

Multijurisdictional Norovirus Outbreak Associated with Commercially Distributed Ice Cream, Minnesota, 2016



Amy Saupe, MPH – Minnesota Department of Health

Alida Sorenson, MPH – Minnesota Department of Agriculture

The Chain of Regulatory Responsibility



Farm



Processor



Distributor



Retail



Home/Restaurant

MINNESOTA
B O A R D
of
ANIMAL
HEALTH



DEPARTMENT OF
AGRICULTURE

 DEPARTMENT
OF HEALTH

MDA's Role in Outbreak Investigations



- Identifying SMEs
- Conducting traceback
- Conducting facility investigations
- Testing of food product or environmental samples
- Taking actions to protect public health
 - Embargo
 - Recall request
 - Consumer advisory
 - Corrective action plans
- Providing coordination for response activities
 - Minnesota Rapid Response Team (MN RRT)

Minnesota Department of Health - Epidemiology

- **Routine surveillance, studies, other projects**
- **Outbreak investigations**
 - **Coordinate between jurisdictions and agencies (e.g., Centers for Disease Control and Prevention, environmental health, MDA)**
 - **Case interviews**
 - **Analysis and statistical support**
 - **Public health response**

Background

- The MDA RRT is physically located in the same building as MDH epidemiology
- Cultivated strong relationship on *Salmonella*, STEC, *Listeria* commercial product outbreaks



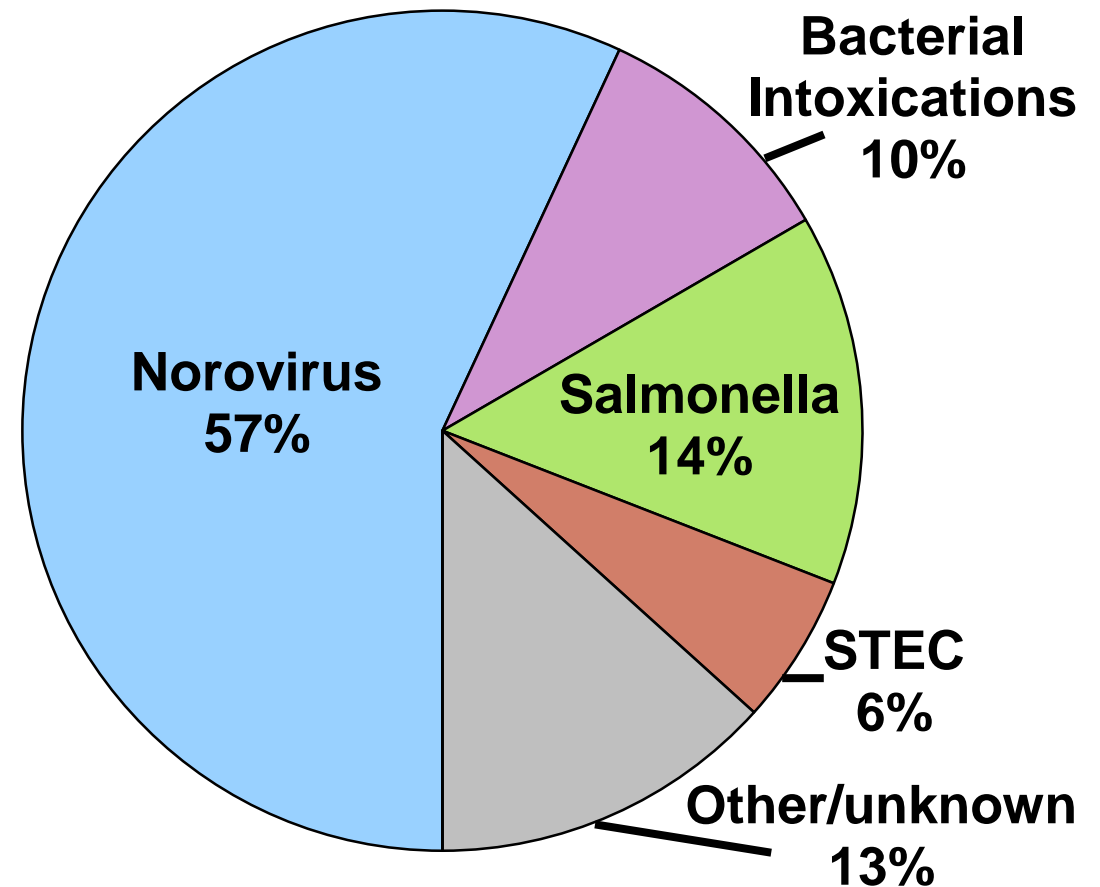
Background

- **MDH/MDA collaboration on norovirus investigations is infrequent**
- **A food item regulated by MDA is seldom identified as the source of a norovirus outbreak**
- **Most common?**
 - **“Cake checks”**
 - **Commissary kitchens (manufacturers)**
 - **Private events “catered” by grocery stores**
- **Used existing collaboration experience to work quickly/effectively on a “novel pathogen” for RRT**

Background – Norovirus Outbreaks

- Norovirus is the most common cause of acute gastrointestinal illness in the United States
- In Minnesota, norovirus is the etiology for ~60% of foodborne outbreaks
- Foodborne norovirus outbreaks usually caused by contamination at time of preparation

Confirmed Foodborne Outbreaks by Etiology, Minnesota, 1999-2016



Background – Complaint System

Almost all norovirus outbreaks identified through the Minnesota Department of Health (MDH) foodborne and waterborne illness hotline

- Centralized complaint system**
- Illness reports collected and assessed at state level**
- Investigations initiated with state or local environmental health jurisdictions**

