RESEARCH LETTER

Requests for Diagnoses of Sexually Transmitted Diseases on a Social Media Platform

Although many studies document the use of social media for sharing and requesting information on specific health conditions,[1,2] whether individuals obtain diagnoses on social media platforms has not been investigated.[3,4] The occurrence of requests for a diagnosis on social media (*crowd-diagnosis*) and determination as to whether the requested diagnosis was for a second opinion after seeing a health care professional were evaluated in a case study.

Methods | Reddit, a social media website with 330 million monthly active users that hosts more than 232 health forums,[5] includes a large subreddit (r/STD) that allows users to publicly share "stories, concerns and questions" about "anything and everything STD [sexually transmitted disease]-related." We selected r/STD because it focuses exclusively on a health topic of substantial public health concern.[6] We first obtained all posts from inception of the subreddit in November 2010 through February 2019. r/STD metadata, including the number of posts and time stamps, were described for the full sample. To quantify the extent to which crowd-diagnosis occurred on r/STD, we drew a random sample of 500 posts. Three authors (A.L.N., E.C.L., and J.W.A.) independently coded whether each post requested a crowd-diagnosis and if so, whether that request was made to obtain a second opinion after seeing a health care professional, using directed content analysis. R statistical software version 3.5.3 (R Foundation) was used to compute the percent of posts (with 95% CIs) that requested a primary or second-opinion crowd-diagnosis, contained an image of the physical signs, or received a reply, and the time to first reply from the random sample. All analyses adhered to Reddit's terms and conditions, relied on existing public data with nonidentifiable participants, and were exempted by the University of California, San Diego human research protections program.

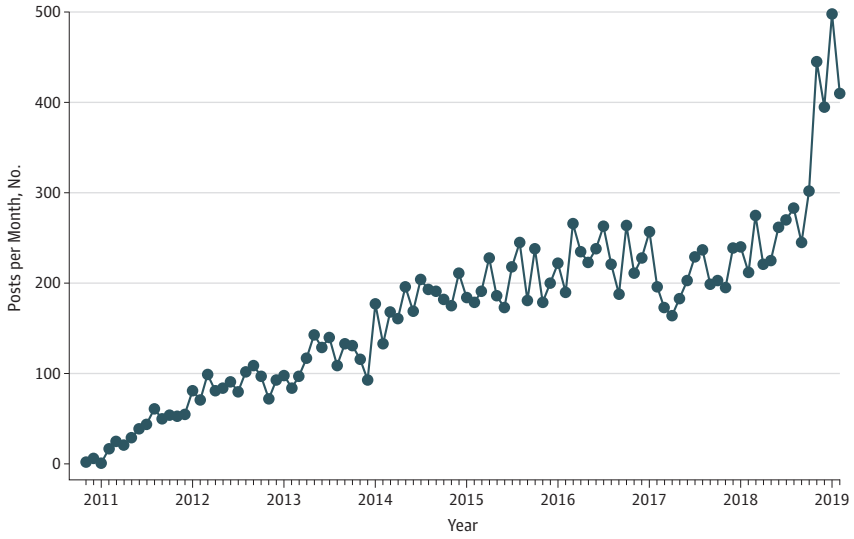
Results | There were 16 979 total posts, 8 in November and December 2010, 2478 in 2017, 3375 in 2018, and 908 in January and February 2019 (**Figure**). There was 80% agreement among all coders on crowd-diagnoses (Cohen κ = 0.73) and 88% agreement on whether the crowd-diagnosis was a request for a second opinion (Cohen κ = 0.53) among an overlapping sample of 50 posts.

Fifty-eight percent (95% CI, 54%-63%) of posts requested a crowd-diagnosis, of which 31% (95% CI, 26%-36%) included an image of the physical signs. Of those requesting a crowd-diagnosis, 20% (95% CI, 15%-24%) did so to obtain a second opinion after receiving a previous diagnosis by a health care professional. Examples of posts obtained from r/STD are in the **Table**.

Eighty-seven percent (95% CI, 83%-91%) of all posts requesting a crowd-diagnosis received a reply (mean responses, 1.7 [SD, 1.2]). The median time for the first response was 3.04 hours (range, 59 seconds to 8.8 weeks), and 79% of requests (95% CI, 74%-84%) were answered in less than 1 day.

Discussion | In the case of r/STD, requests for crowd-diagnoses were frequent, with most receiving a reply within hours, and

Figure. Posting Behavior on Reddit r/STD



STD indicates sexually transmitted disease. The time trend shows the number of r/STD posts each month since the inception of the subreddit in November 2010 through February 2019.

Table. Example Posts From Reddit r/STD

Example Post[a]	Crowd-Diagnosis[b]	Second Opinion[b]	No. of Replies	Time to First Reply
"My previous girlfriend had high-risk HPV. My doc told me that guys have nothing to worry about and everyone has it. But, the internet says it gives women cancer. Do I need to tell future partners? I'm terrified I could pass this along to a future girlfriend."			5	1 hour 50 minutes
"Help! What is this? In the past month I have developed these papules on my butt close to my vagina. Normally my skin is very clear. Can anyone help identify this? Is this herpes?!"	✓		2	5 hours 38 minutes
"Is this ingrown hairs or genital warts? I went to the doc a few days ago and he said it's genital warts. I'm floored because I always use condoms. I recently shaved so the doctor could be wrong and they're ingrown hairs? Here's a pic. I'd appreciate a second opinion. If it is warts, I may try apple cider vinegar first."	✓	✓	12	12 minutes
"I went to the clinic to get tested. I'm really scared because they said my results showed 'HIV-1 Confirmation.' I have to go back and get another test but I'm wondering is the doc wrong, do you think I have HIV?"	✓	✓	3	52 minutes

Abbreviations: HPV, human papillomavirus; STD, sexually transmitted disease.

