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State of the Science Review

Ebola virus disease and social media: A systematic review

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Key Words:

Health communication
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 Surveillance

Objectives: We systematically reviewed existing research pertinent to Ebola virus disease and social media, especially to identify the research questions and the methods used to collect and analyze social media.

Methods: We searched 6 databases for research articles pertinent to Ebola virus disease and social media. We extracted the data using a standardized form. We evaluated the quality of the included articles.

Results: Twelve articles were included in the main analysis: 7 from Twitter with 1 also including Weibo, 1 from Facebook, 3 from YouTube, and 1 from Instagram and Flickr. All the studies were cross-sectional. Eleven of the 12 articles studied ≥ 1 of these 3 elements of social media and their relationships: themes or topics of social media contents, meta-data of social media posts (such as frequency of original posts and reposts, and impressions) and characteristics of the social media accounts that made these posts (such as whether they are individuals or institutions). One article studied how news videos influenced Twitter traffic. Twitter content analysis methods included text mining ($n = 3$) and manual coding ($n = 1$). Two studies involved mathematical modeling. All 3 YouTube studies and the Instagram/Flickr study used manual coding of videos and images, respectively.

Conclusions: Published Ebola virus disease-related social media research focused on Twitter and YouTube. The utility of social media research to public health practitioners is warranted.

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ICHF conceived, designed, and led the study. CHD, KCF, KRS, and AH searched the bibliographic databases and did the initial screening of abstracts. CHD, KCF, KRS, and PLT screened the full text of the articles and decided on inclusion or exclusion. They also extracted data and assessed the quality of the included studies. ICHF made the final decision on the inclusion/exclusion, data extraction, and quality assessment of the studies. ICHF wrote the first draft of the manuscript. MG, KWF, and ZTHT provided intellectual input and critically edited the manuscript. All authors approved the final version of the manuscript for submission.

Conflicts of Interest: None to report.

The potential applications of social media in public health practice and research have attracted much attention. They include digital disease detection, epidemiologic forecasting, epidemiologic data retrieval, emergency situation awareness, health communication, communication surveillance, behavior intervention, and patient management.¹⁻⁷ However, the utility of social media as a surveillance and communication tool in public health is not self-evident and requires demonstration in practice.

The unprecedented scale of the 2014-2015 Ebola virus disease epidemic in West Africa captured the attention of social media users globally.^{8,9} Social media use provided researchers with data to explore potential applications for public health.

The aim of this systematic review is to provide clinicians, public health practitioners, and policy makers with a comprehensive overview of the up-to-date literature on Ebola virus disease and social media. We critically appraised the quality and utility of these studies,

and identified the gaps in our current understanding that invite further research efforts. In particular, we focused on the research questions and the methods of the studies:

- What were the research questions of a given study?
- What study design and research methods were used by the researchers to address those questions?
- What were the strengths and limitations of these methods in addressing the given research questions?

METHODS

Protocol

We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Checklist in our review process.¹⁰ The first author (ICHF) designed the systematic review and coded the data extraction spreadsheet with author CHD. Detailed instructions of the review procedures were communicated by ICHF to his junior co-authors (CHD, KCF, KRS, PLT, and ACH) via e-mail. The Online Supplementary Materials for this systematic review are available online at <http://healthdata.engr.uga.edu/static/publications/>.

Definition of social media

For the purpose of this systematic review, we defined social media as social networking sites that include websites or online applications that allow users to communicate or follow each other.¹¹ We excluded online collaborative projects (eg, Wikipedia) and online games (eg, Second Life). We also excluded Google Trends because the relative quantity of search queries is not considered social media.

