Introduction

Highly Pathogenic Avian Influenza (HPAI), also known as Bird Flu and Avian Influenza, is a type A virus that affects a variety of domestic and wild bird species including chickens, turkeys, ducks, and geese (Agricultural Life Considerations, 2008). HPAI can also impact various sectors of the agricultural industry such as poultry and cattle (CDC, 2024c; USDA, 2025). There is evidence that the range of several Influenza A subtypes are expanding to different species like horses, pigs, whales, and seals (Webster et al., 2006). The U.S. Department of Agriculture (USDA), working with State officials, local governments, and other agencies, has been responding to HPAI in U.S. poultry since February 2022. However, there have been outbreaks in the U.S. dairy herd and several human cases, both events increasing the need for public health interventions. The efforts include actively looking for ways to monitor the spread of the virus, to or among people, in jurisdictions where the virus has been identified (CDC, 2024a).

While HPAI is a public health concern, it is also a major threat to the U.S. agriculture industry, which impacts animal health, trade, and the global agricultural economy. In March 2022, an HPAI outbreak impacted 48 states with over 82 million birds being culled and 36 dairy herds affected (Hignett, 2024). During this period, the USDA tested retail ground beef and milk samples to ensure product safety, especially as consumer anxiety about the domestic food supply increased. This period also saw an increase in farm-level egg prices, up 53.8% at its peak in January 2023, with some supermarkets reporting up to $7 a dozen. While there was a period of low HPAI exposure cases, there was an emergence of HPAI in the U.S. after being detected in a Midwestern dairy herd on March 20, 2024, and eventually being detected in 494 dairy herds across 16 states (Nelson, 2024).

One of the key factors to keeping zoonotic disease outbreaks under control is communication (Llarena, 2019; Tabbaa, 2010; Zinsstag et al., 2007). While traditional media sources are essential for conveying information to consumers, in a post-pandemic world, social media platforms such as TikTok are powerful tools to provide effective science communication (Madhumathi et al., 2021; Radin & Light, 2022). TikTok is an engaging, short-form video sharing platform popularized during the COVID-19 pandemic (Radin & Light, 2022). According to the Oxford Economics Report, TikTok is not only as a source of entertainment but also an economic driver with more than 170 million active users in the United States and contributing more than $24 billion to the country's Gross Domestic Product (GDP) (TikTok, 2024). Furthermore, TikTok has demonstrated potential as a medium for communicating information about infectious diseases. Studies have shown that it can provide opportunities for health communication in the context of disease outbreaks, enabling future exploration of TikTok as a health communication channel for audience-centered risk communication (Baker et al., 2022b; Che et al., 2022; Li et al., 2021; Rampold et al., 2024).

Digital sources play an increasingly important role in how Americans consume news (Atske, 2025). Included in this rise of digital media is social networking sites, which play an especially important part in how younger adults consume news media. In turn, TikTok is positioned to have unmatched potential compared to other platforms for science communicators to reach audiences that might not seek science content on their own. Since 2020, the share of TikTok users that say they regularly get their news on the platform has increased from 22% to 55% (Atske, 2025). As a result, apps such as TikTok have become powerful tools for disseminating public messages to audiences that normally would not opt for this type of information on their own (Willson, 2017).

Little is being done to address the role of social media in science communication strategies (Li et al., 2021). Traditional media professionals have historically been the gatekeepers of scientific information; but with new media technologies, this grants scientists more power to be proactive about communicating with the public (Dudo, 2015). As organizations and communication leaders navigate the evolving landscape of social media being used for science communication, it is important to understand the dynamics of social media values to adapt and thrive in this current paradigm (UF College of Journalism, 2024). In turn, this means scientists must understand how crisis events such as zoonotic disease outbreaks are being communicated on social media platforms. The research study investigates science communication videos on TikTok regarding the 2024–2025 U.S. HPAI outbreak.

Review of Literature

Highly Pathogenic Avian Influenza's Impact on the U.S.: Agriculture and Beyond

In birds, HPAI can be spread through direct contact with discharge from infected birds, such as feces, contaminated water, or food (WOAH, 2024). In domestic chickens and turkeys, it is classified into two recognized forms based on disease severity: highly pathogenic avian influenza (HPAI), also known as fowl plague, and low-pathogenic avian influenza (LPA). Mortality rates often approach 100% if the avian influenza virus that causes HPAI infects flocks. Aquatic birds are considered the natural reservoirs for the virus; however, waterfowl generally will not develop the disease when infected with the avian influenza virus (Fouchier et al., 2004; Horimoto & Kawaoka, 2001).

HPAI impacts birds, mammals, and humans in different ways. While most birds avoid getting sick, they can still carry the virus (AVMA, n.d.). Unfortunately, if poultry are infected with HPAI, they rarely recover; thus, detection is critical for stopping its spread. Mammals can become infected by HPAI if they consume sick or infected birds, drink unpasteurized milk or cream from infected cows, eat undercooked meat, or come in close contact with other infected animals. There is also a chance for humans to become exposed from infected animals, which typically occurs from prolonged exposure to infected dairy cows, poultry, or wild birds (Charostad et al., 2023). According to the Centers for Disease Control (CDC), symptoms in humans include mild fever, headaches, fatigue, body aches, and sore throats (CDC, 2024b).

