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Zika Virus–Related News Coverage and Online Behavior, United States, Guatemala, and Brazil

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To the Editor: News coverage of emerging infectious diseases tends to be episodic and ephemeral rather than thematic, comprehensive, and consistent over time, in part because of newsroom constraints (*1–3*). Public health authority announcements may help drive peaks in coverage and warrant attention, in particular given the importance of trust and credibility for information acceptance (*4,5*). Moreover, online search behavior and social media interaction tend to respond to news coverage, especially for novel health issues (*6,7*).

The nature of Zika virus transmission as a novel phenomenon not completely understood by researchers could encourage anxiety and fear among the public (*8,9*). Patterns of social interaction and search behavior regarding Zika virus can point to opportunities and constraints for education efforts.

To assess relationships between news coverage, social media mentions, and online search behavior regarding Zika virus, we studied data available for January 1–February 29, 2016. Although news outlets occasionally covered Zika virus before 2016, our selected period included prominent announcements. For example, on January 28, the World Health Organization declared that Zika virus was "spreading explosively" (*10*), and the Centers for Disease Control and Prevention issued a travel alert. On February 3, authorities reported the first case that appeared in the United States.

Across 3 data sources, we searched for mentions of "Zika" or "El Zika." We used Google Trends (Google Inc., Mountain View, CA, USA) to assess the number of total searches that originated in the United States, Guatemala, or Brazil for these terms, relative to total Google searches for any topic for the same period. We used a scale of 0–100 (as an indicator of relative volume), with 50 representing half the volume as 100 but not a specific absolute number. Zika virus has been detected in >25 countries since 2015; the countries selected were places where transmission has been relatively widespread or where Zika virus had not yet been but was anticipated to be. We used a monitoring tool, Crimson Hexagon (http://www.crimsonhexagon.com/), to capture the total number of daily Twitter posts (tweets) and focused on tweets geotagged as originating from the United
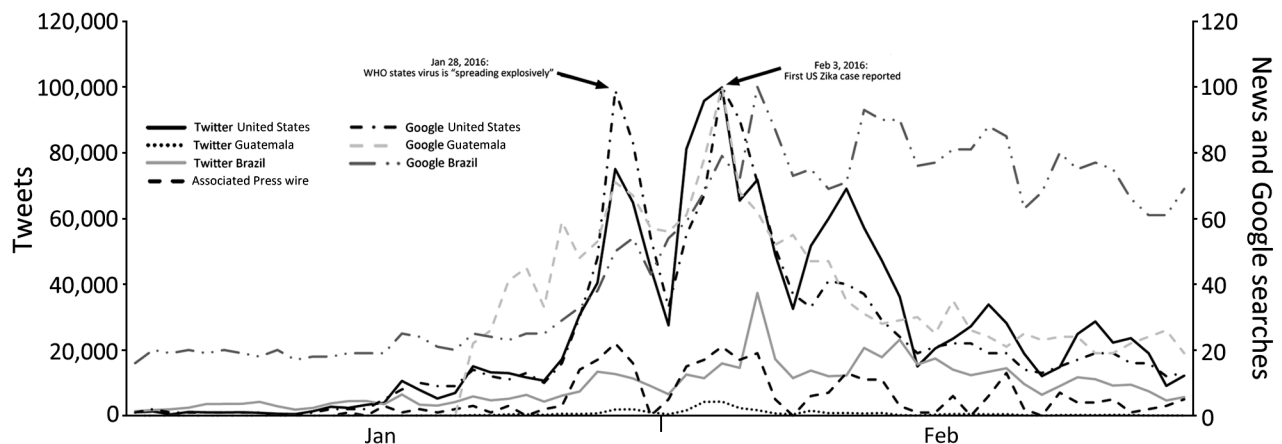
Figure. Comparison of number of tweets by individual persons, Google searches by individual persons, and Associated Press news stories about Zika virus in the United States, Guatemala, and Brazil, January 1–February 29, 2016.

States, Guatemala, or Brazil. Last, we counted Associated Press news wire stories as a proxy for daily volume of Zika news coverage in the Western Hemisphere (online Technical Appendix, http://wwwnc.cdc.gov/EID/article/22/7/16-0415-Techapp1.pdf).

