

Memorandum: ***E. coli* O157:H7 Outbreak Associated with Romaine Lettuce – Washington, Idaho and Minnesota, July 2002**
CDE Number: 02-143

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I. Introduction

On the evening of July 17, 2002, Spokane Regional Health District (SRHD) contacted the Washington State Department of Health (DOH) to report a cluster of diarrheal illnesses among teenagers who had recently attended a girls' cheerleading drill dance camp (Camp A) in Spokane County. At least one camper reported bloody diarrhea, and two had presumptive *Escherichia coli* O157:H7 isolated from stool. They reported about eight of their fellow campers were also ill. This report summarizes the investigation of this multistate outbreak of *E coli* O157:H7.

Background

Camp A was a four-day residential clinic for dance routines sponsored by "Just for Kix" and held at Eastern Washington University (EWU) in Cheney, Washington, from the afternoon of July 11th through the morning of July 14th. About 130 girls and coaches on ten teams from Washington and Montana and additional trainers from Minnesota attended Camp A.

The majority of Camp A attendees stayed in Streeter Hall on the EWU campus and ate meals at Tawanka, one of the two campus cafeterias. On July 12th a cold lunch was served outside on a mall, and cafeteria records indicate that 33 people who consumed that meal were not attendees of the camp. A small number of camp attendees commuted to campus daily and did not eat meals from the cafeteria. Camp A activities were held on campus at an enclosed field house where ice water was available in portable 5-gallon coolers and crushed ice was available separately for injuries. Preliminary interviews indicated the teams traveled separately to EWU and did not share any common exposures prior to arriving there.

Several Camp A participants subsequently attended a rustic overnight camp (Camp B) in the same county. Interviews were conducted for approximately 170 campers there. One secondary

culture-confirmed case of *E. coli* O157:H7 was identified from Camp B. Subsequent *E. coli* O157:H7 cases in the community having an indistinguishable pulsed-field gel electrophoresis (PFGE) pattern and no association with either camp or EWU led to a broader investigation by multiple agencies.

II. Methods

Case Finding & Case Definition

Telephone contact was attempted with all Camp A attendees on July 18th to notify them of the suspected outbreak and to advise those with diarrhea to refrain from food handling or the provision of child care or health care. Persons ill with diarrhea were advised to submit a stool culture for *E. coli* O157:H7 testing to their health care provider or SRHD.

Six girls with diarrheal symptoms had gone from Camp A directly to Camp B for a tent camping session from July 15-19th. Of 169 teenagers attending Camp B, 159 campers and 10 adults contacted by telephone July 26th responded to a symptom survey sent by mail, fax, or e-mail, as each person preferred. The 14 individuals reporting diarrheal illnesses on the survey who had not attended Camp A were advised to submit stool cultures for *E. coli* O157:H7.

SRHD contacted the medical clinic designated to provide health care for EWU students and the large regional laboratory providing clinical laboratory services in Spokane daily to identify any additional suspect cases based on symptoms of illness or results of stool cultures. To identify additional outbreak-associated cases, SRHD requested that laboratories in Spokane forward all *E. coli* O157:H7 isolates to the Washington State Public Health Laboratories (PHL) for confirmation and PFGE analysis.

Electronic mail alerts describing both camp-associated clusters of illness were sent to all local health jurisdictions in Washington and adjacent state and provincial health departments, and were posted on Epi-X, the Centers for Disease Control and Prevention's (CDC) electronic bulletin board. To identify cases in other states, the PFGE pattern of the outbreak *E. coli* O157:H7 isolate was posted on PulseNet, the CDC's confidential nationwide website listing PFGE patterns.

A case was defined as 1) illness associated with Camp A or EWU occurring from July 11-17th which was characterized by either abdominal cramps or diarrhea, or isolation from stool of *E. coli* O157:H7, 2) illness associated with Camp B during the month of July which was characterized by either abdominal cramps or diarrhea, or isolation from stool of *E. coli* O157:H7 for a person who did not attend Camp A. An outlier case was defined as isolation of *E. coli* O157:H7 with the outbreak PFGE pattern during the month of July from a person not associated with EWU or Camps A or B.