The corresponding HPAI outbreak used for the study has caused challenges for several sectors across the country. The poultry industry saw the most impact on egg layers and turkeys. As of August 2024, more than 73 million egg layers were affected by HPAI, causing a spike in egg prices (Iacurci, 2024). According to the USDA Economic Research Service (ERS), projections showed continued increases in egg price volatility from the impacts of HPAI through 2025 (Grossen, 2025). Turkey production dropped 6.3% from 2023 to 2025, as well as a 6% drop in turkeys raised, which is the lowest U.S. inventory since 1985 (Knight et al., 2024). In terms of the dairy industry, the outbreak mostly affected lactating dairy cattle with symptoms such as reduced milk production, milk with a thicker, colostrum-like texture, reduced feed consumption, dehydration, loose feces, or fever (Reiley, 2025). A high virus load was also in milk, making transmission likely for people working with dairy cows or equipment (Bjurstrom, 2024). The USDA responded to the HPAI outbreak in the U.S. dairy herd with a federal order mandating the testing of lactating dairy cattle prior to interstate travel and the mandatory reporting of all positive tests (APHIS, 2024).

In January 2025, the USDA confirmed HPAI outbreaks across eight states in commercial operations and backyard flocks (Schnirring, 2025). California had the highest infection reports with 263 dairy cattle cases, resulting in the governor declaring a State of Emergency (Aleccia, 2024). In Louisiana, the first patient hospitalized with a human case of HPAI died after reporting two backyard flocks affected by HPAI (LaRose, 2025). In Georgia, a backyard flock of chickens and ducks tested positive for HPAI, marking the fourth detection since the 2022 outbreak (Fox 5, 2025). Consequently, all in-state poultry activities were suspended (Georgia Department of Agriculture, 2025).

Engaging in Science and Risk Communications

As emergency and public health events put communities at risk, it is critical for those impacted to have the necessary information needed to navigate potential effects (Lawson et al., 2025; Yuan, 2024). To fully engage with scientific information, such as what would be associated with a public health outbreak, consumers receive communications from a variety of sources (Jacobsen et al., 2020; Mercer-Mapstone & Kuchel, 2017). Sources include scientists, science public relations specialists, and science journalists, through different media channels such as newspapers, television, press releases, and social media (Weingart & Guenther, 2016).

One reason why information stems from different sources is the changing communication ecosystem (Mercer-Mapstone & Kuchel, 2017). Such changes include the channels and formats used- languages, products, media, etc.- as well as in the actors participating in communication and interactions. As these transformations occur, new questions about the nature of today's science communication best practices arise.

Effective science communications inform consumers about the benefits, risks, and other costs to help facilitate decision making (Fishhoff, 2013). Therefore, it is important that science professionals be involved in the dissemination of information related to scientific, medical, and environmental issues (Llorente & Revuelta, 2023). However, general news outlets and social media often lack the oversight of professional science editors, resulting in content that differs from that of specialized science sources. Although scientists and organizations, such as those at land-grant universities, share study results on social media crucial details about study limitations from peer-reviewed articles may not always be included in news reports or social media posts (National Science Board, National Science Foundation, 2024; Ruth, 2018). The gap in information sharing creates the potential for unclear messaging, widespread public confusion, and placing claims of incompetence to communicators (Michelle Driedger et al., 2021).

Despite scientists' strong support for science communication efforts, these initiatives face significant challenges. Some communication missteps can come from the sender while others arise from the audience's lack of familiarity with science or specific scientific findings relevant to decision-making (Grant, 2023; National Academies of Sciences, Engineering, and Medicine, 2017). A lack of institutional support and confidence in communication skills also highlights the nuances that exist in effectively conveying scientific information to the public such as trust, science literacy, and the influence of personal opinions (Allum et al., 2008; Intemann, 2023; Nisbet, 2005; Rose et al., 2019). Communications are also seen as an area for scientists to improve on. Data collected from the PEW Research Center in 2024 (Tyson & Kennedy, 2024) found that overall, 45% of U.S. adults describe research scientists as good communicators. Thus, it is crucial for science communicators to develop effective communication skills to help people connect science information to their personal values or beliefs (Ruth et al., 2020). Strengthening these connections play a role in making decisions surrounding individualized issues such as healthcare and food safety (National Academies of Sciences, Engineering, and Medicine, 2017).

Trust in Science Communicators

Trust in scientists among Americans has remained high for decades, despite some fluctuations (National Science Board, 2024; National Science Board, National Science Foundation, 2024; Navallhas, 2025). Findings from the PEW Research Center indicated 76% of U.S. adults have confidence in scientists to act in the public's best interests (Tyson & Kennedy, 2024). Results from this study also indicated that the proportion of adults with "a great deal" of confidence in scientists increased to 26% after taking steeps declines from 2021-2023 after the COVID 19 pandemic.

Trust in science can vary among different audience groups (Arnot et al., 2016; Intermann, 2023; Momme et al., 2025). Specifically, rural Americans are less likely to trust scientists than urban Americans. Trust in science played a role during the COVID-19 pandemic in Americans' attitude toward vaccinating themselves (Baker et al., 2022a) and their children (Yang et al., 2024a). Additionally, people's information sources were an important influence on decisions related to their health during this public health crisis (Baker et al., 2022a; Yang et al., 2024a). Online communication and social media were major sources of information during COVID-19, and trust of social media from government and health agencies was high during this time (Baker et al., 2022b).