**Minnesota
Foodborne
Illness
Hotline**

**Call to report
foodborne illness:
(651) 201-5655**

**Toll free statewide:
1-877-366-3455
1-877-FOOD ILL**



625 North Robert Street
PO Box 64975
St. Paul, MN 55164-0975
www.health.state.mn.us

Outbreak Detection – Restaurant A

August 8, 2016

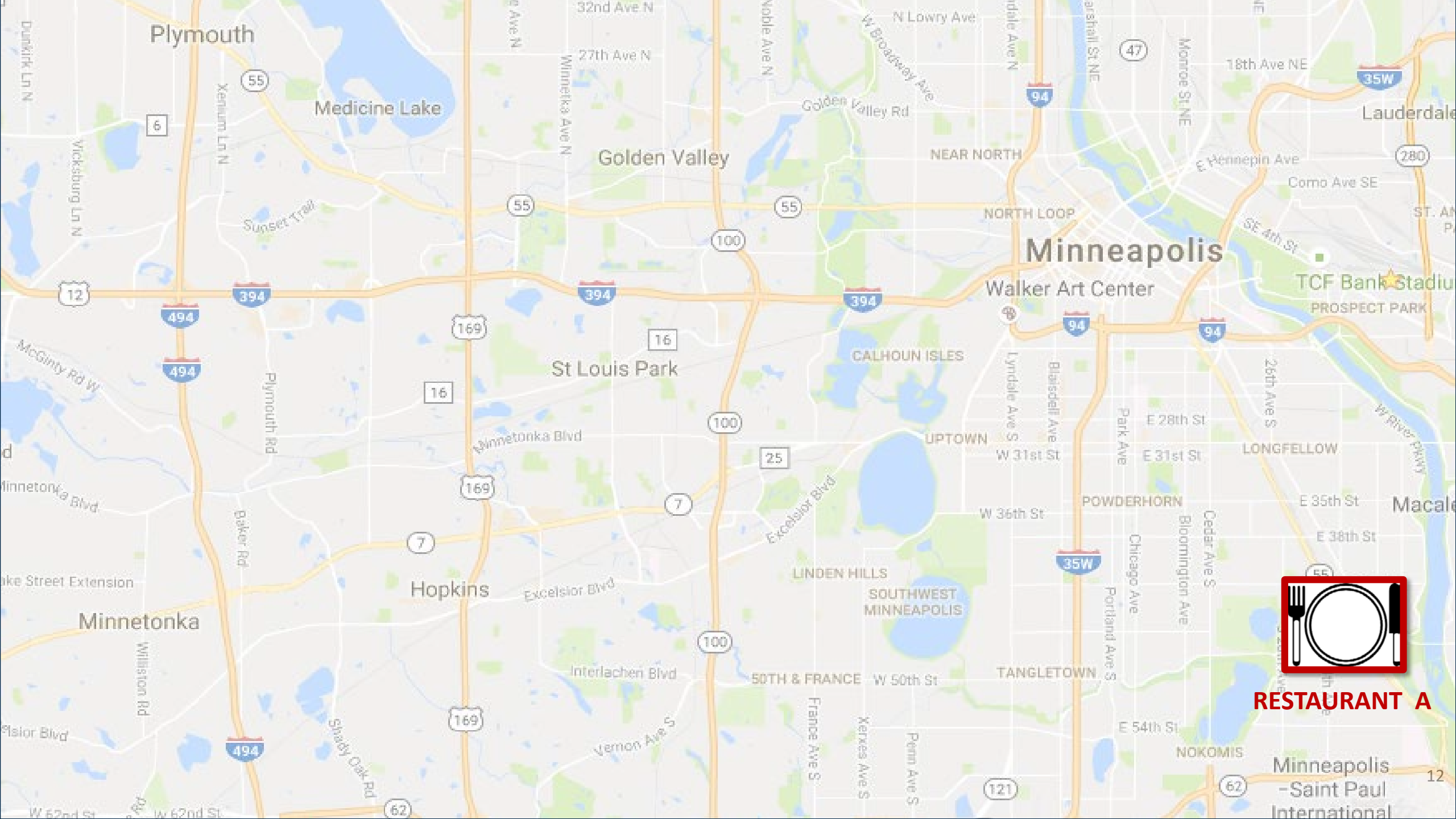
- **Received complaint**
 - **Gastrointestinal illness among 2 of 3 meal companions**
 - **Only common exposure: August 4 meal at Restaurant A**
 - **Incubation periods 29.5 and 32 hours**

Establishment that the complainant suspects: Restaurant A

Number of persons exposed: 3 Number ill: 2 How many households with illness: 2

Outbreak Investigation – Restaurant A

- **Investigation initiated at Restaurant A**
 - **Lead agencies**
 - **Hennepin County Human Services and Public Health Department, Epidemiology**
 - **Minneapolis Health Department, Environmental Health**
 - **Norovirus interventions**
 - **Restaurant clean/sanitize, education (hand hygiene, exclusions)**
 - **Food worker interviews**
 - **Patron interviews (case finding, case-control study)**



RESTAURANT A

Investigation Results – Restaurant A

- **Two cases identified**
 - **Vegetarian tacos; Brand X raspberry chocolate chip ice cream**
- **Five controls interviewed**
 - **Variety of other menu items; no ice cream**
- **Five of 85 employees with vomiting/diarrhea**
 - **Illness onsets July 27 – August 6**
 - **Patron meal date: August 4**

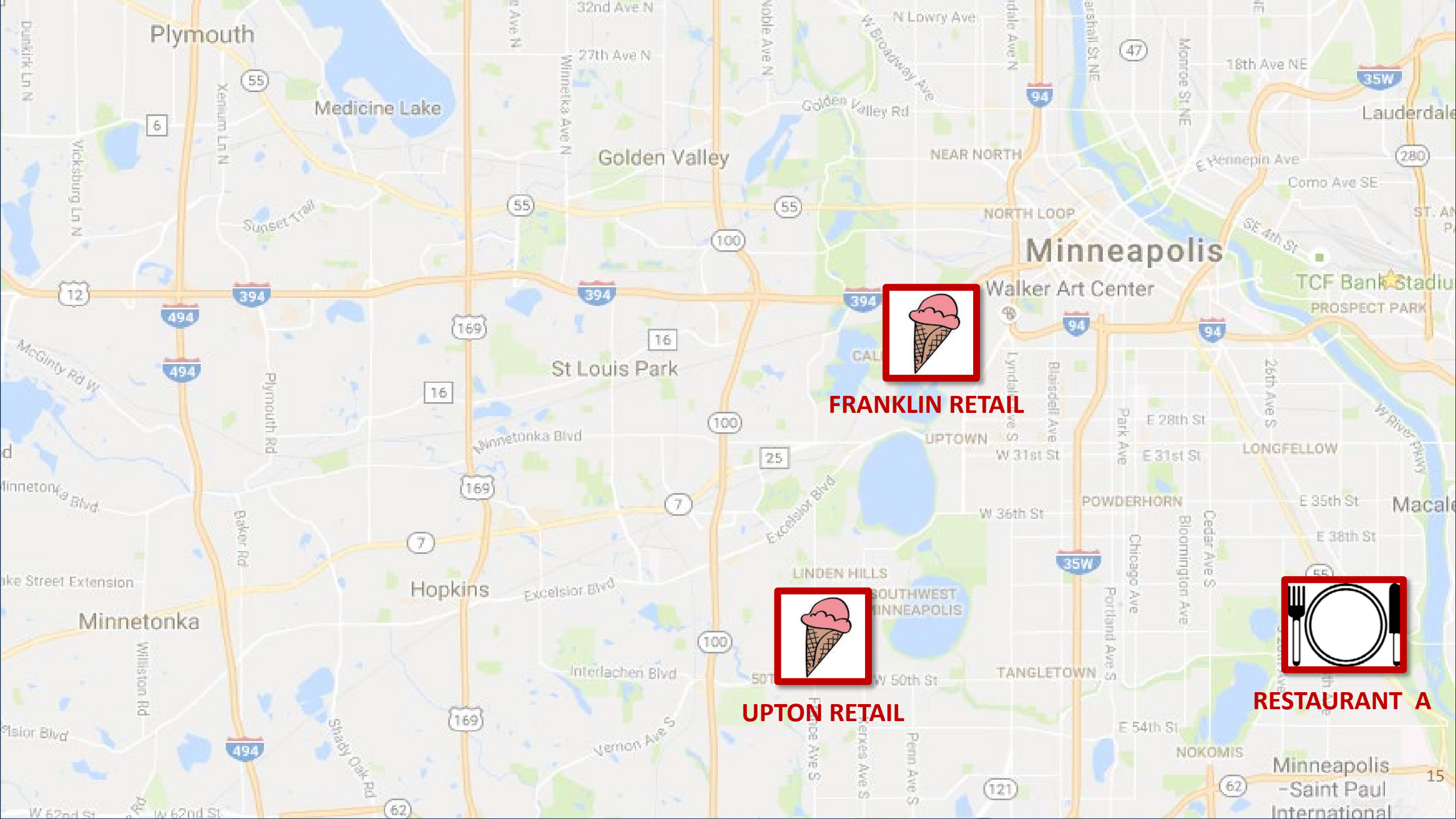


One employee: eats Brand X raspberry chocolate chip ice cream during most shifts

Outbreak Detection – Retail Locations

August 15, 2016

- **MDH foodborne illness hotline received another complaint**
 - **Gastrointestinal illness among 3 of 20 meal companions**
 - **Only common exposure: August 11 visit to Brand X Ice Cream's Franklin retail location**
 - **All cases ate raspberry chocolate chip ice cream**
 - **Well individuals ate a variety of other flavors**