Epidemiological Investigation

Cohort study

Preliminary interviews indicated that the campers at Camp A had no common meals or activities prior to attending Camp A July 11th. To identify risk factors associated with illness, a cohort study of Camp A participants, parents attending Camp A, and Camp A staff was conducted

beginning July 19th. For the cohort study, a case was defined as illness associated with Camp A occurring from July 11-17th, either accompanied by abdominal cramps or diarrhea, or with isolation from stool of *E. coli* O157:H7 with the outbreak PFGE pattern.

SRHD and DOH generated a standard questionnaire to interview all members of the cohort. A range of potential routes of exposure were identified for the questionnaire including exposure to: an ill camp attendee, food from the campus cafeteria, water from the dormitory, water from cafeteria water dispensers, ice at the cafeteria, water from portable field house coolers, and water from a decorative fountain on campus. Meal menus for foods served at Camp A were obtained from the cafeteria food service and all food items listed were included in the questionnaire.

The questionnaire was completed by local and state health department staff through electronic mail, by regular mail, or by telephone. The cohort members were asked about the presence or absence of gastrointestinal symptoms during the outbreak period, as well as potential exposures and activities participated in while attending Camp A from July 11-14th. Seven days into the investigation, additional information provided by the cafeteria food service indicated that two different salads, a Caesar and a tossed salad, were served at the July 11th dinner. An additional short telephone survey was then conducted with members of the cohort to clarify which specific salad had been consumed at that dinner.

Data were analyzed using Epi-Info version 6.4. Risk ratios (RR) and 95% confidence intervals (CI) were calculated; when CIs were undefined, the Mantel-Haenszel p-value was used to determine the statistical significance of an association.

Local and state health department staff using standard food and exposure history interview forms investigated outlier *E. coli* O157:H7 cases. Information obtained included symptoms of illness and activities and food histories during the five days prior to illness onset.

Laboratory Investigation

Stool specimens and/or *E. coli* O157:H7 isolates from suspect cases were forwarded to Washington State Public Health Laboratories (PHL) for confirmation and PFGE analysis using *Xba* I enzyme. All *E. coli* O157:H7 specimens received in 2002 were reviewed to compare their PFGE patterns to that of the outbreak strain. For comparison of isolates from outliers with the outbreak pattern, PFGE analysis was performed using two enzymes, *Xba* I for all isolates and *Bln* II for a subset. The *Xba* I pattern was posted on PulseNet and compared with the pattern of other U.S. isolates posted during the previous six months.

At the time that the outbreak was recognized, no food remained from implicated meals at Camp A for microbiological testing. The only food samples available from the dance camp session during a July 18th inspection were green beans (served at July 13th dinner) and precooked sausage patties (served at July 14th breakfast). Food samples collected were tested for bacterial contamination at PHL. Swab or water specimens were obtained July 18th from all water coolers potentially used at the mall meal or at the field house (21 samples total, although typically three coolers were used at a time for water in the field house), bagged ice (1 sample) and ice machines (6 samples); all water specimens and swabs were tested for bacterial pathogens at SRHD.

Environmental Investigation

EWU stopped cafeteria food service operations on July 17th when first notified about the suspected outbreak and SRHD conducted an extended environmental investigation of the EWU Tawanka cafeteria to identify potential sources of *E. coli* O157:H7 contamination at the cafeteria. Based on preliminary results of the cohort study, the SRHD, with the assistance of the DOH Food Safety and Shellfish Program, conducted additional site visits to the cafeteria to inspect the water supply, water coolers, and the dining service facility, and to interview the food service staff preparing meals at Tawanka. This investigation included collection of information on the ingredients and preparation of salads.

Trace-backs of suspected food items were conducted by the DOH Food Safety and Shellfish Program, Washington State Department of Agriculture, and the United States Food and Drug Administration (FDA).