Social media posts related to COVID-19 were also highly shared by Americans during the pandemic. While Americans reported Facebook as the most used platform to share information during the pandemic, Twitter (now X), Instagram, YouTube, and TikTok were also used (Wang, 2020; Xu et al., 2022). The platforms' use during this time was contentious because of inaccurate and culturally inappropriate messages related to COVID-19 and its spread (Kenyon, 2020). However, the World Health Organization (WHO) saw a need to connect with a younger generation and joined the platform to share accurate health communication related to COVID-19 (Brown, 2020).

Social Media vs Science Communications

While the premise of different social media platforms varies, the common goal across all of them is to share information (Riddle, 2024). One of TikTok's main advantages is that the algorithm exposes users to new topics as opposed to exclusively showing users videos about things they are already interested in (Rein, 2023). One way to increase the visibility of TikTok videos is through an increased engagement rate. The median engagement rate for TikTok is 2.6% (Lauron, 2025). The top industry ranked by engagement rate on TikTok is higher education, and health and beauty are grouped together and ranked No. 13 as an industry.

Through engagement rates and other metrics, the TikTok algorithm will recommend content to users. Thus, users do not have to follow creators of scientific content to be shown scientific content. Given that TikTok has become one of the top social, messaging, and video networks Americans use to access news and information (Newman et al., 2024), its selection as the medium for analyzing the construction of information is both meaningful and relevant.

Theoretical Framework

The research study used the social amplification of risk (SAoR) as a guiding theoretical framework. SAoR posits there is an intersection between psychological, social, cultural, and institutional factors with crisis events, such as a public health crisis, that intensify participants' perception of risks (Chew & Eysenbach, 2010; Edgar et al., 2000; Yang et al., 2014). SAoR was developed by Kasperson et al. (1988) to explore how risks are perceived and communicated. SAoR framework moves beyond the traditional view of risk as an objective measure, acknowledging the influence of social and psychological factors in shaping risk perception and behavior. Understanding these factors are especially important when individuals are faced with risk information in their decision-making process.

Key Components of SAoR are the risk event; amplification stations; psychological, social, and cultural processes; and secondary impacts (Burns et al., 1993). The risk event is the initial occurrence or information that signals a potential risk. It could be an accident, a scientific study, a media report, or in the case of the current study, a disease outbreak. The amplification stations are individuals or groups that process and transmit information about the risk event (Pidgeon, 2003). Included in these groups would be individuals such as scientists, experts, community leaders, and concerned citizens or organizations including media outlets, social networks, advocacy groups, and government agencies.

Psychological, social, and cultural processes can influence how risk information is interpreted and responded to through cognitive biases, which are mental shortcuts that can lead to misinterpretations of risk information (Norman & Delfin, 2012). Social interactions can influence risk processing through discussions and debates within communities and social networks that shape risk perceptions. Cultural values or beliefs and norms can influence how people perceive the acceptability and severity of risks (Ma-Kellams, 2020).

All of these factors can lead to secondary impacts (Kasperson et al., 2012). Secondary impacts amplify or attenuate risk perceptions and can lead to a range of consequences, including behavioral responses, economic impacts, and social and political consequences. Behavioral responses are changes in individual behavior, such as adopting protective measures or avoiding certain activities. Economic impacts are effects on markets, industries, and investments. The social and political consequences can be far-reaching and include changes in public trust, policy decisions, and social conflict.

The concept of framing was utilized in this study to operationalize SAoR. Framing offers a way to understand the meaning and symbolism surrounding socially constructed ideas, such as risk (Kandzer et al., 2022; Reese et al., 2001). Meaning can be communicated through framing by organizations, individuals, and groups to provide context and understanding of complex societal issues (Hertog & Mcleod, 2001; Scheufele & Tewksbury, 2007). Multiple studies have employed framing to understand messaging related to risks within science communication (Kandzer et al., 2022; Rampold et al., 2021; Yang et al., 2024, 2025). Within the current study, framing was used to measure how the risks associated with Avian Flu were positioned online. Additionally, framing was used to examine how SAoR principles were communicated within short-form video content. The specific aspects of social interactions were measured through identification and connections of engagement and the sources delivering messages online. Amplification of the risk messages was operationalized through the context of video sharing, liking, and commenting, also referred to as engagement (Yang et al., 2024b, 2025).

Purpose & Objectives

The purpose of the research study was to describe how TikTok was used to communicate during a zoonotic disease outbreak. Specifically, Bird Flu/HPAI was selected as a case study to understand how science communication occurred during the 2024–2025 outbreak. The following research objectives guided this study:

RO 1: Describe how Avian Flu was framed on TikTok

RO 2: Identify the sources of communication for the videos (social interaction)

RO 3: Understand the relationship between frames, sources, and engagement (amplification of risk)

Methods

The study utilized a combination of qualitative and quantitative content analyses to describe the portrayal of Bird Flu (HPAI) on TikTok. Content analysis, as a methodological approach, provides a systematic and replicable process for collecting media data, coding it to assign numerical or categorical values (Riffe et al., 2023). Using this method of coding allows researchers to examine patterns, relationships, and interpret the meaning of messages within specific contexts.

The quantitative content analysis was built on the findings of the qualitative analysis conducted in the first phase. The research team focused on short videos posted on TikTok to explore how HPAI is communicated on the platform. In recent years, short-form video content, such as those posted on TikTok and similar platforms, has gained significant popularity. Given that TikTok has become one of the top social, messaging, and video networks Americans use to access news and information (Newman et al., 2024), its selection as the medium for analyzing the construction of information is both meaningful and relevant.