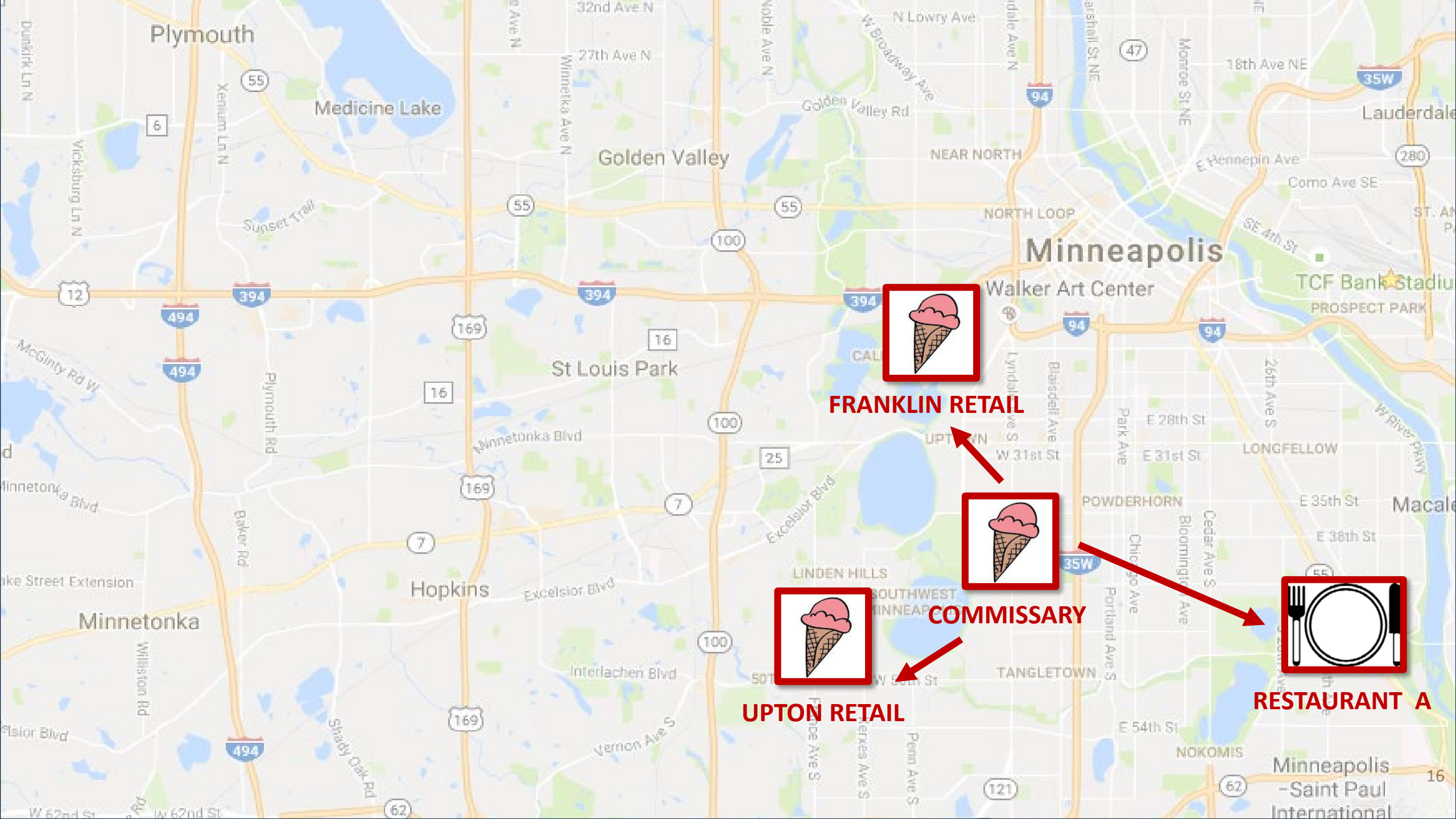
FRANKLIN RETAIL



UPTON RETAIL



RESTAURANT A



FRANKLIN RETAIL



COMMISSARY



UPTON RETAIL



RESTAURANT A

Outbreak Detection – Private Party

August 17, 2016

- **Hennepin County Epidemiology received a complaint from a local country club**
 - **Gastrointestinal illness among attendees of a catered birthday event on August 13**
 - **Country club did not serve Brand X ice cream**
 - **Symptoms/duration = norovirus; incubation periods too short**
 - **The group also ate together August 12 at a private home**
 - **For dessert: Brand X ice cream**



