SUMMARY REPORT

OUTBREAK 2014-119

September 2014

Office of Infectious Disease Epidemiology and Outbreak Response
Prevention and Health Promotion Administration
Maryland Department of Health and Mental Hygiene

INTRODUCTION

On April 11, 2014, the Baltimore City 311 system received 3 reports of illness from attendees of Conference A. A 4th report was received on April 15. All of the reports were from conference attendees who also worked in the same building at another work location. The reporters stated that they, and several coworkers who also attended Conference A, became ill with diarrhea between April 8 and April 10. The attendees suspected that lunch served on April 9 was the source of the illnesses. All 4 reports were assigned in the 311 system to Baltimore City Health Department's (BCHD), Bureau of Environmental Health, Environmental Inspection Services (EIS) Food Control Section. On April 16, BCHD, EIS identified that these reports were related and informed BCHD's Office of Acute Communicable Diseases (ACD). An outbreak investigation was initiated on April 16 by BCHD. BCHD notified the Maryland Department of Health and Mental Hygiene (DHMH) Division of Outbreak Investigation on April 16. Subsequently, the response proceeded as a joint state-local outbreak investigation.

BACKGROUND

Conference A was held at Convention Center A in Baltimore, Maryland. The main conference was held from Tuesday, April 8 through Thursday, April 10. Two smaller training sessions were held on Monday, April 7. Approximately 1300 people attended, exhibited at, or spoke at the conference. Attendees were from 42 states, Canada, Mauritius, and Costa Rica.

Caterer A, the primary caterer for Convention Center A, supplied food for the conference. Food was also available for purchase at vendors and concession areas in the convention center. Caterer A provided food for continental breakfasts on April 8, 9, and 10, lunch on April 9 and 10, afternoon break on April 8, 9, and 10, and for evening receptions on April 8 and 9. All food was served buffet style.

METHODS

Epidemiologic investigation:

Case finding and exposure assessment:

DHMH conducted a retrospective cohort study of conference attendees. In order to develop hypotheses about what caused the outbreak, BCHD and DHMH conducted open ended interviews with several attendees, including those who reported to the 311 system. Combining the information from the open ended interviews, a food menu obtained from Caterer A, and a list of sessions and activities from Conference A's website, DHMH created an internet survey that asked about demographics, food consumed at the conference, sessions attended at the conference, other activities at the conference,

and health status (Attachment A. Internet Survey). The event organizer for Conference A provided a list of email addresses for people who were at the conference.

On April 17, DHMH sent a letter by email to the email addresses provided containing the link and password to the internet survey and a request that all attendees fill out the internet survey (Attachment B. Survey Letter). Within hours after sending the email, the letter containing the link to the internet survey and password was posted on a public webpage by one of the email recipients. At that point, more than 400 responses from conference attendees had already been received. In response, DHMH deactivated the internet survey link that same day to ensure that people who did not attend the conference could not access and enter information into the survey. On April 22, after receiving requests from attendees who were unable to access the internet survey, DHMH distributed a new link and password to all attendees by email and included a message not to share the link and password with people who did not attend Conference A (Attachment C. Survey Email).

An outbreak-associated case was defined as:

Diarrhea or vomiting in a person who attended Conference A, with an onset up to 72 hours after the conference.

Exposure assessment:

We calculated the relative risk (RR) of developing disease and 95% confidence interval using Microsoft Excel (2013) for each session, activity, and food item.

Environmental investigation:

In response to the complaints of illness, Environmental Health Specialists from BCHD, EIS inspected Caterer A on April 16. During this inspection, the Environmental Health Specialists asked if any employees had been ill recently and if other conferences took place around the same time as Conference A. No food was being prepared at the time of inspection. There was no leftover food prepared for Conference A available for testing; however, some ingredients used to prepare dishes for the conference and likely from the same manufacture lots were identified for possible testing. On April 18, personnel from the DHMH Office of Food Protection and DHMH Division of Outbreak Investigation returned to the kitchen to collect these ingredients for testing.

On April 23, personnel from BCHD, EIS, DHMH Office of Food Protection and DHMH Division of Outbreak Investigation returned to observe food preparation and hot holding. Information about the preparation of food, sources of food, and other procedures was obtained from the chef through in-person interviews conducted during the inspections, and subsequently by phone and email.

Laboratory analyses:

Ill individuals were asked to submit stool specimens for testing. The DHMH Laboratories Administration and the state public health laboratories of 8 other states conducted initial laboratory investigations. Stool specimens were cultured for *Salmonella*, *Shigella*, *E. coli* O157, and *Campylobacter* and tested for

Shiga toxins, norovirus, rotavirus, sapovirus, and astrovirus. Due to the length of time that had passed between the onsets of illness and specimen collection, culture for *Bacillus cereus*, *Clostridium perfringens*, and *Staphylococcus aureus* was not attempted at state public health laboratories. However, based on initial reports of illness onset, incubation, and suspect food items, *C. perfringens* was considered a possible etiology so specimens were sent to the Centers for Disease Control and Prevention's (CDC) Enteric Diseases Laboratory Branch for *C. perfringens* culture and testing for *C. perfringens* enterotoxin (CPE) using Oxoid's Perfringens EnteroToxin – Reversed Passive Latex Agglutination test kit (PET-RPLA). PCR was performed on selected suspect *C. perfringens* isolates for the genes that encode the alpha toxin (*cpa*) which is produced in all toxin types of *C. perfringens*, the foodborne enterotoxin (*cpe*), and the necrotic enteritis-producing beta toxin (*cpb*) was performed on selected suspect *C. perfringens* isolates. The tests used for the detection of all of the viral agents (norovirus, rotavirus, sapovirus, and astrovirus) have not been FDA-approved therefore, the results of these tests are not intended to be used for clinical purposes; however, they can be a useful adjunct to epidemiologic investigations. The meaning of the *C. perfringens* and CPE test results has not been well-established.

Food samples were cultured for *B. cereus* and *C. perfringens* at the DHMH Laboratories Administration.

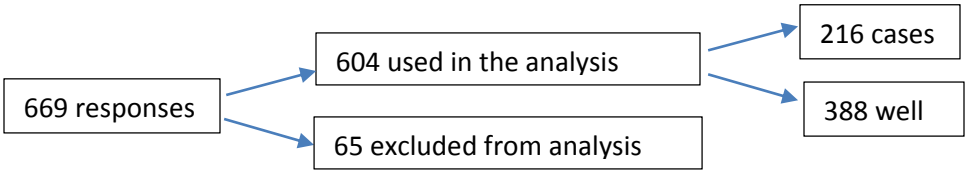
RESULTS

Epidemiologic findings:

Case finding and exposure assessment:

Through internet and phone interviews, we identified 669 respondents. Of the 669, 604 responses were used in the analysis and 65 responses were excluded from the analysis. (Diagram 1) Of the 65 excluded responses, 2 were from respondents reporting onsets more than 72 hours after the conference. Another 14 of the 65 respondents were excluded because they reported feeling unwell but did not have diarrhea or vomiting as required in the case definition. Additionally, another 14 were excluded because they reported an onset of illness before attending Conference A. Lastly, 35 entries were excluded because the respondent did not provide adequate information to determine case status and/or exposure history. Duplicate responses were also excluded from the analysis. Of the 604 respondents included in the analysis, 216 were cases and 388 were well conference attendees.

Diagram 1. Disposition of survey responses



Of the 216 cases, 99 (45.8%) were female and 117 (54.2%) were male. (Table 1) Ages ranged from 22 to 79 years with a median of 43 years and a mean of 43.5 years. Two hundred and thirteen cases (98.6%) reported diarrhea, 162 (75.0%) stomach cramps, 97 (44.9%) nausea, 73 (33.8%) headache, 52 (24.1%) chills, 22 (10.2%) fever, 22 (10.2%) vomiting, and 5 (2.3%) bloody stool. Five (2.3%) visited a healthcare provider. (Table 2) None was hospitalized or died. Onsets ranged from April 8 at 12 pm to April 12 at 10:30 am, with a median onset at 12 am on April 10. (Appendix 1. Epidemic curve). The epidemic curve forms a peak around the time of the median onset, as 117 of 216 total cases became ill within a 16-hour period (4 pm on April 9 until 8 am on April 10). The duration of illness ranged from 0.25 hours to 225 hours with a median of 28.5 hours and a mean of 38 hours. Eight cases reported having ill household members who did not attend the conference.

Of the well respondents to the survey, 176 (45.4%) were female, 205 (52.8%) were male, and gender was unknown for 7 (1.8%). Ages ranged from 21 to 72 years with a median of 48 years and a mean of 45.4 years. Nine well respondents reported having ill household members who did not attend the conference.

Table 1. Sex and age distribution of 216 cases and 388 well respondents

Gender:	**Cases**	**Well respondents**
Female	99 (45.8%)	176 (45.4%)
Male	117 (54.2%)	205 (52.8%)
Unknown	0 (0.0%)	7 (1.8%)
Age:		
Age range	22-79 years	21-72 years
Median age	43 years	48 years
Mean age	43.5 years	45.4 years

Table 2. Symptom frequency among 216 cases

Signs and Symptoms:	**Number (%)**
Diarrhea	213 (98.6%)
Stomach cramps	162 (75.0%)
Nausea	97 (44.9%)
Headache	73 (33.8%)
Chills	52 (24.1%)
Fever	22 (10.2%)
Vomiting	22 (10.2%)
Bloody stool	5 (2.3%)

Several exposures had elevated RRs and had a prevalence of >50% among the cases, including attendance on April 8 (RR=1.9 (1.4, 2.6), p<.001), attendance on April 9 (RR=5.2 (1.7, 15.7), p < .001), eating lunch served on April 9 (RR=5.1 (2.9, 9.1), p < .001), and eating the pan-seared breast of chicken Marsala served for lunch on April 9 (RR=3.5 (2.0, 6.1), p < .001). (Appendix 2. Exposure Tables) The pan-

seared breast of chicken Marsala was the food item most commonly consumed by cases, with 146 of all 216 (67.6%) cases consuming it and 146 of the 157 (93.0%) cases who ate lunch on April 9 consuming it.