The content sample was collected during the fall of 2024, focusing on short-form videos posted between February 2023 and July 2024. The period selected for the study coincided with two HPAI outbreaks that have occurred since March 2022. To facilitate the initial data collection, several hashtags were strategically selected, including #HPAI, #BirdFlu, and #H5N1. The hashtags for the study were selected based on three common names used to identify HPAI across media and official channels (Avian Influenza, 2024; WOAH, 2025). Videos containing these hashtags were manually downloaded and collected for subsequent analysis. For each hashtag, an individual search was conducted to identify relevant videos. The sampling methodology was selected based on its use in previous studies examining risk communication (Baker et al., 2020; Kandzer et al., 2022; Yang et al., 2024bc).

All results were systematically archived, and duplicate entries were removed to refine the dataset. Ultimately, a total of 63 videos were included in the final sample. Videos in the sample originated from 49 unique accounts, comprising five verified accounts and 44 personal accounts. The duration of the videos ranged from as short as five seconds to as long as four minutes and 38 seconds.

The study utilized a structured coding process to analyze the extracted data, adhering to the codebook, as done in previous studies (Baker et al., 2020; Kandzer et al., 2022; Yang et al., 2024bc). Two trained coders were engaged to conduct a reliability test, ensuring the credibility and consistency of the codebook. Inter-coder reliability was assessed using Cohen's Kappa, a widely recognized statistical measure for nominal data agreement (Cohen, 1960; Zagonel et al., 2021). A random sample comprising 20% of the dataset was selected for this test. Cohen's Kappa values were interpreted as follows: ≤ 0 indicates no agreement, 0.01 – 0.20 represents slight agreement, 0.21 – 0.40 is fair, 0.41 – 0.60 is moderate, 0.61 – 0.80 is substantial, and 0.81 – 1.00 indicates almost perfect agreement. The reliability scores for all themes after two rounds of coding ranged from 0.64 to 1.0, indicating that the research team's codebook was acceptable (Cohen, 1960; McHugh, 2012).

Following the establishment of inter-coder reliability, the remaining videos were coded using the same codebook and procedures to maintain consistency across the dataset. All coded data were systematically organized in an Excel spreadsheet to facilitate detailed analysis. Using this approach ensured efficient data sorting, filtering, and statistical analysis, while also providing a structured framework for identifying trends and patterns within the dataset.

The coding scheme used in the study was derived from the qualitative analytical framework developed in the earlier stages, similar to methods used in Shellhouse and Baker (2024). To ensure objective and accurate data collection, a coding sheet was developed to systematically document and record the content (Riffe et al., 2019). The coding process was divided into two types: binary coding (Yes = 1/No = 0) to determine whether a theme was present, and multiple-choice coding to categorize specific elements within each theme. In the study, a frame was considered "present" if it appeared in any form within the video, whether conveyed through narration, spoken dialogue, written text, or visual imagery.

The four themes used in the binary coding analysis are as follows:

1. Public health: Coded as 1 if the video mentions organized practices or responses to protect and promote health or prevent injury, illness, and disability, emphasizing systemic or societal health interventions.
2. Response: Coded as 1 if the video reflects emotional or behavioral reactions to HPAI.
3. Disease conditions: Coded as 1 if the video addresses the disease's current state, including control measures or assessments, highlighting its progression and consequences.
4. Communication: Coded as 1 if the video focuses on health communication strategies to promote activities improving population well-being.

The remaining six themes were analyzed using multiple-choice coding, allowing each video to include multiple categories. First, the bird flu theme identified terms used to describe the avian infectious disease, including frames such as (1) HPAI, (2) Avian Bird Flu, (3) Bird Flu, (4) Avian Flu, (5) Avian Influenza (Avian-Type Influenza), (6) Influenza-A, (7) Type A Virus, (8) Highly Pathogenic Avian Influenza, and (9) H5N1. The affected groups theme categorized stakeholders mentioned in the videos, with frames including (1) producers, (2) epidemiologists, (3) scientists, (4) the United States, (5) community, (6) general public, (7) USDA, (8) veterinarians, (9) officials, (10) countries other than the United States, and (11) N/A. Additionally, to examine wildlife references, the wildlife theme included frames for (1) birds (excluding chickens), (2) mammals, (3) ferrets, (4) seals, (5) dairy cows, (6) chickens, (7) livestock, (8) other, and (9) N/A. Similarly, domesticated animals were analyzed under the domesticated animals' theme, which coded mentions of (1) dogs, (2) cats, (3) other, and (4) N/A. For references to agricultural products, the theme included frames such as (1) raw milk, (2) pasteurized milk, (3) dairy, (4) beef, (5) eggs, (6) poultry, (7) meat, and (8) N/A.

The visual criteria theme, adapted from Adami and Jewitt (2016), categorized visual elements present in the videos. Coding for this element included (1) graphs, (2) illustrations or rendered pictures, (3) still photographs, (4) moving photographs, (5) composite graphics, and (6) N/A. Using a comprehensive multiple-choice coding framework facilitated the systematic analysis of both thematic and visual elements, providing a robust understanding of the content under investigation.

Data was analyzed in SPSS version 29. To address research objectives 1 and 2, descriptive statistics of frequency and percentage were calculated. To address the third objective in the study, we calculated the engagement rate for each video. Engagement on TikTok is calculated as total likes + comments + shares, divided by total views, and multiplied by 100 (Lauron, 2025). After the engagement rate was calculated for each video, Means, Standard Deviations, and T-tests were calculated in SPSS for each video frame and source. Dummy variables were used to account for videos having multiple themes.