PRIVATE PARTY



FRANKLIN RETAIL



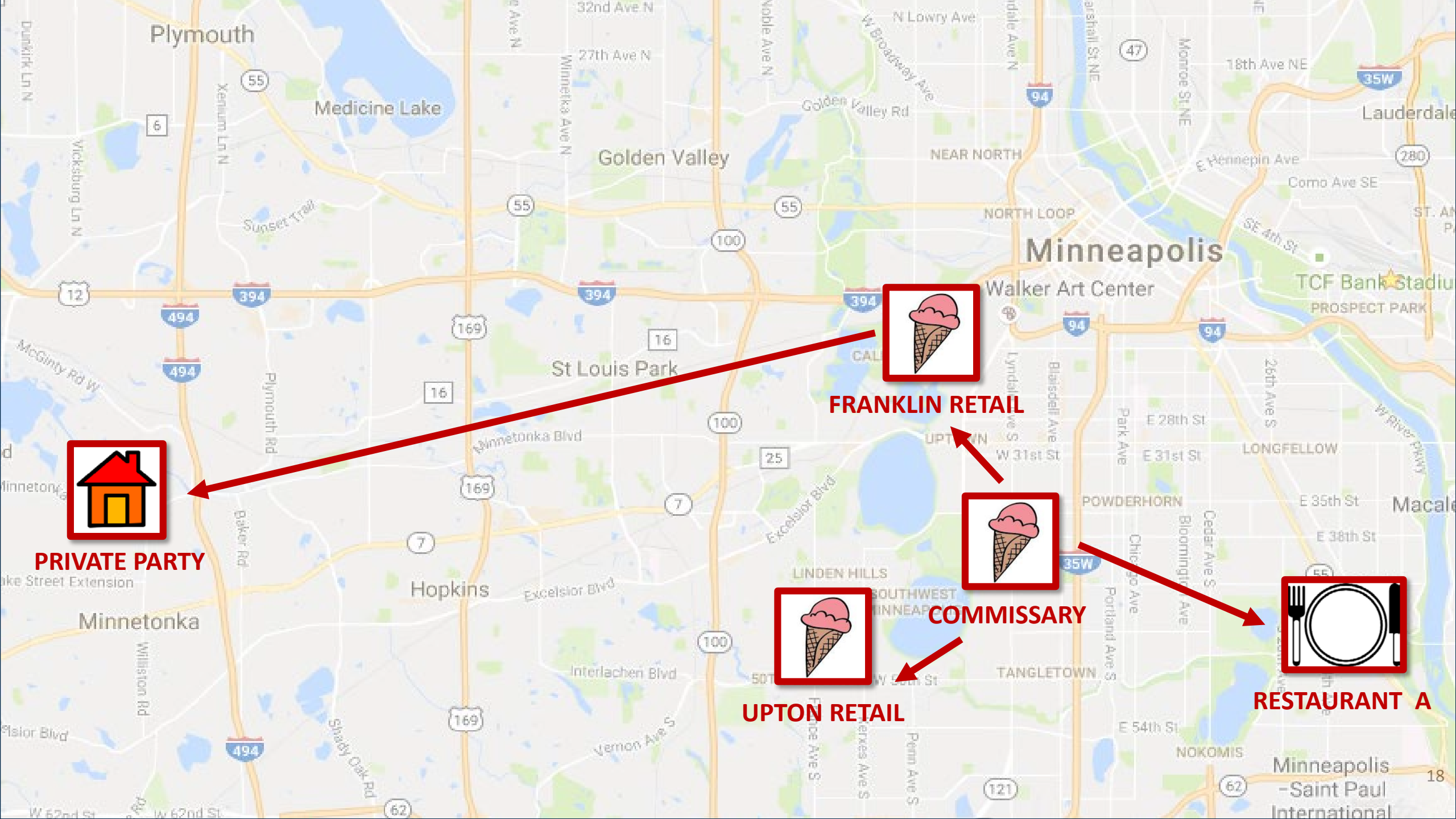
COMMISSARY






UPTON RETAIL



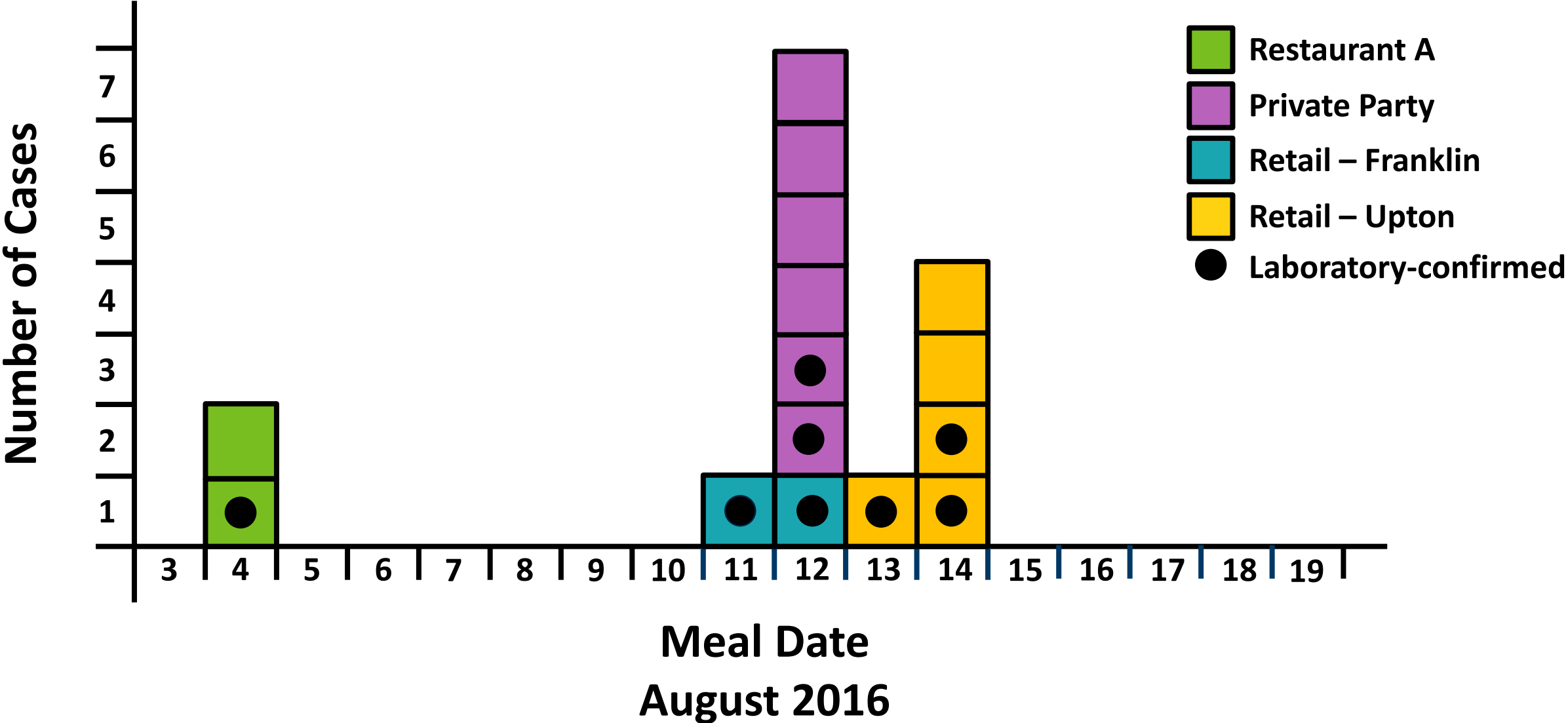
RESTAURANT A



Private Party Case-Control Study Results

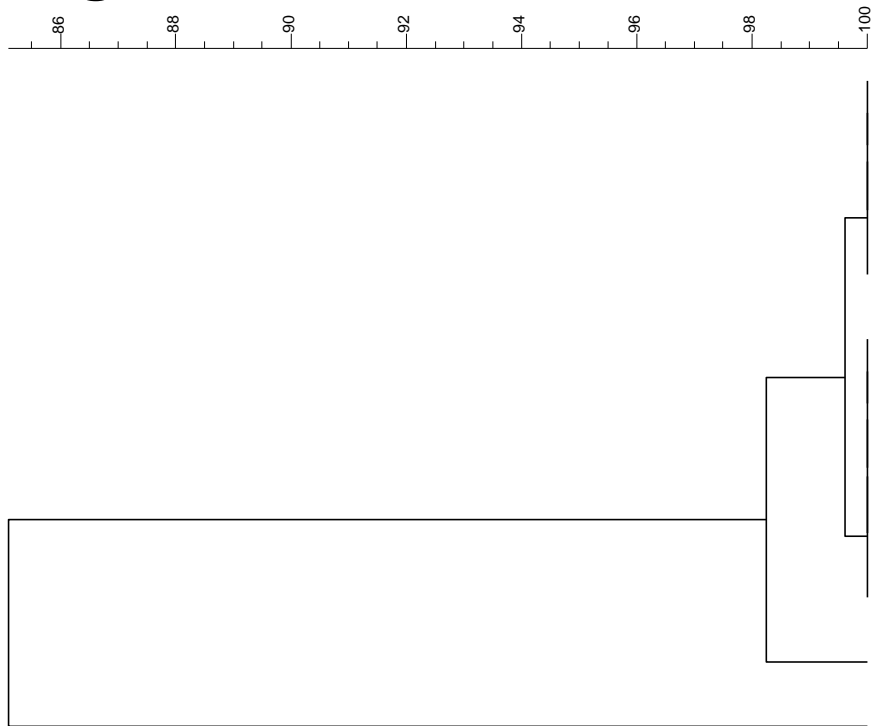
Brand X Ice Cream Flavor		Cases n/n (%)	Controls n/n (%)	Odds Ratio	p-value
Vanilla		1/5 (20%)	1/10 (10%)	2.25	1.00
Chocolate		3/5 (60%)	1/10 (10%)	13.5	0.08
Raspberry Chocolate Chip		5/5 (100%)	2/9 (22%)	--	0.02

