



Gastroenteritis Outbreak Among Competitors at the 2011 Rock 'n' Roll Las Vegas Marathon & 1/2 Marathon – Interim Report

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INTERIM REPORT

This report describes the initial investigation and findings of the Southern Nevada Health District into illness reported related to the 2011 Rock 'n' Roll Las Vegas Marathon & 1/2 Marathon. All findings and interpretations are subject to change based on the ongoing investigation.

BACKGROUND

On Tuesday, December 6, 2011, the Southern Nevada Health District (SNHD) Office of Epidemiology (OOE) received a foodborne illness complaint from persons who had travelled to Las Vegas to compete in the Rock 'n' Roll Las Vegas Marathon & 1/2 Marathon on Sunday, December 4, 2011. Through Wednesday, December 7, a total of 5 additional complaints were received from marathon participants specifically about gastrointestinal illness during or after the race.

On December 8, 2011, the Las Vegas Review Journal ran a story entitled “Las Vegas marathon runners say they were sickened”¹, citing posts on the event’s Facebook page² with a number of participants reporting gastrointestinal illness.

An investigation into the complaints was initiated on December 8, 2011.

Race

The 2011 Rock 'n' Roll Las Vegas Marathon & 1/2 Marathon was held mostly on Las Vegas Boulevard, starting and ending at Mandalay Bay. The half-marathon course proceeded north on Las Vegas Blvd to Fremont Street and returning to the finish line at Mandalay Bay, a distance of 13.1 miles. From the same starting line, the marathon course first travelled west on Hacienda Ave, across I-15, and wound through the area bordered by I-15 on the east, Wynn Rd on the west, Tropicana Ave on the north, and Patrick Lane on the south. The course then headed west on Hacienda Ave to Jones, then returned to Las Vegas Blvd on Hacienda Ave and merging with the half-marathon course for the remainder of the race, a total distance of 26.2 miles.³ The marathon started at 4:00pm, and the half-marathon started at 5:30pm.

A total of 16 water stations were located throughout the course, located approximately every mile to mile-and-a-half. In addition, every other station provided Cytomax, a sports drink, and two stations provided GU Energy Gel to runners.⁴

In addition to the race, a number of race-related events were held over the course of the weekend, including a pre-race concert, pre-and post- race parties, meals, and a health and fitness expo. An estimated 44,000 runners participated in the race.

METHODS

Environmental Investigation

As the race was completed several days prior to the initiation of the investigation, all materials related to the race had been cleaned up and were not available for inspection or testing. A captain of one of the water stations was interviewed as to the process used to fill water and Cytomax, a sports energy drink, for the competitors. In addition, comments received through the SNHD survey on water handling were reviewed.

Laboratory

Ill persons identified by the survey as being local residents were asked to provide stool specimens for testing. The SNPHL performed cultures for enteric pathogens (*Salmonella spp.*, *Shigella spp.*, *Campylobacter spp.*, *Escherichia coli* O157, and *Yersinia enterocolitica*), Shiga toxin-producing *E. coli* (STEC) ELISA testing, Norovirus RT-PCR testing, and *Cryptosporidiosis spp.* ELISA testing.

Case Finding

On Thursday, December 8, 2011, SNHD developed a retrospective cohort study utilizing convenience sampling to identify cases and collect basic demographic, medical, and risk factor information. The survey was developed using SurveyMonkey, and links to the survey were posted on the SNHD Facebook⁵ and Twitter⁶ accounts and on the marathon's Facebook page. In addition, the links to the survey were retweeted and reposted by marathon participants in a number of running forums, on Facebook, and in a Las Vegas Review Journal story that ran on December 13, 2011.⁷

Data Analysis

Data collected through the survey were downloaded from SurveyMonkey and analyzed using Microsoft Excel. A standard case definition was used to classify survey respondents as cases or non-cases. Basic descriptive statistics were calculated for demographic variables, and relative risks (including 95% confidence intervals) were calculated for possible disease risks. Significance was evaluated through use of the chi-square test, with p-values less than .05 being considered significant.

