



Improving Public Health Messaging

Exploring the Reach and Effectiveness of Cancer Prevention Communications

Report Summary: This report seeks to explore the reasons cancer prevention messaging has often not resonated with its intended audience nor had the effect it was seeking. Uncovering what is not working and why it is not working will help public health communications professionals course correct and create effective cancer messaging that resonates with people and spurs them to take preventive action.

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Executive Summary

Cancer is the **second leading cause of death** in the United States, representing 18% of U.S. deaths and over 600,000 lives lost per year. Given the public health burden of cancer, cancer prevention has been a key focus of public health messaging and communications in recent decades. Yet, **cancer prevention messaging has often fallen short** of its intended effect.

This report seeks to explore the reasons cancer prevention messaging has often not resonated with its intended audience nor had the effect it was seeking. Uncovering what is not working and why it is not working will **help public health communications professionals course correct** and create effective cancer messaging that resonates with people and spurs them to take preventive action.

This report reflects findings from an in-depth **literature review** that captures the communications literature broadly and does deeper dives into three cancer-related topics as case studies: cervical cancer screening, nutrition, and physical activity; **a digital scan** of social media communications around cancer prevention; and **expert interviews and a roundtable discussion** with 24 individuals working in media, health communications, cancer prevention, health equity, government agencies, universities, and communication-focused and community-based organizations.

Key findings about why and how cancer prevention messaging to date has fallen short are summarized below, categorized by the major elements of health communication.

SOURCE

The source is the creator and/or deliverer of a message.

- What matters most is seeing people like me that share my values. Leading with an identity that others relate to (e.g., “mom”) is most effective.
- Other source characteristics that matter include being engaging (attractiveness, likability), credible (trustworthiness, expertise), and relevant to the audience (similarity, familiarity). Power dynamics between source and receiver also matter.
- These characteristics influence the level of internalization, identification, and compliance in the receiver.
- Values-based messaging from in-group messengers is especially important to address politicization of issues.
- Trusted messengers are especially important to address inequality.
- Patients and doctors may be more effective messengers than celebrities.



MESSAGE

The message is the content and meaning received by the audience.

- Public health does not use personal narratives and storytelling (including embedding information in fictional narratives) enough.
- There is not enough reframing of messages to appeal to emotions, social norms or social responsibility (e.g., anti-industry messaging); to strengthen self-efficacy; or to address key psychological needs (e.g., reframing a behavior as a reflection of one's identity— to help vs. be a helper).
- Public health needs simple and highly visual messages that stress immediate benefits, acknowledge fears, and build empathy.
- At the same time, the perfect message does not exist. One-size-fits-all messaging is ineffective; public health should play to its strengths (evidence-based information, evaluation) while communication experts work on message design and delivery, and local partners tailor to their community.



EFFECTS

Effects are outputs, outcomes, and evaluation measures.

- Campaigns can generate moderate to strong influences on cognitive outcomes, less on attitudinal outcomes, and still less on behavioral outcomes.
- Evaluating and isolating the independent effects of public health messaging is extremely difficult and rarely done well.
- Research and evaluation around messaging are weak and inconsistent; formative research, process evaluation, and outcome evaluation would benefit from more robust metrics (including those that capture skills, behaviors, health outcomes, and unintended consequences) and metrics that are tracked across initiatives.
- There is also a need for stronger audience analysis, message testing, channel testing, and usability testing.



INTERFERENCE

Interference refers to anything that blocks or changes the source's intended meaning of messages.

- Campaigns are not designed with situational awareness of what specific misinformation is circulating.
- Efforts to control misinformation have not been successful and efforts to address it (like fact-checking) can backfire.
- Inoculating the receiver can help, including by building critical thinking numeracy/science skills as well as identity management (i.e., altering the way a person perceives themselves to reduce defense motivation. When motivated to defend their identity, a person is less likely to believe information that contradicts their existing beliefs.)
- Public health messengers should admit errors and unknowns, address changing information immediately, and strive for consistency and coordination across messengers.



FEEDBACK

Feedback refers to messages or input the receiver sends back to the source.

- Public health messaging can backfire, including when receivers regard messages as offensive, disturbing, boring, stale, preachy, confusing, irritating, misleading, irrelevant, uninformative, useless, unbelievable, or uninspiring.
- Messaging can make unhealthy behaviors seem more prevalent than they really are.
- Rarely are all elements of a receiver's response to a message examined (from tuning in and paying attention to post-action thoughts and sharing with others).
- Feedback on messaging is rarely collected and used to nimbly modify campaigns.
- Social media is treated as a one-way delivery system for information instead of the two-way exchange it is designed to be (and that users expect it to be).



ENVIRONMENT/CONTEXT

The environment/context refers to the surroundings where messages are sent/received and the setting, scene, and expectations of the individuals involved.

- Information overload, a fragmented and siloed media environment, and ever-changing guidelines and scientific evidence present a complex and challenging context within which to convey cancer prevention messages.
- Cancer and other health outcomes and related behaviors are impacted by societal, environmental, and policy drivers that behavior change messaging cannot influence. Yet, messaging is rarely accompanied by changes to those drivers (e.g., increased availability of required services, policy change).
- Public relations or media advocacy campaigns that shape how a public health topic is covered can be helpful.



RECEIVER

The receiver is the audience a message is trying to influence.

- Public health does not co-create messages with communities or work closely with them to identify which sources or messages will be most trusted by the audience. Messages are most effective when specific to the local community/ context.
- Public health does not get to know our audience well enough. Often subgroups based on race or other factors are treated as a monolith and work is not done to understand the nuanced differences within these groups. Historical context and past and current injustices are largely ignored.
- Public health does not effectively tailor the content and framing of a message or its source to the audience, considering not only the audience's demographics but their psychographics (their pre-existing values, cultural dimensions, interests, behaviors, personality traits).



CHANNEL

The channel is the way the message travels from source to receiver (e.g., social media).

- Public health messaging and campaigns often fail because they lack sufficient exposure—they have not reached enough people frequently enough to elicit change and they may also not be reaching populations and regions most affected by cancer.
- Public health does not work to understand which receivers are using which channels and then tailoring their channels to those audiences.
- Public health also does not tailor the content to the channel. The kind of content that resonates varies by channel and even by social media platform.
- The approaches used do not align with the fact that channel preference is constantly evolving, and in an age of social media, the actual channels, the kind of content they accommodate, and the kind of content the algorithms promote are ever-changing.



These findings point toward several **action items** for public health organizations like CDC:

- Co-create and co-design messaging with communities and ensure messages are specific to the local community and context.
- Rely on communications experts to develop and design messages and tell stories.
- Reach out to credible, as defined by the community, third-party organizations to disseminate the messaging and stories, especially considering how the public has questioned CDC's credibility.
- In your messages, connect with people by acknowledging the prevalent fear and anxiety surrounding cancer prevention.
- Share authentic personal stories, particularly on social media.
- Collaborate with community organizations on the ground to identify and engage trusted sources and to modify content to appeal to their communities.
- Provide evidence-based information and establish robust evaluation metrics and standards, including those related to tracking outcomes of interest to public health.
- Establish structures and processes that allow you to nimbly modify your messaging and campaigns based on community feedback as well as feedback from process evaluation/continuous monitoring, which should examine the messages' exposure, receptivity, and impact. This includes studying your critics.

- Better align messaging and dissemination strategies with the ever-evolving and increasingly fragmented media environment, accounting for how changing social media platforms and algorithms impact what content is prioritized and shared with audiences.
- Get smarter about misinformation: track what information is out there and get ahead of the misinformation via inoculation strategies, including improving the public's critical thinking and media literacy skills.
- Public health organizations generally, and the CDC in particular, need to take a leadership role in (1) determining standards to analyze communication data, (2) creating content monitoring systems to understand campaign effects and environments, and (3) ensuring campaign evaluation metrics have utility for both marketing *and* public health.

Introduction

Cancer was the second leading cause of death in the United States in 2022 (the most recent reporting year for deaths), representing 18% of all deaths and over 600,000 lives lost that year.¹ According to the most recent data, in 2021, 439 new cancer cases per 100,000 people; and in 2022, 142 deaths due to cancer per 100,000 people were reported.² The top five types of cancer by rates of new cancer cases reported were breast, prostate, lung and bronchus, colon and rectum, and corpus and uterus. Alcohol use, HPV infection, tobacco use, adverse childhood experiences, obesity, and family history are all risk factors linked to increased cancer incidence.³

Given the public health burden of cancer, cancer prevention has been a key focus of public health messaging and communications in recent decades. As in public health, frameworks can be useful to provide structure for understanding multiple aspects of a concept. Health communications efforts need to consider the eight key elements from the Essential Components of Communications Framework in their design, implementation, and evaluation:⁴

1. **Source:** The source is the creator and/or deliverer of a message.
2. **Message:** The message is the content and meaning received by the audience.
3. **Channel:** The channel is the way the message travels from source to receiver (e.g., social media).
4. **Receiver:** The receiver is the audience a message is trying to influence.
5. **Feedback:** Feedback refers to messages or input the receiver sends back to the source.
6. **Environment and Context:** The environment/context refers to the surroundings where messages are sent/received and the setting, scene, and expectations of the individuals involved.
7. **Interference:** Interference refers to anything that blocks or changes the intended meaning of the source's messages.
8. **Effects:** Effects are outputs, outcomes, and evaluation measures.

Communicating about preventing cancer is an important strategy for lowering the cancer incidence in the United States, although one that is not always effective. This report seeks to explore the reasons cancer prevention messaging has not resonated with its intended audience nor had the effect it was seeking. Uncovering what is out there and *why* will help **public health communications professionals course correct** and create effective cancer messaging that resonates with people and spurs them to preventive action. Below, we will discuss case studies regarding physical activity, nutrition, and cervical cancer screening to provide real-life, real-world illustrations and additional details about health communication strategies.

Methods

This project included a literature review, subject matter expert interviews, and a digital scan. A brief methodology is included below.

Literature Scan

ASTHO and PoP Health research teams conducted a two-part literature scan to locate relevant articles published in the last ten years (2014-2024) using PubMed and Google Scholar, with a specific focus on review articles and systematic review articles. Some seminal articles published prior to 2014 were included for context, as were articles mentioned during the subject matter expert interviews. The first part of the literature scan was focused on finding articles related to general strategies within each of the eight elements of the health communication framework. The second part of the literature scan was focused on finding articles related to the case study subjects (physical activity, nutrition, and cervical cancer screening) and the strategies used within each of the eight elements of the health communication framework. Articles related to patient-provider communication and other forms of one-to-one communication were considered out of scope for this report. Additionally, the articles included for the case study topics did not need to have cancer as an outcome of interest. ASTHO and PoP reviewed a total of 174 publications for this report, including 46 about health communications, 37 about physical activity, 39 about nutrition, 46 about cervical cancer screening, and 6 about best practice documents.

Subject Matter Expert Interviews

ASTHO and PoP Health research teams developed a list of subject matter experts in the areas of general health communication, cancer, physical activity, nutrition, and cervical cancer screening and developed an interview guide with question sets for each expertise area. The teams conducted 13 interviews via Zoom, all of which were 45-60 minutes long. Notetakers used a template to extract key learnings within each of the eight framework areas during each interview, and the teams also reviewed the interview transcripts for key learnings. (See Appendix A for the interview guide and list of participants.) Additionally, the teams collaborated with [Comprehensive Cancer Control National Partners](#)

to hold a roundtable with an additional seven experts in the areas of survivorship and cancer support communities/coalitions. (See Appendix A for the roundtable interview guide and list of participants.)



Digital Scan

Riester Influence conducted a digital scan to examine the social medial landscape for messages related to cancer and to the case study subjects (physical activity, nutrition, and cervical cancer screening). The team met with the ASTHO and PoP Health teams to develop a list of key terms for the digital scan to ensure alignment with the literature review and interviews. The total data compiled amounted to 2.7 million posts and comments across X, Reddit, Facebook, Instagram, TikTok, blogs, and forums from April 25, 2022 to May 17, 2024. (See Appendix B for a full report of this scan, including a more detailed methodology.)

Findings

The literature scan and interviews resulted in several pertinent findings for each element of the health communications framework, and these results are described by element below. Findings from the digital scan are included where applicable.

SOURCE

The source is the creator and/or deliverer of a message.

- What matters most is seeing people like me that share my values. Leading with an identity that others relate to (e.g., “mom”) is most effective.
- Other source characteristics that matter include being engaging (attractiveness, likability), credible (trustworthiness, expertise), and relevant to the audience (similarity, familiarity). Power dynamics between source and receiver also matter.
- These characteristics influence the level of internalization, identification, and compliance in the receiver.
- Values-based messaging from in-group messengers is especially important to address politicization of issues.
- Trusted messengers are especially important to address inequality.
- Patients and doctors may be more effective messengers than celebrities.



The source is the creator and/or deliverer of a message.

Overwhelmingly, the major finding within the *source* element is that messages are most effective when the deliverer of the message is someone an audience can relate to and trust.^{5,6} Trusted sources vary by demographic, identity characteristics, and topic. For example, our research showed that people often seek information from non-clinical sources about healthy behaviors (e.g., diet, physical activity).⁷ Across a variety of subgroups, governments, scientists, and other institutions are consistently viewed as *untrustworthy* messengers.⁸ For nutrition particularly, people view scientists as not agreeing with each other and constantly changing their minds, and therefore untrustworthy. The digital scan results also revealed widespread distrust in medical institutions and government health organizations across platforms. The data from this scan suggest this is related to a variety of factors including persons having a history of maltreatment by the medical establishment, lack of faith in institutions, and misinformation. Within the cervical cancer screening literature, there is some evidence that the presence of health professionals on social media platforms can help to mitigate some misinformation.⁹ One study leveraged existing connections in the community by including community-based organizations as the cornerstone of the intervention, which helped ensure the information was locally adapted and enhanced the likelihood that participants would trust the information presented.¹⁰ An investigation of health-related content on Instagram demonstrated that participants trusted campaign content largely due to the fact that they trusted the source of the content.¹¹

The most-trusted message sources were seen as engaging (attractiveness, likability), credible (trustworthiness, expertise), and relevant to the audience (similarity, familiarity), as these

characteristics influence how much the receiver identifies with the source and how likely they are to adhere to their message.^{12,13} Furthermore, the use of trusted messengers is especially important to address power, inequality, and politicization of issues.^{14,15} When people develop relationships with fictional characters in fictional narratives (e.g., television, movies) (i.e. form a parasocial relationshipⁱ), they pay more attention to the information provided. As such, successful educational-entertainment messages rely on media characters with whom the audience members have developed personal bonds. The most common messengers in cancer-related conversations on social media include scientific organizations, patient-focused organizations, researchers, and physicians.¹⁶ A small-scale study in a cancer clinic found health materials linked to celebrities or religious figures were consistently less likely to be selected than those linked to ordinary patients or doctors.¹⁷ In light of the above, it is important to identify trusted sources within communities and work with them within the established societal structures of the community (e.g., religion, social classes).

A variety of sources are emerging as particularly useful to deliver messages. Interviewees suggested that messages should be delivered from the community members themselves, reflecting known leaders. They recommended empowering others to be messengers if they are a better fit for the intended audience. Lay health advisors can be effective health communication messengers.¹⁸

Additionally, one interviewee underscored that **cultural words and cultural recognition need to be incorporated** into messaging to further enhance the intended audience's sense that they have been seen. A study of cancer depictions on primetime scripted television found the majority involved white patients and providers, suggesting a "lack of representation of cultural, social, and environmental factors that affect the health of minority communities, who need to hear these messages the most."¹⁹ The aforementioned interviewee suggested that **it's a big mistake to not recognize that groups of people contain multiple identities and cultural experiences.** For example, "Latino" is a large subgroup encompassing immigrant populations; second, third, and fourth generation Americans; different income levels; and different languages. Another interviewee noted that much social capital exists within rural communities, and that these communities deeply value autonomy and independence. **Messengers should reflect and build upon these values.** Of note, building trusted relationships and partnerships takes a lot of time (one interviewee noted working with a particular community for 20+ years to build the level of trust needed).

User-generated contentⁱⁱ is an important source of information-sharing on social media (although it should be approached with caution). For example, women who experienced an abnormal Pap test result were disproportionately willing to encourage other women to get tested.²⁰ Social media personalities ("influencers") have been identified as a strategic and powerful avenue for product promotion, as *perceived* topic expertise or authority can lead to increased engagement on social media, particularly for topics like nutrition and physical activity.²¹ This strategy requires careful consideration, as several reviews

ⁱ The term [parasocial relationship](#) refers to a relationship that a person imagines having with another person whom they do not actually know, such as a celebrity or a fictional character.

ⁱⁱ The term [user-generated content](#) (also known as UGC or consumer-generated content) is original, brand-specific content created by customers (at no cost to you) and published on social media or other channels. It comes in many forms, including images, videos, reviews, and testimonials.

of information published by influential accounts noted inaccuracies and information of suboptimal quality.²² Journalists are trained to present both sides of information, but this can lead to increased confusion and ambivalence from their audiences.²³ At the same time, issues can arise when sources have a specific ideologic position and omit dissenting information or disseminate information that does not reflect research.²⁴ Given the amount of nutrition and physical activity information currently shared on various forms of media, there is an urgent need for resources for media professionals on how to effectively facilitate knowledge transfer for these topics. In addition, various studies noted the importance of using youth advocates, and numerous interviewees underscored the power of personal narratives and stories in motivating behavior change.²⁵

Several interviewees noted that public health professionals are not communication or marketing experts, and vice versa; these are different skill sets that need to work together for maximum impact. Interviewees also recommended working with community leaders, community health workers, and healthcare providers to identify trusted messengers within the communities. Additionally, one interviewee encouraged CDC to think of partner organizations as a network of advertisers. In this arrangement, CDC would share key facts and let others (e.g., community-based organizations) at the local level do the messaging. This capitalizes on the idea that community-based organizations have greater ability to identify and work with messengers that local audiences relate to and trust, as well as greater ability to develop messages that resonate with and reach local audiences, than larger institutions.

MESSAGE

The message is the content and meaning received by the audience.

- Public health does not use personal narratives and storytelling (including embedding information in fictional narratives) enough.
- There is not enough reframing of messages to appeal to emotions, social norms or social responsibility (e.g., anti-industry messaging); to strengthen self-efficacy; or to address key psychological needs (e.g., reframing a behavior as a reflection of one's identity— to help vs. be a helper).
- Public health needs simple and highly visual messages that stress immediate benefits, acknowledge fears, and build empathy.
- At the same time, the perfect message does not exist. One-size-fits-all messaging is ineffective; public health should play to its strengths (evidence-based information, evaluation) while communication experts work on message design and delivery, and local partners tailor to their community.



The message is the content and meaning received by the audience.

Similar to the *source*, effective message content is highly correlated with the specific characteristics of the intended audience. Message salience, targeting, and tailoring are critical. Interviewees emphasized how important it was to understand how people hear and absorb messaging as well as their priorities and motivations. Messages can then be aligned accordingly, including by using vocabulary the community uses, ideally practical terms that people use in everyday language—*not* complex healthcare

language. One interviewee noted that health-related campaigns are often informed by science experts who do not know how to effectively communicate with the general population. These messages are often too “science-y” and lose the audience. Additionally, messaging needs to consider the lived reality of the audience. There was discussion about the lack of culturally appropriate messaging and **how messages often fail to acknowledge past and current injustices and oppression**. One interviewee suggested that those involved with creating messages need to check their privilege. For example, that interviewee asserted that for messages aimed at tribal nations, messaging must uphold tribal sovereignty.

Messages that are consistently similar are often not persuasive to multiple audiences who differ on aspects of identity.²⁶ Segmentation is “a systematic and explicit process of identifying groups of people within a larger population (who need to be reached) who exist in similar states regarding the campaign’s goals and share psychosocial predictors for change.”²⁷ Audience segmentation is a key element of planning and developing health communication campaigns and allows for the creation of differentiated messages that can target and reach each audience segment. Messages can be targeted to a population subgroup and/or tailored to an individual.²⁸ In this case, it’s necessary to carefully plan and test campaign content and format with the target audiences.²⁹

While tailoring messages to segmented audiences is recommended, one interviewee noted that this approach can be costly. In these situations, it may make sense to explore whether there is a more universal message that is likely to work across populations. At the same time, it is hard to cover different cancers with a single message, and even a particular type of cancer is often the outcome of many health behaviors and other risk factors. Moreover, different groups may prioritize different health outcomes or be more prone to believing in certain effects (e.g., women had higher confidence in information stating that physical activity could prevent heart disease and lower confidence in information stating it could prevent breast cancer.)³⁰The decision to segment must take all of this into account.

Many interviewees noted that to have success in changing behaviors like physical activity and nutrition, a focus on cancer prevention would *not* be effective given the lack of immediacy to the audience. For cancer prevention messages related to physical activity, **messages should highlight immediate and tangible benefits and consequences, such as improved mental health or increased energy**.

In cancer prevention messages related to nutrition, there are too many messages, and public health needs to prioritize the most important messages to highlight consistently and across platforms. Influential messages are credible, contain engaging content and execution, are personally involved and relevant, are understandable, and use motivational incentives (such as prizes or vouchers).³¹

Pragmatic explanations/messages alone lack the motivational immediacy needed to drive behavior change.³² One cervical cancer screening study called for information to be shared in a tiered approach that started with basic concepts and built up to more complex information, all supported by visual aids and behavioral science concepts.³³ An example given by an interviewee specific to cervical cancer screening noted that more multi-level messaging is needed to address knowledge about what happens during a well woman exam, the purposes of Pap tests and HPV screening, and how frequently these

screenings are needed. Cervical cancer screening has particularly negative connotations surrounding it, as it is invasive and often unpleasant to experience. Successful cervical cancer screening messages frame screening as a personal choice; use clear statements about the screening's risks, benefits, and limitations; provides estimates of the probabilities of being diagnosed with cervical cancer; and outlines positive and negative outcomes of the screening.³⁴ Efforts should also address the anxiety that often accompanies cervical cancer screening.³⁵

Messages discussing physical activity guidelines are better grasped if they use simple directions, such as “move more,” rather than describing minutes, intensity, and other details.^{36,37,38} With physical activity messaging, short-term, single messages exhibited greater effects compared to long-term, multiple messages and health application interventions.³⁹ Frameworks Institute recommends expanding the public's mental model of physical activity to include all forms of movement, building the sense that physical activity can be built into everyday life and is not limited just to examples of vigorous exercise.⁴⁰

Reviews of the qualityⁱⁱⁱ of nutrition content across social media platforms (e.g., Instagram) demonstrated that it is extremely varied and often poor, especially when it comes to nutrition messaging.^{41,42} **There is no universally agreed upon definition or established goal of “nutrition messaging.”**⁴³ Notably, information-centered nutrition campaigns were considered ineffective in promoting healthy eating behaviors, according to a qualitative study conducted to inform the development of healthy eating mass media campaigns.⁴⁴

There is not enough use of personal stories and narrative in public health messaging (including via narrative/entertainment education), especially to discuss cancer prevention.^{45,46} Public health messaging sometimes focuses on concepts instead of humans, but a personal, human story with a face associated will always outperform a concept.^{47,48} People process messages via two parallel systems: one is slower and more rational, and the other is faster and more based on emotions, vivid imagery, and associative memories. Public health messaging typically only appeals to the first system.^{49,50} Further, public health messaging is not simple or visual enough; images can be important sources of information and attention-grabbing. Public health messaging also does not appeal to emotions enough, and when they do, they do not always appeal to the right emotions. Appealing to guilt and fear is effective *if* you also boost self-efficacy.^{51,52} Appealing to shame or despair is not effective, but appealing to hope and compassion shows some promise.⁵³ Furthermore, public health messaging does not use social norms and storytelling sufficiently, which research shows is needed to effectively address an issue in a group with disproportionate health burden.^{54,55}

Additionally, public health messaging is often not specific to the local community and context.^{56,57} Public health messaging isn't always rooted in communication science and suffers from “unsophisticated application of theory and models” and “poorly conceived strategic approaches.”⁵⁸ **Public health messaging is often inconsistent with psychological theories of cognitive bias and behavioral economics**

ⁱⁱⁱ The definition of “quality” used in this systematic review was “the reliability of information, compared against a set of defined criteria, which usually includes assessment of financial disclosures, citing of references, transparency and provision of balanced and unbiased information.”

that feature the heuristics (cognitive shortcuts) our minds rely on: **loss aversion and framing effects, anchoring and availability, default and status quo biases, present-biased preferences, and misperceptions of social norms.**^{59,60,61,62} Peer feedback, opt-out messages, and defaults can be effective.⁶³ These terms are defined in the text box to the right. Health messages can be loss-framed (i.e., framed to emphasize the consequences of noncompliance with a particular behavior) or gain-framed (i.e., framed to emphasize the benefits of compliance with a particular behavior). The literature shows support for the effectiveness of gain-framing. Thematic framing (i.e., the specific topic the message is framed to focus on) also matters, but framing effects are not sufficiently understood.⁶⁴ Interviewees especially highlighted the value of gain-framed messages. Stressing the positive impacts of a healthy weight as opposed to the negative impacts of obesity is an increasingly used framing. Physical activity messages should focus on positive-framing and social norms rather than risk messaging.⁶⁵ The SAVI (specific, acceptable, viable, impactful) messaging approach helps break down complex behaviors, draws on social cognitive theory and social norm theory, and may be useful in some message development.⁶⁶ Health-branding is a public health intervention framework that specifies how marketing principles can be used to influence positive health-related behaviors. There is a need to understand which health branding domains are most promising in different nutrition contexts.⁶⁷

Public health messaging does not often appeal to key psychological needs, including cognitive stability (e.g., need for consistency), cognitive growth (e.g., need for stimulation and competence), affective stability (e.g., need for tension reduction and ego defense), and affective growth (e.g., affiliative and identity needs).⁶⁸

Understanding the intention-behavior gap can help create messages that resonate with the receiver. Additional successful message framing includes discussing the benefits to one's family and/or community in addition to, or in place of, the benefits to oneself. Good messaging will get at the core values of a person to change their behavior. Areas of improvement include reframing behaviors in terms that **emphasize how those behaviors serve the values that are most immediate and important to the receiver and reflect the**

Loss aversion is a cognitive bias where the pain of losing something valuable (e.g., money) is psychologically twice as powerful as the pleasure of gaining something valuable. Due to this, an individual will have a tendency to prefer the avoidance of a loss over the acquisition of gains.

Framing effects is a cognitive bias where the individual establishes a decision about information as influenced by how the information is presented.

Anchoring is a cognitive bias where an individual will use the first piece of information they encounter as a reference point for all information that follows.

Availability is a heuristic where an individual will make decisions based on the information that they remember most quickly and easily. More memorable pieces of information have an outsized impact as compared to less memorable pieces of information.

Default bias is a cognitive bias where the individual will prefer the option that is selected if they do nothing.

Status quo bias is a cognitive bias where the individual will prefer their current state of affairs and resist change.

Present-biased preferences is a cognitive bias where the individual will give outsized focus to their present situation over their future situation, even if it results in less beneficial decision-making overall.

Misperceptions of social norms is where an individual misinterprets their peers' behaviors, resulting in a misunderstanding of what is "normal."

Peer feedback is feedback that is based on the comparison of an individual's actions to their peers' actions.

Opt-out messages is a behavioral nudge (e.g., a text message) that provides the option to the user to exclude themselves from being sent future messages.

Defaults are the preselected options adopted by a program that will be chosen if not otherwise specified.

receiver's identity and existing cultural values.^{69,70,71} There is not enough reframing of messages around preventive behavior being within one's control, as self-efficacy is a key component of effective messaging.^{72,73} Furthermore, there is inadequate reframing of messages around social responsibility and social norms; anti-industry messaging can work well (e.g., messaging that calls out the tobacco industry for its manipulative tactics).^{74,75}

Finally, interviewees discussed how public health and other organizations could make it easier for local, community-based organizations to customize messages. As one interviewee noted, "the perfect message does not exist," and what resonates will differ across audiences. While interviewees agreed that messages need to be adapted to different audiences, they also underscored that creating *more* messages that differ in their core content is not always useful. More consistent message content will result in greater alignment and less confusion.

CHANNEL

The channel is the way the message travels from source to receiver (e.g., social media).

- Public health messaging and campaigns often fail because they lack sufficient exposure—they have not reached enough people frequently enough to elicit change and they may also not be reaching populations and regions most affected by cancer.
- Public health does not work to understand which receivers are using which channels and then tailoring their channels to those audiences.
- Public health also does not tailor the content to the channel. The kind of content that resonates varies by channel and even by social media platform.
- The approaches used do not align with the fact that channel preference is constantly evolving, and in an age of social media, the actual channels, the kind of content they accommodate, and the kind of content the algorithms promote are ever-changing.



The channel is the way the message travels from source to receiver (e.g., social media).

Public health communication does not sufficiently tailor the channel to the audience, nor does it sufficiently tailor the content to the channel. Interviews with subject matter experts noted that research needs to be done to understand which channels are appropriate for which audiences. Additionally, one expert noted that the first step is to go to where the audience is, find out what channels they are using and what specific shows or content they are engaging with there, and then create and integrate a story into those specific places.