Norovirus Gastroenteritis Cases Associated with Brand X Ice Cream, by Meal Date

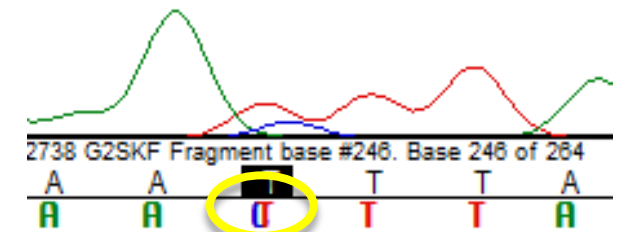


Stool Results – GII.17 Kawasaki

Region C



- Complainant – Upton retail
- Complainant – Franklin retail
- Complainant – Private party
- Complainant – Private party
- Complainant – Restaurant A
- Employee – Restaurant A
- Complainant – Upton retail
- Complainant – Upton retail
- Complainant – Franklin retail
- GII_17B_13BH1_TW13
- GII_17A_Katrina-17_US05



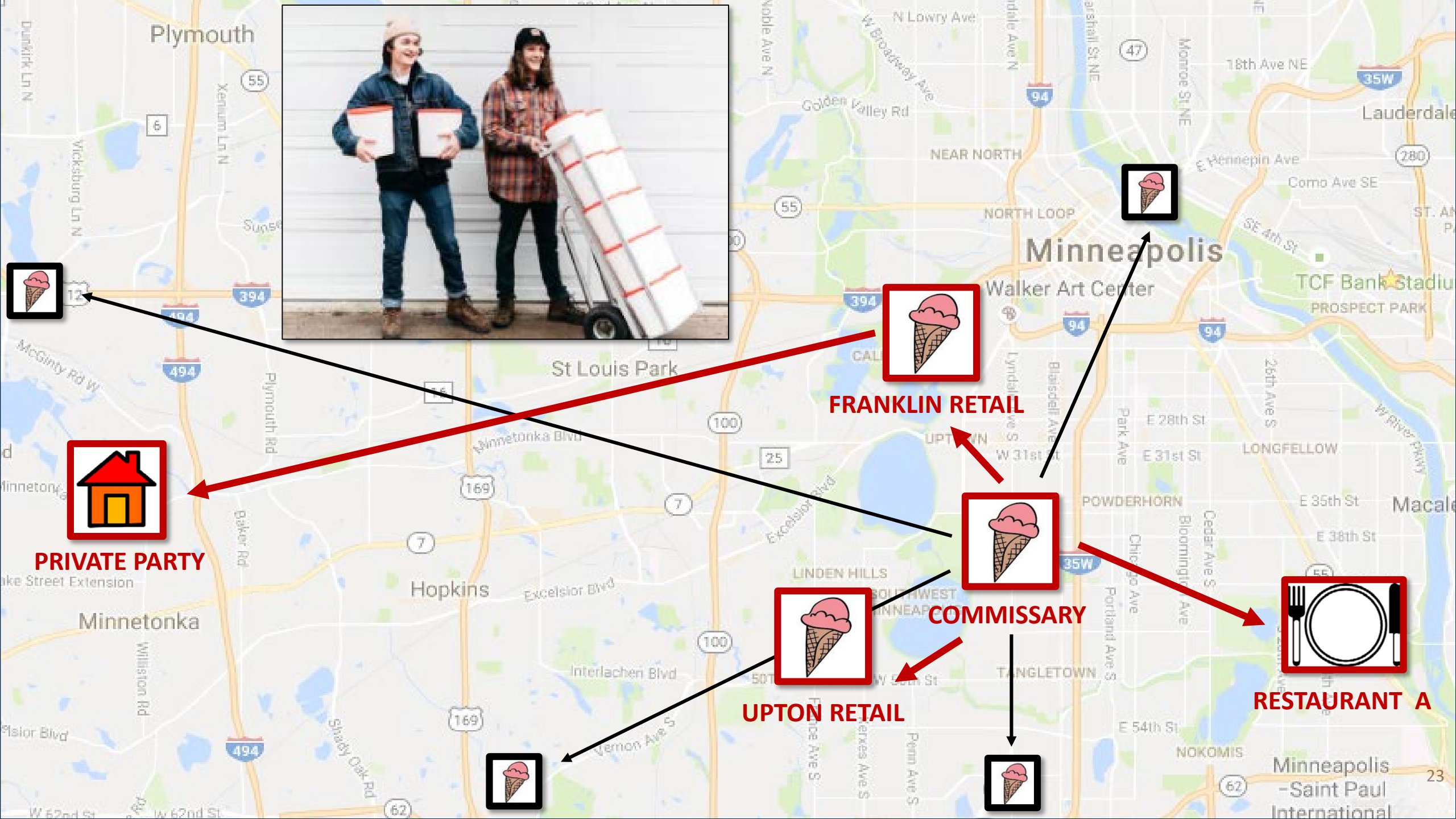
1 nucleotide difference

Ice Cream X Commissary Kitchen

August 16, 2016

- **Raspberry chocolate chip ice cream ingredients:**
 - **Vanilla base mix, chocolate chips, frozen raspberries, sugar, stabilizer**
 - **No kill step for raspberries**
- **Preparation involved no direct food worker handling**
- **All 16 employees interviewed by Team Diarrhea**
 - **No illnesses reported**





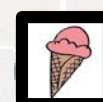
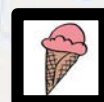
FRANKLIN RETAIL

COMMISSARY

UPTON RETAIL

PRIVATE PARTY

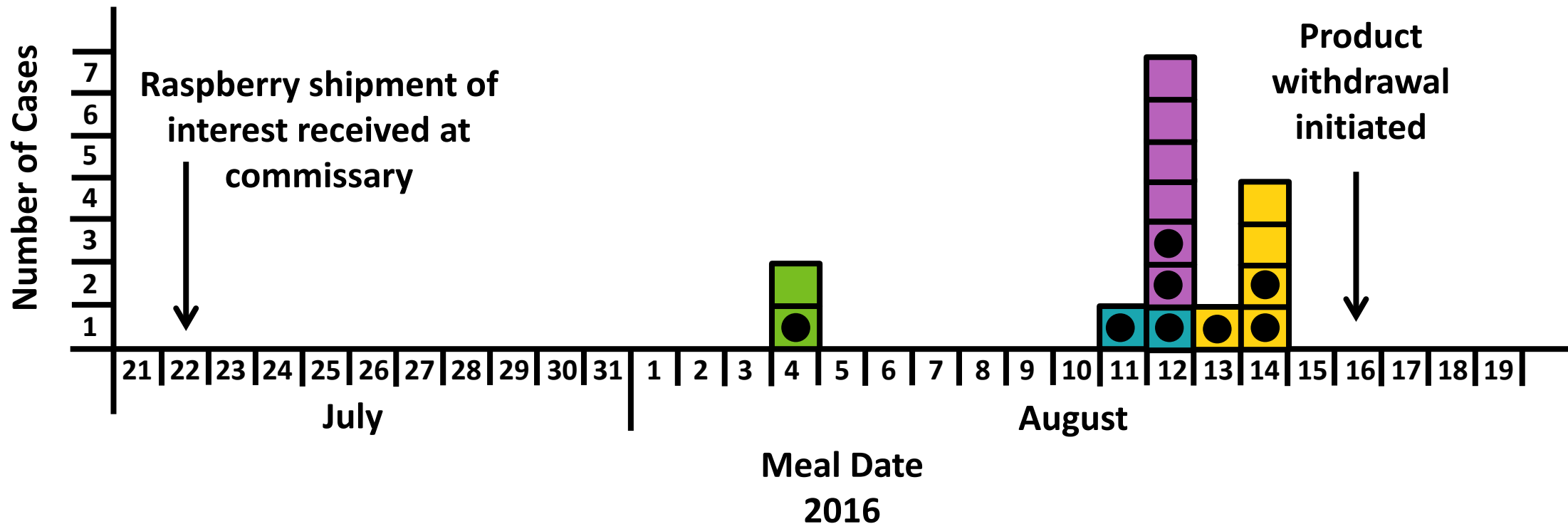
RESTAURANT A





http://www.amcharts.com/visited_countries/

Norovirus Gastroenteritis Cases Associated with Ice Cream, by Meal Date



Brand X Ice Cream Product Withdrawal & Consumer Notification Decision

Retail (2.5 gallon tubs)