For the purposes of this analysis, the definition of a case is: any runner from the Las Vegas Marathon completing the survey who reported either vomiting or diarrhea between December 2, 2011 and December 9, 2011. The definition of a non-case is: any runner from the Las Vegas Marathon completing the survey who reported neither vomiting nor diarrhea between December 2, 2011 and December 9, 2011.

RESULTS

Environmental Investigation

The captain of the water station reported being instructed to have the volunteers wear gloves and to use pitchers to take water from the containers to fill the cups, as well as to wear gloves when handing out the water. The instructions for making Cytomax were to use the same source of water that was being given to the runners during the race, and to use the same process to fill cups and distribute it to runners. However, numerous survey respondents reported observing volunteers dunking cups directly into the water or Cytomax to fill them, not wearing gloves when they filled cups and, handing out drinks without wearing gloves.

Laboratory

Stool specimens were provided by nine race runners and two family members of a race runner who subsequently became ill after contact with the ill race runner. All eleven specimens tested negative for all bacterial, viral, and protozoal pathogens tested.

Case Finding

A total of 1,068 surveys were initiated through 9:21am on December 14, 2011. Of these, 993 provided sufficient sign and symptom information to be classified as to their disease status using the case definition, identifying 531 cases and 462 non-cases.

Data Analysis

The descriptive characteristics of the respondents, including age, residence, race information and race experience are provided in Table 1. The signs and symptoms reported by cases are reported in Table 2, with specific analysis of vomiting and diarrhea provided in Table 3. The outbreak curve is presented in Figure 1. Table 4 provides the analysis of the risk factors. In addition, the median onset time was 8:15 PM on December 4, 2011 for marathon runners and 8:30 PM on December 4, 2011 for half marathon runners; there was no statistical significance to this difference.

DISCUSSION

The most widely-disseminated hypothesis discussed in the media and shared among the runners using social media for the cause of the outbreak is that the water distributed during the race was contaminated with a pathogen or chemical that led to the illnesses. The results of the investigation thus far have been largely inconsistent with this hypothesis. Although a statistically-significant relative risk was identified for the consumption of water during the race, there are issues with the temporality and consistency of this result in determining causality. First, the consumption of water may have followed the onset of illness rather than preceded it; runners who were ill may have consumed water after becoming ill in order to try and prevent dehydration, after vomiting or as part of their normal race-running process. Second, no elevated risk was identified with the consumption of Cytomax, even though the drink was made by adding a powder to the same water that was given to the runners.

Although no pathogen has yet been identified by laboratory testing, the tight clustering of case onsets during the race indicates a point-source outbreak caused by a pathogen having a short incubation period. The high percentage of runners with diarrhea in the absence of vomiting is inconsistent with a chemical or toxin, but would be consistent with several viral pathogens with short incubation periods. Although not specifically covered in the survey, a number of respondents reported in the comments that their illness was still ongoing three or four days after the race; a chemical or toxin would not cause an illness lasting that long. A chemical or toxin would also not result in secondary disease transmission, which was reported in both the survey and from people providing stool specimens.

There were anecdotal reports that a runner had tested positive for cryptosporidiosis; if true, this finding would be coincidental, as none of the laboratory testing performed on cases was positive for cryptosporidiosis. In addition, a point source outbreak of cryptosporidiosis would not be expected to have case onsets as tightly clustered as seen in this outbreak.

The majority of persons who became ill did so while running either the half marathon or the full marathon, with roughly three-quarters of the competitors becoming ill between 5pm and 11 pm, although illness onsets prior to the start of the race and up to three days after the race were reported by competitors. Diarrhea, the main symptom of this outbreak, typically takes at least 12 hours to develop after infection; it is not physiologically possible to develop diarrhea minutes after exposure to a pathogen, as was reported by a number of participants. If this outbreak were caused by the water given to runners, the cases would not be expected to first appear until at least the early morning hours of December 5, 2011. Also, it would be expected that the people running in the marathon (who started at least 90 minutes prior to the first group of half marathon runners started the race) would have an earlier onset of symptoms because of an earlier exposure to the water. This was not identified in the data, and marathon runners were not at a higher risk for disease.