The digital scan analysis noted that message success depends on the social media channel, as different information resonates on different channels (e.g., X enables calls to action and humor, while Reddit allows for community-like conversations and advice). Public health messaging does not take enough advantage of "narrowcasting" to specific subgroups with tailored messages or by leveraging the interactivity of online, social media, or mobile channels.⁷⁶ Direct mail and word of mouth campaigns aimed at specific high-risk or non-traditional groups (e.g., via churches, workplaces) are also underutilized.⁷⁷ Furthermore, a lack of sufficient exposure is an important reason why public health communication has failed.⁷⁸ Campaigns are often too short and poorly funded.⁷⁹ Essential items of

successful campaigns include the total volume of messages, the amount of repetition, the prominence of placement, the scheduling of message presentation, and the length of the campaign.⁸⁰

Additionally, messages need to be tailored to the different media platforms used for delivery. Nearly all interviewees noted that the use of blanket messages in multiple communities and channels is not useful. Multi-level messaging (i.e., developing messages that are deployed in multiple channels) is most effective. The types of messages that are shared on social media vary by channel (e.g., on X people share more informational tweets as opposed to personal experiences; Instagram is the opposite). Using X has been shown to be effective in raising awareness of cervical cancer screening, but this has not been connected to any effect on behavior.^{81,82}

Channel preference is constantly evolving, and in an age of social media, the actual channels, the kind of content they accommodate, and the kind of content the algorithms promote most are also ever-changing. A key challenge of disseminating information is the discrepancy between how researchers share findings (e.g., via academic journals) and how end users/community members seek information (e.g., from news media and social media). By the time medical literature is published, new social media channels and users have developed and/or changed. Different content and formats resonate on different channels/platforms.^{83,84,85,86} Preferred communication channels vary by audience demographics and identity. A major challenge of social media is the rapid pace at which platforms evolve online and gain and lose popularity for certain segments of society. Rural areas in particular have unique needs with regard to channel preference. A study of physical activity interventions showed that operating in nonmetropolitan areas made it easier to use existing networks to involve partners and access mass communication channels.⁸⁷

Message content needs to be tailored to the channel where it will be delivered. Since technology and social media change rapidly, there should be a focus on understanding and leveraging key qualities and features of social media, rather than of specific platforms themselves, in order to influence cognitive and psychological outcomes that relate to health behaviors.⁸⁸ Social media is also highly reciprocal: people are learning information from it, but also actively shaping it. Groups promoting cervical cancer screening are exploring how gaming and gamification may be useful to disseminate their messages, and this may benefit other areas of cancer prevention messaging.^{89,90,91} While technology makes new channels possible, one interviewee cautioned that many cultures and subgroups prefer human, one-on-one personal connections and could view some communication channels as those of the colonizer/oppressor. This interviewee mentioned pamphlets and radio stations were not the preferred way of communication of indigenous cultures prior to the colonization of Native people, and one-on-one, human connection is preferred.

All of this points to the necessity of creating an exposure strategy for a campaign, which is often neglected in public health communication. An exposure strategy refers to determining how often an audience needs to see (i.e., be exposed to) messages to have them resonate and “sink in,” and then ensuring a campaign is designed to achieve that level of exposure (in terms of channels used, duration, etc.).⁹² Furthermore, one interviewee noted that exposure strategies cannot solely rely on active information seeking, as the majority of people are not always active health information seekers. Rather,

their consumption is based on quick scans. In fact, it should be assumed that people consume information differently and that they use as many channels as possible (e.g., news media *and* Facebook *and* Instagram).

Interviewees mentioned that an increasingly complex and fragmented media environment makes it increasingly difficult to achieve high exposure. In order to have an impact via a particular channel, the audience must be paying attention to messages on that channel. Due to this, public health communications professionals should consider **how multiple modes of delivery could be useful in creating repetition and delivering complementary messages for audiences**. Different channels can serve different purposes; for example, digital channels can be great for raising awareness, but less so for changing behavior.

RECEIVER

The receiver is the audience a message is trying to influence.

- Public health does not co-create messages with communities or work closely with them to identify which sources or messages will be most trusted by the audience. Messages are most effective when specific to the local community/ context.
- Public health does not get to know our audience well enough. Often subgroups based on race or other factors are treated as a monolith and work is not done to understand the nuanced differences within these groups. Historical context and past and current injustices are largely ignored.
- Public health does not effectively tailor the content and framing of a message or its source to the audience, considering not only the audience's demographics but their psychographics (their pre-existing values, cultural dimensions, interests, behaviors, personality traits).



The receiver is the audience a message is trying to influence.

Not enough is done to understand the intended audience of a health communication campaign and co-design messages with them. Stakeholder analysis helps define audiences, their ability to interpret various types of messages, and their willingness to hear messages. Formative research segments the population and understands perceptions people hold about issues, including deeply held beliefs, norms, motivators, and perceived barriers. Segmentation isn't enough, and some experts argue there is more in-group variation than between-group variation, especially in light of intersectional identities. Co-designing messages with the audience helps ensure that the source and message reflect and resonate with the audience. Communities often are not, but need to be, engaged in developing messaging to create meaningful segments.⁹³ There is a need to change from communicating *at* people to communicating *with* them, and co-design and bidirectional communication are key. Both receivers and message crafters have expertise to share.⁹⁴

Furthermore, there is not enough segmentation, especially based on psychographics. Psychographics include values, cultural dimensions, interests, behaviors, personality traits (e.g., sensation seeking), readiness for change, current behaviors, and information processing style (e.g., visual, aural).^{95,96,97,98,99} Typical strategies for segmenting audiences are often ad hoc, crude, or based on typologies more appropriate for theory development than for campaign design.¹⁰⁰ The “drive state” of

the receiver (which includes visceral factors like hunger and desire, moods and emotions, and physical pain) also matters for how they receive the message.¹⁰¹ Messaging and communications based on a deeper understanding of the target audience's motivations and fears are better equipped to influence that audience.¹⁰²

Age is also an important factor to consider. Within cervical cancer screening literature, the age of the receiver impacted how much they knew about HPV.¹⁰³ Additionally, adolescents can be motivated by messages that are framed to emphasize social justice and health equity.¹⁰⁴ Adolescents were often the intended receiver of social marketing interventions for improved eating habits, and they are particularly vulnerable to online marketing and peer effects within this space.^{105,106,107} Separately, within physical activity literature, adults show high willingness to increase physical activity by short bouts of duration.¹⁰⁸

Research noted that public health organizations struggle to reach larger and younger audiences using social media due to a number of challenges, including not understanding social media, a lack of resources dedicated to communication, and competing with the vast amount of online information.¹⁰⁹ This is problematic given the direct evidence of the importance of reaching youth in the case study topic literature (i.e., nutrition, cervical cancer screening, physical activity). A scoping review of physical activity messaging categorized key insights by receiver age, demonstrating strong evidence for targeting and tailoring by age.¹¹⁰

It's also important to factor in accessibility to your health communications strategy by considering the difficulties intended audiences may have in accessing information and their levels of health and media literacy. When conflicting messages and information are prevalent (e.g., around nutrition), receivers may not have skills to manage, understand, and reconcile conflicting messages.¹¹¹ More educated people have more access to information and the skills to make sense of this information, but they may not necessarily have the skills to cope with too much information.¹¹² Less educated people may lack access to the full scope of public nutrition information, but this may be protective against information overload.¹¹³

Formative research to understand receivers is imperative and not done often or thoroughly enough.¹¹⁴ Even when it is done, there are implicit assumptions made (e.g., how focus groups are formed based on demographic factors) that undermine its effectiveness.¹¹⁵ Interviewees noted the many assumptions about receivers used when creating health communication campaigns, including English as the language of choice and grouping larger racial and ethnic subgroups as monoliths. **Several interviewees emphasized the need to understand how people receive information and the effect of cultural nuances, particularly where cultural variations impact health behaviors and outcomes.** In the research literature, the study population often does not reflect the target audience(s).

Furthermore, there is a paucity of studies examining diverse audiences or equity considerations. For example, cervical cancer educational strategies should target both men and women, as men have been an underutilized receiver for these messages.¹¹⁶ In the physical activity literature, the biggest gains in knowledge and intention are in audiences with few plans to exercise.¹¹⁷ Data from the digital scan noted heightened levels of distrust within specific communities, particularly among Black women. In summary,

there is a great opportunity to use comprehensive co-design methods to ensure that messages better meet the needs of the intended receivers.¹¹⁸ These concepts should be extended to images that are selected for campaigns.

FEEDBACK

Feedback refers to messages or input the receiver sends back to the source.

- Public health messaging can backfire, including when receivers regard messages as offensive, disturbing, boring, stale, preachy, confusing, irritating, misleading, irrelevant, uninformative, useless, unbelievable, or uninspiring.
- Messaging can make unhealthy behaviors seem more prevalent than they really are.
- Rarely are all elements of a receiver's response to a message examined (from tuning in and paying attention to post-action thoughts and sharing with others).
- Feedback on messaging is rarely collected and used to nimbly modify campaigns.
- Social media is treated as a one-way delivery system for information instead of the two-way exchange it is designed to be (and that users expect it to be).



Feedback refers to messages or input the receiver sends back to the source.

More attention needs to be focused on the feedback received about messages. All elements of the receiver's response to a message are rarely considered, including:

- | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> 1. Tuning in (exposure to communication). 2. Attending to communication. 3. Liking it/maintaining interest in it. 4. Comprehending its contents (learning what). 5. Generating related cognitions. 6. Acquiring relevant skills (learning how). 7. Agreeing with the communication's position (attitude change). | <ol style="list-style-type: none"> 8. Storing this new position in memory. 9. Retrieving the new position from memory when relevant. 10. Deciding to act on the basis of the retrieved position. 11. Acting on it. 12. Post-action cognitive integration of this behavior. 13. Proselytizing others to behave likewise. |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Message recall also matters.¹¹⁹ There are many layers of nuance to engagement that are missed when organizations rely only on surface-level metrics like social media likes, comments, and shares. We need to understand more about how platform interconnectivity affects health information engagement.^{120 121} There are ways that people engage with posts that do not get counted in traditional social media metrics.¹²² It is difficult to understand the intent of social media metrics (e.g., what gets a "like," what does "liking" a post mean) as many things can influence this, including a person's relationship with those sharing posts and the influence of bots.¹²³ Across literature reviewed, engagement metrics were not consistent.¹²⁴ Social media platforms

API^{iv} can restrict how much data can be accessed or systematically searched.¹²⁵ **The bottom line is that we do not fully understand the relationship between social media engagement and behavior change over time.**

^{iv} An [application programming interface \(API\)](#) is a communication system that allows two applications or platforms to "talk" to each other. Social network APIs allow these platforms to integrate with other software providers and apps.

There is also a tendency to disregard “negative” feedback. Public communication campaign outcomes tend to diminish for receivers who regard messages as “offensive, disturbing, boring, stale, preachy, confusing, irritating, misleading, irrelevant, uninformative, useless, unbelievable, or uninspiring.”¹²⁶ There is a need to understand the negative impacts of messaging in order to produce high-quality information.¹²⁷ Defensive responses from receivers of a message may include denial that the message pertains to them, counterarguing against the message, rejecting behavior recommendations that are unappealing, misperceiving susceptibility to consequences, and ignoring the message altogether.¹²⁸ In addition to defensive responses, messages can elicit unintended effects, which have been grouped into 11 categories defined in **Table 1**: obfuscation, dissonance, boomerang, epidemic of apprehension, desensitization, culpability, opportunity cost, social reproduction, social norming, enabling, and system activation.¹²⁹ Results from the digital scan align with these findings; posts gathered in the scan suggest that social media users are not satisfied with cancer prevention information provided by medical professionals and instead seek their own treatments and cures.

Notably, social media is designed for two-way communication. Users communicate back and react to the content posted, often in conversation with the source. In contrast, **public health and health organizations often treat social media as a one-way delivery system for information instead of the two-way exchange it is designed to be—and that users expect.** SMS text messages containing cervical cancer screening reminders are an example of one-way communication that has been successful, as this information is not expected to generate conversation.^{130 131 132} In contrast, an Instagram post sharing a personal story of a cervical cancer survivor may generate comments, questions, and discussion, as this is how users use the Instagram platform.

Table 1: Typology of Unintended Effects of Health Communication Campaigns

Effects	Definitions	Examples
Obfuscation	Confusion and misunderstanding of health risk and risk prevention methods	Cline et al. (1992), Lerman et al. (1990), and Roberts, Imrey, Turner, Hosokawa, and Alster (1986)
Dissonance	Psychological discomfort and distress provoked by the incongruence between the recommended health states and the audiences’ actual states	CANDI Project (1990) and Guttman and Zimmerman (2000)
Boomerang	The reaction by an audience that is opposite to the intended response of persuasion messages	Feingold and Knapp (1977), Hyland and Birrell (1979), Kraus, Riggins, and Franti (1975), Snyder and Blood (1992), and Stuart (1974)
Epidemic of apprehension	Unnecessarily high consciousness and concern over health produced by the pervasiveness of risk messages over the long term	Barsky (1988), Becker (1993), Fitzgerald (1994), Illich (1976), and Mechanic (1983)
Desensitization	Repeated exposure to messages about a health risk may over the long term render the public apathetic	Downs (1972), Larzarsfeld and Merton (1951), and Kinnick et al. (1996)
Culpability	The phenomenon of locating the causes of public health problems in the individual rather than in social conditions	Guttman (1997), Minkler (1999), and Ryan (1976)
Opportunity cost	The choice of communication campaigns as the solution for a public health problem and the selection of certain health issues over others may diminish the probability of improving public health through other choices	Dearing and Rogers (1992), Kaplan (1985), and Reinerman and Levine (1995)
Social reproduction	The phenomenon in which campaigns reinforce existing social distributions of knowledge, attitudes, and behaviors	Fairly et al. (1996), O’Keefe (1971), Salmon et al. (1996), and Vidmar and Rokeach (1974)
Social norming	Social cohesion and control and accompanying marginalization of unhealthy minorities brought about by campaigns	Kim and Shanahan (2003) and Yanovitzky and Stryker (2001)
Enabling	Campaigns inadvertently improve the power of individuals and institution and promote the images and finances of industries	DeJong and Wallack (1992), Glantz (1996), and Montgomery (1993)
System activation	Campaigns influence various unintended sectors of society, and their actions mediate or moderate the effect of campaigns on the intended audience	Hornik (2002), Lando, Bluhm, and Forster (1991), and Viswanath and Finnegan (2002)

Source: Cho, H., & Salmon, C. T. (2007). Unintended effects of health communication campaigns. *Journal of Communication*, 57(2), 293-317.

The interactive functionality of social media offers opportunity for increasing the reach of health interventions and enhancing the ability of people to engage in healthful behaviors while connecting them to others.¹³³ A nutrition study noted that engagement-driving media approaches could increase receptivity and eventual behavior change.¹³⁴ In addition, one best practice document about cervical cancer screening programs called for having strategies in place should a communications crisis unfold online.¹³⁵

Interviewees emphasized the importance of not only collecting feedback from campaigns but **using the feedback to make modifications and improvements to campaigns**, particularly when messages are not working. Public health organizations are currently not as nimble as they need to be to do this, which may be due to a lack of resources, the need for government organizations to obtain clearance for messaging, or not routinely engaging or seeking out people with these skill sets. Often organizations who develop campaigns spend a lot of time on formative foundational research, but very little concentrated on constant monitoring, which would allow for campaigns to constantly evolve with their audience. To date, there have been scarce opportunities to get public feedback on messages, especially in or close to real-time, when it can be used to make modifications to a campaign. This is not to say it has not been done; a CDC blog post notes collecting some real-time information on Zika viruses to inform their messages.¹³⁶

ENVIRONMENT/CONTEXT

The environment/context refers to the surroundings where messages are sent/received and the setting, scene, and expectations of the individuals involved.

- Information overload, a fragmented and siloed media environment, and ever-changing guidelines and scientific evidence present a complex and challenging context within which to convey cancer prevention messages.
- Cancer and other health outcomes and related behaviors are impacted by societal, environmental, and policy drivers that behavior change messaging cannot influence. Yet, messaging is rarely accompanied by changes to those drivers (e.g., increased availability of required services, policy change).
- Public relations or media advocacy campaigns that shape how a public health topic is covered can be helpful.



The environment/context refers to the surroundings where messages are sent/received and the setting, scene, and expectations of the individuals involved.

Campaigns are frequently competing with complex social factors, such as pervasive product marketing, powerful social norms, and behaviors driven by addiction or habit.¹³⁷ Messages alone cannot be fully effective in changing behaviors without supports within the environment. Despite this, messaging is rarely accompanied by more required services/products, more community-based programs, community mobilization, or enforcement or other policy/systems/environmental changes that would motivate/enable behavior change.¹³⁸ ¹³⁹ ¹⁴⁰ These aspects enhance message effectiveness and promote sustainability, as media campaign effects attenuate over time. Public relations or media advocacy campaigns that shape the way news and entertainment media treat a public health issue can also be a helpful approach.¹⁴¹ ¹⁴²

Interviewees said **communication campaigns need to be linked to opportunities for behavior change.** Communications related to discrete behaviors where community supports are more visible and accessible (e.g., cancer screening) have been more successful than those related to longer-term behaviors like nutrition and physical activity. Local and national governmental policies can strengthen work in cancer control and prevention. However, policies are not often meaningfully aligned with communication efforts that support associated norms, underscore enforcement of the policy, or otherwise provide support for the targeted behavior change. Local health departments may also struggle to implement complementary evidence-based practices due to low staff and few resources.¹⁴³ One interviewee noted that expecting people to act on messaging without concurrent social changes and social supports has led to ineffective messaging. Additionally, creating an environment where people are exposed to consistent messages from different sources is difficult. Often messages are pretested in a vacuum, which does not reflect the reality of an overcrowded media landscape teeming with competing and conflicting messaging.

The literature within the case study topic areas notes that competitive analyses could help organizations understand how best to remove some of the economic, policy, and sociocultural influences at play as well as account for other priorities competing for the audience's time and attention.¹⁴⁴ Diet and physical activity in particular are socially influenced.¹⁴⁵ Nutrition literature has noted that even if residents in a given neighborhood are influenced by mass media and nutrition education campaigns to the same extent as people living in another neighborhood, factors such as sensitivity to food prices and poor access to healthy foods may result in a lower consumption of fruits and vegetables.¹⁴⁶ Of note, commercial marketers use a multitude of techniques that extend beyond communication, such as pricing, sensory appeal (i.e., how appealing a product is to one or many senses), product bundling, promotions, and retail displays to influence eating choices.¹⁴⁷ The number of techniques used far outweighs health organizations' social marketing efforts, which are typically based on communication alone.¹⁴⁸

The increasingly fractured and cluttered media environment also poses a challenge.¹⁴⁹ Media campaigns are often implemented as part of a larger public health initiative. Media depictions of unhealthy behaviors, particularly in nutrition, are the norm. **The complexity of healthy eating behaviors creates the need for multiple tailored strategies beyond media communications. Complementary actions in different contexts are crucial.**¹⁵⁰ Long-term strategies to sustain initiatives are also needed, as behavior change is not immediate.¹⁵¹ Media campaigns incorporated into broader, multi-component community interventions could lay the foundation for subsequent behavior change.¹⁵² Media campaigns can also influence social norms, but more work is needed to understand how to do so effectively. Media campaigns traditionally have only examined the effect they have on interpersonal relationships, and not how interpersonal relationships on social media can affect media campaign uptake.¹⁵³

Media campaigns must consider the broader information environment in which messages are occurring; otherwise, public health messages may get lost in the shuffle.¹⁵⁴ With cancer specifically, trends in information seeking and prevention behavior shift over time.¹⁵⁵ Notably, pervasive fatalistic attitudes (e.g., "everything causes cancer") can negatively affect success of media campaigns.¹⁵⁶ Future communications work must consider environment and context in campaign design.¹⁵⁷ Additionally, future research should aim to understand how the effectiveness of cancer prevention campaigns depend on multilevel factors.¹⁵⁸

Culture is an understudied contextual factor that influences uptake of public health information and guidance.¹⁵⁹ In many cultures, family is fundamentally important, and the use of a cultural and generational lens may be effective. For example, Native American context is culturally specific. Before public health messages from the government or other leaders in power can be trusted, they must acknowledge the history of injustice and oppression perpetrated against marginalized communities. Historically, the government and other groups created messages that placed individual blame on people for their behavior and completely ignored the systems that impact their health outcomes and behaviors. Many groups of people are inundated with negatively framed messages from health organizations and the government, which often lowers community trust in their messaging. With respect to cervical cancer screening, women's attitudes toward HPV-based screening strategies were affected by their understanding of personal risk of infection, implication of a positive finding, and the overall screening purpose. Women who feared the implications of a positive finding were more likely to express negative attitudes toward screening. This was especially prevalent in women with strict religious or conservative cultural backgrounds.¹⁶⁰ We need to better understand how media campaigns can synergize with other approaches to influence diverse populations, age groups, and settings.¹⁶¹

The mechanisms of cancer are difficult to understand, notwithstanding the efforts to follow guidelines pertaining to screening, healthy eating, and physical activity. Furthermore, nutrition, physical activity, and cervical cancer screening are complex and multidimensional topics. In examining nutrition, physical activity, and cervical cancer screening, it is important to note that **ever-changing guidelines and contradictory information within these topics can contribute to decreased uptake of guidelines and healthy behaviors.** In all these topic areas, there is frequently changing content, which can lead to audiences disengaging because they do not have the health literacy skills to evaluate the messages.

Viewing communication as a social determinant of health may help in considering the wraparound environment that messages are disseminated within and how aspects of society play a role in creating supportive norms to enable successful messaging. Another interesting aspect of literacy is media literacy and whether people understand how their consumption activities may be revenue generators for corporations—a fact that corporations consider when designing interactive hashtag campaigns (e.g., a recent #WeAreKFC campaign, which encouraged people to post photos of themselves with Kentucky Fried Chicken).¹⁶² Interviewees also noted that the more forthcoming and transparent public health communicators are—especially about information they are unsure about or got incorrect, or changes they have made based on evolving research—the more likely they are to build trust with their audience.

It must be acknowledged that communication is not going to solve all problems, and we need to delineate what communications can and cannot do. A communications approach is appropriate when it can address the outcome. As one interviewee noted, there is a ceiling effect to what cancer-related communications messaging can achieve. Another interviewee called for a broader **systems change approach, building and maintaining connections across the full scope of organizations involved with cancer prevention.**

INTERFERENCE

Interference refers to anything that blocks or changes the source's intended meaning of messages.

- Campaigns are not designed with situational awareness of what specific misinformation is circulating.
- Efforts to control misinformation have not been successful and efforts to address it (like fact-checking) can backfire.
- Inoculating the receiver can help, including by building critical thinking numeracy/science skills as well as identity management (i.e., altering the way a person perceives themselves to reduce defense motivation. When motivated to defend their identity, a person is less likely to believe information that contradicts their existing beliefs.)
- Public health messengers should admit errors and unknowns, address changing information immediately, and strive for consistency and coordination across messengers.



Interference refers to anything that blocks or changes the intended meaning of the source's messages.

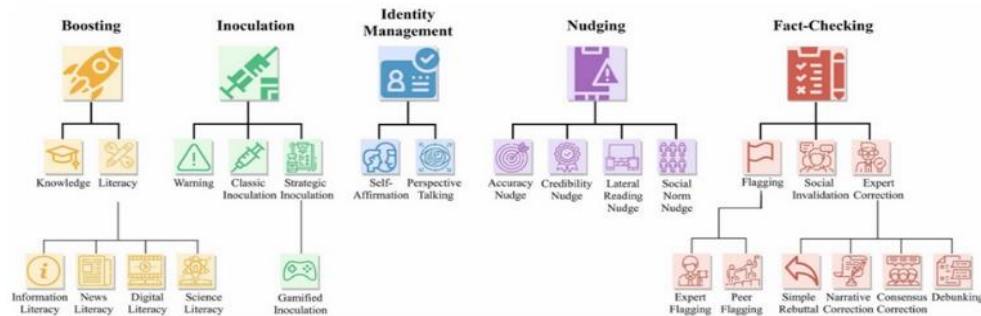
Little research has examined the scope, characteristics, and potential influence of cancer-related nutrition misinformation online.¹⁶³ The narrative of health misinformation often includes and promotes mistrust in authoritative institutions and experts.¹⁶⁴ The public may not understand scientific evidence and often cannot distinguish between “junk” and credible science.¹⁶⁵ It is difficult for health authorities to counter false claims and keep up with misinformation.¹⁶⁶ Exposure to contradictory information is positively associated with confusion.¹⁶⁷ This may lead people to doubt health recommendations more generally, including those that are not surrounded by conflict or controversy. Interestingly, in a study examining the impact of cancer misinformation among Latino/a Facebook users, users weren't engaging with content due to a direct interest in cancer prevention, but instead often just knew and wanted to support the person who posted the content or liked the images that were present.¹⁶⁸ Cancer nutrition misinformation is the most common cancer-related misinformation domain, and online nutrition content frequently uses vague phrases such as “anti-cancer,” “cancer-fighting,” and “cancer-busting,” which contribute to this problem.¹⁶⁹

Online misinformation is widespread and difficult to track and contain.^{170 171 172} Case study literature points to the fact that compelling personal stories containing misinformation can be especially difficult to correct.¹⁷³ It also can be harder to correct misinformation shared by a close friend with consonant cultural values.¹⁷⁴ Stories in news media that contradict long-established recommendations may be particularly confusing. This is especially salient for topics like nutrition, where guidelines and research are ever-changing (e.g., the use of low-fat diets).¹⁷⁵ It is important to acknowledge conflicting research in healthy eating campaigns and interventions to help people make sense of conflicting findings or advice.¹⁷⁶ The digital scan noted that posts that raised awareness for cancer prevention or shared tips for a healthy lifestyle were overshadowed by conspiracy theories, faulty nutrition advice, and doubts about government and the healthcare system.

One specific challenge related to misinformation is how fragmented channels and receivers have become. The fact that people get a variety of information from a variety of sources allows misinformation to flourish. The evolution of science, a field that is constantly changing, also poses challenges for health communications.

Interviewees noted that physical activity was “lucky” in comparison to nutrition in that it is a field with much less conflicting information. Most physical activity communication campaigns are generally pushing people to move more, although there is confusion around how much and what type of exercise “counts” as physical activity. An interesting facet of physical activity misinformation concerns movement during pregnancy. Pregnant people need physical activity, contrary to some prevalent misinformation.

Figure 1: Misinformation Intervention Map



Source: Ziemer, C.-T., & Rothmund, T. (2024). Psychological underpinnings of misinformation countermeasures: A systematic scoping review. *Journal of Media Psychology: Theories, Methods, and Applications*. Advance online publication.

Notably, misinformation is not always a result of intent to do harm; often, people share misinformation in an attempt to be helpful. Counter efforts against misinformation (e.g., fact checking) usually achieve only a limited impact or can even backfire by further spreading misinformation.^{177 178} Overall, there are a variety of misinformation interventions—boosting, inoculation, identity management, nudging, and fact-checking —each with differing subdimensions (see Figure 1 above).

The majority of misinformation efforts are fact-checking interventions and are poorly linked to basic psychological theory and not geared toward reducing motivated reasoning.^v Content control (i.e., either removing misinformation or promoting high-quality information) has been attempted, but is often unsuccessful.¹⁷⁹ **One promising approach is identity management, which alters the way a person perceives themselves to reduce defense motivation.** When motivated to defend their identity, a person is less likely to believe information that contradicts their existing beliefs.¹⁸⁰ Interventions could also target the subset of participants who use social media to make decisions.¹⁸¹ Future research should examine the susceptibility of different sociodemographic groups to misinformation and the role of belief systems on the intention to spread misinformation.¹⁸²

“Inoculating” the receiver against misinformation is another promising approach. Ways to induce resistance to persuasion include:

- Prior commitment (e.g., having the person think about their initial position).
- Inducing anger, anxiety, or other resistant motivational states.
- Conferring resistance by anchoring one’s initial stand to other beliefs/values/esteemed reference groups.
- Educating people in critical thinking by specifically recognizing persuasion attempts, detecting weaknesses in attacking arguments, and summoning counterarguments.
- Showing models of others resisting persuasive pressure.

^v [Motivated reasoning](#) is the human tendency to subconsciously seek information that affirms what we already believe to be true.

- Pre-exposing believers to weakened belief-threatening materials, which stimulates belief defenses without overcoming them.¹⁸³

It's crucial to build the public's analytic reasoning, critical thinking and numeracy skills, and understanding of scientific research and the scientific method.¹⁸⁴ A number of other necessary steps that public health messengers rarely take are addressing uncertainty and changing information that may exist (and doing so immediately and transparently), striving for consistency and coordination between different sources of information, admitting errors and unknowns whenever appropriate, and identifying sources of information.¹⁸⁵

Interviewees noted that the best way to counter misinformation is to be known as a trusted source of information because there is simply not enough capacity to address every piece of information. One interviewee added, "Say the fact, say why it's true, and don't repeat misinformation to give it staying power." Another interviewee noted that it can be difficult for governmental organizations to combat misinformation, and that nonprofit organizations such as ASTHO may have more ability to be at the forefront of this. Interviewees also shared that there is a spectrum of misinformation, and it is difficult to know the specific effects of the various forms of misinformation. One interviewee distinguished between three types of misinformation: topic-adjacent (linking to misinformation about an entirely different topic), general conspiracy theory, and topic-related (factually inaccurate information). This interviewee suggested that topic-related misinformation was the most prominent type to address and should be combatted by campaigning on the positive benefits of healthy behaviors. Yet another interviewee noted that the pre-bunking (i.e., preventing the effectiveness of misinformation by proactively providing tools and strategies that provide a defense against misinformation before it is shared) and de-bunking methods (approaches that work to disprove misinformation after it occurs) of combating misinformation only work when creators have situational awareness of public discourse, which public health typically does not have. Creating a method of collecting misinformation may be a helpful first step. Finally, another interviewee recommended staying ahead of what misinformation could be, rather than chasing and responding to it. One way of doing this is reframing messages according to values (i.e., if someone sees a message as aligning with their values, they will be less likely to believe information that runs counter to it).

