the most likely source of infection for those on the Regular Menu.

The Childcare Facility Worker Retrospective Cohort Study assessed the association between consuming beef meatloaf served for lunch on August 29th and the development of confirmed STEC illness. It indicated that workers who ate beef meatloaf were 23 times more likely to become a confirmed STEC case than workers who did not eat beef meatloaf (RR=23.05, 95% CI 7.39-71.84) (Table 17, Figure 17). This was by far the strongest association between the outcome of interest and any food item on the childcare facility menu for any meal dating back to August 21st.

Eating mashed potatoes (RR=4.21, 95% CI 2.34-7.58) or potato wedges (RR=3.49, 95% CI 1.64-7.43) for lunch on August 29th were also significantly associated with developing confirmed STEC, but the associations were much weaker than for beef meatloaf and these exposures explained many fewer confirmed cases. The associations for

other food items on the August 29th lunchtime Regular Menu were also weak and did not reach statistical significance (RR=2.08 for gravy, 95% CI 0.96-4.53 and RR=2.15 for cucumbers, 95% CI=0.89-5.16.) A multivariable regression analysis found that only the beef meatloaf remained significantly associated with becoming infected with STEC, when adjusting for the effects of the other food items available for lunch (adjusted RR=36.9, 95% CI 9.19-148.09.).

There were no leftover samples of prepared mashed potatoes, gravy, meatloaf, or cucumbers for laboratory testing. There were also no ingredients for the mashed potatoes (frozen mashed potatoes) available for testing. The ingredients from the central kitchen stock for gravy (gravy mix) and fresh cucumbers were sampled and the results were all negative for *E. coli*. Pepper was the only ingredient used in preparing the beef meatloaf that was available for testing and it tested negative for *E. coli*. CFIA undertook traceback / trace forward sampling of ground beef and mirepoix and identified samples from the lots that were most likely used by the kitchen, and these tested negative for *E. coli*. As such, there is no bacteriological confirmation of contamination of any side dishes from the Regular Menu lunch served on August 29th or the beef meatloaf.

Another piece of evidence pointing to the likelihood the beef meatloaf was contaminated is the case investigation findings from two instances where a childcare worker took leftover meatloaf home after it was served for lunch on August 29th. Of the three family members and friends who ate the leftover meatloaf, two ate only the meatloaf and became symptomatic confirmed STEC cases with whole genome sequencing (WGS) profiles that matched other cases in the childcare facilities outbreak. Neither of these cases could be explained by secondary exposure to an infected case. This provides a strong indication that the beef meatloaf was likely contaminated.

There is circumstantial evidence from unlinked STEC cases in the Calgary Zone supporting beef as a source of infection for the Regular Menu meals in this outbreak. This evidence comes from work with partners on the national Outbreak Investigation Coordination Committee (OICC) for Multi-jurisdictional *E. coli* Cluster and the Alberta Foodborne Illness and Risk Investigation Protocol (FIRIP) Coordinating Committee. WGS undertaken by APL-ProvLab on eleven sporadic STEC cases in Alberta between June and September 2023 determined the relatedness of these STEC strains to isolates tested from our childcare facilities outbreak. All eleven of these sporadic cases were investigated and a strong link to likely uninspected beef was discovered for four of them. In one case, a leftover meat sample eaten by a confirmed sporadic case tested positive for *E. coli* O157:H7 with a WGS profile that matched the childcare facility cases. (See Finding #10 for more details.)

The following combined evidence suggests beef meatloaf served on August 29th was the most likely source of infection for those on the Regular Menu:

- **The Childcare Facilities Attendee Retrospective Cohort Study determined that the meal in the childcare facility outbreak most strongly associated with confirmed STEC illness, by a large margin, was lunch on August 29th when the Regular Menu main course had beef as its main ingredient (beef meatloaf).**
- **The Childcare Facilities Worker Retrospective Cohort Study determined that the menu item in the childcare facility outbreak most strongly associated with confirmed STEC illness was the beef meatloaf.**
- **Two confirmed cases occurred when two separate childcare workers brought home leftover food that had been served at a childcare facility and gave it to a family member, in one case, and to friends in the other case. The only leftover food item eaten by both cases was the beef meatloaf and both cases had WGS profiles that matched others in the childcare facility outbreak. Neither of these cases can be explained by exposure to someone who was infectious. Both cases can best be explained by the beef meatloaf being contaminated.**
- **The *E. coli* strain identified from cases in the childcare facility outbreak is genetically linked to an *E. coli* sample from privately purchased beef in Alberta that caused STEC illness in a family member who consumed it. One third of the sporadic STEC cases in Alberta with the same *E. coli***

strain were exposed to privately purchased beef during their incubation period (See Finding #10 for details.)

Finding #6

It is not possible to identify the source of infection for the August 29th Special Menu lunch.

It appears a food item on the August 29th Special Menu lunch was contaminated insomuch as 100% of children on the Special Menu who became STEC confirmed cases were in attendance for lunch on August 29th (42 of 42 cases, 100%) and the peak of the epicurve for cases connected to the Special Menu is consistent with an August 29th exposure (Table 14, Figure 14). Determining which menu item on the Special Menu lunch from that day was likely contaminated has proven challenging.

The Special Menu lunch served on August 29th included vegan loaf, oven ready potato wedges, and cucumbers. While no ingredients used in the preparation of Special Menu items served on August 29th were available for testing, unused potato wedges and cucumbers from the central kitchen freezer / refrigerator tested negative for *E. coli.* CFIA undertook traceback / trace forward using lot codes to trace samples of each product from the vegan loaf that were from the same lots. Plant-based patties, plant-based sausages, and frozen mirepoix mix were traced and samples were tested. They were all negative for *E. coli.*

While the Childcare Facility Attendee Retrospective Cohort Study pointed to the beef meatloaf on the Regular Menu lunch on August 29th as the food item most likely to have been contaminated, only two childcare workers reported having eaten the vegan loaf from the Special Menu (Table 17). There is not enough data regarding vegan loaf consumption by childcare workers to rule in or rule out a likely association between childcare attendees eating vegan meatloaf and developing an STEC infection. Only a relatively weak association was found between eating oven ready potato wedges and developing confirmed STEC infection (RR=3.49, 95% CI 1.64-7.43) and this association became non-significant when added to a multivariable regression model that included beef meatloaf, suggesting the potato wedges were a confounder in that relationship. The Childcare Facility Worker Retrospective Cohort Study found no association between eating cucumbers on August 29th and the likelihood of developing a confirmed STEC infection, although sample sizes were small. But without more information about the cohort of people who ate vegan loaf, a firm conclusion cannot be made about which food item(s) on the Special Menu lunch served on August 29th were contaminated.

Finding #7

It was large mostly because many people were exposed to contaminated food at one time prepared by a central kitchen, not because of secondary transmission.

The STEC outbreak in Calgary Zone childcare facilities resulted in 448 total cases of which 359 were laboratory confirmed. This is the largest gastrointestinal outbreak in AHS history and likely one of the largest STEC outbreaks involving childcare facilities anywhere. The reason the outbreak was so large is primarily because the central kitchen served up to 1,275 attendees and 250 childcare facility workers during the period in question, in addition to exposures to kitchen staff and people in the community who ate leftovers.

Of the 359 laboratory confirmed cases, most (n=326) were primary cases involving people exposed directly to central kitchen food and 33 (9.2%) were secondary cases, meaning they were believed to have contracted the illness through exposure to a primary case. Of these secondary confirmed cases, the majority (n=23 (70.0%)) were among household contacts. The STEC bacteria has a very low infective dose, making control of transmission in household settings particularly challenging, despite best efforts to provide information to support families to reduce risk. Another six confirmed secondary cases occurred in other childcare settings and four occurred in the broader community, meaning the proportion of confirmed cases that were other than primary cases and their household contacts was very low (n=10, 2.8%). **This is testimony to the success of the extensive efforts to control spread.**

Finding #8

E. coli could have been introduced to the central kitchen through one of three mechanisms: 1) through a contaminated ingredient found in ONLY the beef meatloaf or in ONLY the Special Menu Lunch on August 29th; 2) through a contaminated ingredient found in BOTH the beef meatloaf AND the Special Menu Lunch on August 29th; 3) through an infected food handler.

For each mechanism, there are food handling failure points during the preparation/cooking phase and/or the post-cooking phase of lunch preparation on August 29th that could have resulted in both the Regular and Special Menu meals being contaminated. Some failure points (or combinations of failure points) are more likely than others, but none can be ruled out.

Table 21 shows the three mechanisms through which *E. coli* could have been introduced to the central kitchen, and the combination of food handling failure points that would need to have happened to result in contaminated food items being served in both the Regular Menu and Special Menu lunch meals on August 29th.