Several limitations exist in this study and should be considered before generalizing results beyond the sample. The first is that TikTok content was the main unit of analysis. As the data analysis focused on health communication, it is worth noting that many public education institutions have adjusted their policies to refrain from using TikTok as a social media platform. Therefore, the sampling may skew results away from scientific information disseminated by reputable, academic sources.

Additionally, this study selected the sample based on specific hashtags on the content. This effort made the content analysis more systematic and replicable, but it also eliminated several videos in the same contextual areas (e.g., Avian Influenza) from the sample. Because TikTok uses an algorithm that suggests content for the user, based on their viewing patterns, this method of sampling for TikTok should be considered a limitation.

Results

Using both quantitative and qualitative content analyses allowed the researchers to examine the framing, tone, and prominence of relevant concepts used in Tik Tok videos focused on HPAI. During the study timeframe, 63 videos appeared within our search parameters. Additionally, each thematic category revealed distinct patterns in the frequency of specific frames.

Describe How Avian Flu Was Framed on TikTok

The length of each video varied from five to 229 seconds, with the majority being 60 seconds or less (67%; n = 40). The synopsis of the videos included: poking fun at the topic (10%; n = 6), news segments (8%; n = 5), general information (3%; n = 2), and assessing concerns (79%; n = 47). The initial analysis revealed 60 themes. For conciseness, the themes were consolidated into nine frames, presented in Table 1. Public Health was the most used binary frame (88%; n = 53), followed by Disease Conditions (87%; n = 52), and Communication (77%; n = 46). The themes that were mentioned the least across the videos in the sample were Agricultural Products (42%; n = 25) and Domesticated Animals (78%; n = 47). There was also a frame used to illustrate the visual aspect(s) of the videos. Examples of each visual element are presented in Table 3. Moving Photographs represented half of the communication methods used in the sample (50%; n = 48) followed by still pictures (29%; n = 28). Illustrations/rendered graphics were used the least (5%; n = 5). An example of the nine frames used to code videos in the sample are presented in Table 2.

Table 1

Frame Frequency and T-Test to Compare Engagement Rates With and Without Each Frame

				Engagement								
				With			Without					
Frames	Sub-frames	*f*	%	M	SD	n	M	SD	n	T	*p*-value	Cohen's d
Affected Groups		151	100.0	-	-	-	-	-	-	-	-	-
	The United States	33	21.9	5.24	5.23	33	7.07	5.63	28	-1.32	0.19	-0.34
	Officials	24	15.9	6.24	6.04	24	5.98	5.12	37	0.18	0.86	0.05
	General Public	21	13.9	5.98	4.37	21	6.13	5.99	40	-0.11	0.92	-0.03
	Producers	18	11.9	4.79	3.61	18	6.62	6.01	43	-1.20	0.24	-0.34
	Scientists	14	9.3	6.76	8.31	14	5.88	4.37	47	0.38	0.71	0.16
	Countries Other Than the U.S.	14	9.3	6.68	6.20	26	5.43	4.81	35	1.07	0.29	0.28
	Veterinarian	6	4.0	5.39	3.09	6	6.15	5.66	55	-0.33	0.75	-0.14
	Community	2	1.3	7.89	10.46	2	6.02	5.36	59	0.47	0.64	0.34
	Epidemiologist	3	2.0	7.55	4.55	4	5.98	5.53	57	0.55	0.58	0.29
	Scientist	15	9.9	6.76	8.31	14	5.88	4.37	47	0.38	0.71	0.16
Wildlife		133	100.0	-	-	-	-	-	-	-	-	-
	Birds (excluding chickens)	32	24.1	5.39	3.95	32	6.84	6.73	29	-1.01	0.32	-0.27
	Seals	2	1.5	4.38	1.67	2	6.14	5.53	59	-0.44	0.66	-0.32
	Livestock	20	15.0	5.62	4.06	20	6.30	6.05	41	-0.46	0.65	-0.12
	Dairy Cows	18	13.5	5.35	6.40	18	6.38	5.06	43	-0.67	0.51	-0.19
	Mammals	13	9.8	8.20	6.94	13	5.50	4.90	48	1.61	0.11	0.50
	Chickens	13	9.8	5.55	7.26	13	6.22	4.94	48	-0.40	0.70	-0.12
	Other	25	18.8	6.38	5.96	25	5.87	5.15	36	0.35	0.73	0.09
Bird Flu		132	100.0	-	-	-	-	-	-	-	-	-
	H5N1	46	34.8	5.61	5.10	45	7.39	6.33	16	-1.12	0.27	-0.33
	Bird Flu	42	31.8	5.40	4.23	42	7.59	7.40	19	-1.20	0.24	-0.41
	Avian Bird Flu	11	8.3	4.20	2.32	3	6.18	5.56	58	-0.61	0.54	-0.36
	Influenza-A	9	6.8	5.32	4.02	9	6.21	5.68	52	-0.45	0.65	-0.16
	Avian Influenza	8	6.1	3.49	2.61	8	6.47	5.67	53	-1.46	0.15	-0.55

Table 1

Frame Frequency and T-Test to Compare Engagement Rates With and Without Each Frame