III. Results

Epidemiological Investigation

1. Descriptive Epidemiology

During initial telephone interviews with camp attendees, 42 girls reported gastrointestinal symptoms with illness onsets ranging from July 11th through July 21st.

Based on the results of microbiological testing and final interviews we identified 78 cases of gastrointestinal illness that met our case definitions:

- 1) 55 cases associated with Camp A or with meals at EWU, with onsets of illnesses occurring July 11-17th.
 - a. 53 cases from Washington, Montana, or Minnesota attending or working at Camp A, with 34 confirmed by culture and 19 meeting the clinical case definition; six cases became ill at Camp B.
 - b. two culture confirmed cases who ate the EWU mall meal prepared for Camp A on July 12th and which were not attendees or workers at Camp A.
- 2) 14 cases associated with Camp B who did not previously attend Camp A, one culture confirmed and 13 meeting the clinical case definition.
- 3) nine culture confirmed cases sharing the outbreak PFGE pattern, with onsets during the month of July and which were not associated with EWU or Camps A or B, referred to as outlier cases.
 - a. three cases from Spokane County, Washington,
 - b. two cases from Walla Walla County, Washington,
 - c. one case from Minnesota identified through PulseNet, and
 - d. three cases from an extended family in Idaho identified through PulseNet, with additional diarrheal illnesses in the household that were not culture confirmed.

Most Camp A cases were participants aged 14 to 17 years, but three adults associated with the camp were affected. All cases were female, reflecting the majority gender of staff and participants at Camp A. The Camp A-associated cases were from three Washington counties. Four case-patients were hospitalized: three for dehydration and one for hemolytic uremic

syndrome requiring temporary hemodialysis with eventual recovery of kidney function. There were no deaths.

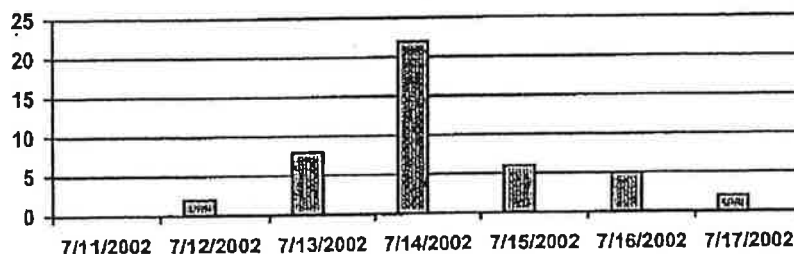
Of the 55 cases associated with Camp A, four culture-confirmed cases were unavailable for a second interview; 49 were interviewed for the cohort study and reported the symptoms summarized in Table 1.

Table 1. Symptoms Reported by Cases Associated with Camp A

Symptom	N	%
Diarrhea	47	96%
Abdominal cramps	46	94%
Nausea	38	78%
Headache	38	78%
Body aches	28	57%
Bloody diarrhea	22	45%
Subjective fever	19	39%
Vomiting	14	29%

Duration of illness ranged from 24 to 298 hours (median 123 hours). Median for the peak number of stools in a 24-hour period was 5.0 (range 2-35). Dates of illness onset for the Camp A-associated cases ranged from July 12-17th, 2002, with a peak on July 14th (Figure 1). One camper who initially reported illness on July 11th and left camp on July 12th was reinterviewed during the cohort study for specific date of onset of diarrhea. She reported the onset of nausea July 11 with the onset of diarrhea July 12, after she had left the camp. No pathogenic enteric bacteria were isolated from a stool culture obtained nine days after the onset of her illness.

Figure 1. Onset of Diarrhea - Cases Associated with Camp A (n=45)



Dates of illness onset for the outlier cases ranged from July 13-27th, 2002.