Table 21

Possible mechanisms of introducing E. coli to the central kitchen, and pathways to contaminating both the Regular Menu and the Special Menu meals

	For Contamination During Each Food Preparation Phase			
	Preparation / Cooking Phase			**Post-Cooking Phase**
Mechanisms of Introduction	**Cross-contamination during meal preparation**	**Inadequate cooking**		**Cooling and portioning**
1) Contaminated ingredient found in ONLY beef meatloaf or ONLY the August 29th Special Menu Lunch	REQUIRED	REQUIRED	And / Or	Contact with contaminated raw ingredient on surface or utensil or via some undercooked product
2) Contaminated ingredient found in beef meatloaf AND the August 29th Special Menu Lunch	Not required	REQUIRED	And / Or	Contact with contaminated raw ingredient on surface or utensil or via some undercooked product
3) Infected food handler	REQUIRED	REQUIRED	And / Or	*Direct* contamination through handling cooled item or *Indirect* contamination through handling surface or utensil

Possible Mechanisms of Introduction

1. **Introduction through a contaminated ingredient found in ONLY the beef meatloaf or ONLY the August 29th Special Menu Lunch**

Ingredient Type 1: an ingredient used in the preparation of only the beef meatloaf served for the Regular Menu lunch on August 29th:

The only ingredient in the beef meatloaf not found in a Special Menu item was ground beef. There were no leftover cooked meatloaves, and none of the raw fresh ground beef used to make them was available for testing. The batch of frozen ground beef sampled from the central kitchen was reportedly not the one used to prepare the meatloaves. CFIA successfully located samples of beef from the same supplier and lot number as federally inspected beef that was received by the kitchen, and these samples tested negative for *E. coli*. Nevertheless, it is not possible to rule out the possibility that contaminated fresh ground beef was received by and used by the kitchen.

If the ground beef that arrived in the kitchen was contaminated, a mechanism is needed to explain how both the Special Menu lunch on August 29th and the beef meatloaf on the Regular Menu lunch that same day were contaminated when served. For both the Regular Menu and Special Menu meals to have become contaminated only during the preparation and cooking phase, cross-contamination was needed between the beef and an ingredient in the Special Menu meal AND both products would need to have been undercooked.

- With the food preparation practices described by the central kitchen management and staff, it is unlikely the contaminated ground beef would have come into direct contact with ingredients from the Special Menu prior to being cooked. The vegan and beef meatloaves were reportedly prepared on different counters and the items remained in their own baking pans before cooking. The same was reportedly true for the Special Menu item 'oven ready potato wedges' that required minimal handling. This account of the separation in time and space in preparing the meat and vegan loaves and potatoes could not be verified by investigators.
- Cross contamination could also have occurred indirectly through shared utensils, equipment, or hands that were in contact with the beef and not washed properly before being in contact with a Special Menu item such as vegan loaf. One kitchen staff member did report preparing both the beef and vegan loaves. Although kitchen staff reported appropriate cleaning of surfaces, utensils, equipment, and hands, the finding of inadequate sanitizer concentration could have provided the opportunity for cross-contamination with items on the Special Menu. Inadequate sanitizer levels may have contributed to cross contamination onto surfaces, utensils, equipment, and hands if indeed the raw beef was contaminated.

- For both the Regular Menu and Special Menu meals to have become contaminated only during the preparation and cooking phase, not only would cross-contamination with the raw beef have been needed, but products on both the Regular Menu and the Special Menu would also need to have been undercooked. (This assumes the cucumbers were unlikely the contaminated item on the Special Menu based on the lack of association with STEC infection in the Childcare Facility Worker Retrospective Cohort Study.)
  - Oven temperature checking was done by AHS investigators to determine the likelihood that if meat and vegan loaves were contaminated prior to cooking, *E. coli* would have survived the cooking process. Results of a trial using chicken pot pies indicated kill temperatures for *E. coli* would likely have been reached if the loaves remained in the ovens long enough. While a kitchen staff member stated in later interviews that a single calibrated probe thermometer was used to test every loaf to ensure they reached a probe

temperature of at least 175° F/79° C, a follow up written response from the kitchen stated the target probe temperature for the loaves was actually "165 degrees Fahrenheit" and "the meatloaf and vegan loaf would not have been removed from the oven until it reached an internal temperature of 165 degrees". Regardless of what actual target probe temperature was set, there were no logs to validate that probe temperatures were ever taken. Furthermore, during the interview, the staff member was not onsite and was thus unable to produce the thermometer used to check the loaves, so the PHI was unable to verify the accuracy of the thermometer. The staff member indicated that the thermometer was stored and calibrated in their home.

- In addition, the measurement of oven temperatures indicated air temperature variability in two ovens resulting in 9° F/5° C differences in probe temperatures for the test items. If *E. coli* was present in loaves placed in cold zones, it may not have been killed during cooking if only one loaf per baking pan was temperature checked, the temperature checked loaf was positioned in the hot zone of the oven, and the probe temperature was at or only slightly above 160° F/71° C. Enough beef meatloaves and product from the Special Menu (vegan loaf or wedge potatoes) would need to have been undercooked to account for the observed attack rates.

- Alternatively, the fully cooked beef meatloaf and items from the Special Menu could have become contaminated during the post-cooking phase after they were cooled and while they were being portioned. This could have occurred if contaminated raw ground beef was not cleaned from a surface or utensil the day before when the meatloaves were being prepared, the *E. coli* were able to incubate overnight, and then the surface or utensil was used again during the final handling and portioning of the products. Again, issues related to the concentration of sanitizer used for surfaces and implements could be relevant in this regard.

- Another post-cooking opportunity for contamination is if even some meatloaves were undercooked, a knife used to slice one that was contaminated could be a vehicle for transferring *E. coli* to other cooked products. Insufficient holding temperatures while awaiting transport, during transportation, and at the childcare facilities could have allowed any *E. coli* to replicate further.

Ingredient Type 2: an ingredient used in the preparation of only the Special Menu lunch served on August 29th:

The ingredients in the Special Menu lunch served on August 29th that were not also included in the Regular Menu lunch were vegan ground round, vegan sausage, and oven ready potato wedges. There was no leftover vegan loaf or cooked potato wedges, but frozen potato wedges from the central kitchen's freezer tested negative for *E. coli.* No vegan ground round or sausage was available from the kitchen for testing. CFIA successfully located samples of vegan hamburger and sausage from the same supplier and lot number as received by the kitchen, and these samples tested negative for *E. coli*. Nevertheless, the possibility that vegan ground round, vegan sausage, or frozen oven-ready potatoes were received by and used by the kitchen cannot be ruled out.

If *E. coli* was introduced to the central kitchen through an ingredient found only in the Special Menu, instead of in the beef, the same mechanisms of contamination described above would need to have occurred to explain how both the Special Menu and the beef meatloaf were contaminated when they were served.

1. **Introduction through a contaminated ingredient found in BOTH the beef meatloaf AND the Special Menu Lunch on August 29th**

   Mirepoix and pepper were the only shared ingredients in the preparation of both the beef and vegan loaves. The pepper from the central kitchen tested negative, but there was no frozen mirepoix available to test. CFIA did traceback and trace forward and located samples of mirepoix from the same brand and lot number that was used by the central kitchen. It tested negative for *E. coli.* Nevertheless, contamination of the mirepoix received by and used by the kitchen cannot be ruled out, especially given that onion is a key ingredient in mirepoix and onions have been implicated in previous STEC outbreaks.

   Cross-contamination is not required to explain how this type of ingredient could have led to contamination of both the Regular menu and Special menu lunch on August 29th. If the mirepoix arrived at the kitchen contaminated, it could have resulted in contaminated beef and vegan loaf if at least some loaves of both types of meatloaf were undercooked. The oven temperature checks described above, and the lack of probe temperature logs made it impossible to rule out the possibility that kill temperatures were not achieved in some batches of beef and vegan loaves.

   If mirepoix was the contaminated ingredient, it is also possible it led to contamination in the post-cooking phase if uncooked mirepoix contaminated a common food contact surface or utensil that later came in contact with cooked beef meatloaf and a Special Meal item. Again, if mirepoix was the mechanism of introduction, low sanitizer concentrations identified as a critical violation during kitchen inspections could be relevant.

2. **Introduction through an infected food handler**

   If *E. coli* was introduced to the central kitchen through an infected food handler, the person(s) could have contaminated the beef meatloaf and the vegan meal before or after the items were cooked.

   Nine of the 11 kitchen staff were STEC positive. Five kitchen staff diagnosed with STEC stated they never developed symptoms and all tested positive after August 29th, including the three kitchen staff who reported having a role in preparing the beef and vegan loaves. It is not possible to know when the asymptomatic individuals became infected. All four symptomatic kitchen staff reported symptom onset dates after August 29th. With this information alone, it is not possible to determine which (if any) kitchen staff acquired an STEC infection outside of work and introduced *E. coli* to the kitchen and which acquired STEC after eating contaminated food prepared for the childcare facilities, or after eating hamburgers made for the kitchen staff on August 28th using raw beef leftover from the preparation of the beef meatloaves. It is also possible one or more of the reportedly asymptomatic STEC positive kitchen staff became STEC infected prior to August 28th by eating a contaminated food item prepared outside the central kitchen.

   STEC infections can result from consuming as few as 15 viable bacteria[19], so an infected food handler can easily contaminate food ingredients or cooking utensils if proper hand hygiene is not maintained. There is no way to confirm whether one of the kitchen staff was already STEC infected at the time the lunches were prepared. But if that were the case, the contamination of the beef meatloaf and an item(s) on the Special Menu lunch for August 29th could have occurred when the infected food handler had direct contact with uncooked ingredients for both menus during food preparation on August 28th. For this to have resulted in contaminated meatloaves and a contaminated item on the Special Menu after cooking, there would need to have been a failure to kill the *E. coli* during the cooking process as described above.