				Engagement								
				With			Without					
Frames	Sub-frames	*f*	%	M	SD	n	M	SD	n	T	*p*-value	Cohen's d
	Highly Pathogenic Avian Influenza	7	5.3	4.44	3.73	7	6.29	5.63	54	-0.84	0.40	-0.34
	HPAI	6	4.5	5.47	4.41	6	6.15	5.58	55	-0.29	0.78	-0.12
	Avian Flu	2	1.5	6.64	5.14	11	5.96	5.56	50	0.38	0.71	0.13
Visualization		96	100.0	-	-	-	-	-	-	-	-	-
	Moving Photographs	48	50.0	6.36	5.68	48	5.03	4.57	13	0.78	0.44	0.24
	Still Photographs	28	29.2	6.47	4.23	28	5.75	6.35	33	0.52	0.61	0.13
	Composite Graphics	8	8.3	3.36	3.03	8	6.49	5.63	53	-1.53	0.13	-0.58
	Graphs	7	7.3	4.09	3.75	7	6.34	5.61	54	-1.02	0.31	-0.41
	Illustrations or Rendered Pictures	5	5.2	3.47	3.71	5	6.31	5.54	56	-1.12	0.27	-0.52
Agricultural Products		92	100.0	-	-	-	-	-	-	-	-	-
	Meat	3	3.3	4.42	4.76	3	6.16	5.51	58	-0.54	0.59	-0.32
	Poultry	20	21.7	4.90	3.64	20	6.65	6.10	41	-1.18	0.24	-0.32
	Dairy	16	17.4	6.18	6.97	16	6.04	4.90	45	0.90	0.93	0.03
	Raw Milk	11	12.0	7.28	9.24	11	5.82	4.31	50	0.80	0.43	0.27
	Pasteurized Milk	10	10.9	7.04	8.06	10	5.89	4.87	51	0.61	0.55	0.21
	Eggs	4	4.3	5.30	1.97	4	6.13	5.62	57	-0.29	0.77	-0.15
	Beef	3	3.3	7.18	1.52	3	6.02	5.58	58	0.36	0.72	0.21
Public Health	N/A	53	100.0	5.74	5.49	54	8.66	4.68	7	-1.34	0.19	-0.54
Disease Conditions	N/A	52	100.0	5.41	4.96	51	9.50	6.77	10	-2.24	0.03*	-0.78
Communication	N/A	46	100.0	4.85	3.84	44	9.25	7.55	17	-2.29	-0.03*	-0.86
Response	N/A	24	100.0	6.94	6.20	26	5.43	4.81	35	1.07	0.29	0.28
Domesticated Animals	Cats	14	22.2	5.44	4.24	14	6.27	5.79	47	-0.50	0.62	-0.15
	Dogs	3	4.8	9.45	6.05	3	5.90	5.42	58	1.10	0.28	0.65

Note. * $p < 0.05$, ** $p < 0.001$

Table 2

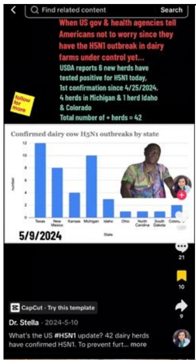
Example of Main Frames Used to Code Videos Across the Study

Video Title	Frames								
	Public Health	Affected Groups	Response	Disease Conditions	Wildlife	Communication	Bird Flu	Domestic Animals	Agriculture Products
H5N1 update- not hitting the panic button, but this is a serious wake up moment	1	1	1	1	1	1	1	1	1
Bird Flu Update June 26, 2024	1	1	0	1	1	1	1	1	1
What we've seen with the current H5N1 outbreak	1	1	0	1	1	1	1	1	1
Bird Flu Outbreak	1	1	0	1	1	1	1	1	1
Eating Beef and Chicken During the Bird Flu Outbreak: What We Know	1	1	1	1	1	1	1	1	1
Microbiologist watching the *raw milk* girlies on tiktok usher into the next Global Disease Event	1	1	0	0	1	0	1	1	1
55 Symptomatic H5N1 workers	1	1	0	1	1	1	1	1	1

Note. 1= Present, 0= Not Present

Table 3

Example of Visual Components Used to Code Videos Across the Study

Video Snapshot	Visual Coding Example
	Graphs
	Illustrations or Graphics
	Still Photographs
	Moving Photographs

Video Snapshot	Visual Coding Example
	Composite Graphics

Of the multiple-choice frame, the affected groups theme was used the most with 151 mentions. The most used frames were "the United States" (n = 33, 21.9%) and "officials" (n = 24, 15.9%). While "epidemiologists" (n = 4, 2.6%) and "community" (n = 2, 1.3%) were the least noted affected groups. The theme of "wildlife" included 133 mentions, "birds (excluding chickens)" being the most prominent frame (n = 32, 24.1%). The bird flu theme was mentioned 132 times. The most frequently used terms were "H5N1" (n = 46, 34.8%) and "Bird Flu" (n = 42, 31.8%), followed by less common terms such as "Avian Flu" (n = 11, 8.3%) and "Influenza-A" (n = 9, 6.8%).

Other commonly mentioned categories included "other" wildlife (n = 25, 18.8%), "livestock" (n = 20, 15.0%), and "dairy cows" (n = 18, 13.5%). For the domestic animal theme (63 mentions), the most frequently cited frame was without any domestic animals in the videos (n = 46, 73.0%), followed by "cats" (n = 14, 22.2%) and "dogs" (n = 3, 4.8%). In the agricultural products theme, there were 92 mentions. The most frequently used frame also did not mention any agricultural products (n = 25, 27.2%), followed by "poultry" (n = 20, 21.7%). Other frames, such as "eggs," "beef," and "meat," were less frequently noted.