Eight of the survey respondents reported that hot food served during the convention did not seem hot enough and/or that cold food did not seem cold enough. Two said that the chicken appeared undercooked and two said that the cheeseburger sliders appeared undercooked.

Two ill employees of Caterer A were identified during the environmental inspection through food service worker absentee log review and interview. These 2 employees were not included in the analysis because they did not have the same exposures as conference attendees.

Environmental findings:

Food was not being prepared in the kitchen during the initial visit on April 16 by two BCHD Environmental Health Specialists. The observed temperature of a walk-in cooler was within the acceptable range. No food prepared for the conference remained. Menus for the conference, temperature logs, and recipes and procedures for food preparation were obtained.

During the same visit on April 16, Caterer A reported that during the event, about 12 employees worked in the kitchen and 40 served food. Of these, Caterer A estimated that about 20 were temporary wait staff. Two other events were held at Convention Center A that same week and were also catered by Caterer A, but neither the facility nor Caterer A received any complaints of illness from either of these groups. DHMH called the contact person that was supplied to the convention center for one of the groups to ask if attendees of that event had become ill. Caterer A also reported that two employees had been ill around the time of the outbreak. One employee who washes dishes started feeling sick the morning of April 10 and vomited in a restroom at work that afternoon; the employee was sent home. Another employee, who did not work in the kitchen, became ill with diarrhea and an upset stomach on April 11, with duration of symptoms less than one day. According to Caterer A management, neither of the ill employees ate food from work. Both of the ill employees submitted stool specimens for testing.

Also during the April 16 visit, Caterer A reported hearing rumors that 20 people associated with Conference A were sick and that someone working at the registration desk for the conference had been sick and could have contaminated the attendees' badges. When additional questions were asked about this at a later date, Caterer A reported that it was the event organizer who told them of the illnesses on April 10. The event organizer and caterer did not report the illnesses to BCHD or DHMH.

Through subsequent calls, emails, and visits with Caterer A, information about the preparation and holding of the chicken Marsala served on April 9 for lunch was obtained. The Marsala sauce was prepared the morning of April 9 and used only for the April 9 lunch. Kitchen staff might also have consumed the chicken Marsala, but the other two groups with events at Convention Center A that day had a different menu and would not have eaten it. Leftovers would have been discarded. However, the ingredients used to make the dish were likely used for other dishes served to this group and for dishes served to other groups. Caterer A reported that precooked frozen chicken breasts were used for the chicken Marsala. The chicken breasts were placed on sheet pans and thawed in a walk in cooler on April

8. They were cooked the morning of April 9 and transferred to 2-inch pans after cooking. The sauce was prepared using wine, pre-sliced fresh mushrooms, 16 lb. buckets of frozen demi-glace that had been placed in a walk-in cooler 24 hours prior to thaw, and peeled fresh garlic from 5 lb. jars that was chopped in the kitchen prior to use. The mushrooms and garlic were added first to a steam jacket kettle, followed by the wine and demi-glace. The sauce was brought to a boil and then simmered for 30-40 minutes. One hundred and fifty gallons of sauce were prepared at one time. The sauce was drained from the steam jacket kettle into pitchers and poured directly over the pans of cooked chicken breasts. Plastic wrap was placed over the pans. The pans were loaded into hot holding cabinets with Sternos on the bottom shelf approximately 1 hour and 20 minutes prior to service. Temperatures were recorded at that time and 2 hours later. The hot holding cabinet was plugged in while in the kitchen, unplugged during transport, and plugged in at the location of service. Transport to the location of service occurred about 50-60 minutes prior to the opening of the buffet. Fifteen to 20 minutes before the buffet lines opened, the pans were loaded onto pre-warmed serving dishes with the lids closed. The plastic wrap was removed when the buffet line opened. The above process was reported by Caterer A management and not directly observed on the day of service by DHMH or BCHD. Time intervals were reported, not recorded, by Caterer A.

Three temperature logs for the April 9 lunch service were available from Caterer A. Temperatures were recorded for 2 time points. All three logs were similar and indicated a temperature of 167˚F at 10:15 am and a temperature of 151˚F or 152˚F at noon for the chicken Marsala. Temperatures were also recorded for vegetable lasagna and roasted vegetables. Per Caterer A, the buffet was scheduled to be open from 11:45 am to 1:15 pm.

Laboratory findings:

Stool specimens from 22 ill individuals were tested, including 1 from an individual who was excluded from the exposure analysis because their onset of illness was April 17, 2 from ill employees of Caterer A, and 19 from case-patients. The median time between onset of illness and specimen collection was 13 days (range 4-21 days). Two specimens from case-patients were positive for norovirus genogroup 2 by real-time reverse transcriptase polymerase chain reaction procedure (RT-PCR). The specimen from the person with an onset of illness on April 17 who was excluded from the exposure analysis was positive for norovirus genogroup 1. Testing for *Salmonella*, *Shigella*, *E. coli* O157, Shiga toxins, *Campylobacter,* rotavirus, sapovirus, astrovirus and Shiga toxins was negative.

Four of 17 stool specimens were positive for CPE toxin by PET-RPLA. (Diagram 2.) Of those 4 specimens, suspect colonies were observed for 3. Of the 3 with suspect colonies, all were *cpa* positive but were negative for *cpe* and *cpb*. Thirteen of 17 specimens were negative for CPE toxin. Of those 13, suspect colonies were observed for 7. Of the 7 with suspect colonies, 1 was *cpa* positive, *cpe* positive, and *cpb* negative. The other 6 were *cpa* positive, *cpe* negative, and *cpb* negative. No suspect colonies were observed for 6.

Frozen chicken breasts, garlic, and demi-glace were cultured for *B. cereus* and *C. perfringens.* Results of <10/gram were reported for both types of bacteria in all samples, indicating that these bacteria were either absent or possibly present at very low levels, below the limit of detection.

Diagram 2. *C. perfringens* testing of 17 specimens sent to CDC.

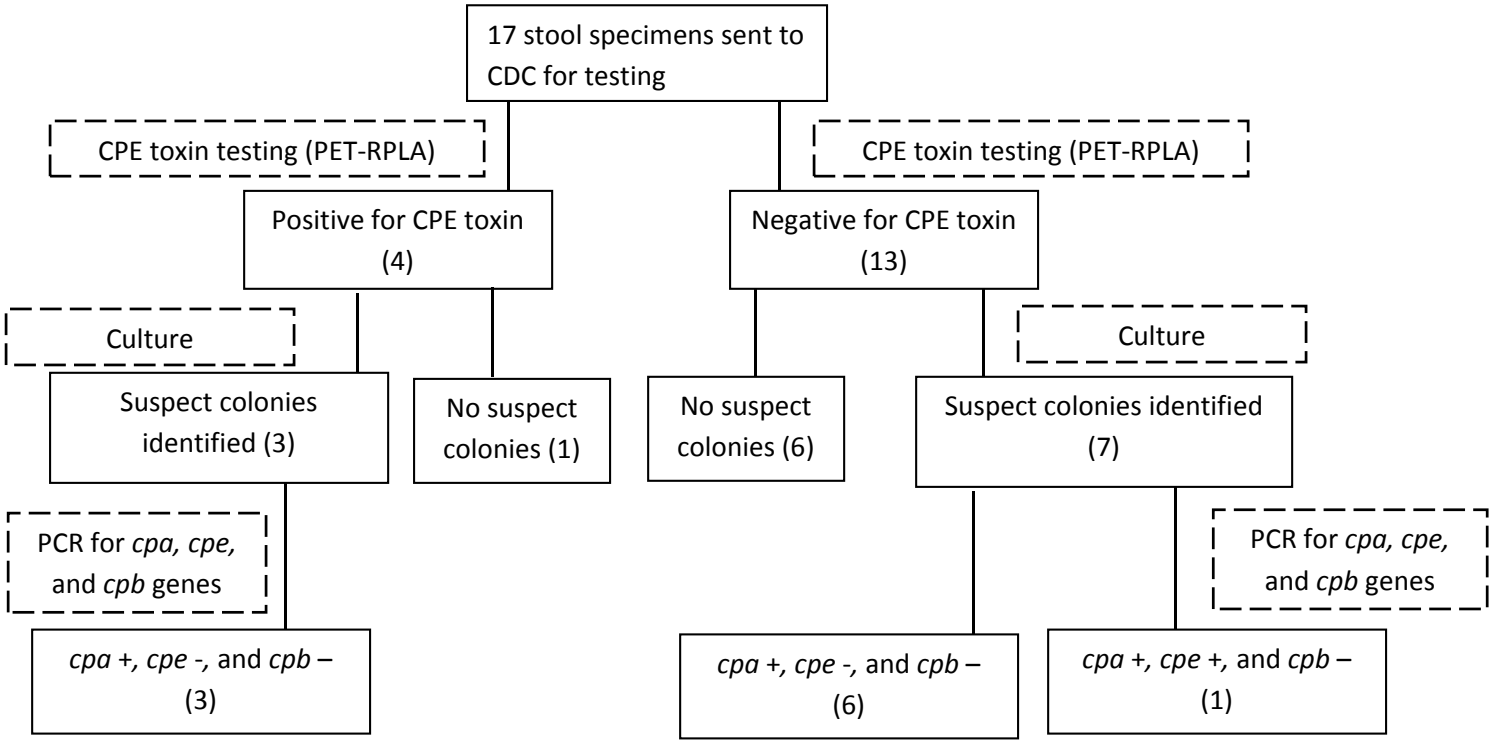


Diagram 2 shows the results of CPE toxin testing, culture, and PCR for the cpa, cpe, and cpb genes for stool specimens sent to CDC for C. perfringens *testing. CPE toxin testing was positive for 4 of 17 specimens, and suspect colonies were identified in cultures from 10 of 17 specimens. The cpa gene was detected in all 10 suspect colonies, the cpe gene was detected in 1 suspect colony, and the cpb gene was not detected in any suspect colonies.*