   It is also possible an infected kitchen worker who was not using proper hand hygiene could have contaminated a common food contact surface and/or contaminated the meat and vegan loaves directly while cutting and portioning the baked loaves and/or the oven ready potatoes on August 29th. At least one worker reported being involved in portioning both the beef and vegan loaves. As with all mechanisms described above, this would have been exacerbated if temperatures were not adequately maintained during

transport of the meals to the childcare facilities and/or during the temperature management of food items at the childcare facilities prior to the meals being served.

At this point in the investigation, it is not possible to discern whether *E. coli* was introduced through a contaminated ingredient found in ONLY beef meatloaf and the Special Menu Lunch on August 29th, through a contaminated ingredient found in BOTH the beef meatloaf and the Special Menu lunch on August 29th, or through an STEC infected kitchen worker.

Finding #9

No conclusions can be drawn regarding the reasons for the varying attack rates across the 11 childcare facilities that received food from the central kitchen. The fact that for lunch on August 29th, the childcare facilities with the highest attack rates for children on the Regular Menu were the same three facilities with the highest attack rates for children on the Special Menu suggests contamination most likely occurred in the post-cooking phase.

The range in attack rates among attendees between the 11 childcare facilities that received food from the central kitchen ranged from zero to 47% (Figure 8). Of the seven facilities that experienced primary confirmed cases during the initial incubation period, four had attack rates greater than 20% (designated as high attack rate facilities) and three had attack rates lower than 20% (designated as low attack rate facilities). Explaining the variability in attack rates requires either differential rates of contaminated food items delivered to the childcare facilities, differential ability to store the received food at a safe temperature, and/or differential rates of food consumption by the child attendees and childcare facility workers.

One such explanation for the differing attack rates is that only some meatloaves and vegan meals were contaminated. This could happen with any of the mechanisms of transmission described in Finding #8. The beef meatloaves were prepared in multiple batches, and it is possible that only some of the batches were contaminated before or after cooking. For lunch on August 29th, the three childcare facilities with the highest attack rates for the Regular Menu lunch (A1, A2, & A3) were the same three facilities that had the highest attack rates for the Special Menu lunch (Table 13, Table 14). This would suggest contamination most likely occurred in the post-cooking phase. If contamination occurred during preparation or the cooking phase, one would expect a more random distribution of childcare facilities affected between the Regular Menu group and the Special Menu group, knowing that Regular Menu and Special Menu items were not prepared and cooked together in batches according to childcare facility.

There is uncertainty about whether transport times and methods used to maintain temperature during transport could be a factor in explaining different attack rates. As described earlier, the central kitchen had two powered insulated units and each of the two delivery trucks used one of these units. They were reportedly used to transport hot meals to childcare facilities that were more than one hour away from the central kitchen. If heated to 70° C and if opened only once for placement of the hotel trays at the central kitchen and once again for removal at the childcare facility, then it would be probable that some of the *E. coli* present in contaminated food items transported in these powered units would be killed. However, these units are designed to maintain heat in food, not necessarily heat it up. Assuming cooked menu items were allowed to cool to a temperature that permitted handling, cutting, and portioning, and that cutting hot foods into smaller pieces augmented the cooling process, these powered units may not be expected to get food back up to a safe hot temperature. The unpowered units cannot raise the temperature beyond what it was when the food was handled, portioned and then placed in the unit. The temperature at which the food was placed in the units would be critical for understanding the likelihood of bacterial replication during transportation, and that information is not available.

The last childcare facility on the South delivery route had a high attack rate (47%). The last childcare facility on the North delivery route on August 29th had a low attack rate (5%) while the attack rate for the first childcare facility on the North delivery route was the highest for all childcare facilities on that route (43%). Transport time for meals cannot by itself explain the differential attack rates seen between childcare facilities.

Temperature logs at the childcare facilities were frequently not kept or they provided no evidence as to whether there were deficiencies in maintaining temperatures during transport. It is also unknown whether the methods used to maintain food temperatures following delivery and prior to serving lunch were adequate. It is possible that some childcare facilities were better able to maintain temperatures than others, such that the *E. coli* were either more effectively killed at some sites, or more effectively replicating at others after arrival.

Follow-up interviews with the childcare facility operators provided some partial explanations for observed differences in attack rates. Childcare facility B1, which had no cases, reported receiving chicken rather than meatloaves for the August 29th lunch. Childcare facility A6, which had a low attack rate, reported that very few child attendees ate the meatloaves because they tended to prefer non-western food and often brought large AM Snacks from home, which made them less hungry at lunch. These differing rates of child consumption based on the food delivered and individual food preferences could explain some of the variability in attack rates. However, there was also an operator from one high attack rate facility who reported that few children ate the meatloaf, and there was an operator from a low attack rate facility who reported the meatloaf was popular and widely consumed. Information provided by the childcare facility operators was anecdotal and could not be confirmed and could not explain all the observed variation in attack rates.

Efforts were also made to determine whether differences between low attack rate and high attack rate childcare facilities could be explained based on characteristics that could indicate differences in food consumption. Age, sex, and proportion of attendees on the Regular Menu versus the Special Menu were explored and none of these characteristics were significantly associated with attack rate category (Table 11).

There was insufficient evidence to suggest variability in attack rates could be explained by differential rates of contaminated food items delivered to the childcare facilities, differential ability to store the received food at a safe temperature, or differential rates of food consumption by the child attendees and childcare facility workers. The fact that for lunch on August 29th, the three childcare facilities with the highest attack rates for children on the Regular Menu were the same three facilities with the highest attack rates for children on the Special Menu suggests contamination most likely occurred in the post-cooking phase.

Finding #10:

One or more source(s) of suspected privately sold beef with a Shiga toxin-producing *E. coli* strain was being distributed in Alberta that was a genetic match by whole genome sequencing (WGS within 10 alleles) to the *E. coli* strain that caused the STEC outbreak in Calgary childcare facilities.

Four of 11 sporadic STEC cases in Alberta with the same WGS profile have been linked to suspected private beef sales, and a sample of beef that caused at least one and likely two clinical STEC cases tested positive for *E. coli* with matching WGS profile. The source of the beef has not yet been determined.

A beef-based menu item (meatloaf) is one of the most likely contaminated items contributing to the childcare facility outbreak, but no conclusion can be drawn at this time regarding the connection between the childcare facility outbreak and the 11 Alberta *E. coli* cases and five *E. coli* cases in another province that shared the same WGS pattern.

As stated in the FIRIP section of this report, the Alberta investigation into the 11 STEC cases that were part of the national cluster was focused on two families that had STEC cases with WGS profiles matching within 10 alleles of the profile associated with the childcare facility outbreak. Two families each had two cases in the cluster, and both had reported purchasing and consuming beef from a private supplier. One family had a leftover sample of the beef that tested positive for *E. coli* with a genetic match to cases from the childcare outbreak. The second family responded to a local advertisement and informed Public Health Inspectors that they had arranged purchase of beef and pick up at a Calgary home. Subsequent investigations garnered evidence suggesting that uninspected beef, with no evidence available of proper temperature control, was being sold to the public

through the private home. The operation was closed through an Executive Officer Closure Order under the *Public Health Act*. The farm from which the beef was sourced has not yet been determined.

From Finding #8, it was concluded there are three possible mechanisms by which *E. coli* was introduced to the central kitchen leading to the childcare facility outbreak:

- through a contaminated ingredient found in ONLY beef meatloaf and the Special Menu Lunch on August 29th,
- through a contaminated ingredient found in BOTH the beef meatloaf and the Special Menu lunch on August 29th; or
- through an STEC infected food handler.

Given what is known about the existence of contaminated beef in the community with the same WGS profile, if *E. coli* was introduced to the central kitchen through a contaminated ingredient, it was most likely beef. And if *E. coli* was introduced to the central kitchen through an STEC infected food handler, it is most likely that the food handler acquired their STEC infection eating a food item contaminated with STEC with the same WGS profile but that was prepared outside the central kitchen. None of the kitchen staff, however, reported purchasing meat from any source other than retail grocery chains and none reported having visited a farm or having any contact with farm animals. At this point in time, it is not possible to confirm the connection between the sporadic STEC cases in the community linked to suspected private sales of beef and the childcare facility outbreak cases that had the same WGS profile.

