

Differences in health-related social media usage by organizations and individuals

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Keywords: social media, Twitter, health information, health organization, content analysis

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Abstract

Social media is used as a tool for both information providers and information consumers to disseminate and receive health information. There is a dearth of research that compares the differences between different types of health providers' Twitter posting styles, specifically regarding the ways in which they communicate health information with the public. This is particularly true for more localized studies that focus on small data sets. Our study seeks to help fill this gap through an exploration of emergent trends of social media use of small, but specific stakeholders in Texas, in the United States. A content analysis of health information providers' (individual, organizational, and governmental groups) tweets based on digital ethnographic and grounded theory methods was performed to provide quantitative and qualitative findings in terms of purpose, sentiment, visual features, tone of the tweets, and public engagement. The findings indicate how individual or organizational users differentially use their Twitter accounts and opens up a discussion of what factors might influence effective communication with the public.

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Introduction

Social media are potential tools for both information-providers and information-consumers due to their characteristics as interactive and conversational platforms.^{1,2,3} The utility of social media are particularly highlighted in a crisis, as citizens can interact with official organizations, first responders, and volunteers.^{4,5} Amongst social media, Twitter has been the dominant platform of study, particularly in its role in facilitating the dissemination of real-time information and responses to events.⁶ Twitter has been increasingly seen by the public as reliable and up-to-date in terms of health information and is used as a source of health information.⁷ Though there is skepticism of social media, including Twitter spreading misinformation, the converse is also enabled by Twitter's extensive and fast dissemination system. Namely, the platform has the potential to rapidly and efficiently disseminate accurate health information which counters misinformation.^{3,8} Twitter's specific platform affordances for sharing up-to-date information can augment government or health organizations' strategies to reduce the public's anxiety or fear by discerning knowledge from the tweets about a health issue.⁹

The rapid rise of big data-based health informatics is testament to this. Moreover, even though health information providers' use of social media is important for disseminating information to the public, the differences between the types of health information posted has not been examined closely. Knowing the distinguishing characteristics of each provider group can be insightful in measuring the impact of the agency's and organization's message. In addition, by understanding the ways in which users engage with providers on social media platforms, delivery methods and strategies can be optimized. Therefore, this study explores the purposes and the features of the content (posts) and public engagement in the posts from the tweets of different types of health information providers.

RQ1: What are the differences in sentiment, visual features, purpose and tone of tweets from different types of health-related users?

RQ2: What is the difference in the numbers of comments, retweets, and likes on an original tweet between the user types?

Materials and Methods

DATA COLLECTION

As health-related stakeholders constitute a diverse group, we focused on a specific case study of prominent individuals and organizations from Texas as identified by a collaborating health information organization that publishes a Texas-focused online health journal. The editor of the journal, an expert in reporting on health-related topics in Texas, selected eight accounts that represent journalists, politicians, health organizations, and state-based institutions. Even though this selection criteria is clearly subjective and the accounts are based on one U.S. state, Texas, the selection reflects that large institutions and departments of public health or state health services in other states also have Twitter accounts. Moreover, it is likely exactly these types of subjective samples are valuable to healthcare institutions in other U.S. states.

From November 7 to December 8, 2017 health-related tweets were collected from these selected Twitter accounts (Table 1 provides a brief description and summary of the Twitter users selected for our sample). Again, the criteria of the account selection was purely based on the experiential knowledge of the health organization we collaborated with. Though this represents a heavily biased sample, we believe such case studies are vital given predilections towards big data methods. There is also a dearth of these types of small-scale, experientially-derived studies. Moreover, we are not critiquing large-scale computational methods, but believe more focused and stakeholder-led studies are also important to better understanding social media styles related to health communication and can provide an accessible case study for healthcare institutions trying to understand how organizational and individual health-related social media usage differ. The eight accounts we studied are: *@KirkPWatson*, *@DonnaHowardTX*, *@ClayDellMed*, *@peterhotez*, *@texmed*, *@MDAndersonNews*, *@marissaaevans*, and *@texasdshs* (see Table 1 for detailed profile information). We intentionally use a ‘small data’ approach ¹⁰ so that our sample reflects a very detailed understanding of prominent health communication stakeholders in Texas. We employ digital ethnographic methods ¹¹ to understand the corpora of these users and qualitative, grounded theory methods for an iterated development of our codebook.