EFFECTS

Effects are outputs, outcomes, and evaluation measures.

- Campaigns can generate moderate to strong influences on cognitive outcomes, less on attitudinal outcomes, and still less on behavioral outcomes.
- Evaluating and isolating the independent effects of public health messaging is extremely difficult and rarely done well.
- Research and evaluation around messaging are weak and inconsistent; formative research, process evaluation, and outcome evaluation would benefit from more robust metrics (including those that capture skills, behaviors, health outcomes, and unintended consequences) and metrics that are tracked across initiatives.
- There is also a need for stronger audience analysis, message testing, channel testing, and usability testing.



Effects are outputs, outcomes, and evaluation measures.

Overall, evaluation plans for health communication strategies need to be strengthened. Much stronger formative research and evaluation is necessary. Isolating the independent effects of mass media campaigns is difficult; rarely do studies measure inputs and outcomes, and when they do, it is not consistent across studies, prohibiting meta-analyses. Communication campaigns are often part of multicomponent interventions, and the individual contributions of each component to an outcome are unknown and/or not measured. Many studies are rated as unclear or at high risk of bias due to incomplete outcome data. One article noted the chasm between what is said to be conducted in literature (e.g., “formative research”) and the specific details of implementation.¹⁸⁶ Furthermore, there are several different types of campaign effectiveness: definitional effectiveness (e.g., getting a social phenomenon defined as a social problem or elevating it on the public agenda), contextual effectiveness (e.g., impact within particular contexts, such as education vs. enforcement vs. engineering), cost-effectiveness comparison (e.g., prevention vs. treatment, addressing certain problems over others), and programmatic effectiveness (e.g., testing campaign outcomes relative to stated goals and objectives).¹⁸⁷ If organizations evaluate their campaigns, they most likely only target programmatic effectiveness.

It’s essential to do stronger research on audience analysis and formative and summative evaluation. It’s also crucial to test messages (including testing of message concepts as well as actual messages before they are finalized) and evaluate the channel, source credibility, and usability of the message.¹⁸⁸ Concept and messaging testing research should aim to: 1) assess the attention value of a message, 2) measure its comprehensibility, 3) determine its relevance to the intended audience, 4) identify strengths and weaknesses, and 5) gauge any sensitive or controversial elements.¹⁸⁹ Testing should also evaluate message recall and recognition levels.¹⁹⁰

The public health communications field must address the gap in long-term, longitudinal studies of exposure to cancer-related information and misinformation. Additionally, further research should focus on components of social media, as opposed to the platforms themselves, so that findings are more generalizable as platforms change.¹⁹¹

Interviewees noted that there is a lack of best practice standards for prevention-focused social media analysis. Cancer-related messaging campaigns also need stronger evaluation plans that are developed along with the campaign. **The typical evaluation metrics used in messaging campaigns are valuable from a marketing perspective, but not for the public health field.** For example, many campaign evaluations, especially on social media, look only at engagement metrics and don’t examine changes to knowledge, behavior, or social norms. All types of engagement are treated as equal and positive, the impact of non-linear and bidirectional communication and impact pathways are not considered, and the impact on outcomes of most interest to public health are often absent entirely.¹⁹²

Metrics *must* be useful to a multidisciplinary group of people. Interviewees suggested there is an **important role for CDC to play in advancing rigorous evaluation protocols.** While the randomized controlled trial is the gold standard in evaluation in other areas of public health, this is not the goal within health communication evaluation. Community-wide implementation requires process evaluation and implementation modification based on lessons learned.¹⁹³ Summative evaluation should measure the specific factors a campaign or message is trying to change: knowledge and literacy, beliefs and perceptions, attitudes and values, salience priorities,

efficacy, and skills.¹⁹⁴ It is also important to use a sensitive outcome evaluation design that reduces threats to internal validity and enables stronger conclusions to be drawn about the campaign's influence on attitudes and behaviors.¹⁹⁵ Evaluations should also consider unintended consequences and outcomes over the long term.¹⁹⁶

Additionally, there are few economic evaluations (e.g., cost-effectiveness research) tied to media campaigns. There needs to be more widespread use of theories of change and logic models (i.e. the blueprints of evaluation strategies), which can boost the likelihood of success. Successful message creation, implementation, and development requires the involvement of researchers and multidisciplinary leaders (e.g., public health, health communications, marketing, data science, disease-specific clinical expertise, behavioral science, social marketing, qualitative and quantitative methodology expertise). Specifically, interviewees highlighted that complex survey and evaluation tools fail to engage the public, a strengths-based approach to data analysis is often lacking, and evaluations do not assess perceived message effectiveness or behavior/outcome change. Interviewees emphasized that it's vital to incorporate structures for continued monitoring and real-time message and campaign modification in response to feedback. Interviewees noted, however, that such structures are rare in public health communications, despite being extremely common in commercial advertising.

Although study designs are typically weak, in aggregate, research shows that mass media campaigns have the capacity to generate moderate to strong influence on cognitive outcomes, albeit less influence on attitudinal outcomes, and still less influence on behavioral outcomes.¹⁹⁷ Average effect sizes on behaviors are small, so evaluations need to use a large enough sample to detect small effects.¹⁹⁸ Notably, behavior change is more likely when the target behavior is a one-time or episodic occurrence (e.g., screening, vaccination, children's aspirin use) rather than a habitual behavior (e.g., food choices, physical activity).¹⁹⁹ Social marketing efforts with positive, statistically significant findings are also more likely to apply audience insights and cost-benefit analyses to motivate behavior change.²⁰⁰ As discussed in previous sections, the likelihood of behavior change is also influenced by exposure, message quality, and the integration of mass and interpersonal communication and social change strategies. All of these factors need to be considered when designing a messaging campaign.

Discussion

This project sought to explore the reasons cancer prevention messaging has often not resonated with its intended audience nor had the effect it was seeking. The literature scan, subject matter expert interviews and digital scan, organized around the Essential Components of Communication Framework, resulted in numerous findings and action items presented below.

Summary of Results

Based on the literature review, subject matter expert interviews, and digital scan conducted for this project, the primary reasons cancer prevention messages have not succeeded (and the elements of health communication they relate to) are:

- Public health communications professionals do not get to know the intended audience, and do not tailor the content and framing of a message based on both audience demographics and psychographics (audience values, cultural dimensions, interests, behaviors, and personality traits). Public health communications professionals do not co-create messages with communities or work closely with them to identify what sources and messages they will trust most. They also do not meet audiences where they are; messages should be simple and personable, acknowledge fears, and build empathy and connection, as opposed to relying on too much text, too many facts, and staged photographs. There is a need for stronger audience analysis, including message, channel, and usability testing. [These concepts are related to the RECEIVER, MESSAGE, SOURCE, and EFFECT elements of the communications framework, as defined earlier in the report.]
- Public health communications professionals do not use personal narratives from real people (including in the forms of on-camera testimony, photos of real individuals as opposed to stock photos, or direct quotes attributed to an individual) and storytelling (including embedding factual information in fictional narratives) enough. Health communications inadequately reframes messages to appeal to emotions, social norms, or social responsibility (e.g., anti-industry messaging); to strengthen self-efficacy; or to address psychological needs. [These concepts are related to the MESSAGE element of the communications framework, as defined earlier in the report.]
- Public health communications professionals do not often use simple and highly visual messages that stress the immediate benefits of the activity. Highlighting “cancer prevention” in conjunction with nutrition and physical activity is *not* a promising strategy; rather, stressing the immediate benefits of these choices leads to greater uptake and behavior change. [These concepts are related to the MESSAGE element of the communications framework, as defined earlier in the report.]
- At the same time, public health communications professionals need to recognize that the “perfect message” does not exist, as there are too many behaviors/drivers and audiences. Homogenous messages are ineffective. [These concepts are related to the MESSAGE element of the communications framework, as defined earlier in the report.]

- It's necessary to use a more multidisciplinary approach to message creation that involves a variety of professionals playing to their strengths. Public health organizations specifically should build on their skills of collaboration, co-design, research, and evaluation. Those trained in communication science should work on message design and delivery, and local partners should tailor messages to their communities. [These concepts are related to the MESSAGE element of the communications framework, as defined earlier in the report.]
- What matters most to receivers is that they identify with and relate to the sources of a message. Other source characteristics that matter include being engaging, credible, and relevant to the audience. Notably, the public currently questions the credibility of CDC, which means it can be more effective to partner with other organizations that are perceived as credible to deliver messaging. Additionally, patients and doctors may be more effective messengers than celebrities. Power dynamics between sources and receivers are also an important consideration. Values-based messaging from in-group messengers is especially important to address issues that have been politicized. Trusted messengers are especially important to address inequality. [These concepts are related to the SOURCE element of the communications framework, as defined earlier in the report.]
- Public health messaging and campaigns often fail because they lack sufficient exposure; they have not reached enough people frequently enough to elicit change. In addition, messaging may not be reaching those populations and regions most affected by cancer. [These concepts are related to the CHANNEL element of the communications framework, as defined earlier in the report.]
- Public health communications professionals do not work to understand which channels are used by which receivers and then tailor the channel to the audience. Public health communications professionals also do not tailor the content to the channel. Channel preference is constantly evolving, and in an age of social media, the actual channels, the kind of content they accommodate, and what the algorithms promote most are also ever-changing. Public health communications professionals treat social media as a one-way delivery system for information, instead of the two-way exchange it is designed to be (and that users expect it to be). Public health communication professionals would also benefit from studying and learning from effective tactics used by influential social media sources that spread messages in opposition to public health. [These concepts are related to the CHANNEL and FEEDBACK elements of the communications framework, as defined earlier in the report.]
- Groups based on a larger racial or ethnic category are treated as a monolith, and health communications professionals do not work to understand the nuances within each group. Messaging also largely ignores historical context and past and current injustices. [These concepts are related to the RECEIVER, ENVIRONMENT, and CONTEXT elements of the communications framework, as defined earlier in the report.]
- Public health communications professionals do not often collect feedback or use the feedback they do collect to modify campaigns in a constantly evolving communication environment. Furthermore, public health messaging/campaigns can backfire, including when receivers regard messages as offensive, boring, preachy, confusing, misleading, irrelevant, unbelievable, or uninspiring. Rarely do health

communications professionals examine all elements of a receiver's response to a message (including post-action thoughts and whether and how they share the message with others) and then use this information to nimbly modify campaigns. [These concepts are related to the FEEDBACK element of the communications framework, as defined earlier in the report.]

- Information overload, a fragmented and siloed media environment, and ever-changing guidelines and scientific evidence present a complex and challenging context within which to convey cancer prevention/public health messaging. More broadly, cancer and other health outcomes and related behaviors are impacted by several societal, environmental, and policy drivers that behavior change messaging cannot influence. Messaging efforts are strongest when aligned with systems changes to those drivers. [These concepts are related to the ENVIRONMENT and CONTEXT elements of the communications framework, as defined earlier in the report.]
- Public health communications professionals know misinformation abounds but do not know the specifics of the characteristics and potential influence of misinformation. Campaigns are not designed with situational awareness of what misinformation is circulating. [These concepts are related to the INTERFERENCE element of the communications framework, as defined earlier in the report.]
- Fact-checking and other approaches to addressing misinformation can backfire, and efforts to control misinformation content have not been successful. Inoculating the receiver against misinformation may be more promising and includes efforts to build the public's critical thinking/numeracy/science skills, as well as identity management (i.e., altering the way a person perceives themselves to reduce defense motivation). To decrease the spread of misinformation, it is important to build a reputation as a trusted source of information, state facts, avoid repeating misinformation, and work with partners to ensure messaging consistency. Public health messengers should admit errors and unknowns, immediately address changing information, and strive for consistency and coordination across messengers. [These concepts are related to the INTERFERENCE element of the communications framework, as defined earlier in the report.]
- Campaigns can generate moderate to strong influences on cognitive outcomes, albeit less on attitudinal outcomes, and still less on behavioral outcomes. Evaluating and isolating the independent effects of public health messaging and campaigns is extremely difficult and rarely done well, as no widely accepted best practice standards for evaluation of cancer prevention messaging exist. Research and evaluation around messaging and campaigns are weak and inconsistent. Formative research, process evaluation, and outcome evaluation would all benefit from more robust metrics that are tracked across initiatives. [These concepts are related to the EFFECT element of the communications framework, as defined earlier in the report.]

Campaign success is more likely if the campaign building principles (formative research, audience segmentation, message design, channel placement, process evaluation, and use of theory) are used as part of campaign design and planning.²⁰¹ While these are core principles of health communication, the findings from this project demonstrate that they are still not widely used in cancer prevention communication.

Moreover, comparing the findings from this report with seminal health communication best practice documents from CDC, National Cancer Institute, and World Health Organization, along with a cancer-specific communications guide from the George Washington University Cancer Center, reveals some notable similarities and differences.^{202,203,204,205,206,207}

- While the idea of knowing and segmenting your audience is mentioned across many of these resources, there is little mention of specific psychographics (e.g., values, cultural dimensions, personality traits) that can be used to segment an audience, nor is there mention of co-designing messages with your audience.
- Many of these resources provide helpful practical guidance around word choice and organizing content, and some touch on concepts like storytelling, social norms, and self-efficacy. However, none of these guides explore key messaging appeals that are often lacking in public health messaging, including addressing psychological needs, aligning with cognitive heuristics (i.e., shortcuts), and appealing to emotions.
- These resources do not underscore the importance of exposure strategy to public health messaging (i.e., determining how often an audience needs to see/be “exposed” to messages to have them resonate and “sink in” and then ensuring the campaign is designed to achieve that level of exposure).
- The idea of picking a channel that will reach and resonate with your audience is noted in many of these resources, but they do not explore how public health messaging must evolve to align with an ever-changing media environment in which the channels, as well as the kind of content they accommodate and promote, are a moving target.
- While misinformation is highlighted as a challenge in these resources, their recommendations for combatting misinformation do not reflect the latest research, including the importance of and effective strategies for inoculating the receiver.
- While evaluation is underscored as important in these resources, they do not explicitly call out the need for more nimble application of continuous monitoring feedback to modify campaigns and messaging in real time, nor do they mention public health campaign evaluations’ overreliance on marketing metrics (such as exposure and engagement) and insufficient tracking of public health metrics (such as behavior change and health outcomes).

Action Items

The findings of this report and the digital scan offer some important insights and recommended action steps for public health communicators and agencies/organizations, including CDC.

- Co-create and co-design messaging with communities, and ensure messages are specific to the local community and context. Meet audiences where they are and develop simple, personable, easy-to-digest messages.

- Rely on communications experts to develop and design messages and tell stories, as they have an in-depth understanding of what characteristics to segment an audience by, what messaging strategies would best appeal to psychological needs and emotions, and how to tell stories that resonate with a particular audience.
- Reach out to credible third-party organizations to disseminate the messaging and stories, especially in light of the public questioning CDC's credibility. Consider what role the public health organization plays in cancer prevention and health communication and how it may be beneficial to disrupt historical roles where the organization develops and deploys the entire messaging campaign to one where it provides the evidence-based information that underlies messages to partnership organizations that work with their communities to drive message design and modify content to fit their populations. Aspects of this idea are currently being used in some campaigns with HHS ([Move Your Way](#)) and CDC ([Screen for Life, Inside Knowledge](#)).
- To connect with people, acknowledge the prevalent fear and anxiety surrounding cancer prevention within your messages.
- Share authentic personal stories, particularly on social media. Stories can be told by people who have survived cancer, people with a family history of cancer, or medical professionals who have helped patients prevent and/or treat cancer. Stock images should be avoided.
- Collaborate with community organizations on the ground to identify and engage trusted sources and to modify content to appeal to their communities.
- While working with communication experts and community organizations on campaign and messaging development and dissemination, play to public health's strengths in terms of providing evidence-based information and establishing robust evaluation metrics and standards, including those related to tracking outcomes of interest to public health. Public health messengers should also admit errors and unknowns, immediately address changing information, and strive for consistency and coordination across messengers.
- Establish structures and processes that allow your organization to nimbly modify messaging and campaigns based on community feedback as well as feedback from process evaluation/continuous monitoring, which should examine the exposure, receptivity, and impact of messages. This includes studying your critics.
- Better align messaging and dissemination strategies with the ever-evolving and increasingly fragmented media environment, accounting for how changing social media platforms and algorithms impact what content is prioritized and shared with audiences. Different approaches are needed for different platforms. For example, the digital scan notes tackling misinformation on X, telling stories on Facebook, and hosting conversations with experts on Reddit.

- Get smarter about misinformation: track what information is out there and get ahead of the misinformation via inoculation strategies, including improving the public's critical thinking and media literacy skills.
- Public health organizations generally, and CDC in particular, need to take a leadership role in (1) determining standards to analyze communication data, (2) creating content monitoring systems to understand campaign effects and environments, and (3) ensuring campaign evaluation metrics have utility for both marketing *and* public health.

Appendix A: Interview Guide and Participant Lists for Interviews and Roundtable

Interview Guide for Subject Matter Expert Interviews

Improving the Reach and Actionability of Cancer Public Health Communication Messages:
Draft Key Stakeholder Discussion Guide and Questions

Sources for Best Practices:

- [Implementation Guide for Key Informant Interviews \(KIIs\) and Listening Sessions](#)

Project Question (this question will help to guide our discussion questions below)

Given that the aforementioned efforts have often fallen short, explore why that might be, answering the question, “What are some reasons cancer prevention messaging has not resonated/succeeded?”

(To be filled out by facilitator/note-taker)

Name of Interviewee:

Organization:

Contact Information:

Name of Interviewer(s):

Date:

Introductory Script

Welcome and Introductions: Hello, my name is [name/title/team], from ASTHO, and I would like to thank you for joining us today for this discussion on cancer public health communication messages. I am also happy to introduce [name], who will be our notetaker for this session.

Informed Consent *(if needed)*

Facilitator: Read the script for informed consent below to the participant(s) after the initial introduction of the objective of the discussion session.

Your participation in this stakeholder discussion is voluntary, and there will be no individual benefit from your participation. There will not be any negative effects if you decide you do not want to participate. Your responses will be written anonymously and reported in aggregate. No one will know how you responded in the final report. We would like to hear your honest opinions about the topics we discuss. There are no right or wrong answers to any of our questions. We encourage you to speak openly and honestly about your opinions and experiences. You can choose not to respond to a question at any time. You can also end the discussion at any time. If one of my questions is unclear, please stop me and I'll ask it in a different way. All information collected from these sessions will be stored securely and kept confidential. **None of the comments you make during today's discussion will be linked with your name in any way.** The discussion should take about 45-60 minutes. For more information about this project, contact chronicdisease@astho.org.

- **Do you agree to participate?**

Yes/No

(If respondent answers no, say “Thank you for taking the time to speak with us today.”)

In addition to taking notes, we would like to audio record this session. The recording will help us to summarize today’s discussion concisely.

- **Do you agree to have this discussion recorded? The data from the recordings will be anonymous.**

Yes/No

[If respondent answers no, let them know the session will not be recorded but notes will be taken. Then skip the next section and begin the discussion at Brief Situational Update.]

[If respondent answers yes, begin recording and continue to the next section.] The recording has begun and, just so we have a record of your agreement to have this discussion recorded, I’m going to repeat the question. Do you agree to have this discussion recorded?

Brief/Information on Project and Situational Update

In this project, ASTHO aims to determine the current state of public health cancer communication messaging and the role that the public health system plays in addressing the national cancer burden. More specifically, we are exploring why certain cancer communication messages have missed the mark and not resonated with audiences. Additionally, through these stakeholder discussions, we hope to glean from you and other experts areas of strength, areas for improvement, and what additional resources are needed to improve cancer communication message development, delivery, and corresponding action. In addition to conducting stakeholder discussions, we are concurrently conducting an exhaustive review of the literature that will shine a light on evidence-supported effective communications strategies, techniques, tools, and resources for cancer risk and prevention from the public health and communications perspective. We are using cervical cancer screening, nutrition, and physical activity as case studies for this review.

Question Bank

The following list represents the entirety of questions to inform the project. It is anticipated that for each interview participant, a tailored interview guide will be created, selecting questions from this list that best speak to the participant’s expertise and prioritizing the questions so the most important ones for that participant are listed first. We may also add targeted questions based on what we find in the literature to confirm/further explore preliminary findings from the literature scan.

A. Field Experience Information (Can be asked of any participant.)

1. Please tell us a bit about yourself and your role within your current organization.
2. What are some of the major cancer-related communications and messaging you have seen work really well/achieve desired outcomes (those that you have either worked on within your time at **X** or noticed from the field generally)?
 - a. What are the key elements that made it successful?

- i. Note eight components from the communications framework (the eight essential components of communication include thinking about the source, the message, the channel, the receiver, feedback, the environment, context, and interference.)
 - b. What do you think are the major facilitators of successful cancer-communications campaigns?
 3. What are some major cancer-related communications and messaging you have seen that have not achieved the desired outcomes?
 - a. What do you think are some of the factors that contributed to these failures?
 - b. What do you think are the major barriers to successful cancer communications campaigns?
 4. In general, are there any other key things that you think need improvement regarding crafting successful cancer-related health communication? (Consider the source, the message, the channel, the receiver, feedback, the environment, the context, and interference.)
 5. How do you measure/evaluate the success of messages or how have you seen it measured/evaluated? What do you think needs improvement regarding how we measure/evaluate cancer-related communications and messaging?
- B. *General Health Communication Knowledge (To be asked of health communications experts, potentially tailored to their scope of expertise.)*
 1. What gets overlooked by communications when developing “successful” messages?
 - a. What are some strategies to improve cancer-related communications? *(You can probe here about specific strategies they/their organization use, e.g., around innovative message framing, use of entertainment media, etc.)*
 2. Given the global nature of cancer prevention, how do you address cultural differences and diverse settings when developing communication messages and strategies? Are there specific challenges or successes in tailoring messages to different populations
 - a. Who helped create the messaging, who served as the “source” of the message, and which channels did you use to spread the messaging? How do you think those choices impacted the success or lack of success?
 - b. To what extent does your organization actively seek feedback from the public regarding cancer prevention and screening messages? How is this feedback incorporated into refining communication strategies?
 3. With the advancements in technology, how do you think leveraging digital platforms, social media, or emerging technologies can positively impact cancer prevention and screening communication strategies?
 4. With the prevalence of health-related misinformation, how does your organization proactively address and mitigate misconceptions surrounding cancer prevention and screening? Are there specific challenges you have encountered in this regard?
 5. What do you think is important to know about the context and environment in order to craft successful messages?
- C. *Cervical Cancer Screening Communications (To be asked of participants with cervical cancer health communications expertise.)*

6. What is important to keep in mind regarding crafting successful health communication around cervical cancer screening specifically?
 - a. The eight essential components of communication include thinking about the source, the message, the channel, the receiver, feedback, the environment, the context, and interference. What do you think messages about cervical cancer screening have been successful with?
 - b. What do you think needs improvement regarding these messages?
- D. Physical Activity Communications *(To be asked of participants with physical activity health communications expertise.)*
 1. What is important to keep in mind regarding crafting successful health communication around physical activity specifically?
 - a. The eight essential components of communication include thinking about the source, the message, the channel, the receiver, feedback, the environment, the context, and interference. What do you think messages about physical activity have been successful with?
 - b. What do you think needs improvement regarding these messages?
- E. Nutrition Communications *(To be asked of participants with nutrition health communications expertise.)*
 1. What is important to keep in mind regarding crafting successful health communication around nutrition specifically?
 - a. The eight essential components of communication include thinking about the source, the message, the channel, the receiver, feedback, the environment, the context, and interference. What do you think messages about nutrition have been successful with?
 - b. What do you think needs improvement regarding these messages?

Subject Matter Expert Interview Participants

- Doreen Bird, PhD, MPH, researcher, University of New Mexico Health Cares Health Disparities Center
- Jon D. Brown, founder, Black Men's Health
- Elisia Cohen, PhD, MA, director, Hubbard School of Journalism and Mass Communication, University of Minnesota
- Angie Craddock, ScD, MS, MPE, principal research scientist and deputy director, the Prevention Research Center on Nutrition and Physical Activity, Harvard T.H. Chan School of Public Health
- Ysabel Duron, executive director, Latino Cancer Institute
- Kate Folb, principal investigator and director, Hollywood, Health, and Society
- Robert Hornick, PhD, faculty director of the Health Communication Core of the Dana-Farber/Harvard Cancer Center (DF/HCC) and founding director of DF/HCC's Enhancing Communications for Health Outcomes Laboratory, University of Pennsylvania Annenberg School of Communications
- Malorie Polster, physical activity advisor, HHS Office of Disease Prevention and Health Promotion
- Michelle Segar, director, Sport, Health, and Activity Research and Policy Center, University of Michigan
- Joe Smyser, PhD, MPH, CEO, The Public Good Projects
- Monique Mitchell Turner, PhD, chair, Department of Communication, Michigan State University
- Robin Vanderpool, DrPH, chief, Health Communications and Informatics Research Branch, National Cancer Institute
- Vish Viswanath, PhD, faculty director, Health Communication Core of the Dana-Farber/Harvard Cancer Center (DF/HCC); founding director of DF/HCC's Enhancing Communications for Health Outcomes Laboratory, Harvard University/Dana Farber Cancer Institute

Roundtable Participants

- Kelly Hendershot, LGSW, LMSW, vice president of mission delivery, Cancer Support Community
- James E. Williams, Jr., chairman, Pennsylvania Prostate Cancer Coalition
- Angela Moore, DrPH, MPH, program evaluation and partnership lead, Comprehensive Cancer Control Branch, Division of Cancer Prevention and Control, Centers for Disease Control and Prevention
- Michelle Mollica, deputy director, Office of Cancer Survivorship, National Cancer Institute
- Irina Iles, PhD, MPH, program director, Health Communication and Informatics Research Branch, Behavioral Research Program, National Cancer Institute
- Liddy Hora, program manager, Comprehensive Cancer Control Initiatives, American Cancer Society
- Tricia Hernandez, director, community engagement, Leukemia and Lymphoma Society

Roundtable Interview Guide

Introductory Script

Welcome and Introductions: Hello, my name is [name/title/team], from ASTHO, and I would like to thank you for joining us today for this discussion on Cancer Prevention Public Health Communication Messages. I am also happy to introduce [name], who will be our notetaker for this session, and [name], who is part of the PoP Health team and will be leading the synthesis of information we glean from these conversations.

Brief/Information on Project and Situational Update

In this project, ASTHO aims to determine the current state of public health cancer prevention communication messaging and the role that the public health system plays in addressing the national cancer burden. **More specifically, we are exploring why certain cancer prevention communication messages have missed the mark and not resonated with audiences. Our focus is on prevention-related communication, and we are especially interested in understanding what does and does not work well with respect to the following elements of communication: the source of a message, the message content and format itself, the channel through which the message is delivered, the characteristics of the audience, the audience response to a message, the broader environment and context within which messages are received, misinformation and other types of interference with a message, and the ultimate impact a message has. Notably, we are using cervical cancer screening, nutrition, and physical activity as case studies for this review.**

Through these stakeholder discussions, we also hope to glean from you and other experts areas of strength, areas for improvement, and what additional resources are needed to improve cancer prevention communication message development, delivery, and corresponding action. In addition to conducting stakeholder discussions, we are concurrently conducting an exhaustive review of literature that will shine a light on evidence-supported effective communications strategies, techniques, tools, and resources for cancer risk and prevention from the public health and communications perspective.

Before we get started, we'd like to formally get your consent to proceed with the interview. Please note - **none of the comments you make during today's discussion will be linked with your name in any way.** The discussion should take about 60 minutes.

Do you agree to participate?

Yes/No

(If respondent answers no, say "Thank you for taking the time to speak with us today.")

In addition to taking notes, we would like to audio record this session. The recording will help us to summarize today's discussion concisely.

Do you agree to have this discussion recorded? The data from the recordings will be anonymous.

Yes/No

[If respondent answers no, let them know the session will not be recorded, but notes will be taken. Then skip the next section and begin the discussion at Brief Situational Update.]

[If respondent answers yes, begin recording and continue to the next section.] The recording has begun and, just so we have a record of your agreement to have this discussion recorded, I'm going to repeat the question. Do you agree to have this discussion recorded?

Instructions: As we move into the virtual roundtable, it would be helpful that, if you would like to answer a question, kindly raise your hand and I will call on you.

Questions for Roundtable Participants

Thinking about your experience, what are some of the major cancer-related communications and messages you have seen work really well?

What were some key elements that led to this outcome?

Let them answer the question first. Then, if needed, probe on additional components from communications framework that they haven't touched on yet (source, message, channel, receiver, feedback, environment/context and interference).

Conversely, what are examples of cancer-related communications or messages that have missed the mark? What were some key elements that led to this outcome?