Using a day as our unit of analysis (i.e., n = 60 in the analysis), we first assessed Pearson product-moment correlations between news coverage, social media mentions, and online search behavior and then fit a time series model. Results suggested prominent but ephemeral peaks in salience and attention, with some variation over time in searches by country (Figure). We found strong positive correlations between news (daily volume) and tweets for all 3 countries (United States, $r = 0.86$, p<0.001; Guatemala, $r = 0.78$, p<0.001; Brazil, $r = 0.60$, p<0.001). We also found strong positive correlations between news and Google searches for all 3 countries (United States, $r = 0.86$, p<0.001; Guatemala, $r = 0.74$, p<0.001; Brazil, $r = 0.48$, p<0.001). Because time series data can reflect autocorrelation that makes observed relationships spurious, interpretation of bivariate correlations alone to link time series data is inadvisable. To assess the relationship between news coverage and online searching related to Zika virus, we used time series analysis to predict US Google searches as a function of other observed trends and date. We fit an autoregressive integrated moving average (0, 1, 3) model to address dependence between residuals, resulting in a Ljung-Box statistic that was not significant (p>0.05). This finding indicated that we sufficiently reduced the time series to white noise to assume no autocorrelation in residuals. Our model achieved an R^2 value of 0.90 and stationary R^2 value of 0.53. Associated Press wire stories emerged as a significant and positive predictor (coefficient = 1.52, $t = 3.24$, p<0.01). No other predictor predicted variance greater than that of news stories (p>0.05). Daily news story volume predicted departures from the expected trend in US search behavior related to Zika virus.

Our results suggest that news coverage of public health authority announcements opens brief windows of information sharing, engagement, and searching that offer opportunities to address perceptions and provide preparation and vector control recommendations through education. Sharing and searching are less apparent outside these windows, especially in contexts in which an emerging infectious disease is not yet prevalent. Our findings may not generalize beyond the initial stages of Zika virus transmission in the United States, and future work could obtain appropriate data for investigating the tone of news coverage and online communication in various countries. Nevertheless, recent trends in online information-seeking about Zika virus has been sensitive to official announcements, suggesting the usefulness of pairing announcements with provision of information resources that can be found through search engines.

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Detection and Genomic Characterization of Senecavirus A, Ohio, USA, 2015

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To the Editor: Senecavirus A (SVA), formerly Seneca Valley virus, is a single-stranded positive-sense, non-enveloped RNA virus (1). The RNA genome of SVA is 7.2 kb long and is translated into a polyprotein in a host

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Technical Appendix

Detailed Methods

Data collection

In addition to using search score data available from Google, we used 2 tools to capture news coverage and social media mentions. We used a licensed tool called Meltwater (San Francisco, CA, USA) to capture Associated Press news stories during January 1–February 29, 2016, although researchers without a Meltwater license also could capture stories manually from the Associated Press wire each day with the appropriate subscription to the wire. For Twitter mentions, we purchased a license to the full census of all Twitter posts in the countries tracked through a tool offered by Crimson Hexagon (Boston, MA, USA). Our use of a full census of Twitter mentions represents a departure from other methods that offer only a sample. We purchased access to the total count of all Twitter mentions and used the search terms described in the paper. Although the array of tools we used may not be freely available to all researchers, we include the data used in our analysis for each news or social media outlet we examined (Technical Appendix Table).

Analysis

Data analysis that assesses relationships between longitudinal variables or data organized by time should acknowledge the possibility of autocorrelation in a time series that can violate assumptions of independence between observations (*1*). For the time series analysis presented, we fit an autoregressive integrated moving average (ARIMA) (0, 1, 3) model by using IBM SPSS Statistics 21 (Armonk, NY, USA). We opted to test this model after inspecting the original time series of dependent variable values by using the partial autocorrelation function and the autocorrelation function to assess whether autoregressive or moving average components would

be useful in eliminating autocorrelation in the time series. Because the partial autocorrelation function declined after 1 lag and the autocorrelation function declined after 3 lags, we fit an ARIMA (0, 1, 3) model, which resulted in a series without apparent autocorrelation in the residuals: the resulting Ljung-Box statistic (23.60, DF = 15) was not significant (p >0.05), indicating that we did not need to reject a hypothesis of no autocorrelation in the residuals. In other words, we applied an ARIMA model to enable our independent variables to predict a prewhitened series that accounted for potential autocorrelation in the dependent series. Specifically, we fit a model to predict a US Google search score that included 4 elements that reflected the dependent variable time series (a difference parameter and 3 moving average parameters) and a set of 7 predictors: a day variable along with Associated Press wire story counts, US Twitter mentions, Guatemala Twitter mentions, Brazil Twitter mentions, a Guatemala search score, and a Brazil search score. Stationary R-squared value for the model was 0.53. Root mean squared error was 8.8.