Appendix 1: Central Kitchen Menu Items

(August 16th-31st, 2023)

FV = Fresh Vegetables | FF = Fresh Fruit

Date	Regular Breakfast Menu	Special Breakfast Menu
16th	Spiced Peach Oatmeal	Spiced Peach Oatmeal
17th	Berry Smoothie with Cookie	Berry Smoothie with Vanilla Wafer
18th	Mini Quiche with Fresh Fruit	Mini Quiche with Fresh Fruit
21st	Whole Grain Cereal with Fresh Fruit	Variety Cereal with Fresh Fruit
22nd	Blueberry Yogurt with Fresh Fruit	Blueberry Yogurt with Fresh Fruit
23rd	Watermelon Smoothie with Crackers and Fresh Fruit	Watermelon Smoothie with Crackers and Fresh Fruit
24th	Turkey Sausage with Hashbrowns	Vegan Turkey Sausage with Hashbrowns
25th	Pancakes with Strawberry and Fresh Cream	Gluten Free Pancakes with Strawberry and Dairy Free Cream
28th	Whole Grain Cereal with Fresh Fruit	Variety Cereal with Fresh Fruit
29th	Acai Breakfast Bowl with Fresh Fruit	Dairy Free Vanilla Yogurt with Gluten Free Granola and Fresh Fruit
30th	Strawberry Banana Smoothie with Cookie and Fresh Fruit	Strawberry Banana Smoothie with Vanilla Wafer and Fresh Fruit
31st	Scrambled Eggs with Hashbrowns	Vegan Eggs with Hashbrowns

Date	Regular AM Snack Menu	Special AM Snack Menu
16th	Tropical Burst Muffin	Tropical Burst Muffin
17th	Blueberry Applesauce with Graham Crackers	Blueberry Applesauce with Graham Crackers
18th	Banana Bread with Fresh Fruit	Banana Bread with Fresh Fruit
21st	Applesauce with Digestive cookie	Applesauce with Digestive cookie
22nd	Cheese Scones and Fresh Fruit	Cheese Scones and Fresh Fruit
23rd	Chocolate Pudding and Fresh Fruit	Chocolate Pudding and Fresh Fruit
24th	Smoothie bowl and Fresh Fruit	Smoothie bowl and Fresh Fruit
25th	Coconut Cream Tart and Fresh Fruit	Coconut Cream Tart and Fresh Fruit
28th	Cheese with Crackers	Dairy Free Cheese with Rice Crackers
29th	Honeydew Lassi with Vanilla Biscuit	Honeydew Lassi with Vanilla Wafer
30th	Vanilla Orange Muffin	Vanilla Orange Muffin
31st	Vegan Banana Pudding	Vegan Banana Pudding

Date	Regular Lunch Menu	Special Lunch Menu
16th	Macaroni with Cheese with fresh vegetables	Gluten and Dairy Free Mac and Cheese with FV
17th	Turkey and Swiss Sandwich and FV	Veggie Sandwich
18th	Karaage Chicken and Potato Wedges with Ketchup	Vegan Nuggets and Potato Wedges with Ketchup
21st	Teriyaki Meatballs with Rice with FV	Vegan Meatballs with Rice with FV
22nd	Chicken Quesadilla with FV	Vegan Quesadilla with FV
23rd	Butter Chicken with Rice with FV	Vegan Butter Chicken with Rice with FV
24th	Lazy Chef Lasagna with FV	Lazy Chef Lasagna with FV
25th	Fish Sticks with Potato Wedges & Ketchup	Tofu Sticks with Potato Wedges
28th	Chicken Stir Fry with Rice	Vegan Chicken Stir Fry with Rice
29th	Meatloaf with Mashed Potatoes and Gravy with FV	Vegan loaf with Mashed Potatoes and Gravy with FV
30th	Chicken Pasta Alfredo with FV	Vegan Chicken Alfredo with FV
31st	Vegan Dan Dan with FV	Vegan Dan Dan with FV

Date	Regular PM Snack Menu	Special PM Snack Menu
16th	Oatmeal Power Balls with Yogurt	Gluten Free Oatmeal Balls and Strawberry Yogurt
17th	Hummus with Crackers	Cheese and Crackers with FF
18th	Chocolate Chip Muffin with FF	Chocolate Chip Muffin with FF
21st	Meat Cheese & Crackers	Vegan Meat Cheese & Crackers
22nd	Strawberry Muffins with FF	Strawberry Muffins with FF
23rd	Wow Butter Blossom with FF	Wow Butter Blossom with FF
24th	Fruit Tart with FF	Fruit Tart with FF
25th	Haystack Drops with FF	Haystack Drops with FF
28th	Blueberry Muffin with FF	Blueberry Muffin with FF
29th	Maple Cinnamon Muffin with FF	Maple Cinnamon Muffin with FF
30th	Naan Bites with Yogurt with FF	Naan with Yogurt with FF
31st	Vanilla Squares with FF	Vanilla Squares with FF

Appendix 2: Central Kitchen Environmental Health Online Inspection Reports

(Fueling Brains Academy Centennial – Food from July 27th, 2021 to September 5th, 2023)

Environmental Health inspection reports that were posted online for Fueling Brains Academy Centennial – Food are presented below for the period July 27th, 2021 to September 5th, 2023. Reports for all food facility inspections are available online for three years from the date of inspection. These reports include details of violations (unsafe conditions or practices) found during the inspection and whether the violation was corrected during the inspection. These reports do not include details of conditions or practices that were already safe at the time of inspection. More information about the inspection disclosure process is available on the AHS website: Inspection Disclosure Details | Alberta Health Services.

VIOLATIONS NOTED DURING INSPECTION **Jul 27, 2021**

Category	Violation	Critical	Status	Comments
Dishwashing (Critical)	Dishwasher is leaking large amounts of water. Two cycles ran with 63C and 71C achieved in rinse cycle. Ensure dishwasher is repaired or replaced. Ensure each cycle is meeting 71C. Test every cycle or hand sanitize if dishwasher is not reaching adequate temperatures. A tech is coming to assess the dishwasher next week.	Yes	Not In Compliance	The mechanical dishwashing equipment is not adequately cleaning and sanitizing utensils. A commercial food establishment must have all the facilities, equipment and utensils that are necessary to ensure its safe operation and maintenance and all equipment and utensils in it and all surfaces in it with which food comes into contact must be maintained in a sanitary condition and, without limiting the foregoing, must be washed and sanitized in a manner that removes contamination. AR 31/2006 s 28(1) &(2)
Housekeeping	There is a build up of dust in the canopy grills. Ensure these are cleaned.	No	Not In Compliance	The indicated areas are not being kept clean and sanitary. A commercial food establishment, all equipment and utensils in it and all surfaces in it in which food comes into contact must be maintained in a sanitary condition and, without limiting the foregoing, must be washed and sanitized in a manner that removes contamination. AR 31/2006 s 28(2)
Utensil / Equipment Storage and Condition	The plastic cover for one of the rolling racks is taped and has holes in it. Ensure this is discarded as tap is not easily cleanable.	No	Not In Compliance	The indicated food equipment is not in good repair or is not in proper working order. All equipment and utensils in a food establishment must be kept in good working order and condition and maintained in a manner that ensures the safe and sanitary handling of food. AR 31/2006 s 28(3)

VIOLATIONS NOTED DURING INSPECTION **Aug 09, 2021**

Category	Violation	Critical	Status	Comments
Dishwashing (Critical)	Dishwasher is still not reaching adequate sanitization temperatures. 3 cycles were ran with all 3 cycles reaching 58C. Due to lack of consistency ensure dishes are hand sanitize. Dishwasher can be used to for the wash portion.	Yes	Not In Compliance	The mechanical dishwashing equipment is not adequately cleaning and sanitizing utensils. A commercial food establishment must have all the facilities, equipment and utensils that are necessary to ensure its safe operation and maintenance and all equipment and utensils in it and all surfaces in it with which food comes into contact must be maintained in a sanitary condition and, without limiting the foregoing, must be washed and sanitized in a manner that removes contamination. AR 31/2006 s 28(1) &(2)