The outlier cases in Washington having an indistinguishable PFGE pattern were residents of two counties, three from Spokane County and two from Walla Walla County. Additional cases identified through PulseNet included a Minnesota resident and a cluster of three cases in a household in Idaho. The Panhandle Health District of Idaho investigated the Idaho cases but uncertainty about onset dates, the possibility of secondary transmission within the household,

and the consumption of lettuce and other ready-to-eat foods from multiple sources, including food banks, contributed to inability to pinpoint the source of exposure in these cases.

Initial interviews of cases suggested a salad could be the source of exposure: 1) none of the campers who commuted to camp but consumed meals off-campus had diarrhea; 2) among a family of three eating dinner on July 11th at Camp A, only one person became ill and met the case definition, and only that family member consumed Caesar salad; 3) a parent ate only the July 11th dinner including salad, left the camp, and became ill on July 15th, 2002 with symptoms meeting the case definition.

With the exclusion of the Idaho cases, all outliers reported consuming lettuce during the five days prior to illness onset. The cases in Idaho consumed lettuce but determining the exact timing in relation to onset and source of the lettuce was not possible. Five of the non-Idaho outliers specifically recalled consuming romaine lettuce or Caesar salad, and two cases consumed Caesar salad within days of each other during meals at the same Walla Walla restaurant. The Minnesota case reported several meals with lettuce including one dinner Caesar salad. The food histories of the outlier cases for the five days before onset are summarized in Table 2:

Table 2. Summary of Outlier Food Histories

	County	Onset	Beef consumed	Lettuce or produce consumed
Case 1	Spokane	7/13	7/8 deli meat sandwich 7/9 deli meat sandwich, 7/10 deli meat sandwich, BBQ burger or chicken 7/12 deli meat sandwich, BBQ burger or chicken 7/13 chili dog	7/9 Albertson's Caesar salad 7/12 Albertson's Caesar salad
Case 2	Spokane	7/18	7/15 Carl Jr cheeseburger, beef taco at O'Dougherty's 7/16 Jack in the Box burger	7/11 three pack Costco head lettuce 7/15 lettuce on taco 7/15 garden salad with romaine at O'Dougherty's 7/18 Costco garden mix salad
Case 3	Spokane	7/16	7/11 McDonald's cheeseburger 7/15 hamburger at home	Salad, unknown source
Case 4	Walla Walla	7/19	7/13 beef and broccoli restaurant dinner 7/15 Swiss burger	Multiple salads from iceberg salad mix 7/16 Chicken Caesar salad at Paisano's in Walla Walla
Case 5	Walla Walla	7/24	Vegetarian - no beef	Local organic produce 7/20 Caesar salad at Paisano's in Walla Walla
Case 6	MN	7/17	7/11 meat calzone 7/15 steak	7/12 Caesar salad 7/15 and 7/16 lettuce on purchased chicken sandwiches

2. Analytical Epidemiology – Cohort Study

The cohort study included 106 (76%) of the approximately 140 people participating in Camp A, including 96 campers, six parents, and four camp staff; 49 (46%) were ill and 57 (54%) were not ill. The cohort for the second interview, necessitated when additional menu information for the July 11th dinner was obtained and two different salads identified, included 80 (57%) of the 140 participants, 41 (51%) ill and 39 (49%) not ill.

Onset of diarrhea for first case in the outbreak was July 12th; therefore onset of illness after that date may have been caused by secondary transmission at the camp, and not by exposure to the initial source of contamination. In order to avoid confounding by potential secondary cases, univariate analysis of cohort data focused on food and beverages consumed during first three days of the camp including three meals (dinner July 11th, and breakfast and lunch July 12th).