[INSERT TABLE 1 HERE]

EXCLUSION AND INCLUSION CRITERIA OF THE FINAL TWEETS

From the initial data set, we established criteria to exclude unnecessary data which were not part of the focus of our study: we excluded retweets and included only tweets for analysis. For example, @KirkPWatson was tagged in a tweet, but the tag was a retweet, so the tweet was excluded from our sample. This is because tagging the account indicates that someone is responding to @KirkPWatson's tweet which is beyond the scope of our study - the identification of sampled account characteristics. Second, retweets were deleted. For example, @MDAndersonNews, was included on the original tweet and its retweets. In this case, only the original tweet was included in our sample. Third, the data were organized as a data table, which included the URL links of the tweets. Broken links (e.g. 404 and non-resolving addresses) were excluded. Specifically, if the link did not return a valid, final website (http 200 result) or the tweet was not found from the link, the data was not included in our final sample.

Filtering by these criteria, the final number of tweets per each account was 37 (@claydellmed), 57 (@donnaHoward), 46 (@kirkPWatson), 41 (@marissaevans), 43 (@MDAndersonNews), 45 (@peterhotez), 50 (@TexasDSHS), and 42 (@texmed). Tweets were studied by two of the authors through content analysis methods.

THEMES

Two authors analyzed 40 tweets (5 per account) and derived relevant variables to code. First, tweet *purposes* were distinguished: 1) recognition and thanks, 2) current and local events, 3) promotion of a behavior, 4) selling a product, 5) health education/news, 6) materials for professionals, 7) personal interest, and 8) other. For *sentiment*, positive, negative, and neutral options were coded. *Visual features* were identified as image-included, video-included, and text-only. *Tone of introduction*, which was an account holder's response type on an issue, was coded by 'judgmental' and 'nonjudgmental.' Lastly, *the numbers of comments, retweets, and likes* on an original tweet were identified to represent the engagement of the tweet. The details of the variables are described in the codebook (see Appendix A).

CODING PROCEDURE

Two of the study's authors developed a coding scheme (see Appendix A) by using iterated grounded theory methods.¹² Specifically, rubrics were developed and then refined until a final coding scheme was agreed. Tweets were then coded. The final content analysis categories were: account information, tagging, purpose of tweet, sentiment, visual features (i.e., image and video), tone of introduction (i.e., judgement), target of message, and engagement (i.e., number of comments, retweets, likes).

21 randomly selected tweets were used to evaluate the inter-rater reliability (i.e., percent agreement), which was 0.935 on average across all coded categories, a level higher than the minimum inter-coder reliability of 0.70 suggested in the literature.¹³ Specifically, percentage agreements for each variable were as follows: purpose (ranged from 75% to 100%; Cohen's kappa 0.51 to 1), sentiment (ranged from 75% to 93.8%; Cohen's kappa 0.44 to 0.64), visual features (ranged from 93.8% to 100%; Cohen's kappa 0.77 to 1), and engagement (100%; Cohen's kappa 1). Since the variable, *response*, was added later, the inter-rater reliability of this variable was not assessed.

Results

The user accounts were first categorized by user type: individual, organizational, and governmental account. For more details, Table 2 describes the definitions of user type and examples of each type and tweets.

[INSERT TABLE 2 HERE]

RQ1 and 2 explore the characteristics of user type in terms of purpose, sentiment, visual features, tone of introduction, and engagement. Descriptive statistics and a Chi-square test were employed to find the differences between groups in purpose, sentiment, visual features, and response type and answer the research question 1. For Research Question 2, descriptive statistics and an ANOVA test were used to show the differences in engagement. The overall percentages of each variable by user group are shown in Table 3.

