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Social Media Memes and Early Public Opinion Formation Regarding Highly Pathogenic Avian Influenza (HPAI) as a Public Health Threat in the United States

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Abstract

Per Research Letter article type, we are not including an abstract.

Misinformation, disinformation, and conspiracy theories gain traction in times of uncertainty when little is known about a disease and when trust in government and public institutions is low.[1] Amidst uncertainty, public health-related memes act as a sort of coping mechanism.[2] Memes–images, text, or video that serve as a shorthand form of communication—have the potential to spread quickly and widely on social media.[3] While memes can be humorous, perhaps harmless, they can have serious effects at other times, as during the COVID-19 pandemic.[4,5] One thing they have in common, however, is their transportability from user to user and platform to platform.

Frame analysis[6] of Internet memes is useful for categorizing what we call frames of meaning in digital space. Unlike the agenda-setting function of mass media,[7] in which gatekeepers (e.g., news editors) set the agenda regarding public issues, framing theory in the digital age is more dynamic, as content may take on different forms or formats, change over time, and the digital frame may traverse media platforms.[8] Consumer-generated content (CGC) plays a significant role in setting the agenda or framing the event. Based on the fluid nature of social networks[9] and changes in the hierarchy of agenda setting, the model of connective action[10] applied to public discourse on digital media can be visualized and analyzed through topic modeling to understand the role that memes play in shaping emergent public issues.

In this study, we focused on memes shared in response to the current Highly Pathogenic Avian Influenza (HPAI), specifically the H5N1 outbreak in the United States,[11] to get a glimpse into the early stages of public opinion formation around a potential public health issue. We present this approach to study the situational awareness of this public health issue through analysis of memes as a form of public discourse and as a cost-effective tool for resource-challenged public health agencies to scan the environment for emergent issues.

Methods

We used CrowdTangle, "a public insights tool from Facebook that helps publishers, journalists, researchers, fact-checkers and more follow, analyze, and report on what's happening across social media," in order to identify memes shared on Facebook.[12] We searched for the terms *bird flu*, *avian flu*, *avian influenza*, and *H5N1* within the date range of January 1, 2024-June 6, 2024. To ensure anonymity, URLs, account handles, and usernames were deleted before analyzing the data. We used Nomic Atlas, an online tool that automatically identifies and groups social media posts with semantic similarity, including latent topics.[13] We then measured the virality for each topic by calculating the ratio of number of posts to the number of total shares for all memes in that topic.

Results

We identified 26,736 posts on Facebook with our search terms. Figure 1 shows the visualization of topics from the message content extracted by Nomic Atlas, including the labels automatically generated by its algorithm. These included (in alphabetical order): agriculture, Alamogordo News, animal rights, egg safety, FDA regulations, food safety, influenza exposure, medicine, milk infection, occasion dressing, poultry feed, raw milk safety, and vaccine development.
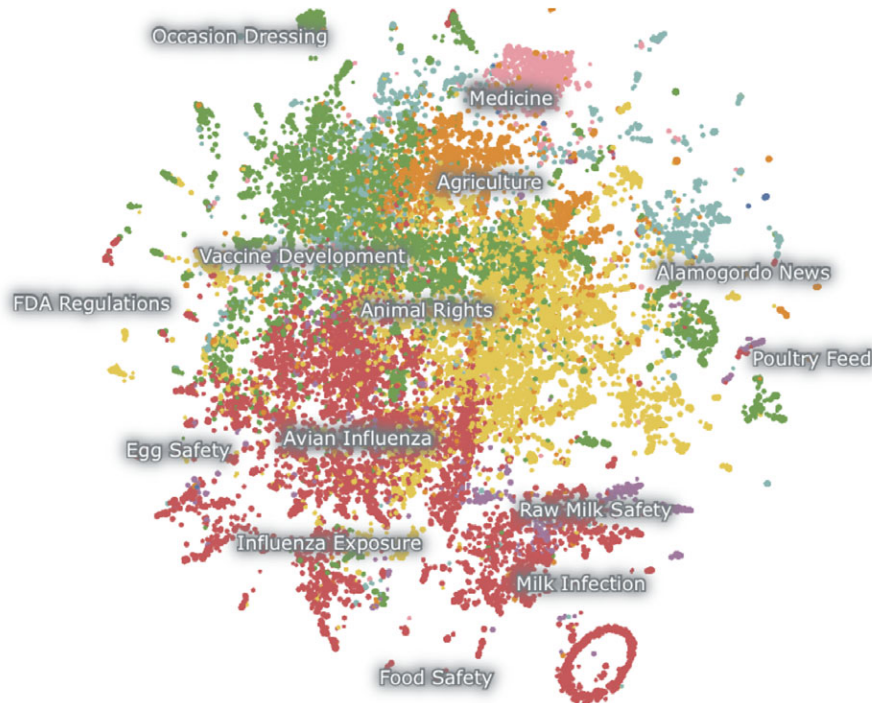
Figure 1. Top topics from Facebook meme data using Nomic Atlas.