VIOLATIONS NOTED DURING INSPECTION **Aug 17, 2021**

Category	Violation	Critical	Status	Comments
	No Violations Reported			

VIOLATIONS NOTED DURING INSPECTION **Feb 04, 2022**

Category	Violation	Critical	Status	Comments
Dishwashing (Non-Critical)	There were no test strips available inside the kitchen to monitor the dishwasher or sanitizing solutions. ** Purchase test strips and have them readily available inside the kitchen for staff use.	No	Not In Compliance	Chemical testing equipment is not available for measuring sanitizing agent concentrations and/or an adequate thermometer is not available for measuring water temperatures. A commercial food establishment must have all the facilities, equipment and utensils that are necessary to ensure its safe operation and maintenance and all equipment and utensils in it and all surfaces in it with which food comes into contact must be maintained in a sanitary condition and, without limiting the foregoing, must be washed and sanitized in a manner that removes contamination. AR 31/2006 s 28(1) &(2)
Equipment Sanitation	The small kitchen aid machine and the large commercial mixer beside it appears as though it was being neglected from proper cleaning/sanitizing in certain areas. Though the mixer bowl appeared to be properly cleaned/sanitized, there is a build up of old food debris and staining noted along the backsplash guard of the machines. ** Please make sure that these areas are properly being cleaned/sanitized as well.	Yes	Not In Compliance	Equipment and food contact surfaces are not being cleaned and sanitized properly. A commercial food establishment, all equipment and utensils in it and all surfaces in it with which food comes into contact must be maintained in a sanitary condition and, without limiting the foregoing, must be washed and sanitized in a manner that removes contamination. AR 31/2006 s 28(2)
Food Protection (Non-Critical)	1. Staff aprons and hats were being stored on the shelf in the back storage area and making direct contact with food and other food related items. ** Please store staff personal items in a designated area that is separate from food / food handling areas. 2. There was a staff apron being stored inside one of the cooking pots in the kitchen. ** Please store staff aprons in a designated area that is separate from food/ food handling areas. Take the pot and sanitize it before use.	No	Not In Compliance	Articles not associated with food processing, preparation, handling, serving, or storage are stored with food. All articles and materials in a commercial food establishment that are not associated with or required for the operation or maintenance of the food areas must be stored separately from the food and the food areas and in a manner that contaminates neither. AR 31/2006 s 20(1)
Hand Sinks	The paper towel dispenser on the wall near the kitchen door/ middle hand sink by the dish pit was being blocked by large food warmers and large containers. ** Please relocate the food warmers/ large containers to another location as this blocks staff access to the dispenser. Alternatively, you can relocate the paper towel dispenser to another location that makes it easy for staff access and is not too far from the hand sink.	Yes	Not In Compliance	Handwash facilities are inadequate in number and/or location. An operator must ensure that a commercial food establishment has handwashing stations, adequate in number and location, to ensure convenient access to all food handlers. AR 31/2006 s 17(1)(e)
Utensil / Equipment Storage and Condition	1. There was a large bin of flour that had a container with no handle being used for portioning out the bulk ingredient. The entire container was submerged in the flour. ** Please purchase a proper scoop with a handle to be used for removing bulk products. The handle of the scoop should be stored upwards (not touching the bulk ingredients) or in another clean container outside the bulk ingredient. 2. There were clean utensils being stored in bins that had an accumulation of old food debris. ** Store clean utensils in a clean bin to reduce the likelihood of possible contamination. 3. A large bin of brown sugar was stored directly on the floor in the back storage area. ** Please relocate this bin to the shelving units. Keep all food and food related items stored up off the ground at least 6 inches to facilitate cleaning in addition to reducing the liklihood of contamination. 4. Take out containers were being stored directly on the floor in the back storage area. ** Please relocate these boxes of take out containers up off the ground at least 6 inches to facilitate cleaning and reducing the liklihood of contamination.	No	Not In Compliance	Dishes / utensils are being stored in an improper manner. All equipment and utensils in a food establishment must be kept in good working order and condition and maintained in a manner that ensures the safe and sanitary handling of food. AR 31/2006 s 28(3)

VIOLATIONS NOTED DURING INSPECTION **Oct 25, 2022**

Category	Violation	Critical	Status	Comments
Dishwashing (Critical)	VIOLATION: 1. The chemical dishwasher was in disrepair. The dishes were soapy when dishwashing was completed. 2. The dishwasher was not sanitizing adequately (chlorine concentration measured at 0 ppm). Please do the following: 1. Perform manual dish washing until the dishwasher is repaired and sanitizing adequately. 2. Record chlorine concentration during sanitizing cycle of dishwashing daily in the log book.	Yes	Not In Compliance	The mechanical dishwashing equipment is not adequately cleaning and sanitizing utensils. A commercial food establishment must have all the facilities, equipment and utensils that are necessary to ensure its safe operation and maintenance and all equipment and utensils in it and all surfaces in it with which food comes into contact must be maintained in a sanitary condition and, without limiting the foregoing, must be washed and sanitized in a manner that removes contamination. AR 31/2006 s 28(1) &(2)
Dishwashing (Non-Critical)	REPEAT VIOLATION:: QUAT test strips were not available inside the kitchen to monitor the sanitizing solution. ** Purchase test strips and have them readily available inside the kitchen for staff use.	No	Not In Compliance	Chemical testing equipment is not available for measuring sanitizing agent concentrations and/or an adequate thermometer is not available for measuring water temperatures. A commercial food establishment must have all the facilities, equipment and utensils that are necessary to ensure its safe operation and maintenance and all equipment and utensils in it and all surfaces in it with which food comes into contact must be maintained in a sanitary condition and, without limiting the foregoing, must be washed and sanitized in a manner that removes contamination. AR 31/2006 s 28(1) &(2)
Equipment Sanitation	REPEAT VIOLATION: The small kitchen aid machine and the large commercial mixer beside it appears as though it was being neglected from proper cleaning/sanitizing in certain areas. Though the mixer bowl appeared to be properly cleaned/sanitized, there is a build up of old food debris and staining noted along the backsplash guard of the machines. Please make sure that these areas are properly being cleaned/sanitized as well.	Yes	Not In Compliance	Equipment and food contact surfaces are not being cleaned and sanitized properly. A commercial food establishment, all equipment and utensils in it and all surfaces in it with which food comes into contact must be maintained in a sanitary condition and, without limiting the foregoing, must be washed and sanitized in a manner that removes contamination. AR 31/2006 s 28(2)
Food Protection (Non-Critical)	REPEAT VIOLATION: 1. Staff aprons and hats were being stored on the shelf in the back storage area and making direct contact with food and other food related items. ** Please store staff personal items in a designated area that is separate from food / food handling areas.	No	Not In Compliance	Articles not associated with food processing, preparation, handling, serving, or storage are stored with food. All articles and materials in a commercial food establishment that are not associated with or required for the operation or maintenance of the food areas must be stored separately from the food and the food areas and in a manner that contaminates neither. AR 31/2006 s 20(1)
Utensil / Equipment Storage and Condition	REPEAT VIOLATION: 1. There was a large bin of flour that had a container with no handle being used for portioning out the bulk ingredient. The entire container was submerged in the flour. ** Please purchase a proper scoop with a handle to be used for removing bulk products. The handle of the scoop should be stored upwards (not touching the bulk ingredients) or in another clean container outside the bulk ingredient. 2. There were clean utensils being stored in bins that had an accumulation of old food debris. ** Store clean utensils in a clean bin to reduce the likelihood of possible contamination.	No	Not In Compliance	Dishes / utensils are being stored in an improper manner. All equipment and utensils in a food establishment must be kept in good working order and condition and maintained in a manner that ensures the safe and sanitary handling of food. AR 31/2006 s 28(3)

VIOLATIONS NOTED DURING INSPECTION **Oct 26, 2022**

Category	Violation	Critical	Status	Comments
Dishwashing (Non-Critical)	REPEAT VIOLATION:: QUAT test strips were not available inside the kitchen to monitor the sanitizing solution. ** Purchase test strips and have them readily available inside the kitchen for staff use.	No	Not In Compliance	Chemical testing equipment is not available for measuring sanitizing agent concentrations and/or an adequate thermometer is not available for measuring water temperatures. A commercial food establishment must have all the facilities, equipment and utensils that are necessary to ensure its safe operation and maintenance and all equipment and utensils in it and all surfaces in it with which food comes into contact must be maintained in a sanitary condition and, without limiting the foregoing, must be washed and sanitized in a manner that removes contamination. AR 31/2006 s 28(1) &(2)
Equipment Sanitation	REPEAT VIOLATION: The small kitchen aid machine and the large commercial mixer beside it appears as though it was being neglected from proper cleaning/sanitizing in certain areas. Though the mixer bowl appeared to be properly cleaned/sanitized, there is a build up of old food debris and staining noted along the backsplash guard of the machines. Please make sure that these areas are properly being cleaned/sanitized as well.	Yes	Not In Compliance	Equipment and food contact surfaces are not being cleaned and sanitized properly. A commercial food establishment, all equipment and utensils in it and all surfaces in it with which food comes into contact must be maintained in a sanitary condition and, without limiting the foregoing, must be washed and sanitized in a manner that removes contamination. AR 31/2006 s 28(2)
Food Protection (Non-Critical)	REPEAT VIOLATION: 1. Staff aprons and hats were being stored on the shelf in the back storage area and making direct contact with food and other food related items. ** Please store staff personal items in a designated area that is separate from food / food handling areas.	No	Not In Compliance	Articles not associated with food processing, preparation, handling, serving, or storage are stored with food. All articles and materials in a commercial food establishment that are not associated with or required for the operation or maintenance of the food areas must be stored separately from the food and the food areas and in a manner that contaminates neither. AR 31/2006 s 20(1)
Utensil / Equipment Storage and Condition	REPEAT VIOLATION: 1. There was a large bin of flour that had a container with no handle being used for portioning out the bulk ingredient. The entire container was submerged in the flour. ** Please purchase a proper scoop with a handle to be used for removing bulk products. The handle of the scoop should be stored upwards (not touching the bulk ingredients) or in another clean container outside the bulk ingredient. 2. There were clean utensils being stored in bins that had an accumulation of old food debris. ** Store clean utensils in a clean bin to reduce the likelihood of possible contamination.	No	Not In Compliance	Dishes / utensils are being stored in an improper manner. All equipment and utensils in a food establishment must be kept in good working order and condition and maintained in a manner that ensures the safe and sanitary handling of food. AR 31/2006 s 28(3)