While the distribution of water and Cytomax to runners by volunteers may pose a potential public health risk of disease transmission, it does not appear that the outbreak is the result of these practices. However, these practices need to be reviewed prior to next year's race to ensure that disease transmission risks are minimized.

Other concerns that were expressed in the media or through social media included the inexperience of the runners and dehydration affecting runners not used to running in the desert. Neither of these two concerns as factors in the outbreak were borne out by the data; runners from outside Las Vegas had the same attack rate as local runners and first-time runners had the same attack rate as runners who had previously competed in marathons or half marathons.

CONCLUSION and NEXT STEPS

At this time, the source of the outbreak has not yet been identified. Additional testing is being arranged for sapovirus, astrovirus and adenovirus, as these pathogens have been identified in other, similar outbreaks. Identification of one of these pathogens would indicate a common source of the outbreak at least 24-36 hours prior to the start of the race.

TABLES AND FIGURES

Table 1. Survey respondents by disease classification

Category	Cases	Non-Cases	Total
Responses	531 (53.5)	462 (46.5)	993 (100.0)
n (%)			
Age	36.6	37.4	37.0
Average (years)			
Residence			
Out of Town n (%)	459 (46.2)	394 (39.7)	853 (85.9)
Local n (%)	55 (5.5)	52 (5.2)	107 (10.8)
Unknown n (%)	17 (1.7)	16 (1.6)	33 (3.3)
Race			
Full Marathon n (%)	81 (8.2)	85 (8.6)	166 (16.7)
Half Marathon n (%)	435 (43.8)	367 (37.0)	802 (80.8)
Unknown n (%)	15 (1.5)	10 (1.0)	25 (2.5)
Experience			
First-timer n (%)	79 (8.0)	75 (7.6)	154 (15.5)
Some experience n (%)	150 (15.1)	154 (15.5)	304 (30.6)
Experienced n (%)	283 (28.5)	220 (22.2)	503 (50.7)
Unknown n (%)	19 (1.9)	13 (1.3)	32 (3.2)

Table 2. Signs and Symptoms reported by cases

Sign/Symptom	N	%*
Diarrhea	455	87.2
Abdominal cramps	432	84.7
Nausea	435	84.0
Fatigue	374	76.6
Chills sweats	311	64.0
Dizziness	275	57.7
Headache	276	57.5
Vomiting	272	54.1
Fever	114	31.1

* Percentages calculated of all cases who provided an answer to this question

Table 3. Diarrhea and vomiting reported by cases

Sign/Symptom	n	%
Any diarrhea	455	87.2
Any vomiting	272	54.1
Diarrhea only	231	46.8
Vomiting only	67	13.6
Both diarrhea and vomiting	196	39.7

Figure 1. Outbreak curve (n=436)