Let them answer the question first. Then, if needed, probe on additional components from communications framework that they haven't touched on yet (source, message, channel, receiver, feedback, environment/context and interference).

In general, what needs improvement to craft successful cancer-related health communication?

What frequently gets overlooked when developing these messages?

What is the field getting wrong?

Let them answer the question first. Then, if needed, probe on additional components from communications framework that they haven't touched on yet (source, message, channel, receiver, feedback, environment/context and interference).

How effectively do you believe current cancer prevention messages address the needs and concerns of diverse communities, including underserved populations?

What have you seen work well to address cultural differences, diverse settings, and/or diverse populations when developing communication messages and strategies?

Are there specific challenges or successes in customizing messages for different audiences?

Considering the widespread dissemination of health-related misinformation, how does your organization take proactive steps to address and mitigate misconceptions surrounding cancer prevention and screening? If any, what specific challenges have you encountered?

What role do you believe survivor stories and testimonials play in shaping public perceptions and behaviors related to cancer prevention?

In your opinion, what steps can be taken to more effectively incorporate the voices and insights of cancer survivors into the dissemination of cancer prevention guidance and messaging?

How do you measure/evaluate the effectiveness of messages, or how have you seen it measured/evaluated? What do you think needs improvement for how we measure/evaluate cancer-related communications and messaging?

In closing, does anyone have any final thoughts, comments or “aha moments” to wrap up today’s conversation?

Appendix B: Full Digital Scan Report

SCAN OF SOCIAL MEDIA MESSAGES AND CONVERSATIONS RELATED TO CANCER AND CANCER PREVENTION

DRAFT Report

Period Covered: April 2022 – May 2024

RIESTER INFLUENCE
Arlington, VA

July 12, 2024

TEAM CREDITS

Robert Johnson.....Project Director
Hannah Woulfe.....Project Manager
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INTRODUCTION

Cancer prevention communication on social media is impacted by the same forces that have overtaken and occupied other topics online. Thus, it is important for organizations to understand the complex environments they will encounter and the attitudes they will experience when talking about cancer and related topics. This report reviews recent online conversations surrounding cancer prevention for public health and communication professionals to understand how messages are disseminated on social media platforms and how the public regards cancer prevention topics, which can be used to inform future campaigns. The two main research questions are:

1. What are some reasons cancer prevention messaging has not resonated/succeeded?
2. What recommendations would improve cancer prevention messaging on social media?

Data from April 25, 2022 to May 17, 2024 were collected with the help of two social media listening tools. Mentions of cancer prevention on seven of the most popular social media platforms were gathered using the Boolean search method. A total of three searches were conducted: Comprehensive Cancer Prevention, HPV Screening, and Physical Activity and Nutrition. The data were then analyzed according to the source, message, feedback, channel, and interference, to maintain alignment with other work performed as part of this project. Topline findings revealed a varied user demographic, with traditional news media, individual medical advice accounts, and celebrity influencers playing pivotal roles in shaping the conversation. Results also indicated that personal narratives that allow users to connect on an emotional level are more effective at spreading awareness for cancer prevention. The findings further expose high levels of interference caused by misinformation, conspiracy theories, and distrust or skepticism toward government and medical institutions, which are barriers to successful cancer prevention messaging.

Our recommendations are to embrace storytelling to better connect with audiences. We also believe campaigns should focus on geographic areas with the highest levels of cancer cases using CDC data to direct that outreach. An enormous obstacle is the prevalence of misinformation and a continued lack of institutional credibility that continues to manifest in online conversations. These challenges can be overcome but given the negative tone of most social media content reviewed in this scan, it is important to maintain a realistic perspective about what can be accomplished in this forum.

METHODOLOGY

This scan assesses how the individuals and organizations discuss cancer prevention on social media and identifies the potential reasons cancer prevention messaging from public health and communications professionals has failed to resonate with audiences. It is important to note that a social media scan inherently relies on both the opinions in the social media posts and the expert evaluation of those conducting the scan. Information presented in this scan relies on the data gathered from social media posts. Data are from April 25, 2022 to May 17, 2024 and limited as much as possible to posts originating in the United States and its territories. Due to geographical data mining limitations, the location of some data could not be identified.

The data and information for this scan were gathered using two social media listening tools, Meltwater and Mention, which differed slightly in their collection and analysis capabilities. Meltwater allows users to monitor, research, and analyze content across the entire social web, with real-time and historical access to social conversations. Mention relies on data gathering to review forums and social media platforms and identifies every post that mentions cancer prevention communications. Meltwater yielded a larger volume of results but was restricted to 15 months of historical data. Meltwater also restricted searches to 12-month periods, so data had to be collected from 2023 and 2024 separately before being averaged. Mention yielded a smaller volume of results but provided 24 months of historical data and allowed for a comprehensive timeline of collected data.

This scan leveraged Boolean operators and key terms to aggregate data. These search terms were grouped into three main searches: Comprehensive Cancer Prevention, HPV Screening, and Physical Activity and Nutrition. Additional sub-searches focused on hashtags, Centers for Disease Control and Prevention (CDC), and healthcare providers were completed within the Comprehensive Cancer Prevention search. The hashtag search was excluded due to the results being irrelevant to cancer prevention. A complete list of Boolean searches used for this report can be found in [Appendix One](#).

Total data compiled amounted to 2.7 million posts and comments across X (formerly Twitter), Reddit, Facebook, Instagram, TikTok, blogs, and forums. Included in the total were 1.4 million posts from Meltwater and 1.3 million posts from Mention. Meltwater and Mention could only search for text as opposed to images or videos, so the results from Facebook, Instagram, and TikTok are derived from post captions and comments. For this reason, YouTube and Pinterest were excluded due to their strong focus on videos and photos. Also, because of Meta privacy regulations, data collection is limited to public pages and hashtags on Facebook and Instagram. This means personal and private accounts could not be evaluated. A full list of public pages and hashtags is provided in [Appendix Two](#).

Data from the social media scan were analyzed according to the most relevant elements of the established communications framework: source, message, feedback, channel, and interference. These criteria were identified as the most important for each element:

- Source: user demographics, location, influencers
- Message: sentiment, emotion, frequently used keywords
- Feedback: messages with the highest engagement
- Channel: engagement by platform
- Interference: environment, echo chambers, misinformation

Elements were measured using a combination of the analysis tools provided by the two social listening platforms, manual data mining, and sampling. Some of the metrics, including sentiment analysis and emotion, were gathered using a sentiment analysis application programming interface (API) based on keywords, phrases, punctuation, and emojis. The data may not be entirely accurate.

For the purposes of this scan, “viral” is defined as content that spreads quickly across social media platforms, being shared by thousands or even millions of users over a short period of time.

DATA

Comprehensive Cancer Prevention

Introduction

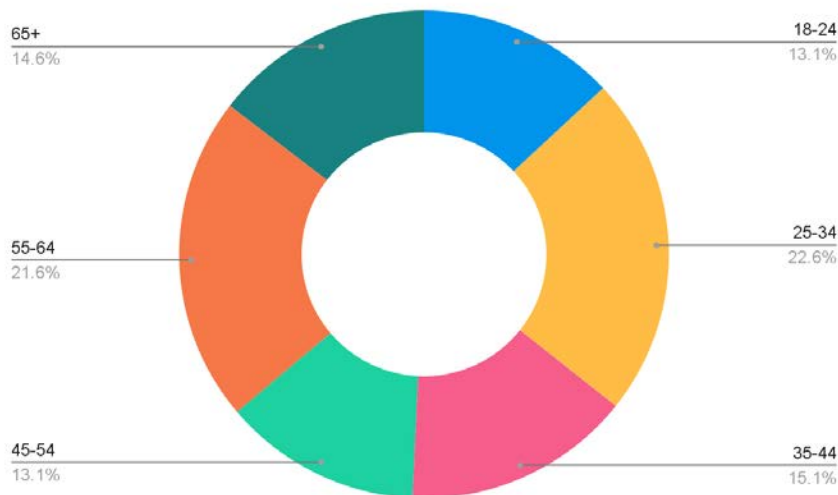
The Comprehensive Cancer Prevention search reveals how people in the United States and its territories talk about cancer prevention, cancer screenings, and the risk of cancer. A total of 1.3 million results were found between Meltwater (958K) and Mention (354K). These results include original posts, reposts, quote posts, and comments.

Source

Due to privacy restrictions, some demographic data were limited. Geographic data were collected from all platforms, except for X, which only provided user-reported gender and age data. The states with the highest volume of posts across all platforms were California (25.64k), Texas (19.97k), New York (19k), and Florida (15.49k). Data gathering platforms only rank the top ten states in this category.

On X, the gender breakdown of the top 100 influencers, ranked in 2023 and again in 2024, was 37.85% male, 33.6% female, and 28.55% unknown. A large percentage is unknown because X

Figure 1:
Comprehensive Cancer Prevention Search - Age Breakdown on X



users self-report demographic data and are not required to provide the information. X does not provide demographic data on the unknown category to identify gender expression. Age Breakdown provides insight on the distribution of the top 100 influencers, ranked in 2023 and again in 2024, based on age ranges inferred from their Twitter bios. X users who were 25-34 (22.6%) and 55-64 (21.6%) years old make up the leading groups of people included in this search. It is important to note that age-related data is user-reported and could be misrepresented.

Meltwater was used to pull a sample of [the top 60 posts with the most engagement from 2023 and 2024](#). This information helps us understand those who discuss cancer prevention on social media and who has the most influence. Out of these posts, 16 were by individuals or pages with a significant social media presence (defined here as having over 10K followers per account), 15 were by people who claimed medical knowledge, 10 were from organizations dedicated to health, 10 from conspiracy theorists or groups, 5 from elected officials, and 4 from anonymous sources. Individuals who claimed medical knowledge were classified based on the inclusion of “PhD” or “MD” or “PA” in their username, or when calling themselves a doctor or health expert in their bios. This means both certified healthcare experts and those who may falsely represent themselves as experts shape the conversation around cancer prevention. The number of conspiracy theorists represents about 16% of the sample of the top 60 posts, but their impact on the conversation is far greater than this figure suggests.

From this sample, several accounts that frequently received high engagements emerged as thought leaders. [The Vigilant Fox](#), a conspiracy theorist who labels themselves as a “Writer, video clipper, and pro-freedom citizen journalist with 12 years of healthcare experience” on X, appears 6 times on the Top 60 list, with each post sharing a method of cancer treatment and a claim that a medical entity or news source was guilty of withholding it from the public. A [post from May 2024](#) with 2.6 million views, 19K likes, 8.8K reposts, and 581 comments claims that avoiding sunlight causes cancer and alleges the dermatology industry has used fearmongering to make more money.

[Dr. Rhonda Patrick](#), who has a PhD in biomedical science according to her bio, hosts the FoundMyFitness podcast. She appeared twice in the Top 60 sample. Dr. Patrick posts about nutrition and aging. Her [post about magnesium](#) decreasing the risk of pancreatic cancer went viral on X in March 2024.

The [American Cancer Society \(ACS\)](#) appeared 7 times in the sample. Each of these 7 were Facebook posts raising awareness for cancer screenings and celebrating the stories of cancer survivors. They each received over 10K likes and over 1K comments and shares. ACS is well regarded on social media with 48.8% positive sentiment compared to only 9.3% negative sentiment. Keywords used in conversations about ACS include accuracy, gold standard, early detection, and screenings.

By contrast, CDC posts did not score high engagement in this survey with 29.3% negative sentiment compared to 11.9% positive sentiment. The CDC did not appear in the sample of the

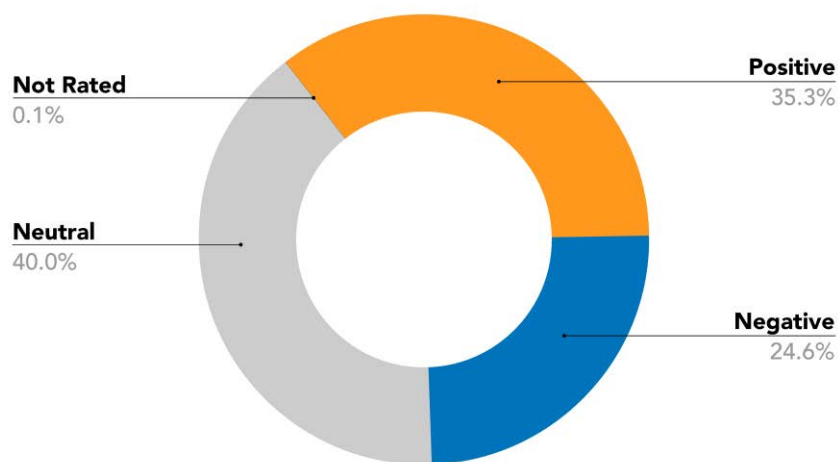
top 60 posts with the most engagement from 2023 and 2024. Keywords that appear in a search about CDC include *cancer timebomb*, *disinformation*, *deaths*, *accused*, and “utter bullshit.” Instead of the support and praise found in comments associated with an [ACS post](#) about awareness for cancer screenings, a [CDC post](#) of the same nature was criticized: “You have lost all credibility” and “So whose fault is this?” The audience in this comparison appears to react more favorably toward the ACS post that tells a story.

Message

Messaging centers around methods that people believe prevent cancer, whether through scientific findings/recommendations; personal experience, including the importance of a healthy lifestyle; the benefits of specific foods and natural remedies; or screenings and vaccines. For instance, Angie Boxberger used her [Instagram account](#) dedicated to dieting advice for cancer survivors to share a [post about using spices](#) such as turmeric and cinnamon to reduce cancer risk and lower inflammation.

Comments also focus on raising awareness for cancer prevention, discussing barriers that prevent people from being screened for cancer, sharing doubts about the healthcare system, and spreading information about recent events. COVID-19, in particular, was a frequent topic of discussion with over 90K posts and comments, many of which linked the virus to a greater risk of cancer. The COVID-19 Longhailer Advocacy Project, for example, [shared a post](#) encouraging patients to be regularly screened for cancer after having COVID-19. Conversely, [The Vigilant Fox posted](#) that the “cancer virus” was found in COVID-19 vaccines.

Figure 2:
Comprehensive Cancer Prevention Search - Sentiment Analysis



As shown in Figure 2, the average sentiment of all posts identified across Meltwater and Mention was 35.3% positive, 24.6% negative, 40% neutral, and 0.1% not rated. Sentiment trends are positive for posts and comments that raise awareness for cancer prevention, early detection, and screenings, especially those that share life updates or personal experiences. A [post by @Ragtimeugly](#) shares “Great news! My cancer screening came back normal/negative! Yippee.” A [post by @HorganRoberta](#) shares a repost and comments “Makes me so sad. I grew up watching loved ones die from #BowelCancer and nearly lost my mother to it. Reg screening has saved me from the same faith! Pls get screened. You'll most likely be fine but if you do have asymptomatic cancer this is your chance at early detection.” Positive sentiment spikes on World Cancer Day (annually celebrated on February 4) when users encourage others to be screened for cancer, such as in posts by the [World Health Organization](#) and [New York Governor Kathy Hochul](#).

In contrast, the sentiment is negative around controversial political decisions and COVID-19. A highly engaged X thread by [Dr. Simon Goddek](#) reads “Remember when they canceled millions of cancer screening appointments, leading to a significant increase in avoidable cancer deaths, while they performed ridiculous dance routines instead?” The comment is accompanied by a video of healthcare providers dancing to raise awareness for COVID-19. This post promoted negative sentiment surrounding cancer screening but was not critical of cancer screenings themselves.

Barriers to cancer screenings also are regarded negatively, seen in posts by [Shayne](#) and [Amanda Stroud](#) that mention the expensive cost of screenings, and in posts by [Jess Piper](#) and [Laura Burkhardt](#) about a Missouri legislative proposal that would defund Planned Parenthood and make cancer screenings less accessible. A breakdown of top keyword sentiment can be found in [Appendix Three](#).

While many emotions emerged throughout the scan, an application programming interface (API) analysis of words, emoji, and punctuation that expressed emotion revealed that *love* and *fear* were the two most frequently used icons in message posts.

Love was used in roughly 39K posts on Meltwater to show a positive attitude toward cancer prevention and support for advocates of cancer prevention. In a [post by the American Cancer Society](#) that advocates for regular screening during Colorectal Awareness Month, both the post and comments talk about winning the fight against cancer, emphasized by numerous heart-shaped emoji.

Fear was documented in roughly 37K posts on Meltwater, showing a negative attitude toward the risk of cancer, certain products, or healthcare entities. For example, a post by social media influencer and nutritionist [Liana Werner-Gray](#) suggests wearing perfume may have had something to do with a tumor she developed in her lymphatic system, promoting fear and then a natural perfume alternative she sponsors. A comparison of emotions used in social media messaging in 2023 and 2024 is shown in Figure 3.1 and 3.2.

Figure 3.1: 2023 Comprehensive Cancer Search - Emotional Comparison

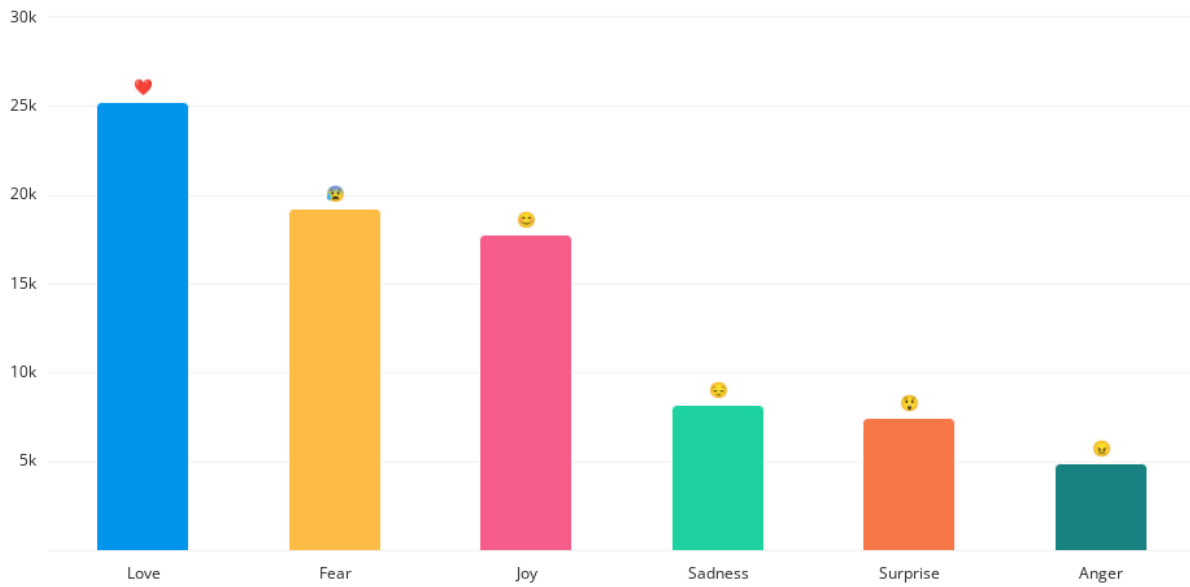
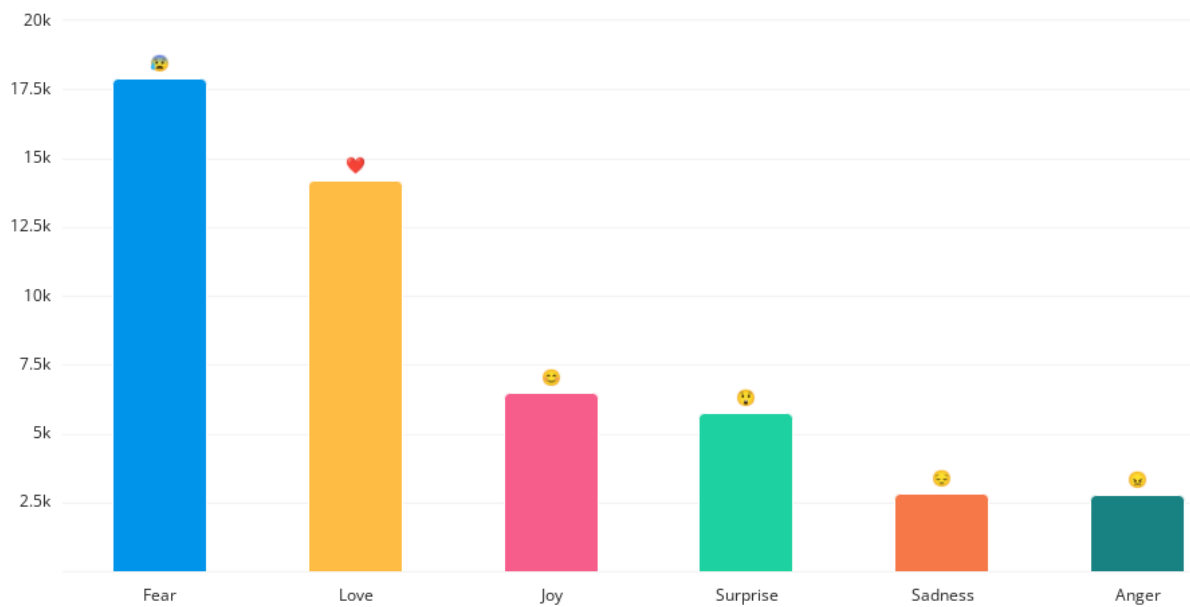


Figure 3.2: 2024 Comprehensive Cancer Search - Emotional Comparison



Certain keywords in this scan received positive audience response. Most are used in a negative context including [shocking truth](#), lies, [hoax](#), and [money](#). All are used to elicit engagement by “exposing” controversial or false information that the author believes has been purposefully

kept from the public by the government, news media, or healthcare institutions. Tweets by [The Vigilant Fox](#), [Natural Immunity FTW](#), and [Jessica Rojas](#) show how the keyword “lie” is used to ignite distrust in the medical community.

Keywords used in a more neutral or positive context include [risk](#), [prevent](#), and [evidence](#). These help users identify actions or items that either put them at risk for cancer or could help prevent cancer. The word “evidence” is often used alongside “risk” or “prevent” to lend credibility to arguments, whether they are scientifically sound or based on misinformation. A full list of the top keywords and entities can be found in [Appendix Three](#).

Emoji and hashtags were used to support the messaging mentioned above and capitalize on social media algorithms. Emoji such as 🏮 (red paper lantern), 🧵 (thread), and ⬇️ (down arrow) were used to discuss misinformation and conspiracies. 🏮 (red paper lantern) was used to alert the audience to important information and 🧵 (thread) was used to indicate a thread of posts on X. Emoji such as ❤️ (red heart), 💙 (blue heart), 🙏 (folded hands), and 💪 (flexed biceps) were used to discuss love, support, and encouragement. A full list of the top emoji appearing on X can be found in [Appendix Three](#). The most used hashtags included #cancer, #cancerprevention, and #worldcancerday. **Adding popular hashtags such as these can boost the visibility of posts by users without many followers but were not used by conspiracy theorists and influencers found in this search.**

Messaging frequently recycles news articles on social media. Instead of sharing evidence or scientific studies, users will share news articles about those studies. In these posts by [Tamiya](#) and [Michele Blair](#), the authors link to articles published by Axios and CNN that share information about cancer disparities and vegetarianism they considered helpful.

Feedback




Audience exposure to social media messages about cancer prevention is measured by engagement in the form of likes, comments, and reshares.

Table 1 and 2 illustrate the details behind the top 10 posts in each category, as indicated by those with the highest levels of engagement from Meltwater. **Table 1** includes posts from X, Facebook, Instagram, Reddit, blogs, and forums. **Table 2** lists posts from TikTok, ranked separately due to the platform receiving significantly higher than average engagement when compared to other social media platforms.

Trend Definitions:

- **Conspiracy** - Posts that spread misinformation, disinformation and conspiracy theories.
- **Storytelling** – Posts that share a personal story from a user’s life or community.
- **Prominent Person** – Posts from users who are well-known, including those who are social media influencers, elected officials, or celebrities.
- **News Source** – Posts from an account that represents an established news organization.

Table 1: The posts with the highest levels of engagement from Meltwater, excluding TikTok data, are as follows:

	Post Content	Engagement	Author	Trend
1.	<p>THREAD: Remember when they canceled millions of cancer screening appointments, leading to a significant increase in avoidable cancer deaths, while they performed ridiculous dance routines instead?</p> <p>Let me show you 25 more pieces of evidence proving that Covid was a big hoax. </p>	62,000 likes, 2,500 comments, 23,000 reshares, 4.8 million views	Dr. Simon Goddek	Conspiracy
2.	"On November 2, 2021 I was diagnosed with Stage 3 Grade 3 Triple Negative Breast Cancer. I underwent 16 rounds of chemotherapy and on June 29, 2022 I had a bilateral mastectomy. I am one year cancer free, healing and learning how to navigate my new life after cancer. Today, I am passionate about fundraising for cancer research and educating and advocating for more health protective laws....	74,000 likes, 6,400 comments, 1,700 shares	American Cancer Society	Storytelling
3.	My hearty thanks to #Billrothhospital chairman Dr. Rajesh J for organizing a special screening for Doctors, staffs and Cancer Survivors along with their families  	61,000 likes, 336 comments, 7,900 shares, 1 million views	Lokesh Kanagaraj	Prominent Person
4.	I did an 86 hour water fast and i feel INCREDIBLE! Obviously i'm not a doctor, but i've been told by the experts that water fasting can help to significantly reduce the risk of cancer, alzheimers and a ton of other health issues.	44,000 likes, 1,800 comments, 5,300 shares, 10 million views	Dana White	Prominent Person
5.	We want YOU to spread the word this #HPVAwarenessDay	43,100 likes,	Ask About HPV	Storytelling

	<ul style="list-style-type: none"> - Share your unique post or personal story - Organize or support a local awareness event - Make the campaign your own #AskAboutHPV #OneLessWorry #cancerprevention 	342 comments, 25 shares		
6.	<p>One of the questions I'm always asked is "If you could do anything at all, what would you do?"</p> <p>My answer: I'd cure cancer.</p> <p>It's not just personal – it's about what's possible.</p> <p>That's why we're investing \$240 million to accelerate new ways to prevent and treat cancer.</p>	30,000 likes, 8,900 comments, 5,500 shares, 3.8 million views	President Biden	Prominent Person
7.	<p>"Grateful thanks to everyone who helped me get through my first #colonoscopy, including the amazingly kind (& fun!) staff at @sturdyhealth! I'm all clear & good for another 10 years. 🙌 Also, this post is to remind you that #cancerscreening save lives! Find out what #cancer screenings are right for you at http://cancer.org/getscreened" - Theresa</p>	30,000 likes, 898 comments, 316 shares	American Cancer Society	Storytelling
8.	<p>"Today my pathology #cancer report came in just 8 days post robotic prostate removal. I am sooooo happy 😊😊😊 ...</p>	27,000 likes, 2,000 comments, 387 shares	American Cancer Society	Storytelling
9.	<p>The Shocking Truth About Skin Cancer: What You're Not Being Told About the Sun...</p>	19,000 likes, 579 comments, 8,000 reshares, 2.6 million views	TheVigilantFox	Conspiracy
10.	<p>Imagine a world where women could be</p>	16,000 likes,	President	Prominent

	<p>charged more for preventive services like mammograms.</p> <p>Where cancer patients are cut off from insurance halfway through chemo because they'd reached what they call "their limit."</p> <p>That's the future Republicans in Congress want to write.</p>	<p>9,100 comments, 5,900 reshares, 1.2 million views</p>	<p>Biden</p>	<p>Person</p>
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Table 2: The TikTok posts with the highest levels of engagement from Meltwater include:

	Post Content	Engagement	Author	Trend
1.	<p>[Video] The creator posted pictures of herself with a list of her symptoms she ignored, with the caption:</p> <p>"The cancer had completely taken over my body in these pictures. Posting these so more people get checked out."</p>	<p>965,000 likes, 4,000 comments, 19,000 shares, 14.4 million views</p>	<p>Hannah Grace</p>	<p>Storytelling</p>
2.	<p>[Video] The creator posted a video describing a new blood test that can predict what type of cancer a person will get, and where the tumor will form, with the caption:</p> <p>"Is this the future of cancer screening?"</p>	<p>263,000 likes, 3,800 comments, 27,700 shares, 2.1 million views</p>	<p>Dr. Karan Raj</p>	<p>Prominent Person</p>
3.	<p>[Video] The creator explains the process of a colonoscopy with pictures of a healthy colon, a colon with a polyp, and a cancerous colon. He explains the extraction method and says it's how healthcare professionals can prevent and cure cancer.</p>	<p>228,000 likes, 4,700 comments, 20,900 shares, 6.4 million views</p>	<p>Dr. Joseph Salhab</p>	<p>Prominent Person</p>

	<p>“Here’s with a normal colon should look like, and here’s what a colon looks like with both a pre-cancerous polyp and full blown cancer. I’m gonna show you how to prevent and cure this so that cancer never develops.”</p>			
4.	<p>[Video] The creator explains the benefits of eating a colorful fruits and vegetables.</p> <p>“ 🌈 Eat The Rainbow</p> <p>👉 On Sunday for the first time in years my 1 on 1 health coaching program opens back up, check my stories this week for more information!</p> <p>🍇 Purple and Blue foods = Better brain health (PMID: 31491856)” ...</p>	<p>197,700 likes, 838 comments, 15,900 shares, 2.1 million views</p>	<p>Health with Cory</p>	<p>Prominent Person</p>
5.	<p>[Video] “Sweetener commonly used in Diet Cola likely to be listed as ‘possible cancer risk’ by WHO”</p>	<p>146,000 likes, 10,000 comments, 104,000 shares, 3.6 million views</p>	<p>itvnews</p>	<p>News Source</p>
6.	<p>[Video] “Superleaf Spotlight: Soursop leaves have several health benefits, including: boosts the immune system, improves digestive health, regulates blood pressure, reduces inflammation, and is rich in antioxidants.</p> <p>Link for one of the studies is provided below: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9256652/”</p>	<p>96,100 likes, 3,900 comments, 39,200 shares, 1.8 million views</p>	<p>organic pharmacist</p>	<p>Prominent Person</p>

7.	<p>[Video] Food that will cause cancer:</p> <ul style="list-style-type: none"> - 4 pieces of bacon a day, or one hotdog, increases risk of pancreatic cancer by 67% - Palm oil is cancer causing - Potatoes have pesticides, and fries and chips often have ingredients found in cigarettes - Farmed salmon has pesticides and flame retardants 	31,000 likes, 1,540 comments, 46,000 shares, 1.1 million views	Hoochie Harry	Prominent Person
8.	<p>[Video] “March is colon cancer awareness month, so don’t miss out on videos on how to recognize colon cancer and also how to prevent it.”</p>	104,600 likes, 2,400 comments, 5,500 shares, 1.7 million views	Dr. Joseph Salhab	Prominent Person
9.	<p>[Video] “Soap for skin cancer?!</p> <p>Yes - there is 14-yr-old kid that figured out how to make soap that can prevent skin cancer and he was awarded as "America's Top Young Scientist".</p> <p>This is the incredible story of Heman.”</p>	74,000 likes, 856 comments, 3,500 shares, 544,000 views	nasdaily	Storytelling
10.	<p>[Video] “Did You know McDonald's fries contain acrylamide? acrylamide is a substance formed in starchy foods like fries when fried at high temperatures and has linked to increased cancer risk. Minimal consumption of these types of foods is recommended.”</p>	53,600 likes, 3,800 comments, 35,300 shares, 2.2 million views	JDNutrition	Prominent Person

As we can see from these two tables, conspiracy, storytelling, and celebrity or influencer authorship drive significant audience engagement.