[INSERT TABLE 3 HERE]

PURPOSE BY USER GROUP

For the purpose behind tweet postings, the individual-held accounts mostly posted content pertaining to: health education/news (41%), personal interest (18.9%), events (15.6%), recognition (10.7%), whereas the organization-held accounts posted health education/news (63.8%), recognition (21.3%), and materials for professionals (6.4%) topics, and the government-held account tweets were about health education/news (77.4%), promotions (12.9%), and events (6.5%). Among these purposes, there were significant differences between user groups in terms of events [$\chi^2 (2, N = 359) = 7.82, p < .05$], promotion [$\chi^2 (2, N = 359) = 7.33, p < .05$], health education/news [$\chi^2 (2, N = 359) = 12.22, p < .005$], and personal interest [$\chi^2 (2, N = 359) = 16.27, p < .001$]. Specifically, individual accounts tended to include tweets related to events and personal interests, rather than tweets about health education/news. This is in contradistinction to the organizational and governmental accounts. On the other hand, the governmental account was more likely to post tweets related to organizational or specific campaign promotion than the individual and organizational accounts.

The purpose of health education/news were analyzed more precisely because several themes were found in that category (Table 4). With detailed classification, different patterns of tweets regarding health education/news were dependent on the user type (Table 4). Individual accounts included topics of policy most (38.5%), followed by research results (30.8%), and health advice (23.1%). On the other hand, organizational accounts most frequently provided health advice (62.5%), followed by research results (25%). The governmental account had a different pattern in that research results (38.5%) and health news (38.5%) were primary topical areas of its tweets and the third most frequent categories were health advice (15.4%). Statistically, significant differences in the user group were shown regarding research results [$\chi^2 (2, N = 359) = 11.838, p < .005$], news [$\chi^2 (2, N = 359) = 9.66, p < .01$], advice [$\chi^2 (2, N = 359) = 40.623, p < .001$], policy [$\chi^2 (2, N = 359) = 9.89, p < .01$].

[INSERT TABLE 4 HERE]

SENTIMENT

For sentiment, the feeling reflected in the tweet was coded—whether the account holder has positive, negative, or neutral positions on a certain issue. All user types indicated neutral tones most in the ratio of sentiment used: individual (64.2%), organizational (87%), and governmental (96.6%). These values indicate the percentage of total sentiment tone that is neutral versus positive/negative. However, the most significant difference was found in the positive tone. Individual accounts showed positive tones (29.2%), which was significantly more than organizational (13%) and governmental accounts (3.4%) [$\chi^2(2, N = 359) = 15.65, p < .001$]. Additionally, organizational and governmental accounts did not use negative tones.

VISUAL FEATURES

For visual features of the tweets, individuals included tweets with text only (51.6% of the time) and an image (44.3%); those of organizational account holders had inverse patterns such as having an image included in tweets (61.7%) and text-only tweets (38.3%); and the governmental account had mostly image included tweets (90.3%). Statistically, images were found in the governmental account more than other users ($\chi^2(2, N = 359) = 16.24, p < .001$), and text was mainly used in the individual accounts ($\chi^2(2, N = 359) = 32.22, p < .001$).

TONE OF INTRODUCTION

Tone of introduction is about whether the introductory part of a post is judgmental or not. In other words, when an account holder introduces and posts about an issue, s/he writes about the issue briefly. We coded whether the introduction has judgmental reactions or not. As a result, more than half of judgmental responses were posted to introduce an issue on individual accounts (59.5% vs. 40.5%), $\chi^2(2, N = 359) = 12.64, p < .005$. On the other hand, organizational accounts (29.2% vs. 70.8%) and governmental accounts (0% vs. 100%) avoided making a judgement when introducing a topic/issue, clearly indicating that nonjudgmental responses were dominant, $\chi^2(2, N = 359) = 19.78, p < .001$.

ENGAGEMENT

When the types of engagement were compared by user type, there were significant differences in retweets [$F(2, 197) = 4.39, p < .05$] and likes [$F(2, 197) = 5.47, p < .01$] (Table 5). Retweets occurred in individual accounts ($M = 14.02, SD = 21.65$) two times as frequently as organizational accounts ($M = 7.32, SD = 6.22$) and about three times more than the governmental account ($M = 5.65, SD = 4.17$; Table 5). In addition, Twitter users ‘liked’ more of the tweets posted by individual accounts ($M = 34.59, SD = 66.25$) rather than organizational ($M = 13.91, SD = 14.60$) or governmental accounts ($M = 4.45, SD = 4.64$).