Literature search

We retrieved relevant journal articles using a systematic approach. CHD, KCF, and KRS searched 3 major databases that catalog medical and public health journals: Web of Science (October 1, 2015), PubMed (October 4, 2015), and EBSCOhost (October 4, 2015). To

ensure the comprehensiveness of our literature search, CHD subsequently searched Association for Computing Machinery Digital Library for computer science journal articles (November 2, 2015), and ACH searched 2 Latin American databases, Literatura Latino-Americana e do Caribe em Ciências da Saúde and Scientific Electronic Library Online, for Spanish and Portuguese journal articles (November 9, 2015). Our search terms included *Ebola* and 1 of the following terms: *Media, Facebook, Flickr, Instagram, Google, Google+, Line, Myspace, Pinterest, Tumblr, Twitter, WeChat, Weibo, WhatsApp?, Vine, Youku, and YouTube*. The Spanish and Portuguese search terms used in Literatura Latino-Americana e do Caribe em Ciências da Saúde and Scientific Electronic Library Online, are listed in the Online Supplementary Materials. We limited our search to articles published in 2013 or after. No limit was set on language. A total of 1,471 articles were identified; of which, 98 were included for abstract screening (Fig 1).

We included peer-reviewed journal articles only; conference proceedings and grey literature were excluded. A total of 50 journal articles were retrieved for full-text reading; each of which was assigned a unique article identification number. Forty-nine of these articles were in English; 1 was in Korean. No relevant Spanish or Portuguese articles were identified. Four co-second authors (CHD, KCF, KRS, and PLT) were grouped into 2 pairs and each pair read 25 articles.

Inclusion and exclusion criteria

We included any article that met all 3 of the following criteria:

- The article either presented original analysis of social media data (social media contents, users, or networks) generated by individuals or organizations, or presented original evidence of the implementation of social media platforms as tools of public health communication, education, or intervention;
- The topic of the article was the 2014–2015 Ebola virus disease epidemic in West Africa, including the travel-associated cases (and subsequent small outbreaks) in Nigeria, Europe, and North America; and
- The articles were published in peer-reviewed journals.

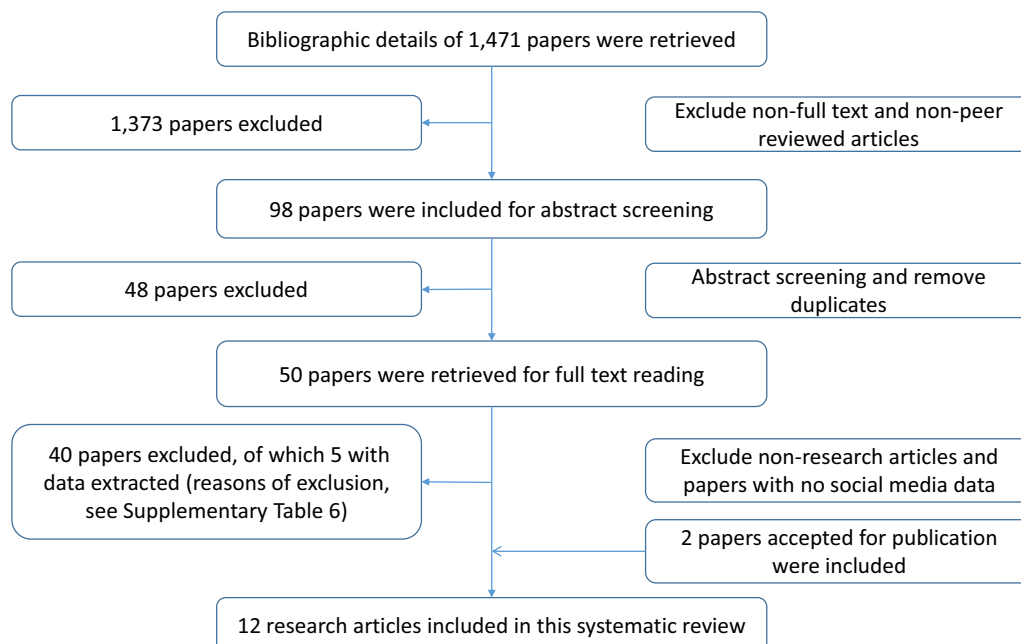


Fig 1. Schematics of literature search, inclusion, and exclusion.

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