Table 3 shows the rates of illness among the cohort and selected food items consumed July 11th and 12th. Of food items served during the first three meals, only dinner salad served July 11th, breakfast cereal served July 12th, and drinking water from the field house coolers served July 12th were statistically associated with illness. All ill persons and 30 well persons ate salad July 11th, therefore the RR and 95% CI were undefined; the p-value was <0.0001. For only July 12th, drinking water from the coolers at the field house was statistically associated with illness (RR and 95% CI undefined, p-value 0.004), but only 9 persons did not drink the water. Although the cold cereal served at breakfast July 12 was statistically associated with illness (RR = 1.9; CI 1.3-2.8, p-value 0.004) consumption of cereal explained only 16 illnesses; 11 of those reported eating three different kinds of cereal and five did not specify the type of cereal consumed. Consuming milk at that breakfast was not significantly associated with illness. For July 11th, consumption of water from the dormitory (faucet), water from dispensers in the cafeteria, water from coolers in the field house, or ice was not significantly associated with illness.

The second interview asked specifically which type of salad was consumed (Caesar or tossed) at the July 11th dinner. Risk for illness was significantly associated with consumption of Caesar salad (RR = 3.4, CI 1.8-6.4, p-value <0.0003), while although not significant, consumption of tossed salad was less likely to be associated with illness (RR = 0.6, CI 0.3-1.1, p-value 0.05).

Laboratory Results

During the month of July, 52 *E. coli* O157:H7 isolates were received and confirmed by PHL; 39 had the outbreak PFGE pattern when analyzed with a standard single enzyme (*Xba* I): 32 cases were associated with Camp A (29 Washington campers, one Montana camper, two persons eating at EWU), one with Camp B, and the remaining six were outliers, including a Minnesota resident whose isolate was forwarded to PHL. Three isolates from Idaho residents posted on PulseNet also had the outbreak PFGE pattern. This *Xba* I PFGE pattern had not been identified on PulseNet or in Washington during the previous six months. All 39 isolates were analyzed by PFGE using a second enzyme (*Bln* I). Isolates from 30 Camp A campers and the six outlier isolates had an indistinguishable *Bln* I pattern. Four other isolates (two Camp A campers, one person who ate at EWU July 12th, and the isolate from the Camp B camper) shared an indistinguishable pattern that was highly related to the predominant *Bln* I pattern (differed by a single band).

SRDH isolated coliform bacteria from one water cooler that had been used in the field house at Camp A, but no *E. coli* were identified in the cultures. Commercial ice samples, samples from the ice machine, and water samples from campus tested at SRHD were all satisfactory. The green beans and sausage patties were negative for bacterial pathogens, including *E. coli*.

Environmental Investigation

Ice and water available in the field house were provided from an ice machine and tap water was obtained from the concession stand or the kitchen. Spokane municipality supplied water on campus.

No food handlers working at Tawanka cafeteria reported having an illness consistent with *E. coli* O157:H7 during meal preparation for Camp A. During inspection no food handling practices were identified that could potentially contaminate salads with raw meat.

Initial and intermediate storage of lettuce was a walk-in produce cooler separate from all meat storage; in addition, no raw ground beef was present in the walk-in cooler or in the Tawanka kitchen during Camp A. The salads for dinner on July 11th were prepared from one and a half 5-pound bags of romaine toss, one 3-lb can of whole olive, one bag of Parmesan cheese, cucumbers, dressing, and one bag of croutons. Using gloves, one food worker mixed salad in a bowl used only for ready-to-eat foods. Two types of salad were prepared for the dinner, Caesar salad with cheese and croutons and green salad with olives and cucumbers. Servings of salad in single-use individual bowls were put on the serving line. On July 12th, the remaining half bag of romaine was used with two additional bags of romaine lettuce to prepare salad for lunch. Salad was served in a clamshell container.

Trace-back

Food Service of America (FSA) delivered four bags of pre-washed "lettuce romaine toss," marked with FSA item number 197386 to EWU on July 11th. The lettuce was shredded and bagged by Spokane Produce Incorporated (SPI). FSA also supplied two 1-gallon containers of Lite House Caesar Dressing, ten 1-lb bags of home-style croutons, and four 5-lb bags of shredded Parmesan cheese.