[INSERT TABLE 5 HERE]

Discussion and Conclusions

Health-related stakeholders in Texas commonly include health and policy issues in their tweets, but the information is managed and shared differently; individual accounts tended to post a specified purpose for communicating health events and personal stories rather than health education and news compared to organizational and the governmental account; the governmental account was likely to promote preventive health behaviors.

For the most prevalent purpose, the health education/news category, the governmental account shared health news the most, whereas the organizational accounts included advice, and individual accounts most frequently had policy posts. For sentiment and the tone of introduction of a tweet, the individual accounts had more positive-nuanced and judgmental posts, while the organizational and governmental accounts did not exhibit judgment when introducing an issue and maintained neutrality in their posts. In terms of visual features, images (particularly graphs and photos of viruses) were used more in the governmental account tweets, whereas text was mainly used in the individual accounts’ tweets. Public engagement occurred frequently in the posts from the individual accounts. These findings are important for both health organizations/agencies and the public.

Practically, health information providers can create strategies for delivering critical information to the public in the ways that the public prefers. In addition, our findings highlight

what strategies they should consider focusing on. Specifically, our findings indicate that members of the public would often be better off by directly consuming tweets from official governmental organizations, rather than consuming this information second- or third- hand. That being said, if a health information seeker is specifically interested in critical opinions on a health-related issue, consuming tweets from health-related individual accounts would be of value.

The low public engagement—indexed by number of comments, retweets, and likes—deserves serious attention, though beyond the scope of our study. We posit two reasons for this result. First, the tweets clearly failed to spur dialogue. Previous research has already documented that users are likely to comment on or ‘like’ tweets made by organizations when the tweets refer to an exchange of idea or opinions.^{14,15} The tweets made by organizational and governmental accounts are mostly about health news/events. That is, those tweets are delivering monologic information to the public rather than delivering a message or “cue” that may encourage a public discussion. Particularly, their tweet messages failed to engage the public in further discussion of what they tweet, probably because of the lack of personal and dialogic voices in the messages. Second, some people may have real privacy issues with the fact that their comments, retweets, likes or other forms of digital engagement are all publicly displayed to other users on social media. As discussed in past research, these digital engagements are in themselves seen as “symbolic speech”.¹⁶ That is, for example, even when “liking” does not verbally express anything, the act of liking a particular tweet message can, though not always, signify/be conflated with an expression of support of that content or speaker. Following this logic, very low levels of interaction may indicate that users do not support these tweets or tweeters; or the tweet users may self-censor what they are saying (commenting, retweeting, or liking).¹⁷ Of course, low levels of interaction can also signify that users do not want to engage with the content for other reasons – it may be perceived as uninteresting or is glossed over.

Following this logic of self-censorship, the high frequency of health education/news does make sense. Promoting non-controversial content is likely not going to elicit engagement, but also promotes positive branding of one’s organization or personal account. In this vein, the health education/news accounts are more informational than political. Therefore, users do not have to

limit liking, commenting on, or retweeting this genre of tweets as they are perceived as less of a political nature.¹⁸ In addition, individuals perceive and use social media as “news sources” rather than solely depending on traditional news media outlets such as newspapers or television news.¹⁹ Thus, the high frequency of these informational tweets may be in line with the increasing informational motives for using social media.

Overall, the sentiment of our sampled tweets tended to be neutral or positive. Of note - though not unsurprising - is that the organizational and governmental accounts showed no negativity in their tweets. This result is likely explained by the fact that the governments use the tweets for public-relations purposes. The core purpose of public relations is to build trust between the organization and the public.²⁰ Particularly, it is crucial to form positive public attitudes toward an organization in order to build trust. Social media such as Twitter are crucial tools for organizational and governmental public relations. Thus, these organizations and governments also self-censor or try to aggressively control the sentiment of their tweets in order to avoid causing any unnecessary negative, public perceptions, while actively trying to employ positive sentiments in their tweets.