- Distributed to Brand X's two retail locations and other venues (restaurants)
 - By August 19, 146 tubs returned to commissary

Patron Homes (pints)

- Brand X retail locations sell pints scooped at counter
 - Sales information: 348 pints of all flavors sold July 1 to August 15
 - Raspberry chocolate chip 3rd most popular flavor



Sample Collection for Testing at FDA Center for Food Safety and Applied Nutrition (CFSAN) Laboratory



Ten 2.5 gallon containers



Six bags of frozen raspberries



Chile
(n=2)



China
(n=2)



Serbia
(n=2)

Sample Analysis and Timeline

- Samples shipped to FDA CFSAN on September 28, 2016
- Challenges:
 - Size of shipment
 - Timing
 - Use of dry ice
 - Insulated boxes
 - Labeling requirements
 - How much dry ice?
- Raspberry samples set up by CFSAN on October 10, 2016



Product Testing Results

FDA CFSAN & Office of Regulatory Science Laboratories

Product		Amount Tested	Norovirus Results
Vanilla Ice Cream		2 pints	pending
Chocolate Ice Cream		2 pints	pending
Raspberry Chocolate Chip Ice Cream		10 x 2.5 gallons	presumptive positives
Frozen Raspberries		Chile: 2 bags Serbia: 2 bags China: 5 bags	negative negative positive

Raspberry Sequences

Region B

A phylogenetic tree for Region B. The tree shows a clade of human specimens (ME2016012738, ME2016012799, ME2016012168, ME2016012834, ME2016012842) and two raspberry sequences (Seq1 raspberries, Seq2 raspberries). The human specimens are highly similar to each other and form a distinct clade. The raspberry sequences are more divergent and form a separate clade. The scale bar at the top right indicates 0.01 substitutions per site.

ME2016012738	Human Specimen	GII.17 Kawasaki
ME2016012799	Human Specimen	GII.17 Kawasaki
ME2016012168	Human Specimen	GII.17 Kawasaki
ME2016012834	Human Specimen	GII.17 Kawasaki
ME2016012842	Human Specimen	GII.17 Kawasaki
Seq1 raspberries	Raspberries	GII.17 Kawasaki
Seq2 raspberries	Raspberries	GII.17 Kawasaki

Conclusions

- **Outbreak of norovirus associated with ice cream produced using contaminated frozen raspberries, sourced from China**
- **Ice cream manufacturer has initiated a kill step for frozen raspberries**

Discussion

- **Frozen berries: vehicle for hepatitis A virus, norovirus (Europe)**
- **This is the first norovirus outbreak due to imported frozen berries in United States**
- **Outbreak was tough to find**
 - **Outbreak-detection systems venue-focused, not sensitive to commercially distributed vehicles**
- **Norovirus outbreaks due to commercially distributed foods likely more common**
- **Several system components were essential to detecting and solving**



Detection of Norovirus Outbreaks due to Commercially Distributed Products

- 1. Centralized complaint system**
 - Link complaints from multiple jurisdictions
- 2. Rapid and thorough investigation of all norovirus outbreaks**
 - Analytical studies, timely sequencing
- 3. Strong relationships and communication among investigators**
 - All levels of outbreak response
- 4. Iterative investigation process**
 - Restaurant A employees re-interviewed
 - Private party attendees re-interviewed

Lessons Learned

- **Used previously-existing relationships between RRT and Epi for a strong response to a novel outbreak type**
- **Fostered communication for investigations involving several agencies**
- **Good example of importance of investigating all norovirus outbreaks**
- **Consider shipment challenges early in the sampling process**
- **Are frozen berries a high-risk food?**

Norovirus Frozen Berry Outbreaks

<http://ucfoodsafety.ucdavis.edu/files/223896.pdf>

Berry	Form	Country of origin	Pathogen ¹	Year	Outbreak location	Number of cases (deaths ²)	Isolated/ detected in product
Raspberry	Frozen pieces	Poland	Norovirus	2005	Denmark	973	No
Raspberry	Frozen, imported	NR	Norovirus	2005	France	75	No
Raspberry	Frozen	China	Norovirus	2006	Sweden	43	NR

Frozen berries confirmed as deadly bug source



Warning issued over frozen berries following virus outbreak

The FSAI has reminded people to boil all frozen berries before consumption



Advice line: 1890 33 66 77

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FAQs

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Berries - Advice to boil imported frozen berries (May 2015)

Why is the FSAI reiterating its advice to boil imported frozen berries for one minute?

As a result of recent outbreaks of norovirus in Sweden and hepatitis A virus in Australia, both

Norovirus Frozen Berry Outbreaks

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Breaking news for everyone's consumption

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Report: Largest Outbreak in German History Caused by Imported Strawberries

BY NEWS DESK | FEBRUARY 28, 2014

The largest recorded foodborne illness outbreak in German history was caused by frozen strawberries imported from China, according to a study published in the February issue of Eurosurveillance.

At least 11,000 cases of norovirus were reported by 390 institutions – mostly schools and childcare facilities – between Sept. 19 and Oct. 7, 2012.

Epidemiologists were able to quickly identify dishes containing strawberries prepared in regional kitchens of a single catering company as the source of most of the illnesses. They also further traced the strawberries to one 22-ton lot imported frozen from China.



- “Largest outbreak in German history caused by imported strawberries”
- New German recommendations for institutions catering for vulnerable populations -> heat frozen berries
- January 2013, EU regulation: 5% of frozen strawberries imported from China to EU must be tested for norovirus

Norovirus Frozen Berry Outbreaks

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Quebec issues warning on several raspberry products due to norovirus risk

Several bakeries, dépanneurs and grocery stores sold products at risk of contamination

CBC News Posted: Jun 23, 2017 10:17 PM ET | Last Updated: Jun 23, 2017 10:40 PM ET



The Québec Ministry of Agriculture, Fisheries and Food has put out a list of raspberry products that may have been contaminated by the norovirus. (Shutterstock/A_Lein)

Recalls and safety alerts

Recalls & alerts Kids Food Your Health Environment Consumer products

Home > Recalls & alerts

Gelsius brand IQF Whole Raspberries recalled due to Norovirus

[Report a Concern](#)