Outlier case 2 consumed a garden salad containing romaine lettuce at a restaurant that received "lettuce romaine toss" item number 197386 supplied by FSA. Romaine lettuce bagged by SPI was delivered by FSA on July 12th, 2002 to a Walla Walla restaurant where outlier cases 4 and 5 consumed Caesar salads July 16th and 20th, 2002; romaine lettuce from another distributor was delivered July 16th. Croutons, cheese, and commercial dressing used at that restaurant for Caesar salad were all from different suppliers and the suppliers did not receive products from the same manufacturers that FSA provided to EWU.

Based on the lack of new cases, the short shelf life of the product, and the ongoing nature of the investigation, both SRHD and DOH urged further investigation of the source of contamination for the lettuce, but advised against a proposed FDA nationwide alert to consumers to avoid consumption of romaine lettuce distributed by SPI. However, FDA issued an alert on July 29th, 2002, and began a plant inspection and trace-back investigation to identify the source of romaine

lettuce for SPI. The lettuce was traced back to several produce farms in California; however, no source of the contamination was identified. Details of the FDA trace backs are not available.

IV. Discussion

This is the first reported *E. coli* O157:H7 outbreak associated with pre-washed romaine lettuce. Among a cohort of persons attending a drill camp, consumption of a Caesar salad containing romaine lettuce was strongly associated with illness. Although consumption of water from a field water cooler on the second day of camp was also significantly associated with illness, we believe the association reflects the high use of water coolers; only nine respondents did not drink water from coolers. In addition, during the same time period, illness caused by *E. coli* O157:H7 with an indistinguishable PFGE pattern occurred among unrelated individuals in the several states. The only link between these additional cases was the consumption of romaine lettuce during the five days before their illness onset.

Although *E. coli* O157:H7 is typically associated with cattle and bovine products such as ground beef, outbreaks associated with lettuce and other vegetable products have been reported previously. In 1995, a Montana outbreak affecting almost 100 people was associated with leaf lettuce traced to several different farms in two states¹. Mesclun lettuce from a single grower-processor was implicated in a 1996 *E. coli* O157:H7 outbreak with 61 reported cases in Connecticut and Illinois².

This romaine-associated outbreak of *E. coli* O157:H7 included cases from a cafeteria dinner on a Spokane campus, lunch the following day from the same cafeteria, a restaurant salad in Spokane County, romaine purchased at several Spokane area grocery stores, two restaurant salads in Walla Walla County, and romaine served at a restaurant in a Midwestern state. Cases were clustered in time, and no outbreak-associated isolates were subsequently identified through PulseNet.

Contamination of produce such as lettuce could occur at several points from the field to consumption. The multiple sources of romaine involving two distant states suggest that contamination was not caused by consumers or a food handler. Although the trace-back could not identify a single farm, it is likely contamination occurred prior to lettuce distribution. Potential routes of contamination of produce with *E. coli* O157:H7 include manure fertilizer, contamination of the growing field by animal or human feces, contaminated water used for irrigation, rinse, or other processing steps, or ill workers handling lettuce at any point during processing.

Reports of previous *E. coli* and shigellosis outbreaks also found scattered and limited numbers of cases associated with widely distributed contaminated lettuce^{2,3}. In the outbreak described in this report, the limited number of cases identified outside of Camp A may reflect several factors: 1) it is possible that only a small amount of romaine lettuce was contaminated, 2) romaine lettuce may be a product more likely consumed by adults than children (in previous lettuce-associated outbreaks, the median age of cases ranged from 26-50 years)^{1,4}, and 3) cases in adults may be both underdiagnosed and underreported, as adults with *E. coli* O157:H7 have milder symptoms,

are less apt to seek medical care, and are less frequently tested for enteric pathogens when compared with children.

Molecular methods were essential in identifying the scope of this outbreak. Against the background of typically increased numbers of enteric infections during summer months, the small number of outlier *E. coli* O157:H7 cases with lettuce consumption would likely not have been recognized without PFGE analysis identifying a common pattern. In the absence of the Camp A outbreak, it is possible the association of infection with lettuce consumption would not have been identified.