Ultimately, our study also emphasizes the value of intentionally small sample sizes of Twitter data. Unlike other work on Twitter, we focused our work on Twitter user accounts physically based in Texas. Moreover, we also allowed our sample to be guided by the extensive, experiential knowledge of the health organization we collaborated with. Though, we are not claiming any major level of generalizability to health-related tweeting patterns more broadly, our study does shed important light on the practices of influencers tweeting about health in the state of Texas, which we believe informs broader U.S. health-related activity on Twitter related to behaviors specific to particular user types, such as individuals, organizations, and government entities. In order to bolster the generalizability of the findings, future research could consider the comparison of the results of this study (i.e., tweeting patterns in Texas) with Twitter accounts based in other states.

Another limitation is the limited time frame of our data collection. During our 30-day collection period, specific events might have shaped the sample. For example, MD Anderson

hosted various events for “Lung Cancer Awareness month” in November, 2017. The purpose of their tweets in this month could have been different from tweet activity during other months. Moreover, engagement by users (i.e., like, comment, retweet) could have been affected by events in this period. Thus, longer time frames would offer future work a greater ability to discern more generalizable patterns of tweeting and interactions with users in each account.

Lastly, we believe one additional category to analyze health-related tweets, which is not included in this study could benefit methods employed in future work. Specifically, while studying our sample, we found some tweets contained a link to related news or research articles. Though simple, the linking function can provide information seekers more detailed information about an issue. Therefore, health information providers may benefit from specific research on the utility of the link function, which would be an effective strategy for social media users to become interested in seeking further information and understand a health issue in more detail.

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Disclosure Statement

No competing financial interests exist.

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Appendix A: Codebook

Part 1: Account information

1. User: A person or a group who manages this account.
 - 1) Individual: an account is managed by an individual (e.g., journalist) (1: yes, 2: no).
 - 2) Organization: an account is managed by an organization for public benefit (e.g., Texas Medical Association) (1: yes, 2: no).
 - 3) Governmental agency: an account is managed by the government for public benefit, which contains a URL of .gov (e.g., Texas Department of State Health Services) (1: yes, 2: no).
2. Description of account: an introduction of an account, which is described by the account holder; located below the user id. Fill in.

Part 2: Tagging or not

: Whether the account is tagged or not on other's tweet (e.g., @claydellmed). (1: Yes, 2: No)

- 1) If yes but the tagging is not under an original tweet from the sampled account holders, no further coding. For example, @claydellmed is shown on a user's Twitter feed, which means that there is no actual Dell Med's tweet to code.
- 2) If yes and having response from the account holder, coding continues.
- 3) If no (i.e., only the original tweet exists), coding continues.