CONCLUSION

In this gastroenteritis outbreak associated with Conference A, the majority of cases appear to have been associated with a point source exposure. Over half of the cases (117 of 216 total cases) had onsets within a 16 hour period (4 pm on April 9 until 8 am on April 10). Conference attendees who ate any food from the lunch served on April 9 were over five times more likely to develop illness than attendees who did not eat lunch on April 9, suggesting that exposure for these cases may have occurred during that meal. Of the food items served during that meal, chicken Marsala was most strongly associated (RR= 3.5 (2.0, 6.1)) with an increased risk of illness and was consumed by a majority of cases.

The frequency of signs and symptoms, duration of illness, and possible incubation period were consistent with outbreaks caused by *C. perfringens.* In this outbreak, almost all of the cases had diarrhea and only 10% reported vomiting, which is typical of outbreaks caused by *C. perfringens*. The median duration of illness was 28.5 hours, which was slightly longer than is typical for outbreaks caused by *C. perfringens*. The median onset of illness for the outbreak, coinciding with the peak of the epidemic curve, was at 12 am on April 10, approximately 12 hours after the April 9 lunch which was epidemiologically implicated. If the majority of cases were exposed to an etiologic agent during that lunch, the median incubation period for that agent would be approximately 12 hours, which is consistent with *C. perfringens*. These incubation period findings were similar to incubation periods described with other potential etiologic agents, including *B. cereus*, and such pathogens cannot be ruled out.

In this outbreak, there were other reported gastrointestinal illnesses that did not appear to be related to the majority of cases. Two of 19 specimens from case-patients tested positive for norovirus; however, norovirus was unlikely to be the etiology for the majority of cases. Given experimental evidence (1) and experience with previous outbreaks it would be expected that if norovirus had caused most of the illnesses, a higher proportion of specimens would have tested positive for norovirus. Therefore the laboratory results taken as a whole are not inconsistent with a predominant etiology of *C. perfringens*.

It is certainly possible that some transmission of norovirus occurred at the convention and accounted for illness in some of the cases, and some of the cases may be attributable to background levels of norovirus circulating in the community at the time of the outbreak. In support of this, one individual who tested positive for norovirus genogroup 2 was likely infected prior to attending the conference, given the short period between attendance and onset.

If norovirus rather than *C. perfringens* or *B. cereus*, had caused illness for the majority of cases, it would be expected that the epidemiological features of the outbreak would have been different. *C. perfringens* and diarrheal type *B. cereus* typically cause diarrhea and cramps without vomiting lasting less than 24 hours. (2) (3) A review of U.S. *C. perfringens* outbreaks reported from 1998-2010 found 91% of cases had diarrhea and 14% had vomiting, consistent with the signs and symptoms reported by the patients in this outbreak. (4) Incubation periods for diarrheal type *B. cereus* are typically 6 to 15 hours, (3) and incubation periods for C. *perfringens* are typically 8 to 12 hours (range 6 to 24 hours). (2) In contrast, outbreaks caused by norovirus usually meet the Kaplan Criteria: more than 50% of cases have vomiting; the average duration of illness is from 12 to 60 hours; the average incubation period is from 24 to 48 hours; and no bacterial agent is found. (5)

Our epidemiologic findings suggest that a single exposure and agent accounted for the majority of the cases associated with this outbreak. The vehicle for infection appears to have been the chicken Marsala dish served at the April 9 lunch. Chicken Marsala could be a suitable medium for *C. perfringens* and *B. cereus*, and under certain conditions, growth sufficient to cause illness could occur relatively quickly. Meat, poultry, and gravy are foods commonly associated with *C. perfringens* outbreaks (2), and chicken Marsala (chicken breasts served with gravy) has been implicated in previous outbreaks. (6) *C. perfringens* bacteria are commonly found in the intestines of humans and other animals, on raw meat

and poultry, and in the environment; hence, it would not be unusual to find low levels of contamination on food before cooking. (2) The spores can survive cooking and germinate afterwards, so it is also not uncommon to find small numbers of bacteria on just-cooked food. (3) If food is left at temperatures between 54˚F and 140˚F after cooking, growth can occur, with the most rapid growth occurring between 109˚F and 117˚F. (2) With a fast doubling time of less than 10 minutes, counts of *C. perfringens* can reach high enough levels to cause illness relatively quickly compared to other foodborne pathogens. (3) When large quantities of live *C. perfringens* bacteria are ingested, they can produce a toxin that causes diarrhea and cramping in the intestine. (2) If the chicken Marsala was not continuously held above 140˚F after cooking, growth of *C. perfringens* could have occurred.

It is difficult to determine what exactly happened in retrospect, however, at gatherings and events such as this one where large groups of people are served and large quantities of foods such as roasts, gravies, and poultry are often cooked in large batches or prepared ahead of serving, it is possible that proper cooking, cooling, and hot holding intended to decrease the growth of *C. perfringens* and other bacteria in food may not have been achieved. Although the temperatures recorded on the logs were within the acceptable range, it is not possible to rule out that temperature abuse could have occurred and allowed for the proliferation of bacteria in food. The temperatures taken might not have been representative of the temperatures throughout different areas of the pans, because only a small number of temperatures were recorded relative to the number of pans of chicken served. It is likely that the temperatures varied within each pan of chicken and also between pans of chicken. During food preparation and serving, temperatures should be taken in different pans and in different locations within pans. It is especially important to take temperatures in the coldest areas (e.g. the pan farthest away from the heat source) to ensure that all of the food is consistently kept at a safe temperature. Given these factors, it is possible that portions of the food were held at temperatures that allowed for rapid bacterial growth.

It is also possible that the temperatures recorded did not capture the true variability of the temperature of the food over time. The 10:15 am temperature recording would have been taken as the chicken was placed into the hot holding cabinet after cooking, and the noon temperature recording would have been taken about the time that the food was served. The temperature inside of the hot holding cabinet could have varied in an unpredictable way between these time points, given that transportation of the food required unplugging from an electrical source and the use of Sternos to maintain temperature. It is possible that the temperature varied between when it was plugged in and when Sternos were the only heat source and this variation was not captured when temperatures were taken at only two time points. It is also possible that the temperature of the food decreased after the last recorded temperature, given that the buffet was open for another hour. This possibility is corroborated by several attendees who reported that the food, specifically the chicken, was cold. Our survey did not ask what time attendees ate or from which buffet line, so it is not possible to assess whether a particular line or time frame was associated with receiving cold chicken or with increased risk of illness. Finally, it is also possible that some attendees let food sit on their plates before eating it, and it could have cooled off that way.

The relatively short time that elapsed between cooking and consumption (3 hours from the time food was placed in the hot holding cabinet until the buffet closed) should have been adequate to prevent the significant growth of most, but not all, foodborne pathogens even if high enough temperatures were not

maintained throughout all portions of the food for the entire time between cooking and service. However, it is possible that one of the ingredients, including the pre-cooked chicken, demi-glace, mushrooms, or garlic was heavily contaminated before cooking, resulting in a high number of spores in the food with the potential for bacterial growth after cooking. We tested a few products which might not have been the actual ingredients that were used for food preparation; hence, the levels of *C. perfringens* and *B. cereus* in the actual ingredients used to prepare the chicken Marsala are not known. Regardless of the level of bacterial contamination in the ingredients, rapid growth of *C. perfringens* after cooking could have been possible if high enough temperatures were not continuously maintained in all portions of the food. Because no food from the buffet lines was available for testing, the concentration of bacteria in the food consumed by the cases cannot be determined.

LIMITATIONS

Both the event organizer and Caterer A were made aware of multiple suspect foodborne illness complaints while the conference was ongoing; however, neither Caterer A (a required reporter per COMAR 10.06.01.04), nor the event organizer reported the illnesses to the local health department. Once reports were made to Baltimore City, BCHD, EIS did not immediately view the initial illness reports and did not associate them with Conference A right away, which further delayed reporting the cluster to BCHD, ACD. The intervening length of time from exposure to recognition of the outbreak decreased the likelihood of determining an etiologic agent, implicating a contaminated food, collecting clinical specimens from ill attendees and testing available conference food. To prevent these delays for future outbreaks and to ensure related complaints of illness are recognized, required reporters should be reminded of their obligation to report. Since the conclusion of this investigation, required reporters involved in this outbreak investigation, namely Caterer A, have been reminded of their obligation to report; it was suggested to the event organizer, while they are not a required reporter, that early reporting of suspect outbreaks are beneficial to investigations. A redundant reporting system has been created whereby 311 reports are sent to both ACD, EIS and others in BCHD.