E. coli O157:H7 is known to be highly contagious, with secondary cases reported from most large outbreaks. A single secondary case at a rustic camp was identified in this outbreak. Secondary transmission may have been reduced because the dance camp attendees were alerted about refraining from food handling while ill with diarrhea and educated about the importance of personal hygiene with such an illness; several ill teens employed as food workers when first contacted by telephone were removed from work immediately.

This outbreak highlights the role of raw vegetables as a potential source of bacterial contamination, a risk that is apparently not reduced by "pre-washing" of the products. Published guidelines may help producers and distributors of fresh produce to reduce the risk of contamination.⁵ However consumers should be aware that consumption of raw produce, even after it has been rinsed or "pre-washed" may put them at risk for enteric illness.

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Table 3. Rates of illness among cohort by food items consumed

Initial interview	Ate food item			Did not eat food item			R.R.**	C.I.***	p value****
	ill	well	A.R.*	ill	well	A.R.			
July 11th									
Dinner									
Manicotti	47	45	0.51	1	5	0.16	3.1	0.5-18.6	
Bread	32	33	0.49	15	17	0.47	1.1	0.7-1.6	
Potato	40	35	0.53	8	15	0.35	1.5	0.8-2.8	
Sour cream	31	27	0.53	15	20	0.43	1.3	0.8-2.0	
Cheddar	32	28	0.53	15	21	0.42	1.3	0.8-2.0	
Bacon bits	18	20	0.47	28	28	0.50	1.0	0.6-1.5	
Margarine	31	32	0.49	15	16	0.48	1.0	0.7-1.6	
<i>Salad</i>	48	30	0.62	0	20	0	<i>Undef</i>	<i>Undef</i>	<0.0001
Cantaloupe	9	9	0.50	35	39	0.47	1.1	0.6-1.8	
Honeydew	7	6	0.54	39	43	0.48	1.1	0.7-2.0	
Watermelon	14	12	0.54	32	37	0.46	1.2	0.8-1.8	
Red apple	4	1	0.80	43	48	0.47	1.7	1.0-2.8	
Green apple	4	3	0.57	43	46	0.48	1.2	0.6-2.3	
Orange	0	1	0	47	48	0.49	0	Undef	
Banana	7	8	0.47	40	41	0.49	0.9	0.5-1.7	
Choc. Cake	33	21	0.52	14	19	0.58	1.2	0.8-1.9	
Ice in drink	37	33	0.53	11	17	0.39	1.4	0.8-2.2	
Popsicle	25	23	0.52	19	25	0.43	1.2	0.8-1.9	
Water in dorm	17	26	0.40	30	30	0.50	0.8	0.5-1.2	
Water at meal	22	16	0.58	26	39	0.40	1.5	1.0-2.2	
Water cooler	41	41	0.5	5	12	0.29	1.7	0.8-3.7	
July 12th									
Breakfast									
Waffle	30	34	0.47	16	15	0.52	0.9	0.6-1.4	
Eggs	27	34	0.44	17	13	0.57	0.8	0.5-1.2	
<i>Cereal</i>	16	5	0.76	28	42	0.40	1.9	1.3-2.8	
Yogurt	15	21	0.56	29	36	0.45	1.2	0.8-1.9	
Cantaloupe	3	0	1.00	17	22	0.44	2.3	1.6-3.3	
Honeydew	7	8	0.47	36	39	0.48	1.0	0.5-1.8	
Watermelon	7	5	0.58	36	42	0.46	1.2	0.7-2.2	
Red apple	3	1	0.75	41	46	0.47	1.6	0.9-2.9	
Green apple	1	3	0.33	41	46	0.48	0.7	0.1-3.5	
Orange	2	0	1.00	42	48	0.47	2.0	1.7-2.7	
Banana	6	7	0.46	39	40	0.49	0.9	0.5-1.8	
Berries	1	2	0.33	43	44	0.49	0.7	0.1-3.4	
Cinn. Roll	28	27	0.51	16	21	0.43	1.2	0.8-1.9	
Milk	18	10	0.64	27	37	0.42	1.5	1.0-2.3	
Apple juice	10	15	0.40	33	33	0.50	0.8	0.5-1.4	
Orange juice	12	11	0.52	33	37	0.47	1.1	0.7-1.8	
Ice in drink	24	24	0.5	20	24	0.46	1.1	0.7-1.7	
Lunch									
Turkey sand.	31	39	0.52	15	20	0.43	1.2	0.8-1.9	
Ham sand.	12	13	0.48	34	35	0.49	1.0	0.6-1.6	
Veggie sand.	1	2	0.33	45	45	0.90	0.7	0.1-3.4	
Mac. Salad	28	25	0.53	17	23	0.43	1.2	0.8-1.9	
Caesar salad	31	25	0.55	13	21	0.38	1.5	0.9-2.4	
Lemon bar	28	21	0.57	18	27	0.40	1.4	0.9-2.2	
Red apple	1	2	0.33	44	46	0.49	0.7	0.1-3.4	