Part 3: Analysis of tweets

1. Purpose: the aim of a tweet; the focus of a message (Choose only one; choose the most relevant category).

- 1) Recognition and thanks: it includes giving thanks and recognition to volunteers and sponsors, to followers who had participated in relevant events, and to group members who had presented and been awarded in conferences. The content of a tweet advertises or builds an image of an organization sponsoring the account. e.g., organization-specific news, event/program updates, service offerings, and summaries of past events. (1: yes, 2: no)
 - 2) Current and local events: the acknowledgement of noteworthy events, including holiday greetings and support of community events or sports teams. These events are not related to sponsor organizations, which is different from “recognition and thanks” category. (1: yes, 2: no)
 - 3) Promotion of a behavior: a tweet about an event to promote an action, with an informational, promotional, and persuasive purpose. e.g., campaign; vaccinate for your baby! (1: yes, 2: no)
 - 4) Selling a product: direct selling of or introducing a product. e.g., a new book about mental health. (1: yes, 2: no)
 - 5) Health education/news: educational information or news articles on a range of health topics. e.g., health tips, policy decisions that relate to health, and scientific findings. (1: yes, 2: no)
 - A. If yes, do further coding in specific:
 1. Research results: information about consequences of scientific and academic studies. e.g., causes of antibiotic resistance (1: Yes, 2: No)
 2. News: information about recent events. e.g., disease outbreak, a natural disaster. *Note: “News” includes not only articles from broadcasting companies such as CNN but also individual tweets.* (1: Yes, 2: No)
 3. Advice: recommendations for health behaviors. e.g., how to deal with mental health after hurricanes (1: Yes, 2: No)
 4. Policy: information about a political issue. e.g., health insurance coverage for black people. (1: Yes, 2: No)
 5. Other: a tweet which is not included in the categories of research results, news, health advice, and policy. Fill in.
 - 6) Materials for professionals: content that is targeted at health professionals, including professional development. *Note: The tweet should contain distinct instructions for specific population of professionals.* e.g., patients’ trust in physicians, patient-physician relationship (1: yes, 2: no)
 - 7) Personal interest: content that tells a personal story. e.g., introduction of a new restaurant (1: yes, 2: no)
 - 8) Other: content which does not fit into any of the other categories. (1: yes, 2: no). Fill in.
2. Sentiment: account holder’s opinion on a certain issue.
 - 1) Positive: a tweet is in accordance / agrees with the issue posted. (1: yes, 2: no)
 - 2) Negative: a tweet is opposite of / does not agree with the issue posted. (1: yes, 2: no)
 - 3) Neutral: a tweet does not include any positive or negative opinions/feelings on the issue posted. (1: yes, 2: no)
 3. Visual features
 - 1) Image-included: a tweet includes text and an image. (1: Yes, 2: No)
 - 2) Video-included: a tweet includes text and video. (1: Yes, 2: No)
 - 3) Text-only: a tweet is constructed by only text. (1: yes, 2: no)
 4. Tone of introduction: an account holder’s response type on an issue, whether s/he shows a judgment on the issue. *Note: the response should be included in an original tweet, not in a*

retweet.

- 1) Judgmental: when the account holder reveal his/her opinion regarding the post or the linked article. e.g., “Wil #CHIP crumble? States are getting really nervous.”
(1: Yes, 2: No)
 - 2) Non-judgmental: when the account holder just mentions the summary of the post or the title/name of a linked article. e.g., “Me and My Doctor – States – And 9M Kids – ‘In A Bind’ As Congress Dawdles On #CHIP Funding”, which is the title of the linked article.
(1: Yes, 2: No)
5. Engagement of tweet: evidence of the public engagement on an issue. *Note: insert number only; e.g., 2.1k → 2100.*
- 1) The number of comments: ‘comment’ is other’s response to an original content and located below the content. *See the first part of the circled area in the attached figure.* Fill in.
 - 2) The number of retweets: ‘retweet’ shows how many times the post is shared, located below an original content. *See the second part of the circled area in the attached figure.* Fill in.
 - 3) The number of likes: ‘like’ is other’s favorable reaction on an original content and located below the content. *See the third part of the circled area in the attached figure.* Fill in.

Tables

Table 1. Profile information of the Twitter accounts used.

Account (Number of followers)	Biography & Brief summary of tweet
<i>@KirkPWatson</i> (27.2K)	An American attorney and Democratic politician (State Senator) from the capital city of Austin Self-promotion oriented; photos of himself and with others; many videos and images; solicitation of “donations” and “votes”; health policy issues including sexual violence and healthcare services
<i>@DonnaHowardTX</i> (15.9K)	Vice chairman of the House Administration Committee Self-promotion oriented; many videos and images; interactions with diverse stakeholders; active retweets; healthcare (nursing) and education policies
<i>@ClayDellMed</i> (4,295)	Inaugural Dean of the Dell Medical School at The University of Texas at Austin. Information oriented; lots of texts; health issues (obesity and health disparities); an emphasis on collaboration to build a medical school in Austin and the development of medical technology and services
<i>@Peterhotez</i> (19.3K)	A Professor in the Departments of Pediatrics and Molecular Virology & Microbiology, Baylor College of Medicine; Director of Texas Children's Hospital Center for Vaccine Development, Houston, Texas Information oriented; many images and videos related to research (e.g., graphs, photos of viruses); medical and health information (vaccines and viruses)
<i>@texmed</i> (22.8K)	A group of experts on all things healthcare in Texas, including 50,000 physicians and medical students Information oriented; frequent links to research articles; images rather than videos; health information for the public (e.g., promoting flu shots); information for physicians (e.g., how to create their own brands); health policy (e.g. health insurance and voting results)
<i>@MDAndersonNews</i> (96.9K)	MD Anderson Cancer Center Information oriented; frequent videos and images; health information for a variety of audiences (cancer patients, survivors, and caregivers); promoting fundraising efforts (e.g., <i>Boot Walk to End Cancer</i>); Sharing of cancer survivors' stories
<i>@marissaaevans</i> (9,174)	A reporter at Texas Tribune Information oriented; mostly text; health information and policies specific to African Americans and women; high-volume of retweets with news organizations and governmental organizations as well as writers and lay people
<i>@texasdshs</i> (9,598)	Texas Department of State Health Services Information oriented; images , videos, and infographics; health and safety issues (e.g., ways to change smoke alarm batteries; preparation