VIOLATIONS NOTED DURING INSPECTION **Jan 25, 2023**

Category	Violation	Critical	Status	Comments
Dishwashing (Critical)	The dishwasher was not sanitizing adequately (chlorine concentration measured at 0 ppm). Please do the following: 1. Perform manual dish washing until the dishwasher is repaired and sanitizing adequately. 2. Record chlorine concentration during sanitizing cycle of dishwashing daily in the log book.	Yes	Not In Compliance	The mechanical dishwashing equipment is not adequately cleaning and sanitizing utensils. A commercial food establishment must have all the facilities, equipment and utensils that are necessary to ensure its safe operation and maintenance and all equipment and utensils in it and all surfaces in it with which food comes into contact must be maintained in a sanitary condition and, without limiting the foregoing, must be washed and sanitized in a manner that removes contamination. AR 31/2006 s 28(1) &(2)
Equipment Sanitation	REPEAT VIOLATION: The small kitchen aid machine and the large commercial mixer beside it appears as though it was being neglected from proper cleaning/sanitizing in certain areas. Though the mixer bowl appeared to be properly cleaned/sanitized, there is a build up of old food debris and staining noted along the backsplash guard of the machines. Please make sure that these areas are properly being cleaned/sanitized as well.	Yes	Not In Compliance	Equipment and food contact surfaces are not being cleaned and sanitized properly. A commercial food establishment, all equipment and utensils in it and all surfaces in it with which food comes into contact must be maintained in a sanitary condition and, without limiting the foregoing, must be washed and sanitized in a manner that removes contamination. AR 31/2006 s 28(2)
Equipment Sanitation	The sanitizer solution (QUAT) in the sanitizing bucket was measured at 400 ppm. Please use your test strips to ensure that the QUAT sanitizer is 200 ppm.	Yes	Not In Compliance	Solutions used for sanitizing equipment and utensils in this food establishment are not appropriate or are not maintained at adequate concentrations. A commercial food establishment, all equipment and utensils in it and all surfaces in it with which food comes into contact must be maintained in a sanitary condition and, without limiting the foregoing, must be washed and sanitized in a manner that removes contamination. AR 31/2006 s 28(2)
Food Protection (Critical)	Dirty oven mitts were stored on top of the clean food liners above the stove. Please store the food liners in a sanitary manner.	Yes	Not In Compliance	Food in this food establishment is not being protected from contamination during storage or handling. All food used or to be used in a commercial food establishment must be protected from contamination and handled in a sanitary manner. AR 31/2006 s 23(1)
Housekeeping	1. Cleaning schedule was not available for review. Please ensure cleaning schedule is available for review. 2. Poor sanitation was noted underneath the dishpit area. Please clean and sanitize thoroughly.	No	Not In Compliance	The indicated areas are not being kept clean and sanitary. A commercial food establishment, all equipment and utensils in it and all surfaces in it in which food comes into contact must be maintained in a sanitary condition and, without limiting the foregoing, must be washed and sanitized in a manner that removes contamination. AR 31/2006 s 28(2) Written sanitation procedures and/or records are not available or are not complete. A commercial food establishment must have written procedures designed to ensure its safe and sanitary operation and maintenance. The procedures must include the cleaning and sanitizing requirements the food establishment and all equipment and utensils in it and a list of all cleaning and sanitizing agents used including their concentrations and uses. AR 31/2006 s 29 The indicated areas are not being kept well organized to allow for proper cleaning and pest control. A commercial food establishment, all equipment and utensils in it and all surfaces in it in which food comes into contact must be maintained in a sanitary condition and, without limiting the foregoing, must be washed and sanitized in a manner that removes contamination. AR 31/2006 s 28(2)
Nuisance (Critical)	Food particles were observed in the hand sink. Please ensure hand sink is used for handwashing purposes only.	Yes	Not In Compliance	A practice or condition at this food establishment is creating a nuisance. No person shall create, commit or maintain a nuisance. AR 243/2003 s 2(1)
Nuisance (Non-Critical)	Dry cleaning cloth is stored underneath the dirty dish area. Please store the clean cloth in a clean area to prevent contamination.	No	Not In Compliance	A practice or condition at this food establishment is creating a nuisance. No person shall create, commit or maintain a nuisance. AR 243/2003 s 2(1)
Permit	The posted Food Handling Permit is expired. Please obtain and post a valid Food Handling Permit.	No	Not In Compliance	The food establishment was found to be operating without a valid Permit. No person shall operate a food establishment unless the person holds a valid and subsisting permit for the operation of a food establishment. AR 31/2006 s 3(1)
Personnel Health / Hygiene	Used glove was seen on the shelf above the counter. Please discard the single use glove immideatley after use.	Yes	Corrected During Inspection	Operators and/or employees are failing to use gloves safely and at appropriate times when handling food. All food used or to be used in a commercial food establishment must be protected from contamination and handled in a sanitary manner and all food processing must be done in a manner that makes the food safe to eat. AR 31/2006 s 23(1) & 24
Utensil / Equipment Storage and Condition	1. The refrigerator by the dish area and the food warmers are visibly dirty. Please clean and sanitize thoroughly.	No	Not In Compliance	Dishes / utensils are being stored in an improper manner. All equipment and utensils in a food establishment must be kept in good working order and condition and maintained in a manner that ensures the safe and sanitary handling of food. AR 31/2006 s 28(3)

VIOLATIONS NOTED DURING INSPECTION **Jan 26, 2023**

Category	Violation	Critical	Status	Comments
Dishwashing (Critical)	The dishwasher was not sanitizing adequately (chlorine concentration measured at 0 ppm). Please do the following: 1. Perform manual dish washing until the dishwasher is repaired and sanitizing adequately. 2. Record chlorine concentration during sanitizing cycle of dishwashing daily in the log book.	Yes	Not In Compliance	The mechanical dishwashing equipment is not adequately cleaning and sanitizing utensils. A commercial food establishment must have all the facilities, equipment and utensils that are necessary to ensure its safe operation and maintenance and all equipment and utensils in it and all surfaces in it with which food comes into contact must be maintained in a sanitary condition and, without limiting the foregoing, must be washed and sanitized in a manner that removes contamination. AR 31/2006 s 28(1) &(2)
Permit	The posted Food Handling Permit is expired. Please obtain and post a valid Food Handling Permit.	No	Not In Compliance	The food establishment was found to be operating without a valid Permit. No person shall operate a food establishment unless the person holds a valid and subsisting permit for the operation of a food establishment. AR 31/2006 s 3(1)

VIOLATIONS NOTED DURING INSPECTION **Feb 23, 2023**

Category	Violation	Critical	Status	Comments
Equipment Sanitation	Wet cleaning cloths were stored on counter tops and not in the sanitizing solution as required when not in use. Please ensure that the wet used cleaning cloths are stored in approved sanitizing solution when not in use to prevent contamination.	Yes	Corrected During Inspection	Contaminated cleaning cloths and/or sponges are used. A commercial food establishment, all equipment and utensils in it and all surfaces in it with which food comes into contact must be maintained in a sanitary condition and, without limiting the foregoing, must be washed and sanitized in a manner that removes contamination. AR 31/2006 s 28(2)
Nuisance (Critical)	Trays were stored and food particles were observed in the hand sink. Please ensure hand sink is used for handwashing purposes only.	Yes	Corrected During Inspection	A practice or condition at this food establishment is creating a nuisance. No person shall create, commit or maintain a nuisance. AR 243/2003 s 2(1)
Nuisance (Non-Critical)	One of the carts in the dish pit area was cracked. Please replace.	No	Not In Compliance	A practice or condition at this food establishment is creating a nuisance. No person shall create, commit or maintain a nuisance. AR 243/2003 s 2(1)
Permit	The posted Food Handling Permit is expired. Please obtain and post a valid Food Handling Permit.	No	Not In Compliance	The food establishment was found to be operating without a valid Permit. No person shall operate a food establishment unless the person holds a valid and subsisting permit for the operation of a food establishment. AR 31/2006 s 3(1)

VIOLATIONS NOTED DURING INSPECTION **Apr 26, 2023**

Category	Violation	Critical	Status	Comments
Equipment Sanitation	VIOLATION: 1. QUAT sanitizer measured 0 ppm. - Solution was discarded and remade. Ensure to maintain the solution between 200 - 400 ppm. 2. The sanitizer wiping cloth appeared severely stained. - Removed. Ensure wiping cloths are regularly laundered. Obtain new wiping cloths if necessary.	Yes	Corrected During Inspection	Solutions used for sanitizing equipment and utensils in this food establishment are not appropriate or are not maintained at adequate concentrations. A commercial food establishment, all equipment and utensils in it and all surfaces in it with which food comes into contact must be maintained in a sanitary condition and, without limiting the foregoing, must be washed and sanitized in a manner that removes contamination. AR 31/2006 s 28(2) Contaminated cleaning cloths and/or sponges are used. A commercial food establishment, all equipment and utensils in it and all surfaces in it with which food comes into contact must be maintained in a sanitary condition and, without limiting the foregoing, must be washed and sanitized in a manner that removes contamination. AR 31/2006 s 28(2)
Utensil / Equipment Storage and Condition	VIOLATION: 1. The coating on the flat beater of the countertop stand mixer was in poor condition. The coating was severely chipped and may physically contaminate food. - Removed. Ensure food equipment are maintained in good working order.	No	Corrected During Inspection	The indicated food equipment is not in good repair or is not in proper working order. All equipment and utensils in a food establishment must be kept in good working order and condition and maintained in a manner that ensures the safe and sanitary handling of food. AR 31/2006 s 28(3)