The human specimens available for laboratory testing were collected one week or more after the onsets of illness, outside of the optimal time period for testing. Because the number of *C. perfringens* and *B. cereus* bacteria excreted in stool declines rapidly, and success for meaningful culture results outside of the optimal collection period is low, DHMH and the other state public health laboratories did not perform culture for these organisms. Some of the specimens were collected in Cary-Blair media and the PET-RPLA assay kit specifies that testing should be done on stool not preserved in media. The effect of the media on testing for those few specimens is not known. Also, since some time had passed between the onsets of illness and collection of specimens, the detection *C. perfringens* in some specimens did not confirm that the bacteria were there at the time the cases became ill and negative results for other specimens did not establish that *C. perfringens* were not present previously. It is not possible to determine if CPE producing *C. perfringens* was present at the time of illness and at what level. And although *C. perfringens* bacteria were detected in some of the stools that were tested, C. *perfringens* can also be found in the stool of people who have not been sick.

Food samples collected and tested at DHMH may have been from the same manufacturer and possibly the same lots, however, were not samples from the ingredients in the food served at the conference. These ingredients were not subject to the same conditions, such as cooking and hot holding, as the food consumed by the attendees. These limitations for laboratory testing may have prevented the early identification of an agent for the majority of cases.

Finally, the effect of the disclosure of the link to the online survey and password and the subsequent closing and reopening of the survey is unknown. However, we did not identify any obvious widespread issues with the information collected. Names and email addresses of survey respondents were checked against a list of registrants, and it appeared that there was no widespread discrepancy between the names on the 2 lists, meaning the survey respondents are presumed to likely be all registered conference attendees. Some survey respondents did not provide full names, or may have used nick names and different email addresses than were used for registration, so it is not possible to verify that all respondents actually attended. It is possible that fewer conference attendees responded to the survey as a result of closing and reopening the survey; however, having 604 total respondents with information used in the analysis should have provided enough study power to identify an implicated exposure.

While we did not conclusively identify exactly what happened during this outbreak, we did identify numerous opportunities for improvement to reduce the risk of illness for future events and to ensure a more timely response in the event future outbreaks occur.

Recommendations for event A and all event organizers and Caterer A and all foodservice facilities:

1.) Ensure that internal food temperatures are measured at the conclusion of cooking and during the hot holding process.
    a. Temperatures should be taken while the food remains inside the hot holding cabinets at one hour intervals and from multiple locations of the food trays on different shelves.
    b. Food handlers should record the range of temperatures (versus a single temperature) as observed on log sheets. Food must maintain 135°F at all times after cooking and prior to service.
    c. Obtain representative (multiple sites, mix of locations on tray, such as center, corners, edges) temperature measurements of all food trays before serving time.
2.) Report immediately to management or the person in charge when any food temperatures are below the required holding temperatures.
3.) Corrective action, as specified in the facility's approved HACCP plan, must be taken when food measures less than the 135°F critical limit.
4.) Maintain detailed temperature logs.
    a. Retain detailed internal temperature logs of any cold and hot held food every hour for all locations and all serving lines;
    b. Log both internal and external temperature readings for all refrigeration units every 2-4 hours to ensure that potentially hazardous foods do not exceed regulated time and temperature requirements.

5.) Have an approved HACCP plan available at the site and strictly enforce the adherence to the HACCP plan's monitoring, corrective and verification actions.
6.) To facilitate the early recognition and investigation of any future outbreaks:
    a. Required reporters in COMAR 10.06.01.04, including the owners and operators of food establishments, should report suspected outbreaks to the local health department immediately.
    b. Those entities who are not required reporters but are responsible for the well-being of others and who may be aware of a possible outbreak should report suspected outbreaks to the local health department immediately.
    c. The standard procedure of operations should incorporate instructions to keep a small amount of all food served at any large events collected from each serving line at the time of the service for about 3-7 days.
    d. Obtain 3 days' personal health status of all workers prior to working in any events and keep detailed records of any illnesses events (such as vomiting or diarrhea events or food service workers with gastrointestinal illness) during and after any events.
    e. Before any event starts, obtain detailed contact information for all workers and all organizers involved with any events.

REFERENCES

1. *Norwalk virus shedding after experimental human infection.* **Atmar RL, Opekun AR, Gilger MA, Estes MK, Crawford SE, Neill FH, et al.** 10, October 2008, Vol. 14.

2. **Centers for Disease Control and Prevention.** *Clostridium perfringens*. *Food Safety.* [Online] Januar 29, 2014. [Cited: May 14, 2014.] http://www.cdc.gov/foodsafety/clostridium-perfringens.html.

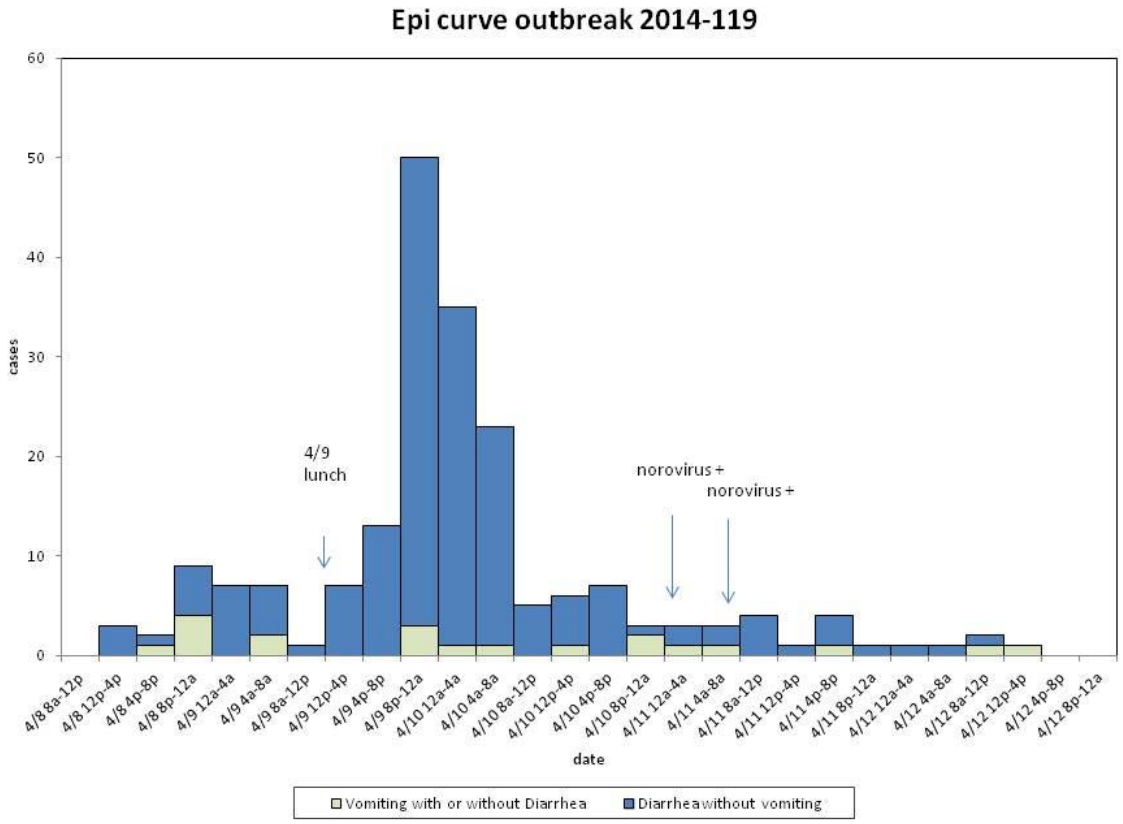
3. **U.S. Food and Drug Administration.** *Bad Bug Book, Foodborne Pathogenic Microorganisms and Natural Toxins.* Second Edition. 2012.

4. *Epidemiology of foodborne disease outbreaks caused by Clostridium perfringens, United States, 1998-2010.* **JE Grass, LH Gould, BE Mahon.** 2, 2013, Foodborne Pathogens and Disease, Vol. 10, pp. 131-136.

5. **Centers for Disease Control and Prevention.** Responding to Norovirus Outbreaks. *Norovirus.* [Online] April 12, 2012. [Cited: May 14, 2014.] http://www.cdc.gov/norovirus/php/responding.html.

6. **Centers for Disease Control and Prevention.** Food Outbreak Online Database. [Online] [Queried: September 18, 2014.] http://wwwn.cdc.gov/foodborneoutbreaks/Default.aspx#.

Appendix 1. Epidemic curve.