[a] Each post was edited for length and to omit content that might make the poster identifiable.

[b] A check mark indicates the post was labeled as requesting a crowd-diagnosis or as requesting a second opinion after obtaining a prior diagnosis from a health care professional.

many of these requests were for second opinions after obtaining an original diagnosis from a health care professional.

Limitations include that a single social media platform and a single medical condition were assessed. Crowd-diagnosing may have been more or less common in other settings. Temporal trends were not analyzed. The characteristics of those posting and responding, the accuracy of the diagnoses, and whether individuals acted on the provided advice were not investigated.

Although crowd-diagnoses have the benefits of relative anonymity, rapid response, and multiple opinions, the underlying accuracy of crowd-diagnoses is unknown given that responders may be operating with limited information about the patient, and responders may lack medical training. Misdiagnosis could allow ongoing disease transmission, and others viewing a post may wrongly self-diagnose their own conditions.

Health care professionals could partner with social media outlets to promote the potential benefits of crowd-diagnosis while suppressing potential harms, for example by having trained professionals respond to posts to better diagnose and make referrals to health care centers.

Alicia L. Nobles, PhD, MS
Eric C. Leas, PhD, MPH
Benjamin M. Althouse, PhD, ScM
Mark Dredze, PhD
Christopher A. Longhurst, MD, MS
Davey M. Smith, MD, MAS
John W. Ayers, PhD, MA

Author Affiliations: Department of Medicine, University of California, San Diego, La Jolla (Nobles, Longhurst, Smith, Ayers); Department of Family Medicine and Public Health, University of California, San Diego, La Jolla (Leas); Institute for Disease Modeling, Bellevue, Washington (Althouse); Department of Computer Science, Johns Hopkins University, Baltimore, Maryland (Dredze).

Accepted for Publication: August 20, 2019.

Corresponding Author: John W. Ayers, PhD, MA, Department of Medicine, University of California, San Diego, 9500 Gilman Dr, #333 CRSF, La Jolla, CA 92093 (ayers.john.w@gmail.com).

Author Contributions: Drs Nobles and Ayers had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.
Concept and design: Nobles, Leas, Dredze, Longhurst, Ayers.
Acquisition, analysis, or interpretation of data: Nobles, Leas, Althouse, Dredze, Smith, Ayers.
Drafting of the manuscript: Nobles, Leas, Longhurst, Smith, Ayers.
Critical revision of the manuscript for important intellectual content: All authors.
Statistical analysis: Nobles, Leas, Althouse.
Administrative, technical, or material support: Longhurst, Smith.
Supervision: Dredze, Longhurst, Smith.

Conflict of Interest Disclosures: Dr Dredze reported receipt of personal fees from Bloomberg LP and Good Analytics. Dr Smith reported receipt of grants from the National Institutes of Health. No other disclosures were reported.

1. Merchant RM, Asch DA. Protecting the value of medical science in the age of social media and "fake news." *JAMA*. 2018;320(23):2415-2416. doi:10.1001/jama.2018.18416

2. Chou WS, Oh A, Klein WMP. Addressing health-related misinformation on social media. *JAMA*. 2018;320(23):2417-2418. doi:10.1001/jama.2018.16865

3. Paul MJ, Dredze M. Social monitoring for public health. *Synth Lect Inf Concepts Retr Serv*. 2017;9(5):1-183. doi:10.2200/S00791ED1V01Y201707ICR060

4. Ayers JW, Althouse BM, Dredze M. Could behavioral medicine lead the web data revolution? *JAMA*. 2014;311(14):1399-1400. doi:10.1001/jama.2014.1505

5. Reddit. List of subreddits. https://www.reddit.com/r/ListOfSubreddits/wiki/health. Accessed May 21, 2019.

6. Centers for Disease Control and Prevention; US Department of Health and Human Services. *Sexually Transmitted Disease Surveillance 2017*. Published September 2018. doi:10.15620/cdc.59237. https://stacks.cdc.gov/view/cdc/59237. Accessed May 21, 2019.

COMMENT & RESPONSE

Trends in Obesity Among Low-Income Young Children

To the Editor Using data from the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), Dr Pan and colleagues[1] found that in low-income children aged 2 through 4 years, obesity declined from 15.9% to 13.9% between 2010 and 2016. These data are important because they suggest that, compared with the period between 1970 and 2010 during which the prevalence of childhood obesity increased in the US population,[2] after 2010 there was a decrease in adiposity among low-income young children.

However, to better interpret the change in adiposity trends among young children with respect to causes and consequences, it is important to clarify to what extent the present data represent body fatness. Pan and colleagues[1] used body mass index (BMI) and defined obesity as a BMI at or above the