VIOLATIONS NOTED DURING INSPECTION **Sep 04, 2023**

Category	Violation	Critical	Status	Comments
	No Violations Reported			

VIOLATIONS NOTED DURING INSPECTION **Sep 05, 2023**

Category	Violation	Critical	Status	Comments
Equipment Sanitation	Manual quat dispenser produced 0 ppm when poured into bucket. -Operator repaired dispenser during inspection -Ensure dispensers are tested daily	Yes	Corrected During Inspection	Solutions used for sanitizing equipment and utensils in this food establishment are not appropriate or are not maintained at adequate concentrations. A commercial food establishment, all equipment and utensils in it and all surfaces in it with which food comes into contact must be maintained in a sanitary condition and, without limiting the foregoing, must be washed and sanitized in a manner that removes contamination. AR 31/2006 s 28(2)
Food Handling	Operator indicated that cold foods were being transported to other locations in excess of 90 minutes without temperature control. Appropriate equipment for keeping food cold during transportation was not available. -Food must be maintained below 4C or above 60C during transport	Yes	Not In Compliance	Food was not being handled in a manner that makes it safe to eat. All food processing must be done in a manner that makes the food safe to eat. AR 31/2006 s 24
Nuisance (Non-Critical)	A sewer gas smell was noted near the two-compartment sink in the food preparation area. -Investigate the source of the sewer odour and abate it -Provide previous receipts and invoices explaining dates of cleaning and what was done	No	Not In Compliance	A practice or condition at this food establishment is creating a nuisance. No person shall create, commit or maintain a nuisance. AR 243/2003 s 2(1)
Pest Control (Critical)	Two live adult cockroaches were observed on the sides of stainless steel equipment around the dishwashing area. The tin cat traps by the two separate two-compartment sinks had at least 20 cockroaches on the sticky pads each. -Provide a pest control report demonstrating further treatments have been completed and that the infestation has been abated -Ensure pest control plan includes preventative measures for preventing spread of cockroaches into daycare The pest control reports dated for the months of June, July, and August 2023 did not mention: -Exact date service was offered -Which monitors had activity -Where baits were applied -Brand and amount of chemical applied -Appropriate recommendations for abating infestation	Yes	Not In Compliance	Significant evidence of a pest infestation was found at this food establishment. The commercial food establishment and any surrounding area, premises or facilities supporting the food establishment must be kept free of pests and of conditions that lead to the harbouring or breeding of pests. AR 31/2006 s 21(1)
Utensil / Equipment Storage and Condition	1) A large pool of water was observed beneath the upright cooler in the dishwashing area. -Abate the leak 2) Probe thermometer that operator indicated was used for checking food after cooking was stored in a bucket with other uncleanable items (e.g. roll of tape) -Store probe thermometer in a sanitary location	No	Not In Compliance	The indicated food equipment is not in good repair or is not in proper working order. All equipment and utensils in a food establishment must be kept in good working order and condition and maintained in a manner that ensures the safe and sanitary handling of food. AR 31/2006 s 28(3) Dishes / utensils are being stored in an improper manner. All equipment and utensils in a food establishment must be kept in good working order and condition and maintained in a manner that ensures the safe and sanitary handling of food. AR 31/2006 s 28(3)

Appendix 3: Childcare Facility Hot Food Temperature Logs

Childcare Facility	Date	Time Taken	Temperature
A1	August 25th	1100h	65° C
	August 28th	1100h	66° C
	August 29th	1100h	65° C
	August 30th	1100h	66° C
	August 31st	1100h	65° C
A3	August 25th	missing	missing
	August 28th	1007h	144° F/154° F *
	August 29th	1036h	132° F/134° F *
	August 30th	1021h	124° F/112° F *
	August 31st	1009h	145° F/138° F *
A6	August 25th	1050h	150° F
	August 28th	1100h	145° F
	August 29th	1045h	150° F
	August 30th	1000h	140° F
	August 31st	0900h	140° F
A8	August 25th	0830h	120° C
	August 28th	0830h	120° C
	August 29th	0830h	120° C
	August 30th	0915h	120° C
	August 31st	0830h	120° C

- A3 recorded two temperatures each day. The first temperature was recorded for 'upper' and the second was recorded for 'lower.'
- Temperature recordings in the log for A2 stopped on August 16th.
- Temperature recordings in the log for A5 stopped on August 22nd.
- No temperature logs were available for A4, B1, B2, or B3.

Appendix 4: APL-ProvLab Food Testing Processes

The laboratory processes for food sample testing at APL: ProvLab were as follows:

Day 1: Preparation of food slurries

a) 25g (from different areas of the food sample or 25 g from each area of the sampling) or 25 ml of food was taken aseptically into 225 ml of enrichment broth.

b) The sample was Stomached or hand mixed for thorough mixing.

c) A positive (ATCC 35150 Stx 1 and Stx 2 pos strain, 100 uL of 10^3cfu/mL) and negative control (uninoculated mTSB) were added into slurry bag. All these samples were set up at the same time.

d) Enrichment mixture and controls were incubated for 18-24h at 42 °C.

Day 2: Immunomagnetic separation (IMS)

a) 1ml of the pre-enriched food sample was added to a tube containing anti-*E. coli* O157 magnetic beads.

b) 50uL of mixture was inoculated onto a 'Direct' ChromSTEC plate. (STEC O157 can grow on this plate and produce mauve color colonies.)

c) The sample was mixed and incubated at room temperature for 10 minutes for continuous agitation.

d) A magnetic plate was used to concentrate the beads and the supernatant was discarded.

e) Beads were washed to resuspend the beads and the wash was removed. This washing process was repeated 2 times.

- The beads were resuspended in 100uL of PBS-Tween, and 50uL was inoculated onto agar plates ChromSTEC, CT-SMAC (MacConkey sorbitol agar with Cefixime and Tellurite) and spread over the agar surface area.

Day 3: Observation of colonies on the agar plate (ChromSTEC)

a) Method control plates were assessed Positive control should have mauve colonies; negative control should have no growth.

b) If the prepared food sample tested positive, 3 mauve color colonies were selected for further testing and presumptive identification by O157 agglutination and morphology. Results were confirmed with repeat O157 serology, different biochemical tests, and an EIA assay specific to the Shiga toxins.

Appendix 5: Kitchen Staff Food Histories:

(August 25th-31st, 2023)

		Cases (n=7)		Non-Cases (n=2)	
Date	**Item**	**Ate Item**	**Percent**	**Ate Item**	**Percent**
25-Aug	Pancakes with strawberry	3	42.9%	0	0.0%
	Fresh cream	3	42.9%	0	0.0%
	Gluten-free pancakes with strawberry	1	14.3%	0	0.0%
	Dairy-free cream	0	0.0%	0	0.0%
	Coconut cream tart	2	28.6%	0	0.0%
	Fish sticks	3	42.9%	0	0.0%
	Tofu sticks	1	14.3%	0	0.0%
	Potato wedges	4	57.1%	0	0.0%
	Haystack drops	1	14.3%	0	0.0%
	Cantaloupe	0	0.0%	1	50.0%
	Pineapple	0	0.0%	0	0.0%
	Orange	1	14.3%	0	0.0%
28-Aug	Whole grain cereal	1	14.3%	0	0.0%
	Variety cereal	0	0.0%	0	0.0%
	Cheese	0	0.0%	0	0.0%
	Crackers	0	0.0%	0	0.0%
	Dairy-free cheese	0	0.0%	0	0.0%
	Rice crackers	0	0.0%	0	0.0%
	Chicken stir fry	4	57.1%	1	50.0%
	Vegan chicken stir fry	0	0.0%	1	50.0%
	Rice	4	57.1%	1	50.0%
	Blueberry muffin	2	28.6%	0	0.0%
	Cantaloupe	0	0.0%	0	0.0%
	Honeydew	0	0.0%	0	0.0%
29-Aug	Acai breakfast bowl	1	14.3%	1	50.0%
	Dairy free vanilla yogurt	0	0.0%	0	0.0%
	Gluten free granola	2	28.6%	0	0.0%
	Honeydew lassi	0	0.0%	0	0.0%
	Vanilla biscuit	1	14.3%	0	0.0%
	Vanilla wafer	0	0.0%	0	0.0%
	Meatloaf	6	85.7%	0	0.0%
	Vegan loaf	1	14.3%	0	0.0%
	Mashed potatoes	6	85.7%	0	0.0%
	Gravy	6	85.7%	0	0.0%
	Maple cinnamon muffin	2	28.6%	1	50.0%
	Orange	2	28.6%	0	0.0%
	Banana	1	14.3%	0	0.0%
	Cucumber	1	14.3%	0	0.0%
30-Aug	Strawberry banana smoothie	0	0.0%	0	0.0%
	Cookie	0	0.0%	0	0.0%
	Vanilla wafer	1	14.3%	0	0.0%
	Vanilla orange muffin	3	42.9%	0	0.0%
	Chicken pasta alfredo	6	85.7%	1	50.0%
	Vegan chicken alfredo	4	57.1%	1	50.0%
	Naan bites	0	0.0%	0	0.0%
	Yogurt	0	0.0%	0	0.0%
	Banana	2	28.6%	0	0.0%
	Carrot	1	14.3%	0	0.0%
31-Aug	Scrambled eggs	0	0.0%	0	0.0%
	Hash browns	4	57.1%	1	50.0%
	Vegan eggs	1	14.3%	0	0.0%
	Vegan banana pudding	2	28.6%	0	0.0%
	Vegan Dan Dan	3	42.9%	1	50.0%
	Vanilla squares	2	28.6%	0	0.0%
	Banana	2	28.6%	0	0.0%
	Cantaloupe	0	0.0%	0	0.0%
	Honeydew	0	0.0%	0	0.0%
	Mixed vegetables	3	42.9%	0	0.0%

It should be noted that this questionnaire was administered prior to investigators being aware there were changes to the August 29th menu. Specifically, oven ready potatoes were served for the Special Menu. As such, the oven ready potatoes were not included in the questionnaire administered to the kitchen staff.