Appendix 2. Exposure tables

	Ill			Well							
	Yes	**No**	**% Yes**	**Yes**	**No**	**% Yes**	**Attack Rate Yes**	**Attack Rate No**	**RR**	**lower 95% CI RR**	**upper 95% CI RR**
attend 4/7	22	179	11%	24	364	6%	48%	33%	1.45	1.05	2.01
4/7 training A part 1	15	7	68%	14	10	58%	52%	41%	1.26	0.64	2.45
4/7 training B	5	17	23%	7	17	29%	42%	50%	0.83	0.39	1.76
attend 4/8	159	42	79%	232	156	60%	41%	21%	1.92	1.43	2.57
4/8 training C	2	157	1%	4	228	2%	33%	41%	0.82	0.26	2.55
4/8 workshop 1	11	148	7%	23	209	10%	32%	41%	0.78	0.47	1.29
4/8 workshop 2	33	126	21%	39	193	17%	46%	39%	1.16	0.87	1.54
4/8 workshop 3	22	137	14%	25	207	11%	47%	40%	1.18	0.84	1.64
4/8 training A part 2	14	145	9%	11	221	5%	56%	40%	1.41	0.98	2.05
4/8 workshop 4	53	105	34%	62	170	27%	46%	38%	1.21	0.94	1.55
attend 4/9	171	3	98%	344	44	89%	33%	6%	5.20	1.73	15.65
4/9 session 1	14	154	8%	33	311	10%	30%	33%	0.90	0.57	1.42
4/9 session 2	19	149	11%	19	325	6%	50%	31%	1.59	1.13	2.25
4/9 session 3	16	152	10%	17	327	5%	48%	32%	1.53	1.05	2.22
4/9 session 4	31	137	18%	54	290	16%	36%	32%	1.14	0.83	1.55
4/9 keynote	83	85	49%	144	200	42%	37%	30%	1.23	0.96	1.57
4/9 training A part 3	10	156	6%	11	333	3%	48%	32%	1.49	0.94	2.38
4/9 session 5	25	138	15%	54	290	16%	32%	32%	0.98	0.69	1.40
4/9 session 6	21	142	13%	35	309	10%	38%	31%	1.19	0.83	1.71
4/9 session 7	14	149	9%	26	318	8%	35%	32%	1.10	0.70	1.71
4/9 session 8	20	143	12%	38	306	11%	34%	32%	1.08	0.74	1.58
4/9 session 9	26	134	16%	36	308	10%	42%	30%	1.38	1.00	1.91
4/9 session 10	10	150	6%	31	313	9%	24%	32%	0.75	0.43	1.31
4/9 session 11	17	143	11%	21	323	6%	45%	31%	1.46	1.00	2.13
4/9 session 12	19	141	12%	29	315	8%	40%	31%	1.28	0.88	1.86
4/9 presentation 1	7	156	4%	9	335	3%	44%	32%	1.38	0.78	2.44
4/9 presentation 2	8	155	5%	2	342	1%	80%	31%	2.57	1.83	3.59
4/9 presentation 3	3	160	2%	2	342	1%	60%	32%	1.88	0.91	3.89
4/9 presentation 4	6	157	4%	7	337	2%	46%	32%	1.45	0.80	2.65
4/9 presentation 5	7	156	4%	8	336	2%	47%	32%	1.47	0.84	2.57

	Ill			Well							
	Yes	**No**	**% Yes**	**Yes**	**No**	**% Yes**	**Attack Rate Yes**	**Attack Rate No**	**RR**	**lower 95% CI RR**	**upper 95% CI RR**
4/9 presentation 6	5	158	3%	7	337	2%	42%	32%	1.31	0.66	2.58
4/9 presentation 7	8	155	5%	14	330	4%	36%	32%	1.14	0.64	2.01
attend 4/10	31	9	78%	287	101	74%	10%	8%	1.19	0.59	2.42
4/10 session 13	10	21	32%	58	229	20%	15%	8%	1.75	0.87	3.54
4/10 session 14	2	29	6%	29	258	10%	6%	10%	0.64	0.16	2.55
4/10 session 15	6	25	19%	42	245	15%	13%	9%	1.35	0.58	3.12
4/10 session 16	0	31	0%	16	271	6%	0%	10%	0.00	^	^
4/10 town hall	12	19	39%	111	176	39%	10%	10%	1.00	0.50	1.99
4/10 session 17	7	18	28%	57	230	20%	11%	7%	1.51	0.66	3.45
4/10 session 19	7	18	28%	46	241	16%	13%	7%	1.90	0.84	4.32
4/10 session 18	1	24	4%	15	272	5%	6%	8%	0.77	0.11	5.34
4/10 session 20	3	22	12%	13	274	5%	19%	7%	2.52	0.84	7.55
4/10 presentation 1	1	24	4%	9	278	3%	10%	8%	1.26	0.19	8.40
4/10 presentation 2	1	24	4%	7	280	2%	13%	8%	1.58	0.24	10.31
4/10 presentation 3	1	24	4%	9	278	3%	10%	8%	1.26	0.19	8.40
4/10 presentation 4	0	25	0%	5	282	2%	0%	8%	0.00	^	^
4/10 presentation 5	0	25	0%	8	279	3%	0%	8%	0.00	^	^
4/10 presentation 6	1	24	4%	9	278	3%	10%	8%	1.26	0.19	8.40
4/10 presentation 7	0	25	0%	7	280	2%	0%	8%	0.00	^	^

Foods

	Ill			Well							
	Yes (Ate)	No (did not eat)	% Ate the food	Yes (Ate)	No (did not eat)	% Ate the food	Attack Rate Ate	Attack Rate Did not eat	RR	lower 95% CI RR	upper 95% CI RR
attend 4/7	22	179	11%	24	364	6%	48%	33%	1.45	1.05	2.01
attend 4/8	159	42	79%	232	156	60%	41%	21%	1.92	1.43	2.57
4/8 breakfast*	75	84	47%	88	144	38%	46%	37%	1.25	0.98	1.58
muffin	27	48	36%	27	61	31%	50%	44%	1.14	0.81	1.60
bagel	16	59	21%	17	71	19%	48%	45%	1.07	0.72	1.59
Danish	11	64	15%	11	77	13%	50%	45%	1.10	0.70	1.74
yogurt	21	54	28%	11	77	13%	66%	41%	1.59	1.15	2.20
fruit	22	53	29%	14	74	16%	61%	42%	1.46	1.05	2.04
butter	5	70	7%	3	85	3%	63%	45%	1.38	0.79	2.43
cream cheese	12	63	16%	14	74	16%	46%	46%	1.00	0.64	1.58
preserves	1	74	1%	3	85	3%	25%	47%	0.54	0.10	2.96
coffee	51	24	68%	62	26	70%	45%	48%	0.94	0.66	1.34
tea	7	68	9%	16	72	18%	30%	49%	0.63	0.33	1.19
water	35	40	47%	31	57	35%	53%	41%	1.29	0.93	1.79
creamer	30	45	40%	29	59	33%	51%	43%	1.18	0.84	1.64
sugar	24	51	32%	22	66	25%	52%	44%	1.20	0.85	1.69
lemon	2	73	3%	2	86	2%	50%	46%	1.09	0.40	2.94
4/8 pm break*	82	75	52%	107	125	46%	43%	38%	1.16	0.91	1.47
cookie	47	35	57%	56	51	52%	46%	41%	1.12	0.81	1.56
brownie	28	54	34%	28	79	26%	50%	41%	1.23	0.88	1.72
coffee	38	44	46%	54	53	50%	41%	45%	0.91	0.66	1.26
soda	28	54	34%	27	80	25%	51%	40%	1.26	0.91	1.76
water	40	42	49%	49	58	46%	45%	42%	1.07	0.77	1.48
creamer	24	58	29%	27	80	25%	47%	42%	1.12	0.79	1.59
sugar	13	69	16%	19	88	18%	41%	44%	0.92	0.59	1.46
sweetener	9	73	11%	8	99	7%	53%	42%	1.25	0.77	2.02
4/8 reception*	112	44	72%	151	81	65%	43%	35%	1.21	0.92	1.59
Asian vegetable spring roll	36	76	32%	45	106	30%	44%	42%	1.06	0.79	1.43
Caprese skewer	29	83	26%	26	125	17%	53%	40%	1.32	0.98	1.78
cheese	51	61	46%	61	90	40%	46%	40%	1.13	0.85	1.49
sliced baguette	28	84	25%	30	121	20%	48%	41%	1.18	0.86	1.61
cracker	29	83	26%	33	118	22%	47%	41%	1.13	0.83	1.55
baby carrots	30	82	27%	31	120	21%	49%	41%	1.21	0.89	1.64
patty pan squash	11	101	10%	11	140	7%	50%	42%	1.19	0.77	1.86

	Ill			Well							
	Yes (Ate)	No (did not eat)	% Ate the food	Yes (Ate)	No (did not eat)	% Ate the food	Attack Rate Ate	Attack Rate Did not eat	RR	lower 95% CI RR	upper 95% CI RR
endive	8	104	7%	10	141	7%	44%	42%	1.05	0.61	1.79
Kalamata olives	21	91	19%	24	127	16%	47%	42%	1.12	0.79	1.59
hummus	17	95	15%	19	132	13%	47%	42%	1.13	0.77	1.65
bacon cheese slider	39	73	35%	38	113	25%	51%	39%	1.29	0.97	1.71
fried chicken and butter pickles slider	25	87	22%	29	122	19%	46%	42%	1.11	0.80	1.55
Maryland crab cake slider	41	71	37%	47	104	31%	47%	41%	1.15	0.86	1.53
mustard	8	104	7%	9	142	6%	47%	42%	1.11	0.66	1.88
ketchup	9	103	8%	6	145	4%	60%	42%	1.44	0.93	2.24
barbecue sauce	6	106	5%	10	141	7%	38%	43%	0.87	0.46	1.67
mayonnaise	9	103	8%	7	144	5%	56%	42%	1.35	0.85	2.13
Old Bay cocktail sauce	11	101	10%	14	137	9%	44%	42%	1.04	0.65	1.65
loaded potato salad	24	88	21%	29	122	19%	45%	42%	1.08	0.77	1.51
Dijon-apple vinaigrette slaw	16	96	14%	22	129	15%	42%	43%	0.99	0.66	1.48
macaroni and cheese	28	84	25%	35	116	23%	44%	42%	1.06	0.77	1.46
turkey breast	52	60	46%	46	105	30%	53%	36%	1.46	1.11	1.92
cranberry mayonnaise	33	79	29%	22	129	15%	60%	38%	1.58	1.20	2.08
pumpernickel rolls	18	94	16%	15	136	10%	55%	41%	1.33	0.94	1.89
bottled water	25	87	22%	16	135	11%	61%	39%	1.56	1.16	2.09
water, not bottled	9	103	8%	3	148	2%	75%	41%	1.83	1.28	2.62
canned soda	12	100	11%	13	138	9%	48%	42%	1.14	0.74	1.76
mixed drink	36	76	32%	38	113	25%	49%	40%	1.21	0.90	1.62
wine	30	82	27%	46	105	30%	39%	44%	0.90	0.65	1.24
beer	36	76	32%	53	98	35%	40%	44%	0.93	0.68	1.25
attend 4/9	171	3	98%	344	44	89%	33%	6%	5.20	1.73	15.65
view exhibits 4/9	116	55	68%	224	120	65%	34%	31%	1.09	0.83	1.41
4/9 breakfast*	71	100	42%	112	232	33%	39%	30%	1.29	1.01	1.65
muffin	29	43	40%	48	64	43%	38%	40%	0.94	0.65	1.36
bagel	17	55	24%	12	100	11%	59%	35%	1.65	1.14	2.40
Danish	19	53	26%	15	97	13%	56%	35%	1.58	1.09	2.29
yogurt	18	54	25%	19	93	17%	49%	37%	1.32	0.89	1.96