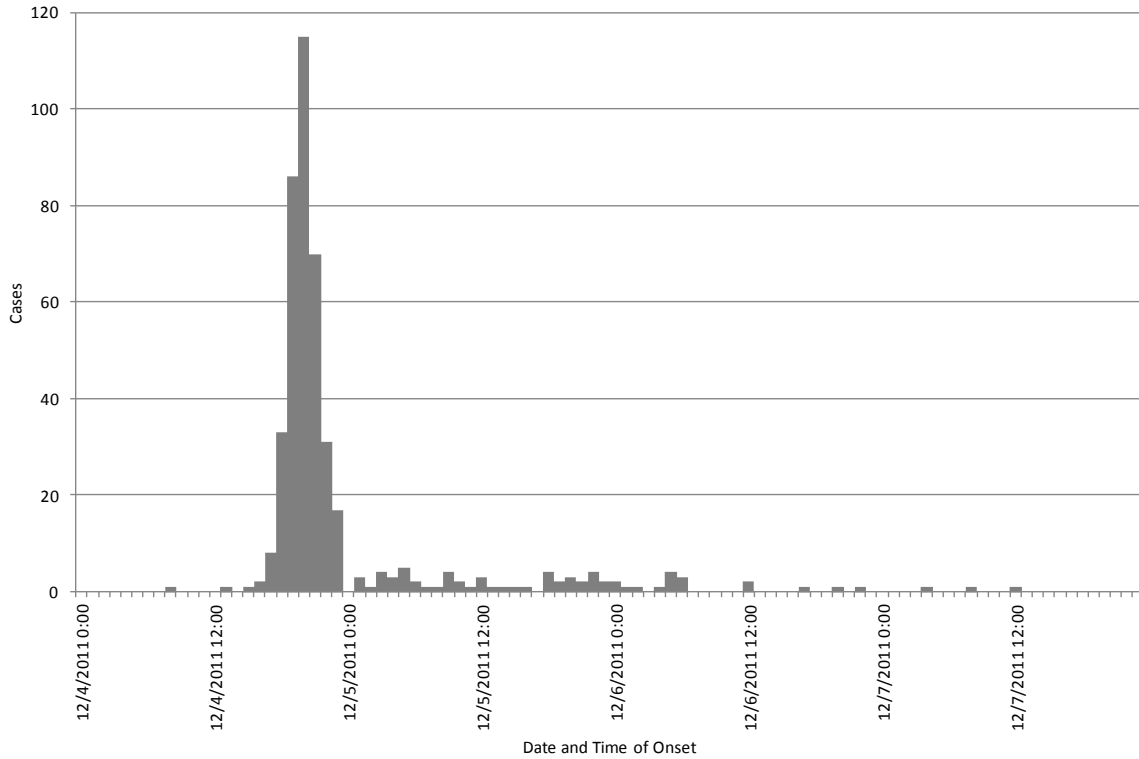


Table 4. Risk factor evaluation

Risk factor	RR (95% CI)	p-value
Events		
Health & Fitness Expo, Friday, December 2nd	1.00 (0.88, 1.13)	0.9921
Health & Fitness Expo, Saturday, December 3rd	1.01 (0.89, 1.15)	0.8697
Pasta Party on Saturday, December 3	1.04 (0.81, 1.33)	0.7657
Las Vegas Great Santa Run on Saturday, December 3	0.72 (0.48, 1.08)	0.0708
Kick Off Party at TAO Nightclub on Saturday, December 3	1.07 (0.69, 1.66)	0.7621
Pre-Race Brunch on Sunday, December 4	0.95 (0.54, 1.67)	0.8465
Pre-Race Concert (Cheap Trick) on Sunday, December 4	0.90 (0.77, 1.05)	0.1729
Race-Related		
Consumed water provided by the race at the starting line	0.93 (0.78, 1.10)	0.3633
Consumed water provided by the race during the race	1.82 (1.24, 2.66)	0.0001
Consumed water provided by the race at the finish line	1.05 (0.91, 1.21)	0.4903
Consumed Cytomax provided by the race	0.99 (0.88, 1.11)	0.8259
Consumed GU Gel provided by the race	1.03 (0.91, 1.16)	0.6248
Competed in the full marathon	1.11 (0.94, 1.32)	0.2006
Compete in a marathon or half-marathon for the first time	0.96 (0.81, 1.13)	0.5911
Out-of-town residence	0.96 (0.79, 1.16)	0.6378

REFERENCES

- ¹ <http://www.lvrj.com/news/marathon-runners-say-they-were-sickened-135233493.html>
- ² <http://www.facebook.com/RnRLasVegas>
- ³ http://runrocknroll.competitor.com/files/2011/03/LV_11_CourseMap.pdf
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