Appendix 6: Environmental Swabbing Sites

Eurodib (Hobart-like mixer)
Paddle Eurodib
Top of where paddle hooks
Brown residue bottom of side
Around hook on foot (inside)
Around bolt on bottom right side
Around silver hook on bottom right side
Rectangular block at back of where bowl attaches
Ledges on mixer bowl
Bowl base stand with casters - crusty bowl stand #1
Bowl base with casters - support #2 stick stuff

Kitchen preparation area
Pans with food residue
Top 2 aluminum pans on muffin tin - dirty pan
Cooking utensil drawer handle
Water from prep room sink, first catch hot/cold no aerator
Bits on floor of dishwasher
Bits tucked behind inside the dishwasher
Brown/gold things on ledge of stainless-steel counter.
Brown beside electrical socket
Left threshold between two prep tables - ran knife through
Drain/sink interface in Right sink preparation room
Right most threshold between prep tables - ran knife through
Drain in Right Sink preparation room
Left sink/drain interface preparation room
Left sink drain in prep room
Soap dispenser push handle by prep sink
Prep Sink
Eurodib top of paddle mixer where paddle attaches (resweep)
Cucumber slicer cylinder (dirty residue present)

Staff Washroom
Staff bathroom sink - first catch water (premixed hot and cold - push tap) aerator
Staff bathroom sink - drain/sink interface
Staff bathroom sink - drain
SINK DRAINS
drain in Right sink preparation room
Left sink drain in prep room
Sink by fridge drain
Left sink by dishwasher drain
Right sink by dishwasher drain
"bar" sink with no tap by dishwasher drain

Dishwashing Room
Water from sink across from fridge, first catch hot/cold aerator present
Water from tap by dishwasher, first catch hot/cold
Water from hand sprayer by dishwasher - first catch hot/cold
Sink by fridge drain/sink interface
Sink by fridge drain
Left sink by dishwasher sink/drain interface
Left sink by dishwasher drain
Right sink by dishwasher sink/drain interface
Right sink by dishwasher drain
"bar" sink with no tap by dishwasher sink/drain interface
"bar" sink with no tap by dishwasher drain
Sink by dishwasher including sprayer

Walk-in Fridge
Beef gravy labelled Aug 28
Chicken alfredo bucket #1 labelled Aug 28-Sep5
Rotting stew - liquid in tray
Chicken alfredo bucket #2
Meatballs - miscellaneous collected from various trays in rack full of meatballs
Mirepoix veg base “Minor's" brand (This is not the frozen product used in meatloaf preparation)
Beef base "Minor's" brand
From top tray #1
From tray #2
Tray #3
Tray #4
Tray #5
Last call fruit

Water Samples
Water from prep room sink, first catch hot/cold no aerator
Water from sink across from fridge, first catch hot/cold aerator present
Water from tap by dishwasher, first catch hot/cold
Water from hand sprayer by dishwasher first catch hot/cold
Staff bathroom sink: first catch water (pre-mixed hot and cold - push tap) aerator

Sink Drains
drain in Right sink preparation room
Left sink drain in prep room
Sink by fridge drain
Left sink by dishwasher drain
Right sink by dishwasher drain
"bar" sink with no tap by dishwasher drain

Appendix 7: Environmental Sampling and Laboratory Methodologies

1) An initial site visit of the central kitchen was conducted on Friday, October 6th from 1300h to 1500h by AHS IPC laboratory Medical Lead and a Medical Laboratory Technologist for infection control, assisted by an AHS PHI. The purpose was to determine which sites would be swabbed and the amount of testing materials required.

2) The materials needed for processing environmental swabs included:

    a. Dey-Engley freshly made tube media for inactivation of disinfectants and Dey Engley agar plates from Fisher Scientific, date of arrival October 11th.
    b. STEC agar from Dalynn Labs.
    c. SMAC agar from Dalynn labs.
    d. A batch of selective agar for *E. coli* O157 from the APL-ProvLab.
    e. eSwabs 100 from AHS CPSM and eSwabs from APL-ProvLab as backup.
    f. MacConkey agar plates made at B-16 Lab.
    g. Water sampling bottles to screen CFU in tap water.
    h. 10 Dey-Engley sponge environmental surface from CFIA.
    i. Miscellaneous supplies, gloves, environmental hazard suits, masks, hair nets, over boots for the monitoring team.

3) The next site visit to the central kitchen occurred on October 11th, from 1300h to 1630h. The purpose was to complete the environmental sampling. The following central kitchen surfaces/areas were swabbed: (A complete list of areas and items swabbed is available in Appendix 7.)

    a. Hobart mixer – swabs were taken from the various components of the Hobart mixer including the paddle, hooks, sides, bolts, insides, ledges of the bowl.
    b. Some oven pans.
    c. Utensil drawer handle.
    d. Dishwasher.
    e. Sinks.
    f. Prep table including the crevices and edges.
    g. Soap push handle by the prep sink.
    h. All drains – 6 drains in the kitchen. Both drain interface and the interior.
    i. Areas around specific food items in the cooler. (e.g., chicken alfredo from August 20th to September 5th, rotting stew tray.)
    j. Cucumber slicer.
    k. Staff washrooms drain and water sample.
    l. Trays that were on the trolley in the cooler.

4) Processing of samples was done at the IPC research lab between 1630h to 2100h on October 11th, 2023. The swabs were incubated in Dey Engley broth media, also on non-selective agar /selective agars as listed above. Growth identified as *E. coli*/presumptive O157 planned to be stocked and sent to the APL-ProvLab. About 60 cultures were obtained.

Appendix 8: Kitchen Staff Questionnaire

In the month of August (Aug 1 to 31st)

1. Where did you prepare and/or consume meats? (home/restaurants/events/BBQs/friends)
2. What kinds of meats did you handle/consume? (Beef/pork/chicken/game/lamb/goat)
3. Did you prepare/consume meat at home/restaurants/events/BBQs/friends:
    a. If yes, approximate dates when and what did you prepare or been involved with the preparation of?
    b. If you were involved with the preparation of meat, who else did you work with on the preparation?
4. Tell us about the meat that you buy (raw/prepared) for home/work?
5. Where did you get your meat from for home/personal and work? (cash/credit/debit) If sometimes with cash, who would those purchases be from?
6. Did you bring any of your food/meals to the workplace? If so, what was the food, how was it prepared, stored and if needed how was it reheated?

Environmental exposures:

7. Visit to farm/agriculture events/rodeo/stampede/petting zoo/ amusement park (dates/locations). Ask about Calaway park.
8. Hobby farm/feedlot/gardening/live on farm (if yes location- what is farmed)?
9. Any family members/close contact work at farm/abattoir (if yes who and which facility)?
10. Other work/hobby/residence/
11. Any family members/close contact work at farm/abattoir (if yes who and which facility)
12. Have they purchased or had contact with non-commercial compost?
13. Also ask about clothing and footwear i.e., are the same clothes/footwear used at both locations?

Animal Exposure:

14. Contact with farm animals
    (Which animals and what is the purpose of the animal i.e., slaughtered or kept as show animal)?
15. Pets; pet feed?

Social event exposures:

16. Did you participate in any social events at work or outside work? (Work: Staff appreciation BBQ)
17. Did you or any family/friends partake in MudGirl Run event or similar events?

Other questions:

18. Have you or anyone else that you have been in contact with (family/friends/acquaintances) been ill or symptomatic of food poisoning or *E. coli*?
19. What is your process for hand cleansing after using the washroom? Do you always wash your hands after using the washroom?
20. What is your process for hand cleansing between the handling of different meats or other food sources?
21. Do you use hand covering when handling food? If so, when are they changed/disposed of?
    Do you use hand covering for some food items and not others? And do you change coverings in between? If oven mitts or other reusable hand coverings are used how often are they washed/cleaned?
22. Have you ever purchased meat from a farmer direct (repeat of question 5, but worth keeping)?
23. We are all trying to determine where the cause of this outbreak originated to ensure it does not happen again. Do you have any thoughts or concerns that we have not covered that may help us to find out what happened?
24. If you have any further information that you would like to share with us, you can call our dedicated disease control phone line at ###-####.

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