	Ill			Well							
	Yes (Ate)	No (did not eat)	% Ate the food	Yes (Ate)	No (did not eat)	% Ate the food	Attack Rate Ate	Attack Rate Did not eat	RR	lower 95% CI RR	upper 95% CI RR
fruit	19	53	26%	15	97	13%	56%	35%	1.58	1.09	2.29
butter	8	64	11%	4	108	4%	67%	37%	1.79	1.15	2.80
cream cheese	15	57	21%	10	102	9%	60%	36%	1.67	1.14	2.45
preserves	1	71	1%	2	110	2%	33%	39%	0.85	0.17	4.25
coffee	50	22	69%	80	32	71%	38%	41%	0.94	0.64	1.39
tea	6	66	8%	15	97	13%	29%	40%	0.71	0.35	1.42
water	25	47	35%	31	81	28%	45%	37%	1.22	0.84	1.76
creamer	27	45	38%	37	75	33%	42%	38%	1.13	0.78	1.63
sugar	19	53	26%	22	90	20%	46%	37%	1.25	0.84	1.85
lemon	0	72	0%	2	110	2%	0%	40%	0.00	^	^
4/9 lunch*	157	11	93%	220	124	64%	42%	8%	5.11	2.86	9.12
spring lettuce mix with onions, olives, tomatoes, and dressing	120	37	76%	157	63	71%	43%	37%	1.17	0.88	1.56
cherry tomato and fresh mozzarella salad	113	44	72%	148	72	67%	43%	38%	1.14	0.87	1.50
pan seared breast of chicken Marsala	146	11	93%	153	67	70%	49%	14%	3.46	1.98	6.06
grilled vegetable white lasagna	115	42	73%	139	81	63%	45%	34%	1.33	1.00	1.75
roasted Italian vegetables	106	51	68%	139	81	63%	43%	39%	1.12	0.86	1.45
roll	53	104	34%	85	135	39%	38%	44%	0.88	0.68	1.14
focaccia	36	121	23%	44	176	20%	45%	41%	1.10	0.84	1.46
butter	37	120	24%	50	170	23%	43%	41%	1.03	0.78	1.36
tiramisu cake	87	70	55%	104	116	47%	46%	38%	1.21	0.95	1.54
iced tea	77	80	49%	113	107	51%	41%	43%	0.95	0.75	1.20
coffee	27	130	17%	45	175	20%	38%	43%	0.88	0.64	1.22
water	76	81	48%	95	125	43%	44%	39%	1.13	0.89	1.43
creamer	15	142	10%	25	195	11%	38%	42%	0.89	0.59	1.35
sugar	18	139	11%	15	205	7%	55%	40%	1.35	0.96	1.89
sweetener	17	140	11%	21	199	10%	45%	41%	1.08	0.74	1.58
honey	3	154	2%	2	218	1%	60%	41%	1.45	0.70	3.00
lemon	12	145	8%	10	210	5%	55%	41%	1.34	0.89	2.00
4/9 pm break*	78	83	48%	133	211	39%	37%	28%	1.31	1.02	1.69
cookie	40	38	51%	75	58	56%	35%	40%	0.88	0.62	1.25

	Ill			Well							
	Yes (Ate)	No (did not eat)	% Ate the food	Yes (Ate)	No (did not eat)	% Ate the food	Attack Rate Ate	Attack Rate Did not eat	RR	lower 95% CI RR	upper 95% CI RR
brownie	26	52	33%	33	100	25%	44%	34%	1.29	0.90	1.85
coffee	28	50	36%	62	71	47%	31%	41%	0.75	0.52	1.09
soda	32	46	41%	41	92	31%	44%	33%	1.32	0.93	1.87
water	26	52	33%	44	89	33%	37%	37%	1.01	0.69	1.46
creamer	14	64	18%	31	102	23%	31%	39%	0.81	0.50	1.30
sugar	7	71	9%	13	120	10%	35%	37%	0.94	0.50	1.76
sweetener	1	77	1%	5	128	4%	17%	38%	0.44	0.07	2.68
4/9 reception*	54	104	34%	76	268	22%	42%	28%	1.49	1.14	1.93
Ginger beef tenderloin	28	26	52%	22	54	29%	56%	33%	1.72	1.15	2.57
spanakopita	16	38	30%	11	65	14%	59%	37%	1.61	1.07	2.40
smoked turkey breast	33	21	61%	32	44	42%	51%	32%	1.57	1.03	2.41
cheese	24	30	44%	33	43	43%	42%	41%	1.02	0.68	1.54
sliced baguette	15	39	28%	22	54	29%	41%	42%	0.97	0.61	1.53
crackers	16	38	30%	25	51	33%	39%	43%	0.91	0.58	1.44
baby carrots	16	38	30%	20	56	26%	44%	40%	1.10	0.71	1.71
patty pan squash	6	48	11%	4	72	5%	60%	40%	1.50	0.86	2.60
endive	1	53	2%	3	73	4%	25%	42%	0.59	0.11	3.29
Kalamata olives	5	49	9%	19	57	25%	21%	46%	0.45	0.20	1.01
garden vegetable dip	13	41	24%	15	61	20%	46%	40%	1.16	0.73	1.84
bottled water	9	45	17%	7	69	9%	56%	39%	1.43	0.87	2.32
water, not bottled	1	53	2%	2	74	3%	33%	42%	0.80	0.16	4.01
canned soda	2	52	4%	3	73	4%	40%	42%	0.96	0.32	2.87
mixed drink	12	42	22%	15	61	20%	44%	41%	1.09	0.67	1.76
wine	11	43	20%	26	50	34%	30%	46%	0.64	0.37	1.11
beer	17	37	31%	23	53	30%	43%	41%	1.03	0.67	1.60
attend 4/10	31	9	78%	287	101	74%	10%	8%	1.19	0.59	2.42
view exhibits 4/10	19	12	61%	155	132	54%	11%	8%	1.31	0.66	2.61
4/10 breakfast*	11	20	35%	89	198	31%	11%	9%	1.20	0.60	2.41
muffin	4	7	36%	34	55	38%	11%	11%	0.93	0.29	2.97
bagel	3	8	27%	13	76	15%	19%	10%	1.97	0.58	6.63
Danish	2	9	18%	18	71	20%	10%	11%	0.89	0.21	3.80
yogurt	3	8	27%	19	70	21%	14%	10%	1.33	0.38	4.59
fruit	0	11	0%	12	77	13%	0%	13%	0.00	^	^

	Ill			Well							
	Yes (Ate)	No (did not eat)	% Ate the food	Yes (Ate)	No (did not eat)	% Ate the food	Attack Rate Ate	Attack Rate Did not eat	RR	lower 95% CI RR	upper 95% CI RR
butter	0	11	0%	3	86	3%	0%	11%	0.00	^	^
cream cheese	4	7	36%	12	77	13%	25%	8%	3.00	0.99	9.07
preserves	0	11	0%	0	89	0%	^	11%	^	^	^
coffee	8	3	73%	59	30	66%	12%	9%	1.31	0.37	4.63
tea	0	11	0%	15	74	17%	0%	13%	0.00	^	^
water	7	4	64%	23	66	26%	23%	6%	4.08	1.29	12.92
creamer	5	6	45%	28	61	31%	15%	9%	1.69	0.56	5.14
sugar	3	8	27%	20	69	22%	13%	10%	1.26	0.36	4.35
lemon	0	11	0%	1	88	1%	0%	11%	0.00	^	^
4/10 lunch*	15	13	54%	163	124	57%	8%	9%	0.89	0.44	1.80
Maryland crab soup	9	6	60%	62	101	38%	13%	6%	2.26	0.84	6.07
crackers	5	10	33%	36	127	22%	12%	7%	1.67	0.61	4.61
chopped romaine	10	5	67%	105	58	64%	9%	8%	1.10	0.39	3.06
red oak lettuce	9	6	60%	83	80	51%	10%	7%	1.40	0.52	3.77
bacon	6	9	40%	53	110	33%	10%	8%	1.34	0.50	3.60
sliced black olives	8	7	53%	62	101	38%	11%	6%	1.76	0.67	4.65
tomatoes	8	7	53%	83	80	51%	9%	8%	1.09	0.41	2.88
pickled red onions	3	12	20%	25	138	15%	11%	8%	1.34	0.40	4.44
Parmesan crisps	7	8	47%	73	90	45%	9%	8%	1.07	0.41	2.83
corn bread croutons	7	8	47%	50	113	31%	12%	7%	1.86	0.71	4.87
black pepper	3	12	20%	22	141	13%	12%	8%	1.53	0.46	5.04
creamy chipotle Caesar dressing	7	8	47%	58	105	36%	11%	7%	1.52	0.58	4.00
herbed vinaigrette	5	10	33%	50	113	31%	9%	8%	1.12	0.40	3.12
lemon-lime tilapia	6	9	40%	58	105	36%	9%	8%	1.19	0.44	3.19
grilled breast of chicken	9	6	60%	99	64	61%	8%	9%	0.97	0.36	2.61
rice pilaf	8	7	53%	93	70	57%	8%	9%	0.87	0.33	2.30
rolls	11	4	73%	74	89	45%	13%	4%	3.01	1.00	9.09
butter	6	9	40%	45	118	28%	12%	7%	1.66	0.62	4.43
pie	7	8	47%	86	77	53%	8%	9%	0.80	0.30	2.11
whipped cream	3	12	20%	30	133	18%	9%	8%	1.10	0.33	3.67
iced tea	6	9	40%	59	104	36%	9%	8%	1.16	0.43	3.11
coffee	3	12	20%	37	126	23%	8%	9%	0.86	0.26	2.91