for the winter); Introduction of research presentations by the Texas DSHS; Quizzes to inform the public

Table 2. Description of user type and tweet examples

User type	Definition	Sampled Accounts
Individual	Account is managed by an individual	@claydellmed, @DonnaHowardTX, @KirkPWatson, @marissaevans, @PeterHotez
Organizational	Account is managed by an organization (for public benefit)	@MDAndersonNews, @texmed
Governmental	Account is managed by the government (for public benefit, contains a .gov domain)	@TexasDSHS

DIFFERENCES IN HEALTH-RELATED SOCIAL MEDIA USAGE

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Table 3. Percentage of purposes, sentiment, visual features in tweets by user group.

	User Type			Total (<i>N</i> in parentheses)
	Individual	Organizational	Governmental	
Purpose				
Recognition	10.7	21.3	3.2	12.0 (24)
Events	15.6	2.1	6.5	11.0 (22)
Promotion	3.3	2.1	12.9	4.5 (9)
Education/News	41.0	63.8	77.4	52.0 (104)
Materials for professionals	0.8	6.4	0.0	2.0 (4)
Personal interest	18.9	0.0	0.0	11.5 (23)
Other	9.8	4.3	0.0	7.0 (14)
Total (<i>N</i> in parentheses)	61.0 (122)	23.5 (47)	15.5 (31)	100.0 (200)
Sentiment				
Positive	29.2	13.0	3.4	21.5 (42)
Negative	6.7	0.0	0.0	4.1 (8)
Neutral	64.2	87.0	96.6	74.4 (145)
Total (<i>N</i> in parentheses)	61.5 (120)	23.6 (46)	14.9 (29)	100.0 (195 ^a)
Visual features				
Image included	44.3	61.7	90.3	55.5 (111)
Video included	4.1	0.0	3.2	3.0 (6)
Text only	51.6	38.3	6.5	41.5 (83)
Total (<i>N</i> in parentheses)	61.0 (122)	23.5 (47)	15.5 (31)	100.0 (200)
Tone of introduction				
Judgmental	59.5	29.2	0.0	37.2 (29)
Nonjudgmental	40.5	70.8	100.0	62.8 (49)
Total (<i>N</i> in parentheses)	47.4 (37)	30.8 (24)	21.8 (17)	100.0 (78 ^b)

^a: 5 missing, ^b: when a tweet has a reply from the user, we analyzed the type of the response. The total number of responses was 78.

Table 4. Percentage of health education/news.

	User Type			Total (<i>N</i> in parentheses)
	Individual	Organizational	Governmental	
Purpose: Health education/News				
Research results	30.8	25.0	38.5	31.0
News	7.7	6.3	38.5	16.7
Advice	23.1	62.5	15.4	35.7
Policy	38.5	0.0	7.7	14.4
Other	0.0	6.3	0.0	2.4
Total (<i>N</i> in parentheses)	31.0 (13)	38.1 (16)	31.0 (13)	100.0 (42)

Table 5. Mean and SD of three types of Engagement.

	User Type			Total
	Individual	Organizational	Governmental	
Comment	1.13 (3.5)	.55 (1.16)	.77 (.56)	.94 (2.81)
Retweet	14.02 (21.65)	7.32 (6.22)	5.65 (4.17)	11.15 (17.6)
Like	34.59 (66.25)	13.91 (14.60)	4.45 (4.64)	25.06 (53.59)
Total <i>N</i>	122	47	31	