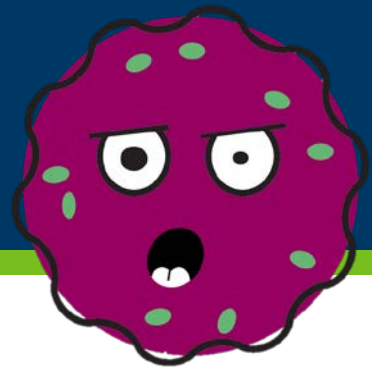
Starting date:	June 20, 2017
Type of communication:	Recall
Alert sub-type:	Notification
Subcategory:	Microbiological - Other
Hazard classification:	Class 1
Source of recall:	Canadian Food Inspection Agency
Recalling firm:	Distribution Farinex (113712 Canada Inc.)
Distribution:	New Brunswick, Ontario, Quebec
Extent of the product distribution:	Hotel/Restaurant/Institutional
CFIA reference number:	11486

[Affected products](#) [Media enquiries](#)

Affected products

Brand name	Common name	Size	Code(s) on product	UPC
Gelsius	IQF Whole Raspberries	5 X 1 kg	D16083101	None

Investigation Partners & Acknowledgements



MN Department of Health

Epidemiology (Joshua Rounds, Nicole Hedeem, Dana Eikmeier, Kirk Smith, Carlota Medus) • Team Diarrhea • Public Health Laboratory (Liz Horn, Ginette Dobbins, Elizabeth Cebelinski)

City of Minneapolis Health Department

Environmental Health

FDA

Office of Human and Animal Food Operations, Division 1 West • Office of Regulatory Science • CFSAN

Brand X Ice Cream Photo Credit

Brand X website <http://bit.ly/1tMslG7>

MN Department of Agriculture

Inspections (Lisa Ramacher) • Laboratory (Matt Forstner)

Hennepin County Human Services and Public Health Department

Epidemiology (Carol Hooker, Erica Bagstad) • Environmental Health

Virginia Department of Health

Laboratory • Epidemiology

CDC

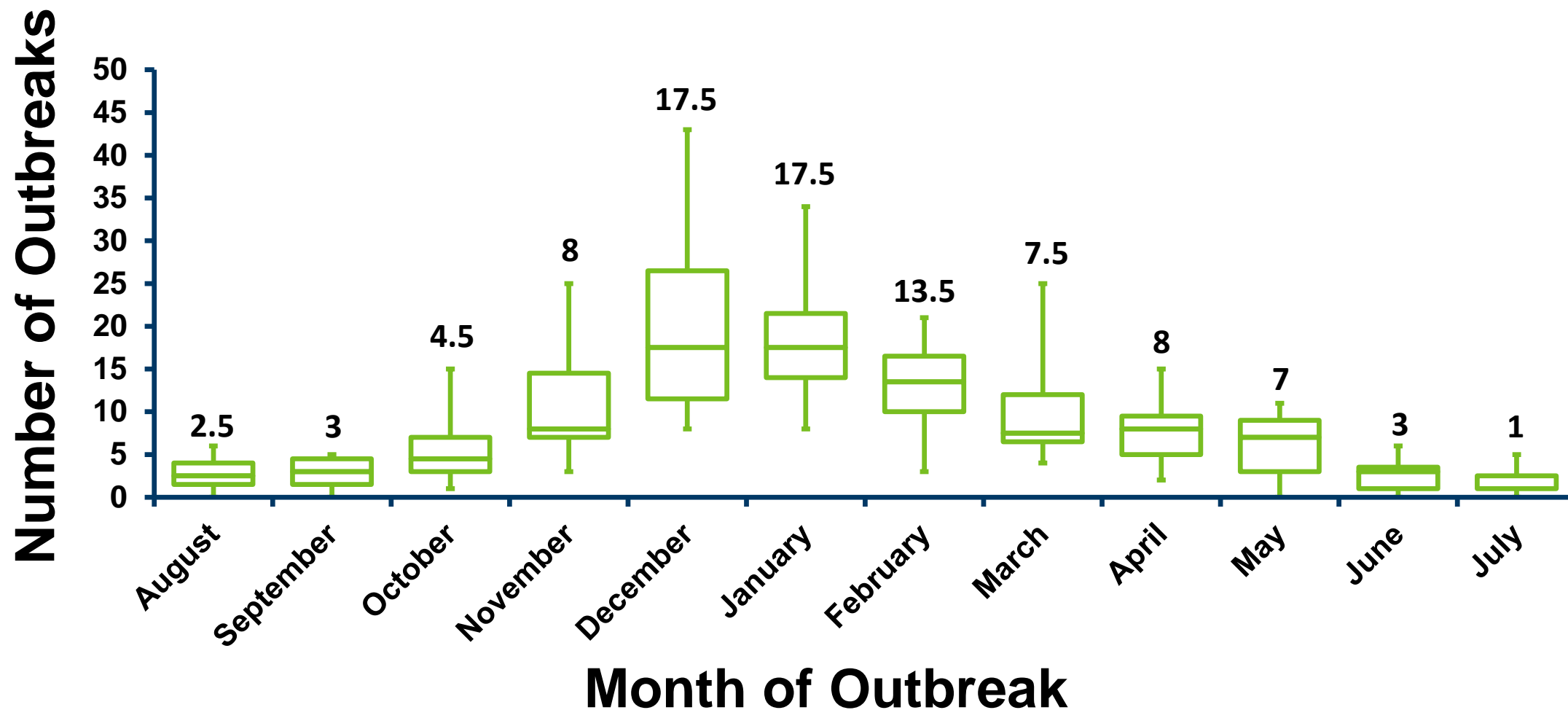
Jan Vinjé, Leslie Barclay, Aron Hall

Thank You! | Questions?

amy.saupe@state.mn.us



Norovirus Outbreaks by Month, Minnesota, 2002-2016



GII.17 Kawasaki

- **First reported Fall 2014 (Jiangsu, China)**

Eurosurveillance, Volume 20, Issue 24, 18 June 2015

Rapid communications

EMERGENCE OF A NEW GII.17 NOROVIRUS VARIANT IN PATIENTS WITH ACUTE GASTROENTERITIS IN JIANGSU, CHINA, SEPTEMBER 2014 TO MARCH 2015

J Fu^{1,2}, J Ai^{1,2}, M Jin³, C Jiang⁴, J Zhang⁵, C Shi⁶, Q Lin⁷, Z Yuan⁸, X Qi¹, C Bao¹, F Tang¹, Y Zhu (jszyf@jscdc.cn)¹

- **Was predominant strain during 2014 – 2015 season (not GII.4)**
- **Sequencing study (Parra et al.) shows same virus also present in U.S. during that time**
 - **Parallel evolution, introduction, or both**

National Outbreaks

Minnesota

- **GII.17 Kawasaki outbreaks with 100% similar sequences seen in previous outbreaks earlier in the year**

CaliciNet

- **57 outbreaks 100% similar to outbreak sequences (April 2015 – May 2016)**
- **90 outbreaks with 1 nucleotide difference (Feb 2015 - May 2016)**
- **3 months between last GII.17 Kawasaki outbreak and ice cream outbreak**