	Ill			Well							
	Yes (Ate)	**No (did not eat)**	**% Ate the food**	**Yes (Ate)**	**No (did not eat)**	**% Ate the food**	**Attack Rate Ate**	**Attack Rate Did not eat**	**RR**	**lower 95% CI RR**	**upper 95% CI RR**
hot tea	0	15	0%	6	157	4%	0%	9%	0.00	^	^
creamers	1	14	7%	18	145	11%	5%	9%	0.60	0.08	4.30
sugar	2	13	13%	13	150	8%	13%	8%	1.67	0.42	6.72
sweetener	1	14	7%	16	147	10%	6%	9%	0.68	0.09	4.83
honey	0	15	0%	0	163	0%	^	8%	^	^	^
lemon	2	13	13%	4	159	2%	33%	8%	4.41	1.27	15.34
water	5	10	33%	49	114	30%	9%	8%	1.15	0.41	3.20
4/10 pm break*	10	15	40%	90	197	31%	10%	7%	1.41	0.66	3.03
cookie	5	5	50%	49	41	54%	9%	11%	0.85	0.26	2.76
brownie	4	6	40%	14	76	16%	22%	7%	3.04	0.95	9.67
coffee	4	6	40%	40	50	44%	9%	11%	0.85	0.26	2.82
soda	5	5	50%	31	59	34%	14%	8%	1.78	0.55	5.73
creamer	1	9	10%	21	69	23%	5%	12%	0.39	0.05	2.94
sugar	1	9	10%	11	79	12%	8%	10%	0.81	0.11	5.88
sweetener	0	10	0%	3	87	3%	0%	10%	0.00	^	^
water	5	5	50%	20	70	22%	20%	7%	3.00	0.95	9.51
purchase food	65	136	32%	155	233	40%	30%	37%	0.80	0.63	1.02

*Was counted as yes if answered yes to one or more items served.

^Cannot be calculated.

Outbreak 2014-119

PLEASE COMPLETE A SEPARATE SURVEY FOR EACH PERSON.

1. Please provide your contact information. It may be necessary for us to contact you again during the investigation.

Name:

Home Address:

Address 2:

City/Town:

State:

ZIP/Postal Code:

County:

Email Address:

Phone Number:

2. Please provide the following information concerning your work and occupation.

Occupation

Work Address:

Address 2:

City/Town:

State:

ZIP/Postal Code:

3. What is your gender?

Gender ○ Male ○ Female

4. How old are you?

Age in years. Please put 0 for someone less than 1 year old. age

5. Where did you stay during the convention?

○ own home

○ hotel

○ other

If you stayed at a hotel, which hotel did you stay at?

Outbreak 2014-119

6. How did you travel to and from the convention each day?

- ◯ drive alone
- ◯ carpool
- ◯ walk
- ◯ public transportation

Other:

Outbreak 2014-119

***1. During the week BEFORE the convention, were you ill with diarrhea or vomiting?**

- ◯ yes
- ◯ no

Outbreak 2014-119

1. When did your symptoms begin?

	MM	DD	YYYY	HH	MM	AM/PM
onset		/	/		:	

2. Have your symptoms ended?

	yes	no
Symptoms ended	◯	◯

3. If so, when did your symptoms resolve?

	MM	DD	YYYY	HH	MM	AM/PM
Resolution		/	/		:	

4. Did you have the following symptoms?

	Yes	No
Nausea	◯	◯
Vomiting	◯	◯
Stomach cramps	◯	◯
Diarrhea	◯	◯
Fever	◯	◯
Chills	◯	◯
Headache	◯	◯
Bloody Stool	◯	◯

Other symptoms

5. If you had a fever, what was your maximum temperature?

	Max Temperature
Temperature in °F	

Outbreak 2014-119

6. Did you receive care for your symptoms at the following places?

	Yes	No
Office or clinic visit	◯	◯
Emergency room visit	◯	◯
Inpatient hospitalization	◯	◯

Please provide location, provider name, and phone number for where you were treated, if available.

7. Stool specimen collection.

Testing stool specimens helps us to determine what caused your illness.

If you answer yes to "Are you willing to submit a specimen?" someone from the health department may contact you to make arrangements for collection.

	Yes	No
Have you submitted specimen already?	◯	◯
Are you willing to submit a specimen?	◯	◯

If you submitted a specimen, please specify where you submitted it.

Outbreak 2014-119

***1. Since Tuesday, April 8, have you been ill with diarrhea or vomiting?**

- ◯ yes
- ◯ no

Outbreak 2014-119

1. When did your symptoms begin?

	MM	DD	YYYY	HH	MM	AM/PM
Onset		/	/		:	

2. Have your symptoms ended?

	yes	no
Symptoms ended	◯	◯

3. If so, when did your symptoms resolve?

	MM	DD	YYYY	HH	MM	AM/PM
Resolution		/	/		:	

4. Did you have the following symptoms?

	Yes	No
Nausea	◯	◯
Vomiting	◯	◯
Stomach cramps	◯	◯
Diarrhea	◯	◯
Fever	◯	◯
Chills	◯	◯
Headache	◯	◯
Bloody Stool	◯	◯

Other symptoms

5. If you had a fever, what was your maximum temperature?

	Max Temperature
Temperature in °F	

Outbreak 2014-119

6. Did you receive care for your symptoms at the following places?

	Yes	No
Office or clinic visit	◯	◯
Emergency room visit	◯	◯
Inpatient hospitalization	◯	◯

Please provide location, provider name, and phone number for where you were treated, if available.

7. Stool specimen collection.

Testing stool specimens helps us to determine what caused your illness.

If you answer yes to "Are you willing to submit a specimen?" someone from the health department may contact you to make arrangements for collection.

	Yes	No
Have you submitted specimen already?	◯	◯
Are you willing to submit a specimen?	◯	◯

If you submitted a specimen, please specify where you submitted it.

Outbreak 2014-119

1. Did you attend the training sessions at the convention on MONDAY, April 7?

- ◯ yes
- ◯ no

Outbreak 2014-119 Baltimore Convention Center

1. Which of the following sessions did you attend on Monday, April 7?

- [ ] Mon. 4/7 [redacted]
- [ ] Mon. 4/7- [redacted]

Other (please specify)

Outbreak 2014-119

1. Did you attend the convention on TUESDAY, April 8?

- ◯ yes
- ◯ no

Outbreak 2014-119

1. Which of the following sessions did you attend on TUESDAY, April 8?

- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]

Other (please specify)

2. Did you do the following at the convention on TUESDAY, April 8?

- [ ] Attend the Welcome Reception

Other (please specify)

3. Did you eat or drink the following items from the continental breakfast at the convention on Tuesday, April 8?

	yes	no
muffin	○	○
bagel	○	○
danish	○	○
yogurt	○	○
fruit	○	○
butter	○	○
cream cheese	○	○
preserves	○	○
coffee	○	○
tea	○	○
water	○	○
creamer	○	○
sugar	○	○
lemon	○	○

Other (please specify)

Outbreak 2014-119

4. Did you eat or drink the following items from the afternoon break at the convention on Tuesday, April 8?

	yes	no
cookie	◯	◯
brownie	◯	◯
coffee	◯	◯
soda	◯	◯
water	◯	◯
creamer	◯	◯
sugar	◯	◯
sweetener	◯	◯

Other (please specify)

_____

Outbreak 2014-119

5. Did you eat or drink the following items from the reception at the convention on Tuesday, April 8?

	yes	no
Asian vegetable spring roll	◯	◯
Caprese skewer	◯	◯
cheese	◯	◯
sliced baguette	◯	◯
cracker	◯	◯
baby carrots	◯	◯
patty pan squash	◯	◯
endive	◯	◯
Kalamata olives	◯	◯
hummus	◯	◯
bacon cheese slider	◯	◯
fried chicken and butter pickles slider	◯	◯
Maryland crab cake slider	◯	◯
mustard	◯	◯
ketchup	◯	◯
barbecue sauce	◯	◯
mayonnaise	◯	◯
Old Bay cocktail sauce	◯	◯
loaded potato salad	◯	◯
Dijon-apple vinaigrette slaw	◯	◯
macaroni and cheese	◯	◯
turkey breast	◯	◯
cranberry mayonnaise	◯	◯
pumpernickel rolls	◯	◯
bottled water	◯	◯
water, not bottled	◯	◯
canned soda	◯	◯
mixed drink	◯	◯
wine	◯	◯
beer	◯	◯