Explore The Sources of Communication for The Videos

Video creators were content-specific advocates, which included epidemiologists, microbiologists, veterinarians, physicians, and Ph.D. scientists (35%; n = 22), news outlets (8%; n = 5), and concerned citizens (57%; n = 36). One of the most consistent aspects of the videos was the limited representation from official organizations such as the USDA, CDC, or WHO; however, these along with similar government organizations were mentioned throughout videos in the sample. There were also limited videos from traditional news media outlets in the sample.

While each video communicated the nuances of HPAI, creators communicated messages differently. Those with scientific-public health backgrounds focused primarily on health effects and intricacies caused by the virus while concerned citizens focused on how the outbreak would impact pets, family members, and daily activities. Regardless of who was communicating the information, the dangers of HPAI were conveyed from many of the videos.

Understand the Relationship Between Frames, Sources, and Engagement

Our third research objective explored the relationship between frames, sources, and engagement. Certain frames had a statistically significant impact on engagement rates (see *Table 1*). Specifically, posts framed around "Disease conditions" had significantly lower engagement rates. Similarly, posts utilizing a "Communication" frame exhibited a significantly reduced engagement rate. However, there were no significant differences between the sources, $F(2, 58) = 1.78$, $p = 0.18$, partial $\eta^2 = 0.06$.

Conclusions and Discussion

Especially in a post-pandemic world, social media platforms such as TikTok are powerful tools for providing effective science communication and keeping exposures low during zoonotic disease outbreaks. The current study investigated how videos posted on TikTok were being used to communicate about HPAI during the 2024-2025 U.S. outbreak. To describe these messages, the research team performed both qualitative and quantitative content analyses to determine who was delivering messages about bird flu, the types of accounts that posted videos, emergent themes, and engagement rates across videos. Themes related to video messaging included poking fun at the topic, news segments, general information, and assessing concerns. Major themes used to communicate about bird flu across TikTok included: affected groups, wildlife, bird flu, agricultural products, public health, disease conditions, domestic animals, communications, disease detection, relevant occupations, interventions, and response. The top visual elements included in the videos were moving photographs, still photographs, composite graphics, graphs, and illustrated pictures. Some videos included multiple visual elements. The themes offer insight into how Avian Flu was framed on TikTok during the 2024-2025 outbreak, which offers insight into how the risk is positioned to the public, or the societal construction of this issue (Kandzer et al., 2022; Reese et al., 2001).

In searching for videos posted during the allotted period, results revealed a variety of creators including content-specific advocates (i.e., epidemiologists, microbiologists, veterinarians, physicians, PhD scientists), news outlets, and concerned citizens. Content-specific advocates focused on the general health effects and intricate details about the virus while concerned citizens dialed in on how the outbreak would impact pets, family members, and daily activities. The common thread, however, was that both groups conveyed the dangers of bird flu. It was also revealed that, even with the variety of people delivering the messaging, bird flu was being discussed with the common terminology versus scientific wording. The individuals who contributed to the social construction of risk during the Avian Flu outbreak provide insight into the societal implications and the people involved in the SAoR within this context.

It is similarly crucial to understanding the social structure of SAoR related to Avian Flu on TikTok to note that the research team identified a gap in messaging from official channels, such as the CDC and USDA, which did not post on the platform regarding the outbreak. While there was representation from the official pages of public health providers, getting updates from the agencies with a direct impact on how the outbreak is being handled is important for effective science communication strategies. The WHO was still on TikTok as of January 23, 2025, but the organization had not yet posted about Avian Flu. Posts from WHO during this time focused on the dangers of vaping, World Polio Day, World Sight Day, Monkey Pox, and drowning prevention.

Because government agencies have relied on traditional media channels as well as in-house communication teams to disseminate information, there is space for these strategies to integrate social media. Combining various communication portals could help amplify the message and use strategies from the social amplification of risk theory to reach an audience who may not actively seek this type of information on their own (Burns et al., 1993; Kasperson et al., 2012; Ma-Kellams, 2020; Norman & Delfin, 2012; Pidgeon, 2003). Doing so could help to cement the role government stakeholders play in disseminating risk communications, especially during early stages of public health outbreaks (Wang et al., 2021). Coordinating risk communication from federal government agencies would not only increase representation from official government agencies on social media platforms but also strengthen the transparency, participation, and collaboration efforts that are embedded in many agency goals (Wukich, 2021).

However, following the change to the Trump-Vance presidential administration, federal agencies such as the Department of Health and Human Services (HHS), U.S. Department of Agriculture (USDA), and Environmental Protection Agency (EPA) were ordered to halt or restrict external communications (Katz, 2025; Lupiani, 2025). The communication freeze was timed congruently with an active bird flu outbreak, which severely limited the flow of information about updated case numbers, preventative measures or food safety concerns. It also hindered information going to researchers, other government stakeholders, and state agencies. In turn, the stop guard on external communications across federal agencies caused operational inefficiencies for public health agencies, environmental oversight, and other critical areas (AABB, 2025; Emanuel et al., 2025; Minovi, 2025).

In addition to the lack of government agencies, the research team also noted the lack of farmer participation as video creators. As consumers move away from contributing directly to agricultural production, most consumers have little- if any- contact with producers (Zander et al., 2010). Social media provides farmers with a powerful tool for agricultural advocacy, public education, and connecting consumers back to agriculture. Farmers embracing digital media platforms such as social media can also fill the role of misinformation surrounding agriculture (Antoniou et al., 2024; Chowdhury et al., 2024). Simply providing information to consumers is insufficient; instead, misinformation is tackled by creating a network between producers and consumers that foster accurate information exchange. Misinformation during an active zoonotic disease outbreak is especially dangerous because it erodes trust in science and industry professionals, leading to people disregarding experts and taking risky actions (Jiang & Fang, 2019).