Indeed, posts that share conspiracy theories related to preventing or causing cancer, which claim that the government, media, or healthcare industry are suppressing information, have high engagement. Some examples include [a thread by Dr. Simon Goddek](#) with “evidence” that COVID-19 was a hoax and posts by The Vigilante Fox about [ivermectin](#), [skin cancer](#), and [three](#)

[simple cancer interventions](#). These posts offer alleged solutions to cancer prevention not available from medical doctors.

Posts that share personal experiences with cancer, whether by individuals or organizations on behalf of individuals, also tend to receive high engagement. Multiple Facebook posts by the ACS feature stories of cancer survivors [Nadia](#), [Lisa](#), [Theresa](#), and [Kevin](#). All were met with measurable positive reactions and support from others. A TikTok post by user [Hannah Grace](#) that shared the cancer symptoms she overlooked before being diagnosed spurred many users to share their stories leading to a civil discussion about how cancer presents itself.

Posts by celebrities, elected officials, and other social media influencers also perform very well. For example, posts from [President Biden](#), [UFC President Dana White](#), and [model Maye Musk](#) about cancer prevention each received over 20K likes and over 1K comments and shares. On TikTok, posts by users claiming to be doctors and nutritionists receive views in the millions and likes in the hundreds of thousands. Users with personal prominence appear to have a strong influence over the cancer prevention conversation on social media.

Channel

X was the least restricted platform in terms of the amount of data that could be accessed and thus provided the most opportunity for study. Across Meltwater and Mention, there were a total of 1M posts and comments about cancer prevention on X. Also, 40 out of the top 60 posts with the most engagement were found on X. Conversations around conspiracy theories, recent events, and politics occurred on X. Many of the spikes in conversations occurred because of timely news and information being shared on X, such as [soil testing in East Palestine, Ohio](#), adjustments to the [Affordable Care Act](#) to end cancer screening requirements, or conspiracy posts going viral. The sentiment on X is generally more negative than on other platforms due to these subjects. A side-by-side comparison of sentiment by source can be found in [Appendix Three](#).

Blogs and forums make up the second highest number of search results with 130.5K, but receive significantly less engagement than X. Most blog posts receive no engagement at all, and access to forums with high traffic, such as 4chan, were restricted on Meltwater and could not be analyzed in this scan.

Reddit was third with 100.8K posts and comments focused on cancer prevention. Reddit comments are generally limited to crowdsourcing answers to problems posted by people worried about cancer. For instance, in the [r/Biohackers subreddit](#), a user asked for cancer prevention tips and was given suggestions on books to read, food to eat, and practices to adopt or avoid. Reddit is also a platform where people feel comfortable going in depth [about their struggles](#) in constructive [back and forth conversations](#). The most popular subreddits for cancer prevention related posts were r/science/, r/AskReddit/, r/todayilearned/, r/NoStupidQuestions, and r/millennials.

Facebook users share the joys and/or struggles in their cancer journey and receive mostly positive engagement. For instance, ACS shares a user's experience with daily exercise and connects it to lowering cancer risk. In the comments, other users agree with the advice and share their exercise habits. In a [post by Chris Beats Cancer](#), the author shares a study about fusobacterium. Almost all 414 comments posted thanked the author for the information. The communities built on Facebook pages and within the comments sections make it the platform with the highest rates of positive engagement.

Although only 1.62K posts and comments were pulled from TikTok, the platform receives relatively high engagement, with 11 of the top 60 posts with the most engagement hosted on the platform. Conversations on TikTok are about the nutritional choices that prevent cancer, such as [avoiding deli meat](#), [eating colorful fruits and vegetables](#), and encouraging others to get screened for cancer by sharing the [process of getting a pap smear](#) or the [symptoms they had before being diagnosed](#). TikTok also features many users who claim to be medical professionals. These people post videos dressed in medical attire. Sample posts about the need for a [colonoscopy](#) and a [superleaf](#) that prevents cancer demonstrate this. The content on Instagram is very similar to TikTok, but in general the 4.7K posts and comments analyzed had lower engagement, with only 1 post making the list of top 60 most engaged posts. Since Meta privacy regulations limit the amount of Instagram data accessed in this study, a complete picture of Instagram content was not available.

Interference

Within the Comprehensive Cancer Prevention search, the audience generally accepts the recommendation that people should get regular cancer screenings and that people should care about and want to prevent cancer. However, social media sends mixed messages about what prevents cancer and often includes misinformation. The most prominent case of misinformation discovered in the search is about the drug ivermectin, which conspiracy theorists claim has anti-cancer effects despite warnings from [CDC](#) and [FDA](#) about going off-label. Over the past two years, there have been 13.87K mentions of ivermectin as it relates to cancer on social media. More mentions were collected from 2024 than 2023, which shows that the debate over ivermectin continues even as the pandemic that gave it prominence becomes more distant. Noteworthy mentions include [The Vigilant Fox](#), [Chief Nerd](#), and [Jan Jekielek](#), all sharing information from The Epoch Times that posits ivermectin as a cure for cancer. The Vigilant Fox even claims propagandists have been trying to hide this information.

In addition to misinformation, there were trends on social media that interfered with users' ability to receive accurate information. These include continued promotion of conspiracy theories, endorsement of miracle solutions, and elevation of users who claim to be healthcare professionals or experts with no way to certify those claims.

Conspiracy-themed posts seem to encourage distrust of government and medical institutions. For instance, the comment section for the thread posted by [Dr. Simon Goddek](#) about canceled cancer screening appointments is full of posts by those who agree that institutions failed them. [Sadie said](#), “The medical community did irreversible damage to their reputation during COVID. I don't think they'll ever come back from it,” and [TaraBull commented](#) “Really great thread, Simon. I'm so glad we have you in this fight.” The comment sections for posts like these give like-minded users an opportunity to confirm one another’s beliefs.

Miracle solutions reported in this scan fail to cite medical evidence in support of their claims. Examples include [water fasting](#), endorsed by UFC President Dana White, and [eating fruit seeds](#), shared in a tweet by Illuminatibot. Although Dana White included a disclaimer that everyone should “do your own research and talk to your own medical professionals,” it is possible that some at least considered water fasting based on this recommendation.

Finally, a search was conducted to identify cancer care providers on social media based on keywords in their bios. It yielded 23.33K posts and comments on Meltwater across 2023 and 2024. However, the results showed that even if people on social media claim to be healthcare professionals, it is difficult to verify their medical credentials even if they share them in their profiles.

Among the top 60 most engaged posts, only 12 were from a user with “MD” listed on their profile. The rest either had “PhD,” “Dr.” or a label such as “dietician” in their bio. The public is unlikely to spend time investigating these claims and making it difficult to distinguish between information shared by legitimate medical professionals and advice shared by users who may falsely identify themselves as such. An example of the influence of the medical credential is this [post by Carolyn Barber, MD](#) that dissuades people from getting cancer screenings.

HPV Screening

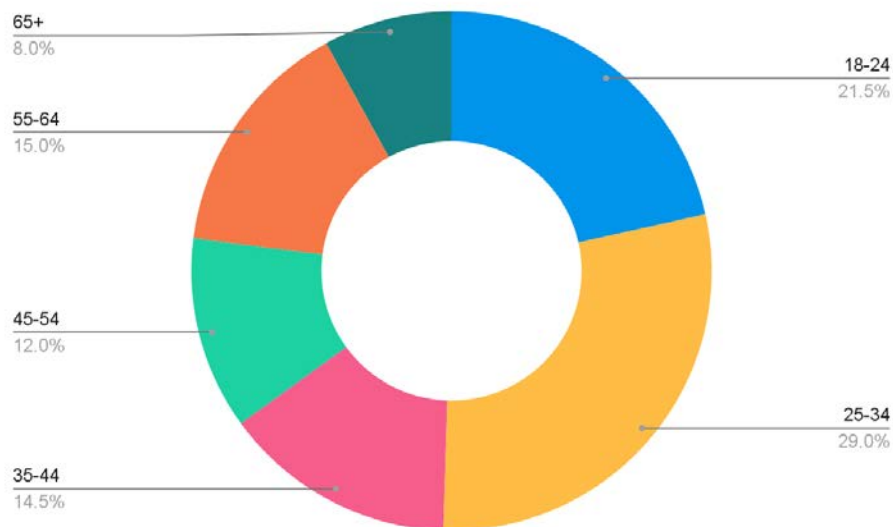
Introduction

The HPV Screening search explores how people in the United States discuss HPV and cervical cancer prevention and screening on social media platforms. A total of 389K results were generated between Meltwater (218K) and Mention (171K). These results include original posts, reposts, quote posts, and comments.

Source

Due to privacy restrictions, some demographic data were limited. Geographic data were collected from all platforms, except for X, which only provided user-reported gender and age data. The states with the highest volume of posts across all platforms were California (3.7K), New York (3.3K), Texas (3.3K), Illinois (2.2K), and Florida (2.1K). Data gathering platforms only rank the top ten states in this category.

Figure 4:
HPV Screening Search - Age Breakdown on X



On X, the gender breakdown of the top 100 influencers, ranked in 2023 and again in 2024, was 31.5% male, 47.2% female, and 21.4% unknown. A large percentage is unknown because X users self-report demographic data and are not required to provide the information. X does not provide demographic data on the unknown category to identify gender expression. Age Breakdown provides insight on the distribution of the top 100 influencers, ranked in 2023 and again in 2024, based on age ranges inferred from their Twitter bios. As shown above, half of X users were aged 25-34 (29%) and 18-24 (21.5%). It is important to note that age-related data are user-reported and could be misrepresented.

Meltwater determines top authors as the users that have the highest follower count from the search sample. In 2023, the top three authors for this search on X were Fox News, Entertainment Weekly, and CDC. In 2024, the top three authors were The Washington Post, the United Nations, and CDC. In 2023, the top ten authors on X were traditional news outlets, but in 2024, eight were established news outlets and two were individual users. News organization accounts mostly share facts and news relating to HPV and cervical cancer with little to no opinion-related content. These posts often have high views (in the tens or hundreds of thousands) but low engagement relative to their follower count. For instance, a [post from CDC](#) had 55k views, but only 67 likes and 44 reposts. Other examples of this dynamic are this [post](#)

from [Fox News](#) and [this post from Health.com](#). In contrast, a post featuring a personal narrative with a negative view of cancer screening from X user [@piper4missouri](#), a local elected official and advocate, received 112.8K views, 4.8K likes, and 1K reposts. Notably, a trend emerges where posts featuring personal narrative and storytelling, such as [@piper4missouri](#)'s post, tend to receive higher engagement than the posts shared by major news organizations. Other examples of this are posts by [@kaylajohnsonatl](#) and [@arghavan_salles](#).

Unlike the Comprehensive Cancer Prevention or Physical Activity and Nutrition searches, no thought leaders emerged from this data. More so, personal X accounts that post about cancer prevention in general attract higher engagement than accounts dedicated to the topics of HPV and cervical cancer.

Similar to the Comprehensive Cancer Prevention search, posts from CDC received mixed reactions, such as [this post](#), with 100K views, 114 likes, and 19 replies, of which 7 are negative. The post promotes free or low-cost cervical cancer screenings to women who qualify; however, some responses are critical of CDC, with comments like “Who knows how accurate this is. You lied so much over COVID,” and “No one trusts you any more.” This trend is also observed in [this post](#) which generated 66 likes, 28 reposts, and 18 replies, 11 of which are negative, and [this post](#) with 63 likes, 14 reposts, and 21 replies, 20 of which are negative.

Message

Numerous messages focused on awareness and the need to address stigma associated with HPV, cervical cancer, and preventive testing. Some centered on dealing with fear related to cervical cancer screening. Two TikTok posts talk about the process of getting a pap smear. The first TikTok video, [posted by user @baldiechi](#), an account with 402.8K followers, aims to educate and address fear about pap smears. The post says: “I’m documenting this entire process from start to finish including a literal video of me getting it done because I used to think that they were painful, uncomfortable and horrible, but they're genuinely not.” Further, the caption addresses the stigmatized nature of the procedure, while also emphasizing their necessity: “Why are paps taboo to talk about when they literally SAVE LIVES! 4,000 women die every year of cervical cancer. if you’re 21+ GO GET HER DONE ✨ 60 seconds could save your life.”

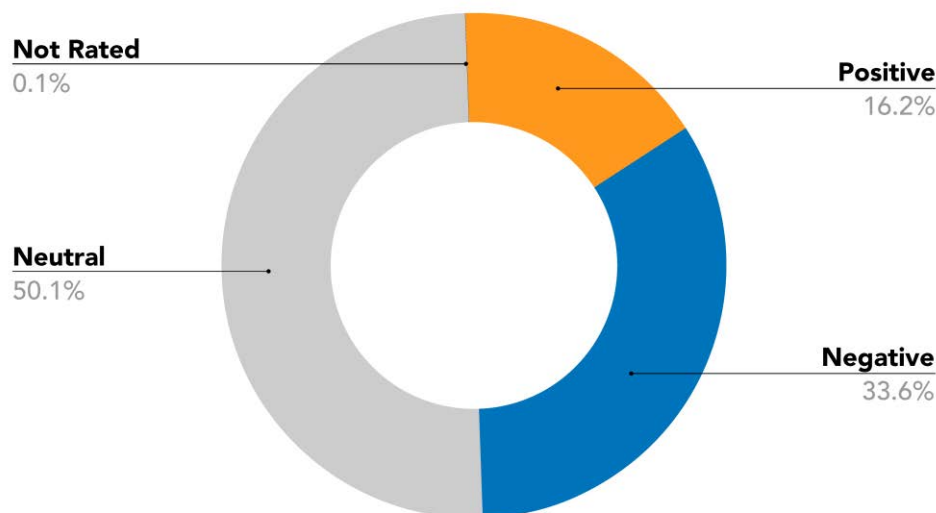
[The second TikTok video by user @marigabitere](#) also discusses the process, emphasizing that all reactions to pap smears are normal. Neither of these accounts are dedicated to HPV or cervical cancer awareness but are instead lifestyle focused. Similarly, many messages focusing on educating and destigmatizing HPV, pap smears, and cervical cancer, such as [this TikTok video posted by @sydneykidneybean](#), engage the messenger’s personal experience with screening to encourage others to keep up with cancer screenings.

Messaging from the CDC often follows a specific standardized format. Examples of this can be seen in [this post](#), featuring a headshot of a woman but does not provide personal details such as her name, history or her personal story. The caption of the post is a variation of the same

language in most CDC messaging: “There are tests that can help prevent #CervicalCancer or find it early. CDC offers free and low-cost screenings to women who qualify. Learn more: <https://cdc.gov/cancer/nbccedp/screenings.htm>.”

The structure of a generic image of a woman, non-personal copy superimposed over the image, and a caption that promotes cancer screening programs is applied in CDC cervical cancer messaging on X. Additional examples of this are [this post](#), about CDC sponsored HPV testing and pap smears, and [this post](#) on Latinas and Hispanic women having higher rates of cervical cancer.

Figure 5:
HPV Screening Search – Sentiment Analysis



In 2023 and 2024, the average sentiment of all posts identified across Meltwater and Mention were 16.2% positive, 33.6% negative, 50.1% neutral, and 0.1% not rated. A breakdown of sentiment by top keyword can be found in [Appendix Three](#).

The emotions highlighted by the data are diverse, but the most prominent emotion found by Meltwater is *fear*, with keywords like [painful/painfully excruciating](#), [anxiety](#), [nervous](#), [terrifying](#), and [medieval torture device](#). The next most prominent emotion highlighted by the data is *joy*, which aligns with keywords such as [life](#), [information](#), [#screeningsaveslives](#), [women](#), and [future](#). A visual representation of these and other keywords can be found in [Appendix Three](#).

Humor in messages about cervical cancer screening and pap smears seems to perform better than expected. Users with low follower count get outsized return on their posts using this approach. An example of this trend is [this post](#), which captions a photo of a children's alligator claw grabber, “Got my first pap smear and they used this?” The post pokes fun at the medical devices used to perform pap smears, which some people find outdated and uncomfortable. Further examples can be found [here](#) and [here](#).

The top emoji identified for both 2023 and 2024 was 🥲 (loudly crying face). Emoji such as 🚓 (police car light) and 🔊 (loudspeaker) also were frequently used to draw attention to posts, as well as 🧵 (reminder ribbon), 🙏 (folded hands), 💪 (flexed biceps), and ❤️ (red heart) to show support and encourage strength in discussions about cervical cancer. Other common emoji can be seen in the top keyword and entities graphic in [Appendix Three](#). The top hashtags highlighted by this search were #cervicalcancer, #hvp, [#poonampandey](#) #cervicalcancerawarenessmonth, #cancer, #cervicalcancerawareness, and #screeningsaveslives.

Feedback

In 2023, [@sydneykidneybean's TikTok](#) had the year's highest engagement of any relevant message. The response to her humorous but intimate personal story was overwhelmingly positive. The audience responded with similar experiences, words of encouragement, and questions, such as a comment from [@vanessaordas69](#): "This is so important to normalize that if you're sexually active, you'll catch something. Being 'Clean' isn't the goal. Being aware is the goal."

The top X post in 2023 was [@piper4missouri's post](#), which takes a stance against pap smears in high school sports. The Facebook post that had the highest engagement in 2023 was from CDC. It [detailed the agency's commitment to increase cervical cancer screening in 2023](#). However, the response from Facebook users was less positive, with the top comment posted by Per Edman saying, "Does science really show enhanced screening to be preventative of cancer death?" Finally, the Reddit post with the highest engagement in 2023 was found on the [r/AskReddit](#) subreddit and was titled "[What's the worst thing a doctor has ever said to you? \[Serious\] \[NSFW\].](#)" The top response under the open forum question was posted by user [@2SadAllTheTime](#) and detailed an experience where the user felt violated by their gynecologist during a pap smear.

In 2024, the post with the highest engagement was [this X post](#) using humor to address pap smears. A comment posted by user [@SabaSmw](#) responded with "At least it's not cold metal ??!!!!!" The relevant TikTok video with the highest engagement in 2024 was a good-humored video blog [posted by @nicolealiciamd](#), who is a gynecologist. The top comment was from user [@cassidylarue19](#), who said "I hate Pap smears this video reminded me I'm due for one again 🙄," to which [@nicolealiciamd](#) responded "Then the video did what it was supposed to do lol."

The Facebook post from 2024 with the most engagement was from ACS. It combined a personal story from a cervical cancer survivor with relevant facts and statistics for Cervical Cancer Awareness month. The two comments that received the most engagement were, "May God continue to bless you with a cancer free life" from user Debi Sturgill, and "Congratulations! May you continue to be blessed with healing and good health! 🙏❤️" posted by user Liz Lyon Seleski.

The Reddit post that received the highest engagement in 2024 was shared on the [r/TwoXChromosomes](#) subreddit and was titled [“Apparently I’m not allowed to receive healthcare because I’m a victim of SA.”](#) It detailed the user @sarahkali’s negative experience with a gynecologist. The top comment, posted by user @__fujoshi, responds with empathy, saying “you mean you advocated for yourself & your rights as a patient. being a karen is a whole other thing, you didn't do anything wrong and you shouldn't feel as if you have. if you paid for this visit via insurance, make sure to call your provider and state that they declined to render services.”

These top-performing posts highlight the power of stories across all social media platforms, with emphasis on emotions versus statistics and facts.

Channel

Among the seven platforms analyzed by Meltwater and Mention (X, Reddit, Facebook, Instagram, TikTok, blogs and forums), X was the platform with the most results in 2023 and 2024 (284.2k), followed by Reddit (62.5k). Remaining platforms had significantly fewer results including Facebook (15.3k), blogs (6.6k), forums (14.7k), Instagram (3.9k), and TikTok (1.7k).

X is used by individuals to highlight or attract attention to issues and deliver calls to action, as seen in [a post](#) from user @munchydaplug, which brings attention to the higher misdiagnosis rates of cervical cancer in Black women. A similar sentiment is shared by user @fatfabfeminist, whose [post](#) highlights the discomfort many women have when treated by a male gynecologist. X is also used for humor; for instance, @smfsaturday shared a [photo](#) highlighting the absurd way social media users perceive the pap smear process. Similarly, @thechadx2 shared a [humorous image](#) regarding a speculum. Beyond individual’s accounts, organizations use X to raise awareness about programs and educate users. The American Cancer Society is a prime example of this, [sharing posts](#) that remind users about the dangers of cervical cancer and proper screening procedures. A similar message is found in a [post from the CDC](#) which highlights the importance of cancer screening. Reddit also is used to raise questions about users’ health issues and as a platform to vent about user experiences. For example, user @Aninska88 created [a thread](#) asking for advice on the results of a medical test and user @Raychulll sparked [a conversation](#) sharing an unpleasant experience she had with her gynecologist. TikTok, which only allows posts in video or photo format, is ideal for storytelling, as seen in [a post](#) from user @jgwellnessclinic, who talks about signs she missed before being diagnosed with cervical cancer, or [in vlogs](#) where users document their cancer screening appointments. TikTok also includes educational content, often posted by doctors. Gynecologist @drannieobgyn posts [an example of this content](#), using a skit to answer common questions about pap smears. Further information can be found in [Appendix Three](#).

Interference

The data highlighted numerous trends on social media that contributed to users’ inability to receive the correct information. One incident that skewed the data was the spike in mentions

after a post on X by Poonam Pandey, a model who [staged a fake death](#) in an Instagram post as part of a cervical cancer awareness campaign in February 2024. The post quadrupled mentions of cervical cancer from the last month and caused mentions to peak in 2024. Another factor that impacted the data and could potentially interfere with users' ability to access information is use of the acronym #hpv in some languages other than English, exemplified in [this TikTok](#) video.

Additionally, a general distrust in the medical system and fear of physicians have resulted in misinformation around and disapproval of cancer screening. This distrust can be observed across platforms, with the most prominence on Reddit and X. Examples of distrust in individual providers and medical institutions can be found in [this Reddit post](#), another [post on Reddit](#), [this post on X](#), and [this post on X](#). Additionally, there is significant fear and distrust within specific communities, particularly among Black women. This can be seen in [this post from X](#) and [this post from X](#).

Physical Activity and Nutrition

Introduction

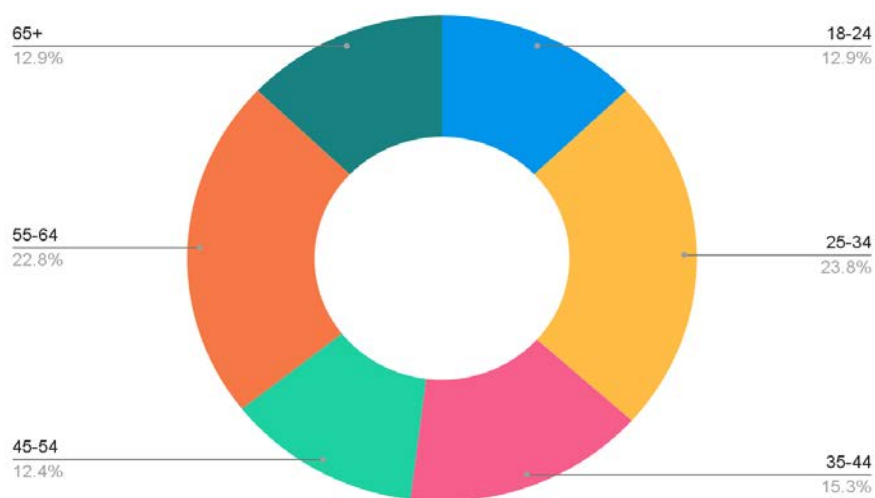
The Physical Activity and Nutrition search explores how people use social media to discuss nutrition, physical activity, and obesity in relation to cancer risk, treatment, and prevention. In total, 1.05M results were found between Meltwater (243.6K) and Mention (811K). These results include original posts, reposts, quote posts, and comments.

Source

Due to privacy restrictions, some demographic data was limited. Geographic data was collected from all platforms, except for X, which only provided user-reported gender and age data. The states with the highest volume of posts across all platforms were California (5.16K), Texas (4.47K), New York (4.24K), and Florida (3.36K). Data gathering platforms only rank the top ten states in this category.

On X, the gender breakdown of the top 100 influencers, ranked in 2023 and again in 2024, was 50% male, 32.5% female, and 17.5% unknown. A large percentage is unknown because X users self-report demographic data and are not required to provide the information. X does not provide demographic data on the unknown category to identify gender expression. Age Breakdown provides insight on the distribution of the top 100 influencers, ranked in 2023 and again in 2024, based on age ranges inferred from their Twitter bios. The largest age demographic among these authors was 25-34 years old (23.8%), followed by 55-64 years old (22.8%). It is important to note that age-related data are user-reported and could be misrepresented.

Figure 6:
Physical Activity and Nutrition Search - Age Breakdown on X



Among users surveyed by Meltwater, accounts operated by established news organizations had the most reach. In 2023, nine of the top 10 authors on X were news organizations. In 2024, seven out of the 10 top authors were news entities. However, these accounts serve mainly as information sources, sharing new developments and studies regarding diet, exercise, and cancer, and generally fail to achieve the level of engagement reached by other accounts. These [news articles](#) are disseminated on social media platforms. This prevalence of news articles was noted in the Comprehensive Cancer Prevention search. In this search, we continue to see the news media play a role in how users source their information on social media. This pattern is demonstrated by a highly-viewed [post from the New York Times](#) as well as a similar type of [post from Fox News](#).

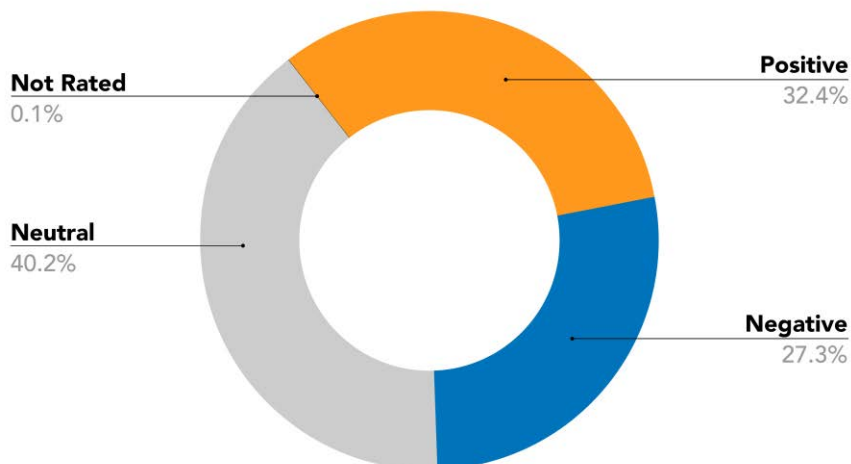
Beyond the news media, X authors with significant influence are individuals who have gained prominence by posting their own medical advice. Examples of these accounts include [DR. Kek](#) (573.6K followers) and [Dr. Naomi Wolf](#) (399.4K followers). Additionally, celebrities appear to wield similar influence. When posting about cancer-related topics, they rank among those with the highest engagement. This is evidenced by a highly-viewed [repost of a cancer study](#) from television host Steve Harvey (6.2M followers).