Other (please specify)

Outbreak 2014-119

1. Did you attend the convention on WEDNESDAY, April 9?

- ◯ yes
- ◯ no

Outbreak 2014-119

1. Which of the following sessions did you attend on WEDNESDAY, April 9?

- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]

Other (please specify)

2. Which of the following Exhibitor [redacted] sessions did you attend on WEDNESDAY, April 9?

- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]

Other (please specify)

Outbreak 2014-119

3. Which of the following did you do at the convention on WEDNESDAY, April 9?

- [ ] Eat Continental Breakfast at the convention
- [ ] Eat Lunch served on Exhibit Hall floor
- [ ] Attend the Evening reception
- [ ] View vendor displays in the Exhibit Hall

Other (please specify)

4. Did you eat or drink the following items from the continental breakfast at the convention on Wednesday, April 9?

	yes	no
muffin	○	○
bagel	○	○
danish	○	○
yogurt	○	○
fruit	○	○
butter	○	○
cream cheese	○	○
preserves	○	○
coffee	○	○
tea	○	○
water	○	○
creamer	○	○
sugar	○	○
lemon	○	○

Other (please specify)

Outbreak 2014-119

5. Did you eat or drink the following items from the Exhibit Hall buffet luncheon at the convention on Wednesday, April 9?

	yes	no
spring lettuce mix with onions, olives, tomatoes, and dressing	◯	◯
cherry tomato and fresh mozzarella salad	◯	◯
pan seared breast of chicken Marsala	◯	◯
grilled vegetable white lasagna	◯	◯
roasted Italian vegetables	◯	◯
roll	◯	◯
focaccia	◯	◯
butter	◯	◯
tiramisu cake	◯	◯
iced tea	◯	◯
coffee	◯	◯
water	◯	◯
creamer	◯	◯
sugar	◯	◯
sweetener	◯	◯
honey	◯	◯
lemon	◯	◯

Other (please specify)

6. Did you eat or drink the following items from the afternoon break at the convention on Wednesday, April 9?

	yes	no
cookie	◯	◯
brownie	◯	◯
coffee	◯	◯
soda	◯	◯
water	◯	◯
creamer	◯	◯
sugar	◯	◯
sweetener	◯	◯

Other (please specify)

Outbreak 2014-119

7. Did you eat or drink the following items from the [redacted] Reception at the convention on Wednesday, April 9?

	yes	no
Ginger beef tenderloin	◯	◯
spanakopita	◯	◯
smoked turkey breast	◯	◯
cheese	◯	◯
sliced baguette	◯	◯
crackers	◯	◯
baby carrots	◯	◯
patty pan squash	◯	◯
endive	◯	◯
Kalamata olives	◯	◯
garden vegetable dip	◯	◯
bottled water	◯	◯
water, not bottled	◯	◯
canned soda	◯	◯
mixed drink	◯	◯
wine	◯	◯
beer	◯	◯

Other (please specify)

Outbreak 2014-119

1. Did you attend the convention on THURSDAY, April 10?

- ◯ yes
- ◯ no

Outbreak 2014-119

1. Which of the following sessions did you attend on THURSDAY, April 10?

- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]

Other (please specify)

2. Which of the following Exhibitor [redacted] sessions did you attend on THURSDAY, April 10?

- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]
- [ ] [redacted]

Other (please specify)

3. Which of the following did you do at the convention on THURSDAY, April 10?

- [ ] Eat Continental breakfast served at the convention
- [ ] Eat Lunch served on Exhibit Hall floor
- [ ] View vendor displays in the Exhibit Hall

Other (please specify)

Outbreak 2014-119

4. Did you eat or drink the following items from the continental breakfast at the convention on Thursday, April 10?

	yes	no
muffin	◯	◯
bagel	◯	◯
danish	◯	◯
yogurt	◯	◯
fruit	◯	◯
butter	◯	◯
cream cheese	◯	◯
preserves	◯	◯
coffee	◯	◯
tea	◯	◯
water	◯	◯
creamer	◯	◯
sugar	◯	◯
lemon	◯	◯

Other (please specify)

Outbreak 2014-119

5. Did you eat or drink the following items from the Exhibit Hall buffet luncheon at the convention on Thursday, April 10?

	yes	no
Maryland crab soup	○	○
crackers	○	○
chopped romaine	○	○
red oak lettuce	○	○
bacon	○	○
sliced black olives	○	○
tomatoes	○	○
pickled red onions	○	○
Parmesan crisps	○	○
corn bread croutons	○	○
black pepper	○	○
creamy chipotle Caesar dressing	○	○
herbed vinaigrette	○	○
lemon-lime tilapia	○	○
grilled breast of chicken	○	○
rice pilaf	○	○
rolls	○	○
butter	○	○
pie	○	○
whipped cream	○	○
iced tea	○	○
coffee	○	○
hot tea	○	○
creamers	○	○
sugar	○	○
sweetener	○	○
honey	○	○
lemon	○	○
water	○	○

Other (please specify)

Outbreak 2014-119

6. Did you eat or drink the following items from the afternoon break at the convention on Thursday, April 10?

	yes	no
cookie	◯	◯
brownie	◯	◯
coffee	◯	◯
soda	◯	◯
creamer	◯	◯
sugar	◯	◯
sweetener	◯	◯
water	◯	◯

Other (please specify)

_____

Outbreak 2014-119

1. Did you purchase any food or drinks from vendors or concession stands at the convention center?

- ◯ yes
- ◯ no

If yes, what did you buy and from which vendor?

2. Did you take any leftover food items home from the convention? If so, what were they?

- ◯ yes
- ◯ no

If yes, what did you take home, who ate it, and did they become ill?

3. Has anyone in your household who DID NOT attend the convention been ill with diarrhea or vomiting recently?

- ◯ Yes
- ◯ No

If yes, please describe.

4. Comments you feel may help with the investigation:

Outbreak 2014-119

Thank you for completing the survey.

STATE OF MARYLAND

DHMH

Maryland Department of Health and Mental Hygiene
Martin O'Malley, Governor – Anthony G. Brown, Lt. Governor – Joshua M. Sharfstein M.D., Secretary

Prevention and Health Promotion Administration
Michelle Spencer, MS, Director
Donna Gugel, MHS, Deputy Director

Ilise D. Marrazzo, RN, BSN, MPH, Acting Director, Maternal and Child Health Bureau
Deborah B. McGruder, MPH, PMP, Director, Infectious Disease Bureau
Clifford S. Mitchell, MS, MD, MPH, Director, Environmental Health Bureau
Donald Shell, MD, MA, Director, Cancer and Chronic Disease Bureau

April 17, 2014

Dear [redacted] Attendee,

The Baltimore City Health Department and the Maryland Department of Health and Mental Hygiene, Division of Outbreak Investigation are investigating illnesses among people who were at the [redacted] from April 8-10, 2014. We have not yet determined how people became ill, and we want your help to do so, even if you did not get sick.

Please assist us by answering some questions regarding your time at the convention, whether or not you became ill. We anticipate that this may take about 15 minutes to complete, but your full participation is critical to determining how people have become ill.

The on-line survey is available at the following link:
https://www.surveymonkey.com/s[redacted]

The password is **Baltimore**

Again, **PLEASE COMPLETE THE SURVEY EVEN IF YOU DID NOT HAVE ANY SYMPTOMS**, as we also need to hear from those who are not ill to investigate this situation. If you have any questions about the survey or would like to answer the questions by phone interview, please contact the Division of Outbreak Investigation at 410-767-6700.

Thank you,

Division of Outbreak Investigation
Office of Infectious Disease Epidemiology and Outbreak Response
Maryland Department of Health and Mental Hygiene
201 W. Preston Street
Baltimore, Maryland 21201

From: **DHMH Outbreaks -DHMH-** <dhmh.outbreaks@maryland.gov>
Date: Tue, Apr 22, 2014 at 1:09 PM
Subject: UPDATE: Maryland Dept. of Health and Mental Hygiene investigation of illnesses among [redacted] visitors
To: DHMH Outbreaks -DHMH- <dhmh.outbreaks@maryland.gov>

The Baltimore City Health Department and Maryland Department of Health and Mental Hygiene continue to investigate an outbreak of gastroenteritis at the [redacted] during the [redacted] on April 8-10, 2014. Currently, there are over 100 reported illnesses, mostly self-limited diarrhea. We have heard from about 400 of approximately 1300 attendees. There have been no associated hospitalizations or deaths reported. We are working on evaluating possible exposures and doing testing at the Maryland state public health laboratory to attempt to identify an agent. At the conclusion of the investigation, a summary report will be available.

If you did not have the opportunity to respond to the previous online survey before it was closed and would still like to, we have opened another link. To protect the integrity of the data, please do not distribute this link or password to those who did not attend the [redacted]

If you have already completed the previous survey, please do not complete this one (the questions are the same).

Link: https://www.surveymonkey.com/s[redacted]
Password: bp%x9

If you have questions about the investigation, please contact the Division of Outbreak Investigation at 410-767-6700 or by email at DHMH.Outbreaks@maryland.gov.

Thank you,

--

Division of Outbreak Investigation
Office of Infectious Disease Epidemiology and Outbreak Response
Maryland Department of Health and Mental Hygiene
201 W. Preston Street, 3rd Floor
Baltimore, MD 21201

Office: 410-767-6700
Fax: 410-669-4215
Email: DHMH.Outbreaks@maryland.gov

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