We then calculated the ratio of number of posts per topic to total number of shares per topic as a measure of virality for each topic.

Table 1. Top topics by ratio of number of memes to shares using Nomic Atlas and CrowdTangle

Topic	Ratio	*n*	Shares
Raw milk	47.34	251	11,883
Homeopathy	35.14	14	492
Eggs	27.62	481	13,285
Production	19.00	2	38
Wildlife	12.72	508	6463
CCP Letter	11.60	94	1090
Election & Politics	10.14	145	1470
Science, Scientists	9.01	88	793
Holidays	8.89	156	1387
County Facilities	7.85	41	322
Animal Welfare	7.72	179	1382
Seabirds	7.72	209	1613
Pandemic	7.65	1207	9228
Herd Immunity & Mgmt	7.63	388	2962
Emergency	7.57	201	1521
Veterinary Inspection	7.40	271	2005
Cats & Pets	6.98	197	1375
Volunteer Rescue	6.84	45	308
Milk Safety & Testing	6.36	425	2705
Kerala	6.28	105	659

Table 1 shows the 20 top topics from our analysis using this measure of virality. We see that "eggs" is the topic in the table with the highest total number of shares, but that "raw milk" was the most viral, with the highest ratio of number of posts to total number of shares among the top 20 topics. It is important to note that the ratio represents a measure of virality and not of reach or impressions for that topic. For example, the topic of "homeopathy" has a high virality ratio even though it does not have as many total shares. This is in part because there are less posts on this topic, but those posts have gone viral at a higher rate than others.

Discussion

In the context of an emerging public health crisis, the associated uncertainty creates a vacuum that can be filled by those who create and share memes. Those memes may support or counter communication efforts by public health agencies. In this instance, studying H5N1 memes serves as a leading indicator akin to an early warning system about potential issues that may impact public health messaging efforts. At the same time, our study demonstrates how a public health issue might be conflated with other issues. For example, our data suggest that the debate over consuming raw cow milk appears to be intricately mixed with the emerging threat of HPAI.

In terms of limitations, our data come from 1 social media network (i.e., Facebook); the "meme-scape" may be different on other platforms. Moreover, additional data are needed about the potential of HPAI transmission through consumption of raw milk and raw milk products such as cheese. The U.S. Food and Drug Administration (FDA) has applied the precautionary principle[14] in its explicit recommendation that industry "not manufacture or sell raw milk or raw/unpasteurized milk cheese products made with milk from cows showing symptoms of illness, including those infected with avian influenza or exposed to those infected with avian influenza."[15]

In conclusion, fractures within the network of topics related to avian flu result from conflicting frames associated with ideological differences or exclusive social grouping. Resolution of such conflicts requires that stakeholders understand the role of Internet memes. Based on this approach to framing through topic analysis, there is a need among stakeholders to marshal the resources to nudge users of social media in the direction of common goals. Studying and identifying Internet memes early on allows public health agencies and others responsible for accurate risk communication to identify the topics that people are talking about and provides opportunities for optimizing risk messaging during the prevention phase of the disaster management cycle.

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