Message

Messaging gathered in this search generally centered around diet. Many users were focused on the connections between Americans’ eating habits and cancer, as well as ways to prevent cancer. This led to the widespread recommendations of specific diets, as opposed to a general push for a healthy lifestyle. Mentions of regular exercise were raised in this context as a preventative measure. Obesity was viewed extremely negatively. Users depict the disease as the

ultimate unhealthy lifestyle. The variation in this messaging led to a widespread range of user' emotions.

Figure 7:
Physical Activity and Nutrition Search – Sentiment Analysis



Average sentiment of all posts identified across Meltwater and Mention was 32.4% positive, 27.3% negative, and 40.2% neutral. Emotions identified in this search vary widely but largely focus on sympathy for those with cancer, a distancing from the mainstream medical community, contempt for those who live unhealthy lives, and mistrust toward people with opposing opinions. A [post from user @proudveternmom](#) illustrates these patterns. The post expresses sympathy for a person diagnosed with cancer while advocating for the Gerson diet, a supposed cancer treatment that has been denounced by medical professionals. Other posts are more negative, inciting fear and anger toward the medical establishment, such as this [post from user @aCarnivoreDiet](#), offering support for the “Carnivore Diet” and its alleged beneficial effects against cancer, while accusing the medical industry of suppressing this information. These two posts demonstrate a movement toward alternative medicine and away from established medical practices. This trend is accompanied by a variety of emotions that range from anger and fear to an honest desire to help others. More information about the top keyword sentiment and emotions gathered in this search can be found in [Appendix Three](#).

A list of frequently used keywords, hashtags, and emoji was generated from this review. In 2023 and 2024, many of these keywords were expected. Words such as “cancer,” “diet,” “obesity,” “risk,” “exercise,” and “study” appear repeatedly. However, along with these examples, each year brings some variety in the language used. In 2023, the search highlighted the prominent use of “Diet Coke,” “Alkaline Diet,” “Ginger with Water,” “Acidic Foods,” and “Sugar.” In 2024, words and phrases like “Simple Intervention,” “Ketogenic Diet,” “Chaga Mushrooms,” and “Kate Middleton” appeared repeatedly.

Along with these keywords, this search also cataloged the most popular emoji. In 2023, this included 🚓 (police car light), 🌿 (herb), ❤️ (red heart), 😭 (loudly crying face), 🤔 (thinking face), 🏃 (woman running), 🥑 (avocado), and 🔥 (fire). In 2024, the results were quite similar: 💉 (syringe), 🏊 (person swimming), 🍀 (green heart), 😊 (smiling face with halo), 🌿 (herb), 🚓 (police car light), 🚫 (no smoking), and 🍷 (wine glass). The Meltwater search also tracked popular hashtags. In 2023, these included #vegvsnonveg, #backtoeden, #govegetarian, #fridayfitness, #obesity, #health, and #cancer. While most are self-explanatory, #backtoeden refers to a way of thinking that prioritizes relying on nature and natural remedies the way humanity was intended to live, according to the Bible. In 2024, the search generated #turbocancer, #diedsuddenly, #worldcancerday, #obesity, and #cancer. The #turbocancer refers to an anti-vaccination conspiracy theory that alleges those who received a COVID-19 vaccine are now suffering from a high incidence of fast-developing cancers. In a similar vein, #diedsuddenly is the title of a 2022 pseudo-documentary produced by alt-right activist Stew Peters, known for promoting anti-vaccination claims about COVID-19 treatment.

The wide range of keywords, phrases, emoji, and hashtags demonstrates the rapidly shifting nature of the online cancer prevention discussion and its connection to current events, trends, and conspiracies. More information on top keywords, entities, and emoji generated in this search can be found in [Appendix Three](#).

Feedback

Information about and reactions to new medical research and studies, promotion of “miracle” diets and programs, and the opinions of influencers and celebrities earned the highest levels of engagement in content identified for this search. In 2023, the [first](#) and [second](#) posts with the highest recorded engagement were reactions to [a study](#) that linked the artificial sweetener aspartame to an increased risk of cancer. Beyond that, the highest engaged posts are authored by a roster of health influencers, such as [@ChiefHerbalist](#) (146.4K followers), [@SBakerMD](#) (283.5K followers), and [@foundmyfitness](#) (557.5K followers). Each influencer follows their own specific brand of messaging, but all form their online identity around a certain health and diet methodology. [@ChiefHerbalist](#) uses X to [promote vegetarian diets and natural remedies](#), [@SBakerMD](#) uses X to [promote the Carnivore Diet](#), and [@foundmyfitness](#) uses X to [promote a more balanced view](#), highlighting the importance of regular exercise and balanced eating.

Channel

Among data collected, 636.2K results were sourced from X, 30.1K from blogs, 27.9K from Reddit, 13.5K from online forums, 959 from Instagram, 552 from TikTok, and 425 from Facebook. While the content of the discussions on all platforms revolved around nutrition, physical activity, and obesity in relation to cancer risk, treatment, and prevention, the ways in which these topics were discussed varied greatly. On X, online communication took on a uniquely negative tone. Users go back and forth expressing disdain for those with differing

opinions, while influencers capitalize on this negativity to promote their messages by bashing others and preying on their audience's anxieties. Platforms such as Reddit, Facebook, online blogs, and forums seem to foster more constructive dialogue. While users still disagree, communication is less argumentative. More information on a breakdown of sentiments by source can be found in [Appendix Three](#).

Message format also varies. Most users on X share only singular claims, relying on linked articles or videos to support their points. [A post from @SBakerMD](#) is a standard example of this format. This style of online communication allows for an extremely efficient spread of information as messages are shared with hundreds of thousands of followers instantly and are easy and quick to comprehend. However, on blogs, forums, or Reddit, where long-form posts are encouraged, discussions are more complex. [This thread](#) from r/science is an example of this difference. While this post originates with a linked news article, the resulting discussion is vastly different. With space to write, users on Reddit feel free to share personal stories, opinions, and knowledge. Users correct each other, request sources, and hold each other accountable for the information they share.

Interference

Messaging on this topic suffers from the same lack of credible evidence as other topic areas included in this scan. [@SBakerMD's](#) post is an example, where the Carnivore Diet influencer's only evidence for his claim is a screenshot of a news headline. In this example, Baker's post has the appearance of credibility without viewers being able to confirm whether the article he cited actually supports his claim. This pattern is widespread across X as well as other short-form media platforms and may play a role in enabling misinformation.

The impact of this issue is made clear through the search results generated in Meltwater. Whether it is the Carnivore Diet (5.9K mentions), Alkaline Diet (36.7K mentions), a vegetarian diet (244.3K mentions), or other natural and unproven remedies, social media users interact most with influencers and posts promising a novel dietary fix that can prevent and/or cure cancer.

However, beyond X, long-form sharing platforms such as Reddit, blogs, and forums give users ample room to write posts and foster the expectation that users will cite evidence when making claims about health and cancer prevention. Still, these platforms have their own unique downsides. The large number of users posting thoughts and information creates a discourse that is difficult to decipher and often contradictory. Those aiming to share a specific message with the public about nutrition, physical activity, and obesity in relation to cancer risk, treatment, and prevention in this environment are quickly lost in the noise coming from so many users.

ANALYSIS

Comprehensive Cancer Search

Although the Comprehensive Cancer Prevention search yielded a high volume of data, much of the information collected was not focused on positive cancer prevention messaging. Posts that raised awareness for cancer prevention or shared tips for a healthy lifestyle were largely overshadowed by those pushing conspiracies, faulty nutritional advice, doubts about government and the healthcare system, and current events. These negative or inaccurate messages appear to interfere with the ability of social media users to receive cancer prevention messaging and were often left unaddressed, further fueling their influence with online audiences.

Message success depends on the social media channel. While many posts with top engagement were from X, it is difficult to get significant traction on X unless the message is controversial. Comments on X also are most likely to be argumentative or negative. Facebook, TikTok, and Instagram are generally more positive and welcoming of health advice, especially if a personal experience is shared. Lastly, Reddit features in-depth messaging where the priority is the crowdsourcing of answers to health problems. **It could be helpful for organizations and healthcare professionals to answer questions on Reddit to ensure accurate information is shared, but it should not be the main channel used for social media campaigns.**

HPV Screening

Data on these topics reveal widespread distrust in medical institutions and government health organizations. This distrust is evident across platforms, with users expressing skepticism and criticism even when those organizations are sharing factual content.

This examination highlights the varying impacts and roles of different social media platforms and channels in discussions around HPV and cervical cancer. The platform with the most mentions and activity was X, followed by Reddit. The nature of these platforms shapes the content. X, although known for its polarizing content, enables calls-to-action and humor, while Reddit allows for community-like conversations and advice. Platforms like TikTok lend themselves to opportunities for personal storytelling and educational content, often from individual medical professionals rather than institutions.

Finally, the data expose heightened levels of distrust within specific communities, particularly among Black women.

Physical Activity and Nutrition

Online conversation concerning nutrition, physical activity, and obesity in relation to cancer risk, treatment, and prevention is plagued by misinformation. While it is universally agreed that exercise and healthy eating are beneficial in treating and preventing cancer, posts about fad diets and natural remedies regularly receive the most social media engagement, diluting the effectiveness of factual cancer prevention information. It is obvious that users identified in this search are dissatisfied with cancer prevention information provided by medical professionals, instead choosing to seek their own treatments and cures. This leaves those affected by cancer vulnerable to manipulation by influencers pushing unfounded cures and remedies online.

Recommendations

1. Share Stories

Social media users respond to authentic personal stories. They prove it by the way they engage with posts revealed in this scan. Stories can be told by people who have survived cancer, people with a family medical history of cancer, or medical professionals who have helped patients prevent and battle cancer. The posts themselves should include direct quotes or on-camera testimony from impacted individuals. Avoid using stock images and comments not attributed to real people, as these reinforce the notion that “official” or “credible” messaging, especially that from the government, is fake.

Authentic storytelling gives people something they can relate to on a personal level, which makes them feel seen, builds trust, and encourages engagement. Stories also are a good way to foster hope around an otherwise bleak topic. They give followers the opportunity to build community with others who have similar life experiences.

Finally, topical channels provide another unique opportunity when messengers not known for regularly discussing these issues in their online communities decide to weigh in on these matters. Recall the impact of two lifestyle influencers ([@marigabitere](#) and [@Baldiechi](#)) who made TikTok videos about pap smears. Expand the discussion beyond the normal channels to improve the chances for impactful messaging.

2. Do Not Rely on Institutional Credibility

Effective messaging depends on the messenger. Health and government organizations broadly lost credibility during the COVID-19 pandemic. But as the scan reveals, even with the pandemic behind us, the damage continues to present itself on social media. Consider this reaction to a [CDC post](#) about low-cost cervical cancer screening, in which some of the comments read, “We Still Think You're Criminals At The @CDCgov @CDCDirector,” or “The whole world is laughing at the CDC,” punctuated with a clown emoji.

Address this by doing whatever possible to enlist credible third-party organizations, like the American Cancer Society, when planning social media campaigns. Let them be the messengers. They can use CDC science but encourage these partners to put it into their own words. Give them tools and resources to make the case. When properly vetted, these organizations, celebrities, and micro-influencers — none of whom are affiliated with the government — can give cancer prevention messaging the credibility it needs to better resonate with online audiences.

3. Meet Audiences Where They Are

Social media users are smart, but they are not trained professionals. They do think they are experts, but in fact most are not. Unfortunately, many organizations forget these facts when they try to discuss such topics online. Most everyday users of social media do not have extensive medical knowledge and are not interested in reading dense scientific materials, as evidenced by the sharing of news articles as opposed to the studies they report.

This does not mean social media users should be treated like they are unintelligent, but it does mean that messaging should be simple, personable, and in easy-to-digest formats. Posts that rely on too much text, too many facts and jargon, and staged photographs [perform poorly](#) because they're uninteresting, robotic, and in the minds of the audience, probably fake.

Emotionally, the data revealed that there is substantial fear surrounding cancer prevention and HPV screenings. Messaging should acknowledge this fear to connect with people online. Simple statements built on empathy and understanding, coupled with storytelling that models how others have overcome their fear, can build supportive communities and have the same far-reaching impact that the most successful users in this scan enjoy.

4. Acknowledge Misinformation

Misinformation about cancer prevention is successful because it is rarely challenged by credible sources and because it comforts fear with easy solutions to a complicated problem. One way to correct misinformation is to address it directly, using it as an entry point for in-depth conversations about proven methods of prevention. This approach is honest, direct, and transparent, and fills the information void that causes people to support unproven practices in the first place. It can be as simple as saying, "We've seen a lot of posts recently about the use of ivermectin to prevent cancer, but here is why they're wrong."

This method is occasionally used by healthcare professionals on social media and has been successful. The scan uncovered a post by an oncologist who used a similar approach to discredit an anti-HPV vaccine tweet by American Frontline Doctors – a technique met by supportive comments. His post included keywords such as “true” and “lying” that resonate in other posts uncovered by this search.

Although government and professional organizations cannot be this confrontational, a softer approach is modeled in this Instagram post by [Krystle Zuniga](#), a cancer dietitian nutritionist. She begins by using “I” statements to acknowledge misinformation and fear mongering and then shifts the audience's attention to more positive efforts. In addition to receiving over 1,000 likes, the comments include thanks for bringing attention to the issue, personal experiences, and questions.

5. Study Your Critics

Credible sources can learn from their antagonists. Spend time with these influencers’ work to understand their methods, their words, and their timing. Sample the profiles of users in their community. Analyze trends in the way they post, what they say, and the words they use. Understand how they have managed to position themselves as authority figures. Then fashion what the research reveals into a counterapproach that competes at the appropriate level with these architects of misinformation. Replace their words with yours, remembering not to replace plain language with official jargon. Get control of the variables that could be holding you back - when to post, what to post, and who posts. Leave no opportunity on the table. Lastly, when you begin a campaign to address positive or negative commentary, launch and never look back. Consistent work in this area will allow you to better lead the conversation.

6. Message to Unreached Populations

The geographic data for each of the searches suggest the states with the most conversation around cancer prevention were California, New York, Texas, and Florida. This is likely due to these states having larger populations that are politically and digitally active. However, according to CDC cancer mortality rates, these states are not the most affected by cancer. If credible cancer prevention messaging on popular social media channels is not reaching the areas where it can have the greatest effect, then strategic and unique approaches to deliver these messages to key audiences should be considered. This is where stories told by authentic voices not associated with leading institutions could help. Likewise, influencers not known for health-related content also should be considered.

7. Additional Recommendations

- Consider different approaches for different platforms. Tackle misinformation on X. Tell stories on Facebook. Host conversations with experts on Reddit.

- Pilot a partnership with an organization with strong positive engagement levels on social media. If it works, replicate the approach with others.
- Use data to focus campaigns where credible information, or any information, may be scarce.
- Support the voices of strong social media role models. Hold a summit and ask them to help.

CONCLUSION

The scan revealed areas that would benefit from future research, especially regarding interference, decreased institutional credibility, and misinformation in the physical activity and nutrition search. When considering forces that interfere with credible messaging, future research topics might seek to uncover how conspiracy theorists build large and loyal audiences on social media, or how organizations with a successful online presence have been able to effectively respond to misinformation challenges. Decreased institutional credibility is another area ripe for examination. Potential research topics might try to develop ways healthcare and government organizations can restore their institutional credibility, or how celebrities and online influencers could be encouraged to contribute more to the case for credible online messages. Finally, misinformation in the physical activity and nutrition search raises the need for further study. It would be beneficial to understand why natural remedies and alternative medicinal practices are quick to gain traction on social media, or if non-cancer related messaging concerning diet, exercise, and obesity struggle with misinformation to the same degree as the topics reviewed in this report.

This scan assessed how social media users discuss cancer prevention, including HPV screening and Physical Activity and Nutrition, and sought to identify the reasons cancer prevention messaging has failed to resonate with audiences. The findings illustrate the important role social media influencers play in shaping the conversation; the success of storytelling in creating emotional connections; and how misinformation, conspiracy theories, and distrust and skepticism toward government and medical institutions dominate the conversation and interfere with the success of cancer prevention messaging.

APPENDIX ONE

Comprehensive Cancer Prevention:

("Risk Of Cancer" OR "Cancer Prevention "OR "Cancer Risk Factors" OR "Cancer screen*" OR "Cancer Disparities" OR "Cancer Care Providers" OR "Cancer Comorbidities") OR (("Cancer Patient*" OR "Cancer Survivor*" OR "Cancer Fighter*") near/10 ("Public Health" OR "screen*" OR "prevent*" OR "scan")) NOT ("Israel" OR "Palestine" OR "Gaza")) OR ("prevent" near/10 "cancer")

Cross search with CDC: "CDC" OR "Center for Disease Control and Prevention"

Cross search with Cancer Care Providers: bio: "MPH" OR bio: "oncolog*" OR bio: "doctor" OR bio: "physician*" OR bio: "hematolog*" OR bio: "psychiatrist" OR bio: "pharmacist" OR bio: "cancer center" OR bio: "cancer care" OR bio: "nurs*" OR bio: "Oncology Nurs*" OR bio: "#PrecisionMedicine" OR bio: "ASCO" OR bio: "Cancer specialist" OR bio: "Cancer Doctor" OR bio: ("chief" and "cancer")

HPV:

("HPV screen*" OR "HPV awareness" OR "HPV Prevention" OR "Cervical Cancer Screen*" OR "HPV Test*" OR "Pap Test*" OR "Pap Smear" OR "#HPV*" OR "#CervicalCancerAwarenessMonth" OR "#CervicalHealthAwareness" OR "#ScreeningSavesLives" OR "#cervicalcancer" OR "#papillomavirus") NOT ("vaccine*" OR "vaccination*" OR "Vax" OR "Anti-Vax" OR "Anti vax" OR "Antivax" OR "anti-vacc*" OR "antivacc*" or "anti vacc*" OR "#antivax" OR "#antivax*" OR "#unvaxxed" OR "#unvacc*" OR "#RatLickers" OR "#NoVaccine" OR "#stopvacc*" OR "unsafevacc*")

Physical Activity and Nutrition:

("Cancer*") near/10 ("Obesity" OR "Poor Nutrition" OR "Physical Inactivity" OR "Healthy Eating" OR "Physical Activity" OR "Exercise*" OR "Healthy Choice*" OR "Healthy Lifestyle*" OR "BeActive" OR "Nutrition Education" OR "Healthy Diet" OR "Active Living" OR "Diet") NOT ("dog*" OR "cat*" OR "owner" OR "pet*")

APPENDIX TWO

Public Facebook Pages:

- [Cancer Support Community](#)
- [Cancer Research and Community](#)
- [Colorectal Cancer Alliance](#)
- [National Cancer Institute](#)
- [NCI News](#)
- [American Cancer Society Cancer Action Network](#)
- [American Cancer Society](#)
- [Stupid Cancer](#)
- [Stand Up To Cancer](#)
- [American Cancer Society Relay For Life](#)
- [Pancreatic Cancer Action Network](#)
- [Breast Cancer Now](#)
- [Teenage Cancer Trust](#)
- [Skin Cancer Foundation](#)
- [American Cancer Society Making Strides Against Breast Cancer](#)
- [I Had Cancer](#)
- [Cancer Fighters](#)
- [Prostate Cancer Foundation](#)
- [National Breast Cancer Coalition](#)
- [The Breast Cancer Research Foundation](#)
- [Ovarian Cancer Research Alliance OCRA](#)
- [National Breast Cancer Foundation](#)
- [CancerCare](#)
- [Cancer Institute NSW](#)
- [Fuck Cancer](#)
- [Health](#)
- [NYP Health & Parenting](#)
- [Chris Beat Cancer](#)
- [Testicular Cancer Awareness Foundation](#)

- [ZDoggMD](#)
- [Colon Cancer Coalition](#)
- [Oncology Central](#)
- [Herpes / HPV Cure in USA](#)
- [Ask About HPV](#)
- [Guard Against HPV](#)
- [Parents: Know HPV](#)
- [NutritionFacts.org](#)
- [Academy of Nutrition and Dietetics](#)
- [Eat Right](#)
- [Precision Nutrition](#)
- [CDC](#)
- [Cancer Prevention with Dr. Eric Ding](#)
- [Dana-Farber Cancer Institute](#)
- [MD Anderson Cancer Center](#)
- [American Society for Clinical Oncology](#)
- [Medscape](#)
- [Takeda Oncology](#)

Instagram Hashtags:

- #cancerprevention
- #preventcancer
- #nationalcancerpreventionmonth
- #cancerpreventionmonth
- #cancersymptoms
- #cancerscreenings
- #IAmAndIWill
- #CancerAwareness
- #CancerCare
- #CancerJourney
- #CancerStory
- #CancerSucks
- #FuckCancer
- #ThanksCancer

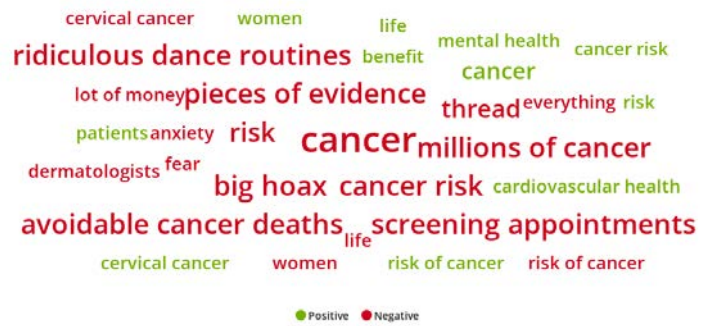
- #LifeAfterCancer
- #CancerFighter
- #CancerSurvivor
- #cancer
- #cancerdemama
- #cancerwarrior
- #cancerfight
- #cancerpatient
- #HPV
- #CervicalCancerAwarenessMonth
- #CervicalHealthAwareness
- #ScreeningSavesLives
- #cervicalcancer
- #papillomavirus

APPENDIX THREE

Comprehensive Cancer Prevention Search - Top Keyword Sentiment

2023

2024



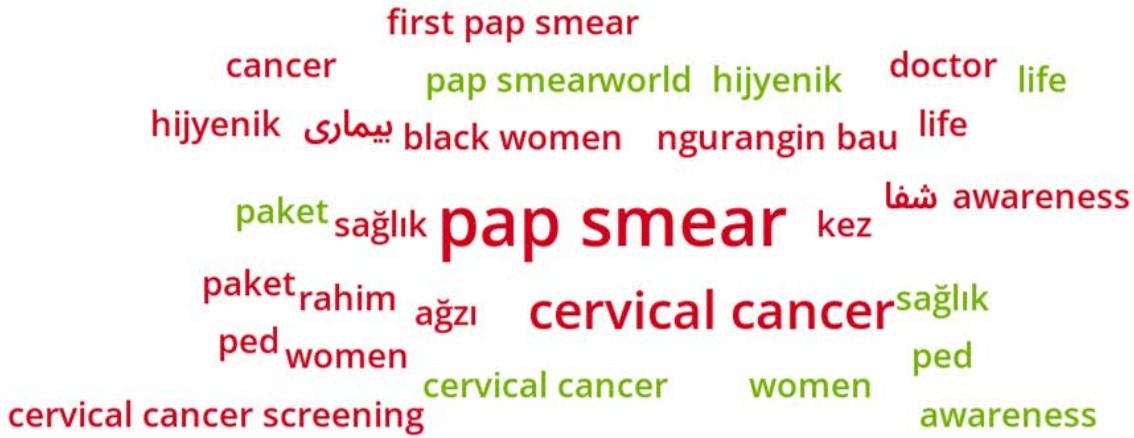
Comprehensive Cancer Prevention Search - Top Keywords and Entities

2023

2024



HPV Screening Search - Top Keyword Sentiment 2024

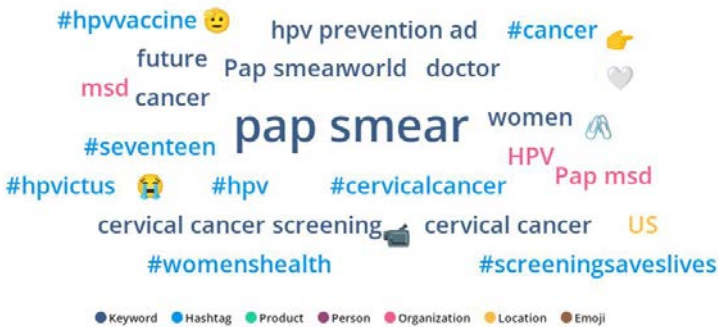


Due to an error within Meltwater, the data from 2023 is unavailable.

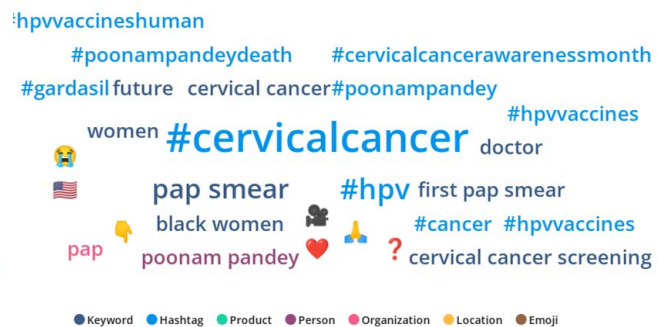
● Positive ● Negative

HPV Screening Search - Top Keywords and Entities

2023

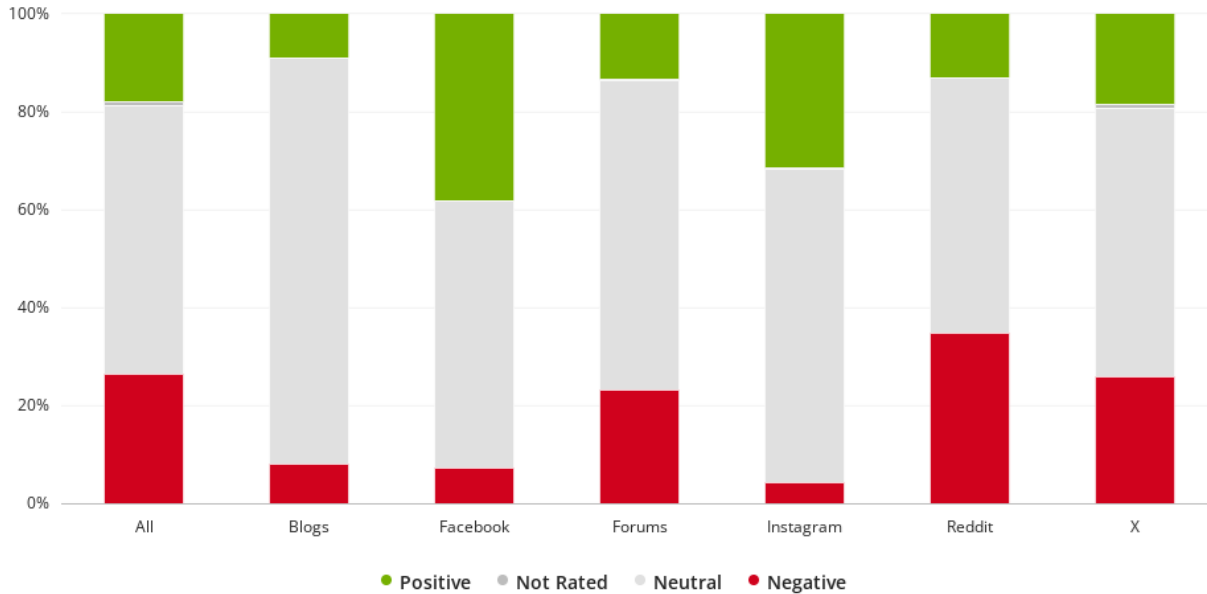


2024



HPV Screening Search - Sentiment by Source

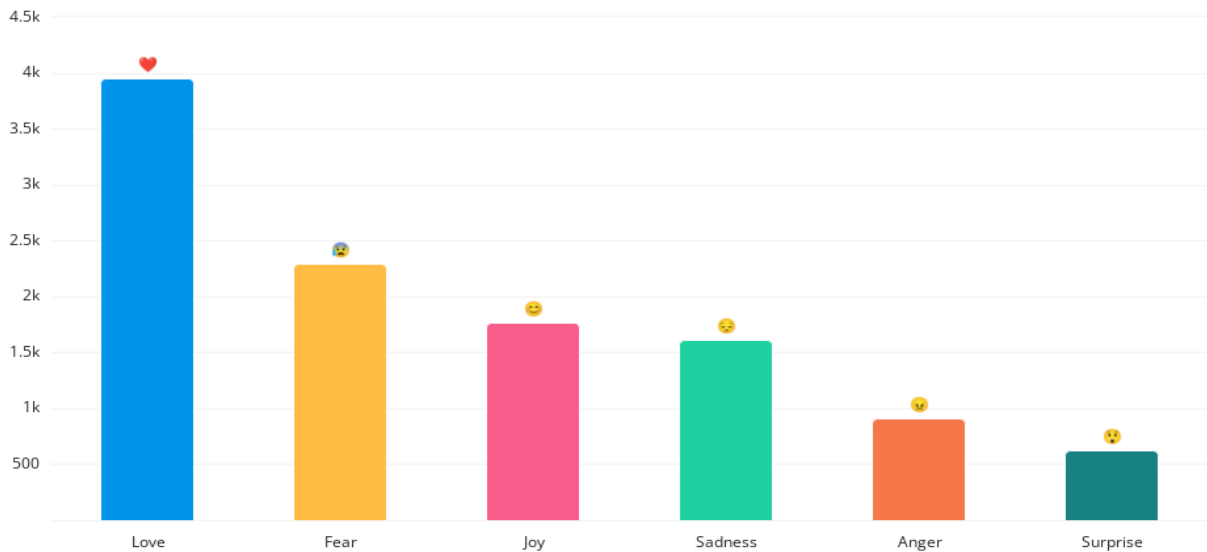
2024



Due to an error within Meltwater, the data from 2023 is unavailable.