Initial interview	Ate food item			Did not eat food item			R.R.**	C.I.***	p value****
	ill	well	A.R.*	ill	well	A.R.			
Green apple	2	1	0.67	43	47	0.48	1.4	0.6-3.2	
Orange	1	0	1.00	44	48	0.48	2.1	1.7-2.6	
Banana	2	3	0.40	43	45	0.49	0.8	0.3-2.5	
Watermelon	5	8	0.39	39	40	0.49	0.8	0.4-1.6	
Cantaloupe	0	0	0	15	22	0.41			
Honeydew	2	4	0.33	38	42	0.48	0.7	0.2-2.2	
Berries	0	2	0	43	45	0.49	0		
Ice in drink	11	9	0.55	34	38	0.47	1.2	0.7-1.9	
Dinner									
Chicken	22	16	0.58	23	32	0.42	1.4	0.9-2.1	
Hash browns	18	18	0.50	17	20	0.46	1.0	0.6-1.5	
Fettucini	27	24	0.53	18	24	0.43	1.2	0.8-1.9	
Tossed salad	36	30	0.60	8	17	0.32	1.7	0.9-3.1	
Gelatin cup	24	18	0.57	20	27	0.43	1.3	0.9-2.1	
Roll	36	32	0.53	9	15	0.38	1.4	0.8-2.5	
Cherry cake	25	22	0.53	19	26	0.42	1.3	0.8-2.0	
Cantaloupe	6	4	0.60	38	44	0.46	1.3	0.7-2.3	
Honeydew	5	2	0.71	39	46	0.85	1.6	0.9-2.6	
Watermelon	16	19	0.46	28	33	0.46	1.0	0.6-1.6	
Red apple	3	1	0.75	41	46	0.47	1.6	0.9-2.9	
Green apple	1	2	0.33	44	45	0.49	0.7	0.1-3.4	
Orange	1	0	1.0	43	47	0.48	2.1	1.7-2.6	
Banana	5	2	0.10	39	45	0.46	1.5	0.9-2.6	
Berries	0	3	0	44	45	0.49	0		
Ice in drink	33	32	0.51	10	17	0.37	1.4	0.8-2.4	
Popsicle	40	39	0.51	7	14	0.33	1.5	0.8-2.9	
Water in dorm	16	27	0.37	29	28	0.51	0.7	0.5-1.2	
Water at meal	25	21	0.54	22	34	0.39	1.4	0.9-2.1	
Water cooler	47	47	0.50	0	9	0	Undef	Undef	0.004
2nd interview									
<i>Caesar salad</i>	33	11	0.75	8	28	0.29	3.4	1.8-6.4	0.000003
Tossed salad	8	16	0.33	31	23	0.57	0.6	0.3-1.1	

* Attack rate

** Relative risk; undefined if attack rate for unexposed = 0

*** 95 % confidence interval; undefined (undef) if RR is undefined or RR = 0

**** Mantel-Haenzel p-value