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Technical Appendix Table. News coverage and social media mentions of Zika virus by various media channels and day, January 1–February 29, 2016

Month/day	Associated Press wire	Google United States	Google Guatemala	Google Brazil	Twitter United States	Twitter Guatemala	Twitter Brazil
1/1	0	1	0	16	1,059	2	1,393
1/2	0	2	0	20	1,295	10	1,736
1/3	0	1	0	19	414	2	1,979
1/4	0	1	0	20	1,137	10	2,459
1/5	0	1	0	19	1,039	12	3,556
1/6	0	1	0	20	990	8	3,587
1/7	0	1	0	19	1,076	9	3,605
1/8	0	1	0	18	887	7	4,212
1/9	0	0	0	20	583	2	2,883
1/10	0	0	0	17	465	5	1,850
1/11	0	1	0	18	1,385	12	2,357
1/12	0	2	0	18	2,725	20	3,760
1/13	1	2	0	19	2,405	39	4,460
1/14	0	2	0	19	3,310	0	4,476
1/15	3	5	0	19	3,907	8	3,510
1/16	1	8	0	25	10,602	47	6,458
1/17	2	10	0	24	7,844	22	3,359
1/18	1	9	0	21	5,251	75	3,059
1/19	2	9	0	20	6,931	31	4,167
1/20	3	14	22	25	15,044	200	5,884
1/21	1	12	26	24	13,194	159	4,686
1/22	3	11	41	23	12,960	423	5,160
1/23	0	13	45	25	11,664	434	6,340
1/24	2	10	33	25	10,682	262	4,300
1/25	3	16	59	29	17,191	582	6,086
1/26	14	30	48	33	30,654	499	7,353
1/27	17	48	53	38	40,411	704	13,386

Month/day	Associated Press wire	Google United States	Google Guatemala	Google Brazil	Twitter United States	Twitter Guatemala	Twitter Brazil
1/28	22	99	71	50	75,014	1,882	12,663
1/29	16	83	67	54	64,885	1,987	11,331
1/30	0	54	57	43	44,834	1,020	9,006
1/31	5	33	56	54	27,524	429	6,555
2/1	15	55	61	59	81,131	1,626	12,525
2/2	17	67	78	68	95,771	4,214	11,436
2/3	21	100	100	79	99,830	4,291	15,895
2/4/	17	90	68	72	65,482	2,320	14,576
2/5	19	71	62	100	71,777	1,693	37,342
2/6	5	51	52	87	49,016	729	17,195
2/7	0	37	55	73	32,508	396	11,443
2/8	6	33	47	75	51,640	1,554	13,747
2/9	7	41	47	69	59,935	796	12,009
2/10	13	40	35	71	69,056	847	12,243
2/11	11	37	31	93	57,113	678	20,615
2/12	11	29	28	90	47,183	846	17,785
2/13	3	24	29	90	36,202	183	23,147
2/14	1	19	30	76	14,995	70	15,587
2/15	1	21	25	77	20,468	358	17,383
2/16	6	22	35	81	23,404	505	14,014
2/17	0	22	26	81	27,197	509	12,314
2/18	6	19	24	88	33,825	436	13,391
2/19	13	19	21	85	28,167	461	14,468
2/20	2	14	25	63	18,913	148	9,629
2/21	0	13	23	68	12,041	41	6,376
2/22	7	15	24	80	14,798	203	9,026
2/23	4	17	24	75	24,839	239	11,683
2/24	4	19	19	77	28,650	203	11,103
2/25	5	19	19	75	22,237	271	9,179
2/26	1	16	22	66	23,589	246	9,465
2/27	2	16	24	61	18,998	83	7,436
2/28	3	12	26	61	9,083	63	4,649
2/29	5	13	19	69	12,162	41	5,670