HPV Screening Search - Emotional Comparison

2024



Due to an error within Meltwater, the data from 2023 is unavailable.

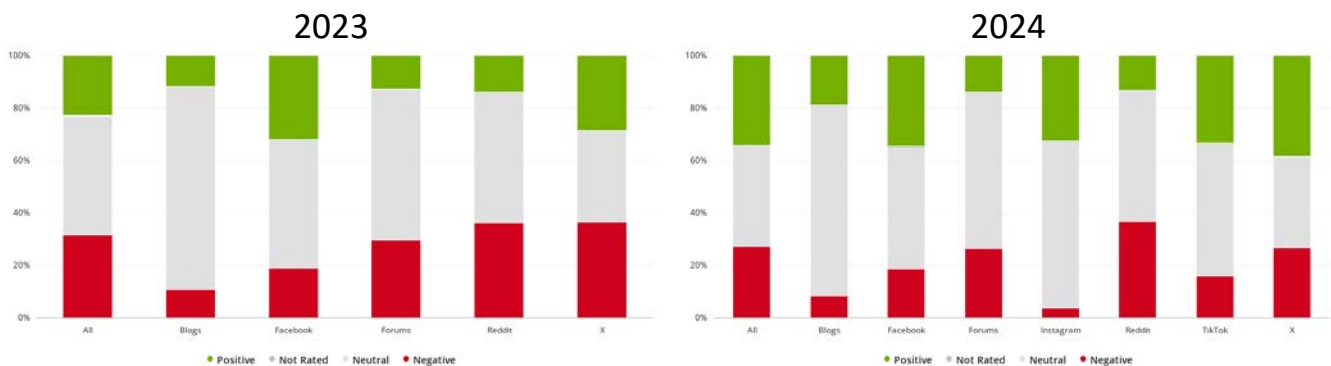
Physical Activity and Nutrition Search - Top Keyword Sentiment



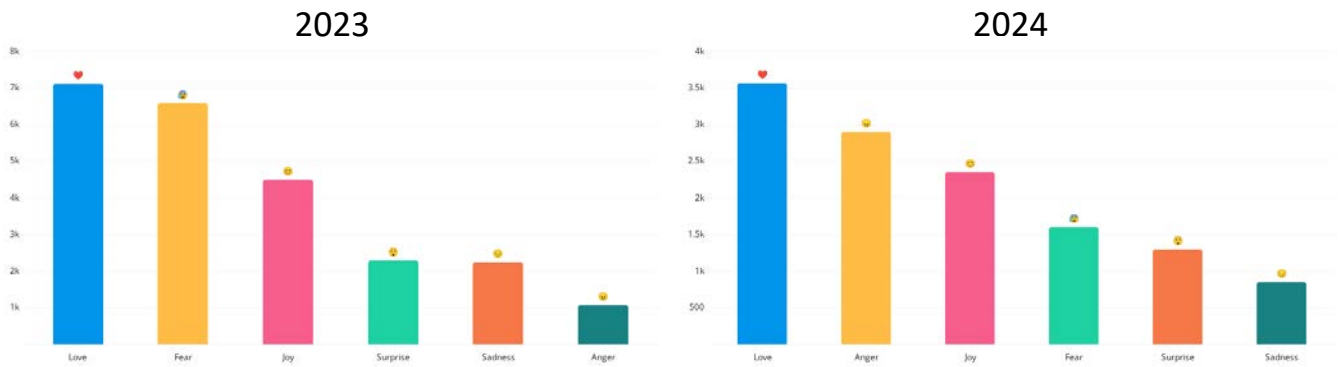
Physical Activity and Nutrition Search - Top Keywords and Entities



Physical Activity and Nutrition Search - Sentiment by Source



Physical Activity and Nutrition Search - Emotional Comparison



Physical Activity and Nutrition Search - Top Emoji

2023



2024



Endnotes

- ¹ Curtin SC, Tejada-Vera B, Bastian BA. Deaths: Leading causes for 2021. National Vital Statistics Reports; vol 73 no 4. Hyattsville, MD: National Center for Health Statistics. 2024. DOI: <https://dx.doi.org/10.15620/cdc/147882>.
- ² U.S. Cancer Statistics Working Group. U.S. Cancer Statistics Data Visualizations Tool. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute; <https://www.cdc.gov/cancer/dataviz>, released in June 2024.
- ³ Centers for Disease Control and Prevention. Risk Factors and Cancer. Available at: https://www.cdc.gov/cancer/risk_factors.htm Accessed May 10, 2024.
- ⁴ eCampus Ontario. Communication for Business Professionals. Available at: <https://ecampusontario.pressbooks.pub/commbusprofcdn/chapter/1-3-eight-essential-components-of-communication/> Accessed May 10, 2024.
- ⁵ Potential Energy. (2023). "Why human stories always win." <https://potentialenergycoalition.org/newsletter/why-human-stories-always-win/>.
- ⁶ Potential Energy. (2024) "Talk like a human Lessons on how to communicate climate change." <https://potentialenergycoalition.org/wp-content/uploads/2024/01/Talk-Like-a-Human.pdf>.
- ⁷ Ramírez AS, Freres D, Martínez LS, Lewis N, Bourgoïn A, Kelly BJ, Lee CJ, Nagler R, Schwartz JS, Hornik RC. Information seeking from media and family/friends increases the likelihood of engaging in healthy lifestyle behaviors. *J Health Commun.* 2013;18(5):527-42. doi: 10.1080/10810730.2012.743632. Epub 2013 Mar 8. PMID: 23472825; PMCID: PMC4254799.
- ⁸ National Academies of Sciences, Engineering, and Medicine; Division of Behavioral and Social Sciences and Education; Board on Science Education; Rhodes HG, Forstag EH, editors. *Effective Health Communication Within the Current Information Environment and the Role of the Federal Government: Proceedings of a Workshop.* Washington (DC): National Academies Press (US); 2023 Sep 8. 2, Key Cross-Cutting Challenges and the Implications for Federal Health Communication. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK596510/>
- ⁹ Vicente EP, De Faria SEE, Almeida ABL, Yamada PA, Lucena TF, Silva TM, Bernuci MP. Cervical Cancer Prevention on Instagram: Content and Social Interaction Analysis of Brazilian Accounts. *Asian Pac J Cancer Prev.* 2022 Sep 1;23(9):3043-3049. doi: 10.31557/APJCP.2022.23.9.3043. PMID: 36172667; PMCID: PMC9810299.
- ¹⁰ Robertson NM, Hudson L, Attia SL, Porterfield JZ, Vanderford NL. Assessing the Effectiveness of Cancer Screening Targeting Appalachian Populations: A Systematic Review. *J Rural Health.* 2021 Jun;37(3):602-623. doi: 10.1111/jrh.12550. Epub 2020 Dec 11. PMID: 33305886; PMCID: PMC9838639.
- ¹¹ O'Kane N, McKinley MC, Gough A, Hunter RF. Investigating the feasibility and acceptability of using Instagram to engage post-graduate students in a mass communication social media-based health intervention, #WeeStepsToHealth. *Pilot Feasibility Stud.* 2022 Dec 12;8(1):254. doi: 10.1186/s40814-022-01207-9. PMID: 36510310; PMCID: PMC9743718.
- ¹² Rice, R. E., & Atkin, C. K. (2012). Theory and principles of public communication campaigns. *Public Communication Campaigns*, 3-19.
- ¹³ McGuire, W. (2012). McGuire's classic input-output framework for constructing persuasive messages. *Public Communication Campaigns*, 133.
- ¹⁴ McGuire, W. (2012). McGuire's classic input-output framework for constructing persuasive messages. *Public Communication Campaigns*, 133.
- ¹⁵ Nan, X., Iles, I., Yang, B., & Ma, Z. (2022). Public health messaging during the COVID-19 pandemic and beyond: Lessons from communication science. *Health Communication*, 37(1), 1-19.
- ¹⁶ Jain, N., Zachary, I., & Boren, S. (2022). Who influences cancer conversations on Twitter?: a comparative surveillance of cancer communications. In *MEDINFO 2021: One World, One Health—Global Partnership for Digital Innovation* (pp. 719-723). IOS Press.
- ¹⁷ Fishman, J., Greenberg, P., Bagga, M. B., Casarett, D., & Propert, K. (2018). Comparing strategies for health information dissemination: Messengers that can help or hinder. *American Journal of Health Promotion*, 32(4), 932-938.
- ¹⁸ Mann L, Foley KL, Tanner AE, Sun CJ, Rhodes SD. Increasing Cervical Cancer Screening Among US Hispanics/Latinas: A Qualitative Systematic Review. *J Cancer Educ.* 2015 Jun;30(2):374-87. doi: 10.1007/s13187-014-0716-9. PMID: 25154515; PMCID: PMC4344418.
- ¹⁹ Kim, G. (2022). Examining Diversity: a Content Analysis of Cancer Depictions on Primetime Scripted Television. *Journal of Cancer Education*, 37(6), 1842-1848.

- ²⁰ Lenoir P, Moulahi B, Azé J, Bringay S, Mercier G, Carbonnel F. Raising Awareness About Cervical Cancer Using Twitter: Content Analysis of the 2015 #SmearForSmear Campaign. *J Med Internet Res*. 2017 Oct 16;19(10):e344. doi: 10.2196/jmir.8421. PMID: 29038096; PMCID: PMC5662788.
- ²¹ Klassen KM, Borleis ES, Brennan L, Reid M, McCaffrey TA, Lim MS. What People "Like": Analysis of Social Media Strategies Used by Food Industry Brands, Lifestyle Brands, and Health Promotion Organizations on Facebook and Instagram. *J Med Internet Res*. 2018 Jun 14;20(6):e10227. doi: 10.2196/10227. PMID: 29903694; PMCID: PMC6024098.
- ²² Denniss E, Lindberg R, McNaughton SA. Quality and accuracy of online nutrition-related information: a systematic review of content analysis studies. *Public Health Nutr*. 2023 Jul;26(7):1345-1357. doi: 10.1017/S1368980023000873. Epub 2023 May 4. PMID: 37138366; PMCID: PMC10346027.
- ²³ Di Sebastiano KM, Murthy G, Campbell KL, Desroches S, Murphy RA. Nutrition and Cancer Prevention: Why is the Evidence Lost in Translation? *Adv Nutr*. 2019 May 1;10(3):410-418. doi: 10.1093/advances/nmy089. PMID: 30915435; PMCID: PMC6520044.
- ²⁴ Ruxton CH, Ruani MA, Evans CE. Promoting and disseminating consistent and effective nutrition messages: challenges and opportunities. *Proc Nutr Soc*. 2023 Sep;82(3):394-405. doi: 10.1017/S0029665123000022. Epub 2023 Jan 6. PMID: 36603858.
- ²⁵ Schillinger D, Ling PM, Fine S, Boyer CB, Rogers E, Vargas RA, Bibbins-Domingo K, Chou WS. Reducing Cancer and Cancer Disparities: Lessons From a Youth-Generated Diabetes Prevention Campaign. *Am J Prev Med*. 2017 Sep;53(3S1):S103-S113. doi: 10.1016/j.amepre.2017.05.024. PMID: 28818240; PMCID: PMC8491805.
- ²⁶ Wakefield MA, Loken B, Hornik RC. Use of mass media campaigns to change health behaviour. *Lancet*. 2010 Oct 9;376(9748):1261-71. doi: 10.1016/S0140-6736(10)60809-4. PMID: 20933263; PMCID: PMC4248563.
- ²⁷ Smith, R. (2017, March 29). Audience Segmentation Techniques. *Oxford Research Encyclopedia of Communication*. Retrieved 7 Jul. 2024, from <https://oxfordre.com/communication/view/10.1093/acrefore/9780190228613.001.0001/acrefore-9780190228613-e-321>.
- ²⁸ Schmid, K. L., Rivers, S. E., Latimer, A. E., & Salovey, P. (2008). Targeting or tailoring? Maximizing resources to create effective health communications. *Marketing Health Services*, 28(1), 32.
- ²⁹ Atkin, C. K., & Freimuth, V. (2013). Guidelines for formative evaluation research in campaign design. *Public Communication Campaigns*, 4, 53-68.
- ³⁰ Williamson C, Baker G, Mutrie N, Niven A, Kelly P. Get the message? A scoping review of physical activity messaging. *Int J Behav Nutr Phys Act*. 2020 Apr 15;17(1):51. doi: 10.1186/s12966-020-00954-3. PMID: 32295613; PMCID: PMC7160981.
- ³¹ Rice, R. E., & Atkin, C. K. (2012). Theory and principles of public communication campaigns. *Public Communication Campaigns*, 3-19.
- ³² Bryan, C. J. (2021). Values-alignment interventions: An alternative to pragmatic appeals for behavior change. In G. M. Walton & A. J. Crum (Eds.), *Handbook of wise interventions: How social psychology can help people change* (pp. 259–285). The Guilford Press.
- ³³ IARC; Department of Health and Health Service Executive of Ireland (2023). Best practices in cervical screening programmes: audit of cancers, legal and ethical frameworks, communication, and workforce competencies. Lyon, France: International Agency for Research on Cancer (IARC Working Group Reports, No. 11). Available from: <https://publications.iarc.fr/625>. Licence: CC BY- NC-ND 3.0 IGO.
- ³⁴ IARC; Department of Health and Health Service Executive of Ireland (2023). Best practices in cervical screening programmes: audit of cancers, legal and ethical frameworks, communication, and workforce competencies. Lyon, France: International Agency for Research on Cancer (IARC Working Group Reports, No. 11). Available from: <https://publications.iarc.fr/625>. Licence: CC BY- NC-ND 3.0 IGO.
- ³⁵ Wanberg LJ, Kim A, Vogel RI, Sadak KT, Teoh D. Usability and Satisfaction Testing of Game-Based Learning Avatar-Navigated Mobile (GLAm), an App for Cervical Cancer Screening: Mixed Methods Study. *JMIR Form Res*. 2023 Aug 8;7:e45541. doi: 10.2196/45541. PMID: 37552527; PMCID: PMC10445170.
- ³⁶ Knox E, Biddle S, Esliger DW, Piggan J, Sherar L. Accounting for Sitting and Moving: An Analysis of Sedentary Behavior in Mass Media Campaigns. *J Phys Act Health*. 2015 Sep;12(9):1198-204. doi: 10.1123/jpah.2014-0360. Epub 2014 Nov 13. PMID: 25393514.
- ³⁷ Edney S, Bogomolova S, Ryan J, Olds T, Sanders I, Maher C. Creating Engaging Health Promotion Campaigns on Social Media: Observations and Lessons From Fitbit and Garmin. *J Med Internet Res*. 2018 Dec 10;20(12):e10911. doi: 10.2196/10911. PMID: 30530449; PMCID: PMC6305879.
- ³⁸ Williamson C, Baker G, Mutrie N, Niven A, Kelly P. Get the message? A scoping review of physical activity messaging. *Int J Behav Nutr Phys Act*. 2020 Apr 15;17(1):51. doi: 10.1186/s12966-020-00954-3. PMID: 32295613; PMCID: PMC7160981.
- ³⁹ Shin Y, Kim SK, Lee M. Mobile phone interventions to improve adolescents' physical health: A systematic review and meta-analysis. *Public Health Nurs*. 2019 Nov;36(6):787-799. doi: 10.1111/phn.12655. Epub 2019 Aug 28. PMID: 31456259.

- ⁴⁰ Connolly N & Sweetland J. Framing Guidance: Equitable Physical Activity. 2022. Available at: <https://www.frameworksinstitute.org/wp-content/uploads/2022/08/aha-playbook-2022.pdf>. Accessed June 3, 2024.
- ⁴¹ Denniss E, Lindberg R, Marchese LE, McNaughton SA. #Fail: the quality and accuracy of nutrition-related information by influential Australian Instagram accounts. *Int J Behav Nutr Phys Act.* 2024 Feb 14;21(1):16. doi: 10.1186/s12966-024-01565-y. PMID: 38355567; PMCID: PMC10865719.
- ⁴² Denniss E, Lindberg R, McNaughton SA. Quality and accuracy of online nutrition-related information: a systematic review of content analysis studies. *Public Health Nutr.* 2023 Jul;26(7):1345-1357. doi: 10.1017/S1368980023000873. Epub 2023 May 4. PMID: 37138366; PMCID: PMC10346027.
- ⁴³ Ruxton CH, Ruani MA, Evans CE. Promoting and disseminating consistent and effective nutrition messages: challenges and opportunities. *Proc Nutr Soc.* 2023 Sep;82(3):394-405. doi: 10.1017/S0029665123000022. Epub 2023 Jan 6. PMID: 36603858.
- ⁴⁴ Capitão C, Martins R, Feteira-Santos R, Virgolino A, Graça P, Gregório MJ, Santos O. Developing healthy eating promotion mass media campaigns: A qualitative study. *Front Public Health.* 2022 Jul 29;10:931116. doi: 10.3389/fpubh.2022.931116. PMID: 35968460; PMCID: PMC9372615.
- ⁴⁵ Nan, X., Iles, I. A., Yang, B., & Ma, Z. (2022). Public health messaging during the COVID-19 pandemic and beyond: Lessons from communication science. *Health Communication, 37*(1), 1-19.
- ⁴⁶ Kim, G. (2022). Examining Diversity: a Content Analysis of Cancer Depictions on Primetime Scripted Television. *Journal of Cancer Education, 37*(6), 1842-1848.
- ⁴⁷ Potential Energy. (2023). "Why human stories always win." <https://potentialenergycoalition.org/newsletter/why-human-stories-always-win/>.
- ⁴⁸ Potential Energy. (2024) "Talk like a human Lessons on how to communicate climate change." <https://potentialenergycoalition.org/wp-content/uploads/2024/01/Talk-Like-a-Human.pdf>.
- ⁴⁹ Roberto, C. A., & Kawachi, I. (Eds.). (2015). *Behavioral Economics and Public Health*. Oxford University Press.
- ⁵⁰ Edwards, D. J. (2021). Ensuring effective public health communication: Insights and modeling efforts from theories of behavioral economics, heuristics, and behavioral analysis for decision making under risk. *Frontiers in Psychology, 12*, 715159.
- ⁵¹ Roberto, C. A., & Kawachi, I. (Eds.). (2015). *Behavioral Economics and Public Health*. Oxford University Press.
- ⁵² Witte, K., & Allen, M. (2000). A meta-analysis of fear appeals: Implications for effective public health campaigns. *Health Education & Behavior, 27*(5), 591-615.
- ⁵³ Nan, X., Iles, I. A., Yang, B., & Ma, Z. (2022). Public health messaging during the COVID-19 pandemic and beyond: Lessons from communication science. *Health Communication, 37*(1), 1-19.
- ⁵⁴ Nan, X., Iles, I. A., Yang, B., & Ma, Z. (2022). Public health messaging during the COVID-19 pandemic and beyond: Lessons from communication science. *Health Communication, 37*(1), 1-19.
- ⁵⁵ Ballard, A. M., Davis, A., & Hoffner, C. A. (2021). The impact of health narratives on persuasion in African American women: A systematic review and meta-analysis. *Health Communication, 36*(5), 560-571.
- ⁵⁶ Potential Energy. (2023). "Why human stories always win." <https://potentialenergycoalition.org/newsletter/why-human-stories-always-win/>.
- ⁵⁷ Potential Energy. (2024) "Talk like a human Lessons on how to communicate climate change." <https://potentialenergycoalition.org/wp-content/uploads/2024/01/Talk-Like-a-Human.pdf>.
- ⁵⁸ Rice, R. E., & Atkin, C. K. (2012). Theory and principles of public communication campaigns. *Public Communication Campaigns, 3*-19.
- ⁵⁹ Edwards, D. J. (2021). Ensuring effective public health communication: Insights and modeling efforts from theories of behavioral economics, heuristics, and behavioral analysis for decision making under risk. *Frontiers in Psychology, 12*, 715159.
- ⁶⁰ The Decision Lab (n.d.). "Cognitive Biases." <https://thedecisionlab.com/biases>.
- ⁶¹ Roberto, C. A., & Kawachi, I. (Eds.). (2015). *Behavioral Economics and Public Health*. Oxford University Press.
- ⁶² Matjasko, J. L., Cawley, J. H., Baker-Goering, M. M., & Yokum, D. V. (2016). Applying behavioral economics to public health policy: illustrative examples and promising directions. *American Journal of Preventive Medicine, 50*(5), S13-S19.
- ⁶³ Center for Health Incentives and Behavioral Economics, University of Pennsylvania. "5 Examples of How Behavioral Economics Can Influence Clinician Behavior." (2023). <https://chibe.upenn.edu/blog/5-examples-of-how-behavioral-economics-can-influence-clinician-behavior/>.
- ⁶⁴ Guenther, L., Gaertner, M., & Zeitz, J. (2021). Framing as a concept for health communication: A systematic review. *Health Communication, 36*(7), 891-899.

- ⁶⁵ den Braver NR, Garcia Bengoechea E, Messing S, Kelly L, Schoonmade LJ, Volf K, Zukowska J, Gelius P, Forberger S, Woods CB, Lakerveld J. The impact of mass-media campaigns on physical activity: a review of reviews through a policy lens. *Eur J Public Health*. 2022 Nov 28;32(Suppl 4):iv71-iv83. doi: 10.1093/eurpub/ckac085. PMID: 36444108; PMCID: PMC9706123.
- ⁶⁶ Wagner DE, Seneres G, Jones E, Brodersen KA, Whitsitt-Paulson S. *Swap Up Your Meal: A Mass Media Nutrition Education Campaign for Oklahoma Teens*. *Int J Environ Res Public Health*. 2022 Aug 16;19(16):10110. doi: 10.3390/ijerph191610110. PMID: 36011746; PMCID: PMC9408208.
- ⁶⁷ Englund TR, Zhou M, Hedrick VE, Kraak VI. How Branded Marketing and Media Campaigns Can Support a Healthy Diet and Food Well-Being for Americans: Evidence for 13 Campaigns in the United States. *J Nutr Educ Behav*. 2020 Jan;52(1):87-95. doi: 10.1016/j.jneb.2019.09.018. Epub 2019 Oct 29. PMID: 31672282.
- ⁶⁸ McGuire, W. (2012). McGuire's classic input-output framework for constructing persuasive messages. *Public Communication Campaigns*, 133.
- ⁶⁹ Bryan, C. J. (2021). Values-alignment interventions: An alternative to pragmatic appeals for behavior change. In G. M. Walton & A. J. Crum (Eds.), *Handbook of wise interventions: How social psychology can help people change* (pp. 259–285). The Guilford Press.
- ⁷⁰ Bryan, C. J., Master, A., & Walton, G. M. (2014). "Helping" versus "being a helper": Invoking the self to increase helping in young children. *Child Development*, 85(5), 1836-1842.
- ⁷¹ Hughes-Cromwick, P., Teutsch, S. M., & Zimmerman, F. J. (2022). Population Health In America: Is Culture Stopping Us Dead In Our Tracks?. *Health Affairs Forefront*.
- ⁷² Ghio, D., Lawes-Wickwar, S., Tang, M. Y., Epton, T., Howlett, N., Jenkinson, E., ... & Keyworth, C. (2021). What influences people's responses to public health messages for managing risks and preventing infectious diseases? A rapid systematic review of the evidence and recommendations. *BMJ Open*, 11(11), e048750.
- ⁷³ Randolph, W., & Viswanath, K. (2004). Lessons learned from public health mass media campaigns: marketing health in a crowded media world. *Annu. Rev. Public Health*, 25, 419-437.
- ⁷⁴ Ghio, D., Lawes-Wickwar, S., Tang, M. Y., Epton, T., Howlett, N., Jenkinson, E., ... & Keyworth, C. (2021). What influences people's responses to public health messages for managing risks and preventing infectious diseases? A rapid systematic review of the evidence and recommendations. *BMJ Open*, 11(11), e048750.
- ⁷⁵ Randolph, W., & Viswanath, K. (2004). Lessons learned from public health mass media campaigns: marketing health in a crowded media world. *Annu. Rev. Public Health*, 25, 419-437.
- ⁷⁶ Rice, R. E., & Atkin, C. K. (2012). Theory and principles of public communication campaigns. *Public Communication Campaigns*, 3-19.
- ⁷⁷ McGuire, W. (2012). McGuire's classic input-output framework for constructing persuasive messages. *Public Communication Campaigns*, 133.
- ⁷⁸ Hornik, R. C. (2002). Exposure: Theory and evidence about all the ways it matters. *Social Marketing Quarterly*, 8(3), 31-37.
- ⁷⁹ Wakefield MA, Loken B, Hornik RC. Use of mass media campaigns to change health behaviour. *Lancet*. 2010 Oct 9;376(9748):1261-71. doi: 10.1016/S0140-6736(10)60809-4. PMID: 20933263; PMCID: PMC4248563.
- ⁸⁰ Rice, R. E., & Atkin, C. K. (2012). Theory and principles of public communication campaigns. *Public Communication Campaigns*, 3-19.
- ⁸¹ Lenoir P, Moulahi B, Azé J, Bringay S, Mercier G, Carbonnel F. Raising Awareness About Cervical Cancer Using Twitter: Content Analysis of the 2015 #SmearForSmear Campaign. *J Med Internet Res*. 2017 Oct 16;19(10):e344. doi: 10.2196/jmir.8421. PMID: 29038096; PMCID: PMC5662788.
- ⁸² Teoh D, Shaikh R, Vogel RI, Zoellner T, Carson L, Kulasingam S, Lou E. A Cross-Sectional Review of Cervical Cancer Messages on Twitter During Cervical Cancer Awareness Month. *J Low Genit Tract Dis*. 2018 Jan;22(1):8-12. doi: 10.1097/LGT.0000000000000363. PMID: 29271850; PMCID: PMC5745036.
- ⁸³ Fung, I. C. H., Blankenship, E. B., Ahweyevu, J. O., et al (2020). Public health implications of image-based social media: a systematic review of Instagram, Pinterest, Tumblr, and Flickr. *The Permanente Journal*, 24.
- ⁸⁴ DePaula, N., Hagen, L., Roytman, S., & Alnahass, D. (2022). Platform effects on public health communication: a comparative and national study of message design and audience engagement across Twitter and Facebook. *JMIR Infodemiology*, 2(2), e40198.
- ⁸⁵ Bhattacharya, S., Srinivasan, P., & Polgreen, P. (2017). Social media engagement analysis of US Federal health agencies on Facebook. *BMC Medical Informatics and Decision Making*, 17, 1-12.
- ⁸⁶ Conley, C. C., Otto, A. K., McDonnell, G. A., & Tercyak, K. P. (2021). Multiple approaches to enhancing cancer communication in the next decade: translating research into practice and policy. *Translational Behavioral Medicine*, 11(11), 2018-2032.
- ⁸⁷ Kreslake JM, Elkins A, Thomas CN, Gates S, Lehman T. Use of Mass Communication by Public Health Programs in Nonmetropolitan Regions. *Prev Chronic Dis*. 2019 Jul 25;16:E96. doi: 10.5888/pcd16.190014. PMID: 31344335; PMCID: PMC6716397.

