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Brief Report

Identifying the public's concerns and the Centers for Disease Control and Prevention's reactions during a health crisis: An analysis of a Zika live Twitter chat

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The arrival of the Zika virus in the United States caused much concern among the public because of its ease of transmission and serious consequences for pregnant women and their newborns. We conducted a text analysis to examine original tweets from the public and responses from the Centers for Disease Control and Prevention (CDC) during a live Twitter chat hosted by the CDC. Both the public and the CDC expressed concern about the spread of Zika virus, but the public showed more concern about the consequences it had for women and babies, whereas the CDC focused more on symptoms and education.

Until 2015, the Zika virus had no known presence in the United States.[1] Its arrival elicited widespread concern due to risks for pregnant women and their newborns.[2] Within the past year, Zika has been linked to microcephaly, a condition that affects the growth of a developing brain.[3] Transmitted by the *Aedes* mosquito species, the Zika virus had been reported previously in parts of Africa, Southeast Asia, and the Pacific Islands.[1] During May 2015, it made its way to Brazil.[1] Public concern quickly grew because of the ease of transmission and uncertainty about the length of time the virus remains in the body. Although many people with Zika virus display no symptoms, public anxiety was heightened further after reports of sexually transmitted Zika virus cases.[4]

Social media platforms can cultivate fear and hasten the spread of misinformation in the face of a public health threat.[5] However, social media can also play an important role in curbing fear because of its ability to deliver timely information and updates.[6,7] These channels are also conducive for public participation, via open forums, where questions can be quickly answered. The Centers for Disease Control and Prevention (CDC) took advantage of the affordances that Twitter offers by hosting a live chat on February 12, 2016, as a response to public concerns about Zika virus in the United States. The CDC hosted a similar session in 2015 about Ebola virus disease and was able to provide up-to-date information about symptoms, transmission, and prevention of the virus.[2,8] Given that many people view social media outlets like Twitter as a source of reliable health information,[5] it is important to consider how timely topics like the Zika virus are addressed. The goal of the current study was to examine the emerging themes during a CDC-hosted live Twitter chat. This study used text mining[9] to evaluate the public's concerns about the Zika virus and the CDC's response to the public's questions.

METHODS

Text analytics and data acquisition

This study used text analytics to identify topics and extract meanings contained in unstructured textual data. Twitter messages were captured during an hour-long live CDC Twitter chat on February 12, 2016, containing the hashtag #CDCchat. Our initial focus was on public concerns related to Zika virus, so tweets from the CDC were

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removed, resulting in 555 public-generated original tweets. In a complementary analysis, retweets from the CDC (n = 1,174) were isolated. Both data sets were analyzed using text-mining software and findings were interpreted.

Text mining

The textual context of public-generated tweets and CDC retweets was analyzed using SAS Text Miner version 12.1 (SAS Institute Inc, Cary, NC),[10] which provides the ability to parse and extract information from text, reliably filter and store that information, and assemble tweets into related topics for introspection and insights from the unstructured data.[8]

First, using text parsing, each message was divided into individual words. These words were listed in a frequency matrix and words that did not contribute to a topic, such as auxiliary verbs and conjunctions, were excluded from the analysis. Following that, a text filter was used to exclude words that appeared in fewer than 4 messages. The words initially included (and excluded) in the analysis were visually inspected to ensure accuracy and identify unrecognizable symbols for exclusion.

With the inclusion criteria set, a text topic node was used to combine terms into 8-10 topic groups. After examining each of the created topics, the 10-topic solution most clearly illustrated the main themes and produced the final topic groups for both tweets and retweets. Lastly, the researchers inspected both the individual tweets and retweets of the final topic groups to interpret the themes.

RESULTS

The 10 mutually exclusive topics from public-generated tweets during the CDC's Zika virus live Twitter chat included information about the virology of Zika virus and how it spreads, consequences for babies, promotion of the chat, prevention and travel precautions, education and testing for the virus, consequences for pregnant women trying to conceive, insect repellant, sexual transmission, encouragement to join the chat, and symptoms. Table 1 contains a list of the topics and their descriptive terms. The greatest concerns—indicated by the number of tweets and themes—were about how Zika virus spreads and how it influences newborns. Less attention was given to symptoms.