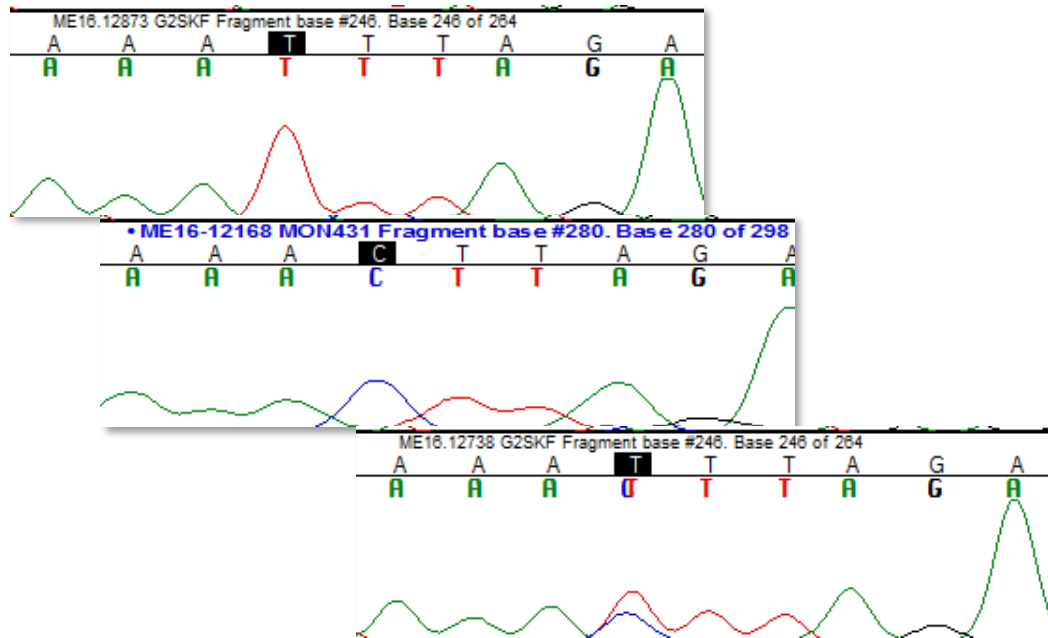
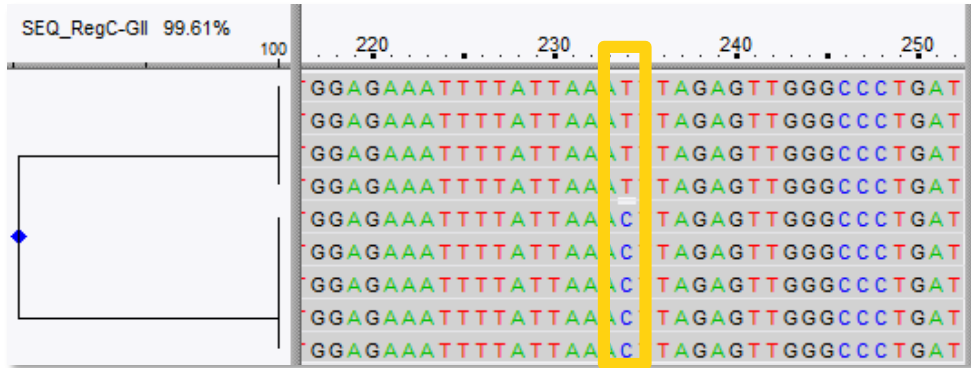
Case Information

15 cases identified

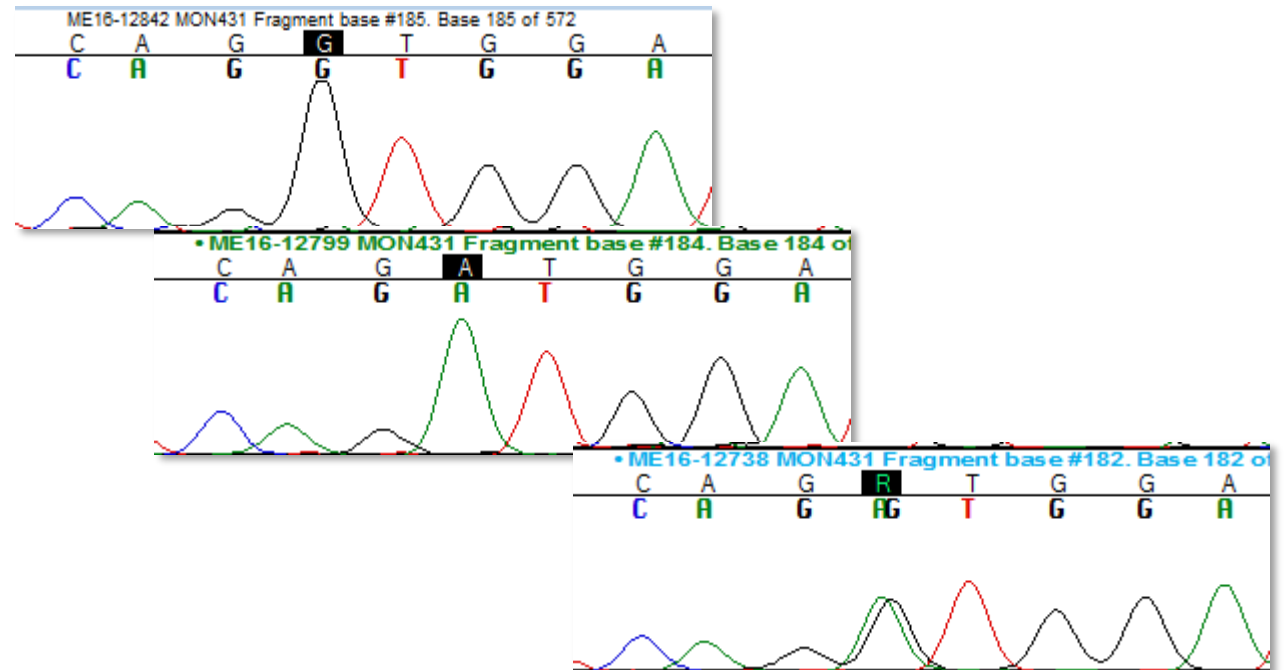
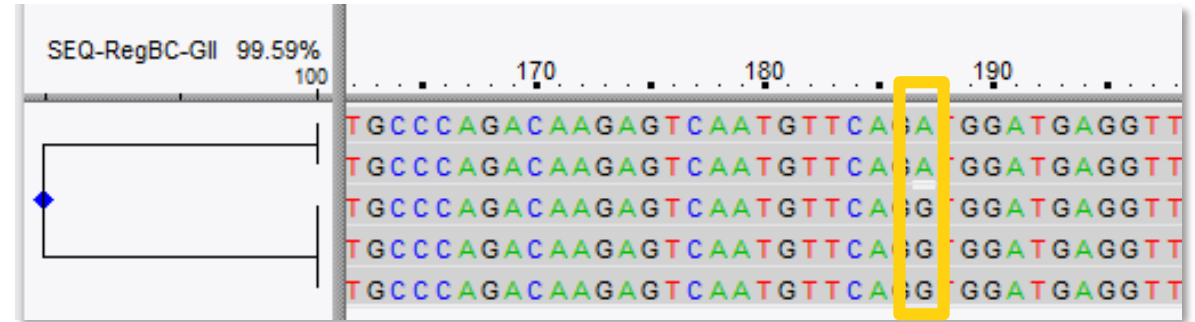
- **Female: 10 (67%)**
- **Median incubation: 31.5 hours (range, 21 to 45 hours)**
- **Median duration (n=8): 34.5 hours (range, 9 to 96 hours)**
- **Vomiting: 13 (87%)**
- **Diarrhea: 13 (87%)**
- **Cramps: 8 (53%)**
- **Fever: 5 (33%)**
- **Hospitalized: 1 (7%)**

Heterogeneous Region C & Region BC

Region C



Region BC



Norovirus im Speise-Eis

Bis Donnerstagnachmittag waren es 157 Meldungen eines Magen-Darm-Virus', die dem Kreisgesundheitsamt gemeldet wurden. Laut dem Reutlinger Amt wurden im konsumierten Speiseeis Noroviren nachgewiesen.

EVA FOCHT-RABEL | 13.03.2014

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