While TikTok can be further explored as a tool for effective science communication, the future of the platform in the U.S. hangs in the balance. In 2020, President Donald Trump attempted to use an executive order to ban TikTok citing national security concerns (Treisman, 2025). After some pressure from the administration, TikTok agreed to protect U.S. data by partnering with Oracle. During the Biden-Harris Administration, TikTok data began being rerouted to Oracle as part of Project Texas, a $1.5 billion plan to ensure American users' data is safe when using TikTok and the platform is free from outside influence. To help regulate TikTok, The House of Representatives passed the bipartisan TikTok bill in March 2024, which was signed by President Biden shortly after it was passed in the Senate.

Soon after, TikTok and ByteDance, the platform's parent company, sued on the grounds that the law was unconstitutional. After a federal appeals court ruled the law constitutional and the Supreme Court upheld the law, the platform stopped functioning in America on January 18-19, 2025, and was removed from Google and Apple's app stores ahead of the law taking effect (McMahon & Fraser, 2025). The platform returned later January 19 with an executive order issued by President Trump on the first day of his presidency for the ban to not be enforced for 75 days. With an unclear path for the app's future, there is uncertainty from both users and creators if the platform remains a reliable distributor of information.

There is also a challenge unique to agricultural and extension science communicators housed at U.S. institutions, especially where state-specific TikTok bans could be enacted or restrictions imposed on what can be posted on the platform. Even if TikTok is prohibited for the U.S., shortform videos such as those popular on TikTok can still be used as a vessel in science communication on different platforms including Instagram or Facebook.

Implications and Recommendations

As more HPAI cases emerge, coordination across both animal and human health agencies will need to increase to enhance U.S. biosecurity measures. The need for cross collaboration emphasizes providing both proper protective measures and timely content during risky situations from different points of view, especially when there is uncertainty. Effects of the HPAI outbreak have emphasized the need for effective science communication strategies from all angles which apply to both traditional media sources and social media platforms. During times of crisis, official channels are used to communicate to the public; however, social media strategies are an important part of the evolving conversation surrounding science communication. Whether these findings can be applied to other social media platforms remains to be determined.

Part of the coordination between these agencies is teaching emerging professionals how to develop science communication messaging. To make informed decisions, public understanding of science can be influential in a wide variety of areas (Fontaine et al., 2019; Mercer-Mapstone & Kuchel, 2017). Especially since scientific ideas can be complex and communication of these ideas often include discipline-specific jargon, scientists play an integral part in breaking down these concepts. And, as more scientists in the U.S. are consulted to participate as information sources, this requires them to engage in communications actions targeting the general public (Llorente & Revuelta, 2023).

However, even if scientists are experts in their field, they are not always natural experts in communicating effectively to laypeople (Radford, 2011). While scientists are trained in research methodologies, analytical skills, and communicating with other scientists, science communication is a skill that needs to be taught (Llorente & Revuelta, 2023). Scientists, as well as emerging professionals in the communications field, will benefit from learning how to provide effective science communication messaging to diverse audiences (Brownwell et al., 2013; Radford, 2011). Without understanding how to properly execute science communications, there is a risk for scientists and communications professionals will not meet the critical need for effective science communication messaging, especially during crisis events such as public health outbreaks.

Increasing use of social media, especially in conjunction with public health events such as recent HPAI outbreaks, has emphasized the value and power of effective science communication through social media (Radin & Light, 2022). In turn, it is equally important for professionals to learn and understand how to use social media actively and effectively for science communication. There is an opportunity for research to be conducted on how scientists and practitioners can use social media platforms, such as TikTok, to expand the reach of science communication messages. Further research should be done to test various scientists’ TikTok messaging or visuals across diverse audiences and evaluate their reception. Results from these studies can not only help inform future science communications campaigns but also examine the effectiveness of messaging in improving responsive measures to public health events.

Social media can serve as a powerful tool for communication as a platform to inform, engage, and mobilize the public during times of crisis. The flexibility and popularity of TikTok allow scientists and communicators to easily use the platform to create educational videos that have the potential of reaching millions of viewers (Brown et al., 2019). Additionally, capturing, editing, and sharing video content can be completed from a single application and makes TikTok easy for new creators to engage with viewers while simultaneously contributing to science outreach conversations. Professionals can then use the platform for building authority with viewers by explaining complex topics such as those associated with public health outbreaks and zoonotic disease crisis.

Ultimately, using multiple outlets for disseminating information not only supports public health efforts, but helps prevent the spread of the disease to protect animal agriculture interests (Li et al., 2021). The efforts also help establish a collaborative approach between different stakeholders for proactive risk communication strategies. Future research should also continue to explore science communication in short-form social media video content across platforms. Since those involved in risk communications should strive to encourage stakeholder dialogue about expanding risk communications strategies (Leiss, 2004), exploring ways to expand the reach of these messages across both traditional and emerging platforms is needed.

Expanding these research opportunities allows researchers to explore the target audience and how they interpret messages they see on TikTok, or other platforms, related to science communication, agriculture, and public health to inform science communication strategies. It also will help explore the values of their target audience and how they interpret short-form content messages related to these topics as well as crisis management and risk communications. Without understanding the role this type of content plays in modern communication methods, there is a missed opportunity for research-backed information being given to consumers in real time and creates room for spreading misinformation.

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