The 10 mutually exclusive topics to emerge from the CDC's responses were information about the virology of Zika virus and how it spreads, prevention, symptoms, transmission (both through bites and sexual activity), a smaller question and answer session hosted by a CDC disease detective, information about how long the virus stays in the body, insect repellant, videos to help the public learn more, general reporting of cases and local health information, and mosquito breeding sites. Table 1 also contains this list of topics retweeted by the CDC and their descriptive terms. The CDC seemed

Table 1
Topics and descriptive items

Original tweets from the public				Retweets from the Centers for Disease Control and Prevention			
Topic ID	Topic	No. of tweets	Description	Topic ID	Topic	No. of tweets	Description
1	Virus, + mosquito, + infect, *Aedes*, + spread	58	Concern about virology of Zika virus, how it is transmitted and spread, and the specific genus of mosquitoes (*Aedes*) that carries Zika virus	1	*Aedes*, + *Aedes* mosquito, + spread, + find	134	Information about the virology of Zika virus, how it spreads, and the genus of mosquitos that carries it
2	Microcephaly, Zika, + baby, cmv, + bear	51	Zika's connection to microcephaly and the consequences Zika virus has for babies	2	Prevent, + step, follow, + bite, first week	78	Emphasis on prevention and steps to take to protect one's self from acquiring Zika virus
3	Question, cdcgov , today, https, + answer	50	Information about joining and participating in the chat	3	Fever, rash, red, + red eye, + eye	72	Describing the symptoms of Zika virus and what to look for if one might be infected
4	Prevent, + mosquito, + bite, + travel	42	Emphasis on how to prevent the spread of Zika virus by issuing travel precautions/regulations	4	Sexual transmission, remain, primary, bite	67	Discussion of both modes of transmission (mosquito bite and sexual activity)
5	Health, + test, + lab, public, cdcchat	39	Information about testing for the virus and encouraging educating the public on Zika virus	5	Question, Hennessey, detective, working	67	Mini question-and-answer session within the larger Centers for Disease Control and Prevention Q and A hosted by "disease detective" M. Hennessey
6	Pregnant, + woman, + health care provider	38	Women who are trying to conceive should talk with their doctors about possible risks and complications from Zika virus	6	Blood, + clear, body, + long, week	61	Information about how long Zika virus stays in the body
7	Repellent, + insect, + woman, safe, pregnant	37	Concern about safe insect repellants for pregnant women and repellents effective at preventing Zika virus	7	Effective, Environmental Protection Agency-registered, safe, repellent	39	Information about what types of repellants are effective and safe to use
8	Sexual, + bite + sexual transmission	30	Focus on discovery that Zika virus can be transmitted through sexual activity	8	Top priority, learning, video, + fight	37	Videos and resources to help the public learn more about Zika virus
9	Amp, + join, + expert, + cdcgov expert, drfrieden	27	Encouragement to join the chat and to spread the word to others	9	Local health, depts, local, notifiable	34	Encouraging the public to report possible cases of Zika virus to local health departments
10	Symptom, fever, rash, + eye, red	19	Describing the symptoms and knowing how to detect if someone has Zika virus	10	Collect water, repair window, remove	17	Information about mosquito breeding sites and how to avoid attracting mosquitoes

NOTE. Tweets were collected February 12, 2016, during the Centers for Disease Control and Prevention's live Twitter chat.
Amp, Association for Molecular Pathology; *cmv*, cytomegalovirus.

to be most concerned with addressing how Zika virus spreads and prevention, and less concerned about mosquito breeding sites. Both the public and the CDC were most concerned about how it spreads and prevention.

DISCUSSION

The comments from the public tweeted during the CDC's live Twitter chat on Zika virus are illustrative of timely health concerns. The Twitter chat served as a unique forum for the fast dissemination of information and allowed a government health organization to provide immediate answers to the public's questions. Both parties were primarily concerned with information about how Zika virus spreads, the nature of the virus, and the safety and effectiveness of insect repellant. However, the CDC did not appear to respond to concerns about consequences for newborns and pregnant women.

As expected, the CDC tweeted more information about educational materials (eg, videos, a separate side chat with a disease detective/veterinarian, and information about local health organizations). On one hand, the lack of agreement between the original tweets and the retweets by the CDC might suggest that the CDC failed to pick up on or respond to all of the topics that were important to the public. On the other hand, it might suggest an effort by the CDC to redirect the conversation back to what the organization believed were the most important topics to address and to focus strictly on the exchange of information to avoid being sidetracked by fear-ridden tweets.

With regard to limitations, this study included only original tweets from the public and retweets by the CDC, which provides insights into a limited slice of social media conversations about Zika virus. Additionally, Twitter users are not representative of the general public.

CONCLUSIONS

These findings have important implications for health campaigns; namely, that the CDC and other health organizations hosting live chats need to have more constant monitoring of the questions and trends within the public's tweets. Social media monitoring coupled with the conversational nature of Twitter allows for the detection of emerging public concerns in real time, which can be an advantage for health organizations attempting to prevent the spread of misinformation and fear. This study's analysis of the original tweets can help health professionals better understand the public's concerns about viral outbreaks. The analysis of the CDC's responses adds an additional layer of insight because it suggests there may be room for improvement in terms of directly responding to the public's concerns, but also highlights the CDC's efforts to address the issues that it perceives as the most important for preventing the spread of Zika virus.

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