- ⁸⁸ Conley, C. C., Otto, A. K., McDonnell, G. A., & Tercyak, K. P. (2021). Multiple approaches to enhancing cancer communication in the next decade: translating research into practice and policy. *Translational Behavioral Medicine*, 11(11), 2018-2032.
- ⁸⁹ Orumaa M, Campbell S, Støer NC, Castle PE, Sen S, Tropé A, Adedimeji A, Nygård M. Impact of the Mobile Game FightHPV on Cervical Cancer Screening Attendance: Retrospective Cohort Study. *JMIR Serious Games*. 2022 Dec 13;10(4):e36197. doi: 10.2196/36197. PMID: 36512401; PMCID: PMC9795393.
- ⁹⁰ Ruiz-López T, Sen S, Jakobsen E, Tropé A, Castle PE, Hansen BT, Nygård M. FightHPV: Design and Evaluation of a Mobile Game to Raise Awareness About Human Papillomavirus and Nudge People to Take Action Against Cervical Cancer. *JMIR Serious Games*. 2019 Apr 8;7(2):e8540. doi: 10.2196/games.8540. PMID: 30958271; PMCID: PMC6475825.
- ⁹¹ Wanberg LJ, Kim A, Vogel RI, Sadak KT, Teoh D. Usability and Satisfaction Testing of Game-Based Learning Avatar-Navigated Mobile (GLAm), an App for Cervical Cancer Screening: Mixed Methods Study. *JMIR Form Res*. 2023 Aug 8;7:e45541. doi: 10.2196/45541. PMID: 37552527; PMCID: PMC10445170.
- ⁹² Roundtable on Population Health Improvement; Board on Population Health and Public Health Practice; Institute of Medicine. *Communicating to Advance the Public's Health: Workshop Summary*. Washington (DC): National Academies Press (US); 2015 Dec 2. 2, The Science of Health Communication: Guiding Principles for Population Health Campaigns. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK338335/>
- ⁹³ Ghio, D., Lawes-Wickwar, S., Tang, M. Y., Epton, T., Howlett, N., Jenkinson, E., ... & Keyworth, C. (2021). What influences people's responses to public health messages for managing risks and preventing infectious diseases? A rapid systematic review of the evidence and recommendations. *BMJ Open*, 11(11), e048750.
- ⁹⁴ Dervin, B., & Foreman-Wernet, L. (2012). *Sense-making methodology as an approach to understanding and designing for campaign audiences*. Public Communication Campaigns. 4th ed: SAGE, 147-61.
- ⁹⁵ Hofstede, G. (2011). Dimensionalizing cultures: The Hofstede model in context. *Online readings in psychology and culture*, 2(1), 8.
- ⁹⁶ Palmgreen, P., Noar, S., & Zimmerman, R. (2012). *A mass media campaign to increase condom use among high sensation-seeking and impulsive decision-making young adults*. Public Communication Campaigns, 4th edition. Thousand Oaks, CA: Sage Publications, Inc, 205-218.
- ⁹⁷ Rice, R. E., & Atkin, C. K. (2012). Theory and principles of public communication campaigns. *Public Communication Campaigns*, 3-19.
- ⁹⁸ Schmid, K. L., Rivers, S. E., Latimer, A. E., & Salovey, P. (2008). Targeting or tailoring? Maximizing resources to create effective health communications. *Marketing Health Services*, 28(1), 32.
- ⁹⁹ Strategic Business Insights (n.d.). "US Framework and VALS(TM) Types." <https://www.strategicbusinessinsights.com/vals/ustypes.shtml>.
- ¹⁰⁰ Slater, M. D. (1996). Theory and method in health audience segmentation. *Journal of Health Communication*, 1(3), 267-284.
- ¹⁰¹ Roberto, C. A., & Kawachi, I. (Eds.). (2015). *Behavioral Economics and Public Health*. Oxford University Press.
- ¹⁰² Firestone, R., Rowe, C. J., Modi, S. N., & Sievers, D. (2017). The effectiveness of social marketing in global health: a systematic review. *Health Policy and Planning*, 32(1), 110-124.
- ¹⁰³ Anhang R, Goodman A, Goldie SJ. HPV communication: review of existing research and recommendations for patient education. *CA Cancer J Clin*. 2004 Sep-Oct;54(5):248-59. doi: 10.3322/canjclin.54.5.248. PMID: 15371283.
- ¹⁰⁴ Schillinger D, Ling PM, Fine S, Boyer CB, Rogers E, Vargas RA, Bibbins-Domingo K, Chou WS. Reducing Cancer and Cancer Disparities: Lessons From a Youth-Generated Diabetes Prevention Campaign. *Am J Prev Med*. 2017 Sep;53(3S1):S103-S113. doi: 10.1016/j.amepre.2017.05.024. PMID: 28818240; PMCID: PMC8491805.
- ¹⁰⁵ Carins JE, Rundle-Thiele SR. Eating for the better: a social marketing review (2000-2012). *Public Health Nutr*. 2014 Jul;17(7):1628-39. doi: 10.1017/S1368980013001365. Epub 2013 May 28. PMID: 23711161; PMCID: PMC10282391.
- ¹⁰⁶ Laestadius LI, Wahl MM. Mobilizing social media users to become advertisers: Corporate hashtag campaigns as a public health concern. *Digit Health*. 2017 May 23;3:2055207617710802. doi: 10.1177/2055207617710802. PMID: 29942600; PMCID: PMC6001194.
- ¹⁰⁷ Laestadius LI, Wahl MM. Mobilizing social media users to become advertisers: Corporate hashtag campaigns as a public health concern. *Digit Health*. 2017 May 23;3:2055207617710802. doi: 10.1177/2055207617710802. PMID: 29942600; PMCID: PMC6001194.
- ¹⁰⁸ Williamson C, Baker G, Mutrie N, Niven A, Kelly P. Get the message? A scoping review of physical activity messaging. *Int J Behav Nutr Phys Act*. 2020 Apr 15;17(1):51. doi: 10.1186/s12966-020-00954-3. PMID: 32295613; PMCID: PMC7160981.
- ¹⁰⁹ Loss J, von Uslar C. How German health insurance providers use social online networks to promote healthy lifestyles: a content analysis of Facebook® accounts. *BMC Med Inform Decis Mak*. 2021 Feb 18;21(1):64. doi: 10.1186/s12911-021-01433-w. PMID: 33602221; PMCID: PMC7891150.

- ¹¹⁰ Williamson C, Baker G, Mutrie N, Niven A, Kelly P. Get the message? A scoping review of physical activity messaging. *Int J Behav Nutr Phys Act*. 2020 Apr 15;17(1):51. doi: 10.1186/s12966-020-00954-3. PMID: 32295613; PMCID: PMC7160981.
- ¹¹¹ Nagler RH. Adverse outcomes associated with media exposure to contradictory nutrition messages. *J Health Commun*. 2014;19(1):24-40. doi: 10.1080/10810730.2013.798384. Epub 2013 Oct 11. PMID: 24117281; PMCID: PMC4353569.
- ¹¹² Ramondt S, Ramírez AS. Assessing the impact of the public nutrition information environment: Adapting the cancer information overload scale to measure diet information overload. *Patient Educ Couns*. 2019 Jan;102(1):37-42. doi: 10.1016/j.pec.2018.07.020. Epub 2018 Jul 26. PMID: 30097378; PMCID: PMC6289837.
- ¹¹³ Ramondt S, Ramírez AS. Assessing the impact of the public nutrition information environment: Adapting the cancer information overload scale to measure diet information overload. *Patient Educ Couns*. 2019 Jan;102(1):37-42. doi: 10.1016/j.pec.2018.07.020. Epub 2018 Jul 26. PMID: 30097378; PMCID: PMC6289837.
- ¹¹⁴ Capitão C, Martins R, Feteira-Santos R, Virgolino A, Graça P, Gregório MJ, Santos O. Developing healthy eating promotion mass media campaigns: A qualitative study. *Front Public Health*. 2022 Jul 29;10:931116. doi: 10.3389/fpubh.2022.931116. PMID: 35968460; PMCID: PMC9372615.
- ¹¹⁵ Slater, M. D. (1996). Theory and method in health audience segmentation. *Journal of Health Communication*, 1(3), 267-284.
- ¹¹⁶ Nothacker J, Nury E, Roebl Mathieu M, Raatz H, Meerpohl JJ, Schmucker C. Women's attitudes towards a human papillomavirus-based cervical cancer screening strategy: a systematic review. *BMJ Sex Reprod Health*. 2022 Oct;48(4):295-306. doi: 10.1136/bmjshr-2022-201515. Epub 2022 Aug 5. PMID: 36223918; PMCID: PMC9606488.
- ¹¹⁷ Berry TR, Rhodes RE, Ori EM, McFadden K, Faulkner G, Latimer-Cheung AE, O'Reilly N, Spence JC, Tremblay MS, Vanderloo LM. The short-term effects of a mass reach physical activity campaign: an evaluation using hierarchy of effects model and intention profiles. *BMC Public Health*. 2018 Nov 27;18(1):1300. doi: 10.1186/s12889-018-6218-7. PMID: 30482163; PMCID: PMC6258458.
- ¹¹⁸ Livingstone KM, Rawstorn JC, Partridge SR, Godrich SL, McNaughton SA, Hendrie GA, Blekkenhorst LC, Maddison R, Zhang Y, Barnett S, Mathers JC, Packard M, Alston L. Digital behaviour change interventions to increase vegetable intake in adults: a systematic review. *Int J Behav Nutr Phys Act*. 2023 Mar 27;20(1):36. doi: 10.1186/s12966-023-01439-9. PMID: 36973716; PMCID: PMC10042405.
- ¹¹⁹ McGuire, W. (2012). McGuire's classic input-output framework for constructing persuasive messages. *Public Communication Campaigns*, 133.
- ¹²⁰ Rivera YM, Moran MB, Thrul J, Joshu C, Smith KC. When Engagement Leads to Action: Understanding the Impact of Cancer (Mis)information among Latino/a Facebook Users. *Health Commun*. 2022 Aug;37(9):1229-1241. doi: 10.1080/10410236.2021.1950442. Epub 2021 Jul 13. PMID: 34256676; PMCID: PMC8755854.
- ¹²¹ Wagner DE, Seneres G, Jones E, Brodersen KA, Whitsitt-Paulson S. *Swap Up Your Meal: A Mass Media Nutrition Education Campaign for Oklahoma Teens*. *Int J Environ Res Public Health*. 2022 Aug 16;19(16):10110. doi: 10.3390/ijerph191610110. PMID: 36011746; PMCID: PMC9408208.
- ¹²² Rivera YM, Moran MB, Thrul J, Joshu C, Smith KC. When Engagement Leads to Action: Understanding the Impact of Cancer (Mis)information among Latino/a Facebook Users. *Health Commun*. 2022 Aug;37(9):1229-1241. doi: 10.1080/10410236.2021.1950442. Epub 2021 Jul 13. PMID: 34256676; PMCID: PMC8755854.
- ¹²³ O'Kane N, McKinley MC, Gough A, Hunter RF. Investigating the feasibility and acceptability of using Instagram to engage post-graduate students in a mass communication social media-based health intervention, #WeeStepsToHealth. *Pilot Feasibility Stud*. 2022 Dec 12;8(1):254. doi: 10.1186/s40814-022-01207-9. PMID: 36510310; PMCID: PMC9743718.
- ¹²⁴ Laranjo L, Arguel A, Neves AL, Gallagher AM, Kaplan R, Mortimer N, Mendes GA, Lau AY. The influence of social networking sites on health behavior change: a systematic review and meta-analysis. *J Am Med Inform Assoc*. 2015 Jan;22(1):243-56. doi: 10.1136/amiajnl-2014-002841. Epub 2014 Jul 8. PMID: 25005606; PMCID: PMC4433372.
- ¹²⁵ Denniss E, Lindberg R, Marchese LE, McNaughton SA. #Fail: the quality and accuracy of nutrition-related information by influential Australian Instagram accounts. *Int J Behav Nutr Phys Act*. 2024 Feb 14;21(1):16. doi: 10.1186/s12966-024-01565-y. PMID: 38355567; PMCID: PMC10865719.
- ¹²⁶ Rice, R. E., & Atkin, C. K. (2012). Theory and principles of public communication campaigns. *Public Communication Campaigns*, 3-19.
- ¹²⁷ Warner EL, Basen-Engquist KM, Badger TA, Crane TE, Raber-Ramsey M. The Online Cancer Nutrition Misinformation: A framework of behavior change based on exposure to cancer nutrition misinformation. *Cancer*. 2022 Jul 1;128(13):2540-2548. doi: 10.1002/cncr.34218. Epub 2022 Apr 5. PMID: 35383913.
- ¹²⁸ Rice, R. E., & Atkin, C. K. (2012). Theory and principles of public communication campaigns. *Public Communication Campaigns*, 3-19.

- ¹²⁹ Cho, H., & Salmon, C. T. (2007). Unintended effects of health communication campaigns. *Journal of Communication*, 57(2), 293-317.
- ¹³⁰ Bhardwaj N, Herndon AT, Kuo YF, Porterfield LR. Text messaging intervention for Pap smear uptake: a single-institution study. *Mhealth*. 2023 Oct 19;9:34. doi: 10.21037/mhealth-23-11. PMID: 38023781; PMCID: PMC10643222.
- ¹³¹ Ciceron AC, Jeon MJ, Monroe AK, Clausen ME, Magnus M, Le D. HPV knowledge, screening barriers and facilitators, and sources of health information among women living with HIV: perspectives from the DC community during the COVID-19 pandemic. *BMC Womens Health*. 2022 Apr 9;22(1):110. doi: 10.1186/s12905-022-01689-y. PMID: 35397535; PMCID: PMC8994173.
- ¹³² Huf S, Kerrison RS, King D, Chadborn T, Richmond A, Cunningham D, Friedman E, Shukla H, Tseng FM, Judah G, Darzi A, Vlaev I. Behavioral economics informed message content in text message reminders to improve cervical screening participation: Two pragmatic randomized controlled trials. *Prev Med*. 2020 Oct;139:106170. doi: 10.1016/j.ypmed.2020.106170. Epub 2020 Jun 29. PMID: 32610059.
- ¹³³ Petkovic J, Duench S, Trawin J, Dewidar O, Pardo Pardo J, Simeon R, DesMeules M, Gagnon D, Hatcher Roberts J, Hossain A, Pottie K, Rader T, Tugwell P, Yoganathan M, Presseau J, Welch V. Behavioural interventions delivered through interactive social media for health behaviour change, health outcomes, and health equity in the adult population. *Cochrane Database Syst Rev*. 2021 May 31;5(5):CD012932. doi: 10.1002/14651858.CD012932.pub2. PMID: 34057201; PMCID: PMC8406980.
- ¹³⁴ Wagner DE, Seneres G, Jones E, Brodersen KA, Whitsitt-Paulson S. *Swap Up Your Meal: A Mass Media Nutrition Education Campaign for Oklahoma Teens*. *Int J Environ Res Public Health*. 2022 Aug 16;19(16):10110. doi: 10.3390/ijerph191610110. PMID: 36011746; PMCID: PMC9408208.
- ¹³⁵ IARC; Department of Health and Health Service Executive of Ireland (2023). Best practices in cervical screening programmes: audit of cancers, legal and ethical frameworks, communication, and workforce competencies. Lyon, France: International Agency for Research on Cancer (IARC Working Group Reports, No. 11). Available from: <https://publications.iarc.fr/625>. Licence: CC BY- NC-ND 3.0 IGO.
- ¹³⁶ Fridinger F. Evaluating communication campaigns. Accessed July 6, 2024 at <https://blogs.cdc.gov/publichealthmatters/2018/04/evaluating-campaigns/>.
- ¹³⁷ Wakefield MA, Loken B, Hornik RC. Use of mass media campaigns to change health behaviour. *Lancet*. 2010 Oct 9;376(9748):1261-71. doi: 10.1016/S0140-6736(10)60809-4. PMID: 20933263; PMCID: PMC4248563.
- ¹³⁸ Ghio, D., Lawes-Wickwar, S., Tang, M. Y., Epton, T., Howlett, N., Jenkinson, E., ... & Keyworth, C. (2021). What influences people's responses to public health messages for managing risks and preventing infectious diseases? A rapid systematic review of the evidence and recommendations. *BMJ Open*, 11(11), e048750.
- ¹³⁹ Randolph, W., & Viswanath, K. (2004). Lessons learned from public health mass media campaigns: marketing health in a crowded media world. *Annu. Rev. Public Health*, 25, 419-437.
- ¹⁴⁰ Wakefield MA, Loken B, Hornik RC. Use of mass media campaigns to change health behaviour. *Lancet*. 2010 Oct 9;376(9748):1261-71. doi: 10.1016/S0140-6736(10)60809-4. PMID: 20933263; PMCID: PMC4248563.
- ¹⁴¹ Wakefield MA, Loken B, Hornik RC. Use of mass media campaigns to change health behaviour. *Lancet*. 2010 Oct 9;376(9748):1261-71. doi: 10.1016/S0140-6736(10)60809-4. PMID: 20933263; PMCID: PMC4248563.
- ¹⁴² Randolph, W., & Viswanath, K. (2004). Lessons learned from public health mass media campaigns: marketing health in a crowded media world. *Annu. Rev. Public Health*, 25, 419-437.
- ¹⁴³ Winterbauer NL, Bridger CM, Tucker A, Rafferty AP, Luo H. Adoption of Evidence-Based Interventions in Local Health Departments: "1-2-3 Pap NC". *Am J Prev Med*. 2015 Aug;49(2):309-16. doi: 10.1016/j.amepre.2015.02.024. PMID: 26190805.
- ¹⁴⁴ Carins JE, Rundle-Thiele SR. Eating for the better: a social marketing review (2000-2012). *Public Health Nutr*. 2014 Jul;17(7):1628-39. doi: 10.1017/S1368980013001365. Epub 2013 May 28. PMID: 23711161; PMCID: PMC10282391.
- ¹⁴⁵ Turnwald BP, Handley-Miner IJ, Samuels NA, Markus HR, Crum AJ. Nutritional Analysis of Foods and Beverages Depicted in Top-Grossing US Movies, 1994-2018. *JAMA Intern Med*. 2021 Jan 1;181(1):61-70. doi: 10.1001/jamainternmed.2020.5421. PMID: 33226424; PMCID: PMC7684525.
- ¹⁴⁶ Li Y, Zhang D, Pagán JA. Social Norms and the Consumption of Fruits and Vegetables across New York City Neighborhoods. *J Urban Health*. 2016 Apr;93(2):244-55. doi: 10.1007/s11524-016-0028-y. PMID: 26940705; PMCID: PMC4835355.
- ¹⁴⁷ Carins JE, Rundle-Thiele SR. Eating for the better: a social marketing review (2000-2012). *Public Health Nutr*. 2014 Jul;17(7):1628-39. doi: 10.1017/S1368980013001365. Epub 2013 May 28. PMID: 23711161; PMCID: PMC10282391.

- ¹⁴⁸ Carins JE, Rundle-Thiele SR. Eating for the better: a social marketing review (2000-2012). *Public Health Nutr.* 2014 Jul;17(7):1628-39. doi: 10.1017/S1368980013001365. Epub 2013 May 28. PMID: 23711161; PMCID: PMC10282391.
- ¹⁴⁹ Wakefield MA, Loken B, Hornik RC. Use of mass media campaigns to change health behaviour. *Lancet.* 2010 Oct 9;376(9748):1261-71. doi: 10.1016/S0140-6736(10)60809-4. PMID: 20933263; PMCID: PMC4248563.
- ¹⁵⁰ Capitão C, Martins R, Feteira-Santos R, Virgolino A, Graça P, Gregório MJ, Santos O. Developing healthy eating promotion mass media campaigns: A qualitative study. *Front Public Health.* 2022 Jul 29;10:931116. doi: 10.3389/fpubh.2022.931116. PMID: 35968460; PMCID: PMC9372615.
- ¹⁵¹ den Braver NR, Garcia Bengoechea E, Messing S, Kelly L, Schoonmade LJ, Volf K, Zukowska J, Gelius P, Forberger S, Woods CB, Lakerveld J. The impact of mass-media campaigns on physical activity: a review of reviews through a policy lens. *Eur J Public Health.* 2022 Nov 28;32(Suppl 4):iv71-iv83. doi: 10.1093/eurpub/ckac085. PMID: 36444108; PMCID: PMC9706123.
- ¹⁵² den Braver NR, Garcia Bengoechea E, Messing S, Kelly L, Schoonmade LJ, Volf K, Zukowska J, Gelius P, Forberger S, Woods CB, Lakerveld J. The impact of mass-media campaigns on physical activity: a review of reviews through a policy lens. *Eur J Public Health.* 2022 Nov 28;32(Suppl 4):iv71-iv83. doi: 10.1093/eurpub/ckac085. PMID: 36444108; PMCID: PMC9706123.
- ¹⁵³ Conley CC, Otto AK, McDonnell GA, Tercyak KP. Multiple approaches to enhancing cancer communication in the next decade: translating research into practice and policy. *Transl Behav Med.* 2021 Nov 30;11(11):2018-2032. doi: 10.1093/tbm/ibab089. PMID: 34347872; PMCID: PMC8634534.
- ¹⁵⁴ Ramondt S, Ramírez AS. Assessing the impact of the public nutrition information environment: Adapting the cancer information overload scale to measure diet information overload. *Patient Educ Couns.* 2019 Jan;102(1):37-42. doi: 10.1016/j.pec.2018.07.020. Epub 2018 Jul 26. PMID: 30097378; PMCID: PMC6289837.
- ¹⁵⁵ Swoboda CM, Walker DM, Huerta T. Odds of Meeting Cancer Prevention Behavior Recommendations by Health Information Seeking Behavior: a Cross-Sectional HINTS Analysis. *J Cancer Educ.* 2021 Feb;36(1):56-64. doi: 10.1007/s13187-019-01597-0. PMID: 31396847.
- ¹⁵⁶ Di Sebastiano KM, Murthy G, Campbell KL, Desroches S, Murphy RA. Nutrition and Cancer Prevention: Why is the Evidence Lost in Translation? *Adv Nutr.* 2019 May 1;10(3):410-418. doi: 10.1093/advances/nmy089. PMID: 30915435; PMCID: PMC6520044.
- ¹⁵⁷ Luo Y, Maafs-Rodríguez AG, Hatfield DP. The individual-level effects of social media campaigns related to healthy eating, physical activity, and healthy weight: A narrative review. *Obes Sci Pract.* 2024 Jan 4;10(1):e731. doi: 10.1002/osp4.731. PMID: 38187123; PMCID: PMC10767147.
- ¹⁵⁸ Luo Y, Maafs-Rodríguez AG, Hatfield DP. The individual-level effects of social media campaigns related to healthy eating, physical activity, and healthy weight: A narrative review. *Obes Sci Pract.* 2024 Jan 4;10(1):e731. doi: 10.1002/osp4.731. PMID: 38187123; PMCID: PMC10767147.
- ¹⁵⁹ Rivera YM, Moran MB, Thrul J, Joshu C, Smith KC. When Engagement Leads to Action: Understanding the Impact of Cancer (Mis)information among Latino/a Facebook Users. *Health Commun.* 2022 Aug;37(9):1229-1241. doi: 10.1080/10410236.2021.1950442. Epub 2021 Jul 13. PMID: 34256676; PMCID: PMC8755854.
- ¹⁶⁰ Nothacker J, Nury E, Roehl Mathieu M, Raatz H, Meerpohl JJ, Schmucker C. Women's attitudes towards a human papillomavirus-based cervical cancer screening strategy: a systematic review. *BMJ Sex Reprod Health.* 2022 Oct;48(4):295-306. doi: 10.1136/bmjsexrh-2022-201515. Epub 2022 Aug 5. PMID: 36223918; PMCID: PMC9606488.
- ¹⁶¹ Kraak VI, Consavage Stanley K, Harrigan PB, Zhou M. How have media campaigns been used to promote and discourage healthy and unhealthy beverages in the United States? A systematic scoping review to inform future research to reduce sugary beverage health risks. *Obes Rev.* 2022 May;23(5):e13425. doi: 10.1111/obr.13425. Epub 2022 Feb 9. PMID: 35142020; PMCID: PMC9286342.
- ¹⁶² Laestadius LI, Wahl MM. Mobilizing social media users to become advertisers: Corporate hashtag campaigns as a public health concern. *Digit Health.* 2017 May 23;3:2055207617710802. doi: 10.1177/2055207617710802. PMID: 29942600; PMCID: PMC6001194.
- ¹⁶³ Warner EL, Basen-Engquist KM, Badger TA, Crane TE, Raber-Ramsey M. The Online Cancer Nutrition Misinformation: A framework of behavior change based on exposure to cancer nutrition misinformation. *Cancer.* 2022 Jul 1;128(13):2540-2548. doi: 10.1002/cncr.34218. Epub 2022 Apr 5. PMID: 35383913.
- ¹⁶⁴ Denniss E, Lindberg R, Marchese LE, McNaughton SA. #Fail: the quality and accuracy of nutrition-related information by influential Australian Instagram accounts. *Int J Behav Nutr Phys Act.* 2024 Feb 14;21(1):16. doi: 10.1186/s12966-024-01565-y. PMID: 38355567; PMCID: PMC10865719.
- ¹⁶⁵ Denniss E, Lindberg R, Marchese LE, McNaughton SA. #Fail: the quality and accuracy of nutrition-related information by influential Australian Instagram accounts. *Int J Behav Nutr Phys Act.* 2024 Feb 14;21(1):16. doi: 10.1186/s12966-024-01565-y. PMID: 38355567; PMCID: PMC10865719.

- ¹⁶⁶ Silva P, Araújo R, Lopes F, Ray S. Nutrition and Food Literacy: Framing the Challenges to Health Communication. *Nutrients*. 2023 Nov 7;15(22):4708. doi: 10.3390/nu15224708. PMID: 38004102; PMCID: PMC10674981.
- ¹⁶⁷ Ruxton CH, Ruani MA, Evans CE. Promoting and disseminating consistent and effective nutrition messages: challenges and opportunities. *Proc Nutr Soc*. 2023 Sep;82(3):394-405. doi: 10.1017/S0029665123000022. Epub 2023 Jan 6. PMID: 36603858.
- ¹⁶⁸ Rivera YM, Moran MB, Thrul J, Joshu C, Smith KC. When Engagement Leads to Action: Understanding the Impact of Cancer (Mis)information among Latino/a Facebook Users. *Health Commun*. 2022 Aug;37(9):1229-1241. doi: 10.1080/10410236.2021.1950442. Epub 2021 Jul 13. PMID: 34256676; PMCID: PMC8755854.
- ¹⁶⁹ Warner EL, Basen-Engquist KM, Badger TA, Crane TE, Raber-Ramsey M. The Online Cancer Nutrition Misinformation: A framework of behavior change based on exposure to cancer nutrition misinformation. *Cancer*. 2022 Jul 1;128(13):2540-2548. doi: 10.1002/cncr.34218. Epub 2022 Apr 5. PMID: 35383913.
- ¹⁷⁰ Edwards, D. J. (2021). Ensuring effective public health communication: Insights and modeling efforts from theories of behavioral economics, heuristics, and behavioral analysis for decision making under risk. *Frontiers in Psychology*, 12, 715159.
- ¹⁷¹ Stimpson, J. P., & Ortega, A. N. (2023). Social media users' perceptions about health mis- and disinformation on social media. *Health Affairs Scholar*, 1(4), qxad050.
- ¹⁷² Wang, Y., McKee, M., Torbica, A., & Stuckler, D. (2019). Systematic literature review on the spread of health-related misinformation on social media. *Social Science & Medicine*, 240, 112552.
- ¹⁷³ Jo S, Pituch KA, Howe N. The Relationships Between Social Media and Human Papillomavirus Awareness and Knowledge: Cross-sectional Study. *JMIR Public Health Surveill*. 2022 Sep 20;8(9):e37274. doi: 10.2196/37274. PMID: 36125858; PMCID: PMC9533211.
- ¹⁷⁴ Rivera YM, Moran MB, Thrul J, Joshu C, Smith KC. When Engagement Leads to Action: Understanding the Impact of Cancer (Mis)information among Latino/a Facebook Users. *Health Commun*. 2022 Aug;37(9):1229-1241. doi: 10.1080/10410236.2021.1950442. Epub 2021 Jul 13. PMID: 34256676; PMCID: PMC8755854.
- ¹⁷⁵ Clark D, Nagler RH, Niederdeppe J. Confusion and nutritional backlash from news media exposure to contradictory information about carbohydrates and dietary fats. *Public Health Nutr*. 2019 Dec;22(18):3336-3348. doi: 10.1017/S1368980019002866. Epub 2019 Oct 7. PMID: 31587681; PMCID: PMC10260685.
- ¹⁷⁶ Lee CJ, Nagler RH, Wang N. Source-specific Exposure to Contradictory Nutrition Information: Documenting Prevalence and Effects on Adverse Cognitive and Behavioral Outcomes. *Health Commun*. 2018 Apr;33(4):453-461. doi: 10.1080/10410236.2016.1278495. Epub 2017 Feb 2. PMID: 28151010; PMCID: PMC6102724.
- ¹⁷⁷ Edwards, D. J. (2021). Ensuring effective public health communication: Insights and modeling efforts from theories of behavioral economics, heuristics, and behavioral analysis for decision making under risk. *Frontiers in Psychology*, 12, 715159.
- ¹⁷⁸ Ziemer, C.-T., & Rothmund, T. (2024). Psychological underpinnings of misinformation countermeasures: A systematic scoping review. *Journal of Media Psychology: Theories, Methods, and Applications*. Advance online publication. <https://doi.org/10.1027/1864-1105/a000407>
- ¹⁷⁹ Edwards, D. J. (2021). Ensuring effective public health communication: Insights and modeling efforts from theories of behavioral economics, heuristics, and behavioral analysis for decision making under risk. *Frontiers in Psychology*, 12, 715159.
- ¹⁸⁰ Ziemer, C.-T., & Rothmund, T. (2024). Psychological underpinnings of misinformation countermeasures: A systematic scoping review. *Journal of Media Psychology: Theories, Methods, and Applications*. Advance online publication. <https://doi.org/10.1027/1864-1105/a000407>
- ¹⁸¹ Stimpson, J. P., & Ortega, A. N. (2023). Social media users' perceptions about health mis- and disinformation on social media. *Health Affairs Scholar*, 1(4), qxad050.
- ¹⁸² Wang, Y., McKee, M., Torbica, A., & Stuckler, D. (2019). Systematic literature review on the spread of health-related misinformation on social media. *Social Science & Medicine*, 240, 112552.
- ¹⁸³ McGuire, W. (2012). McGuire's classic input-output framework for constructing persuasive messages. *Public Communication Campaigns*, 133.
- ¹⁸⁴ Conley, C. C., Otto, A. K., McDonnell, G. A., & Tercyak, K. P. (2021). Multiple approaches to enhancing cancer communication in the next decade: translating research into practice and policy. *Translational Behavioral Medicine*, 11(11), 2018-2032.
- ¹⁸⁵ Ghio, D., Lawes-Wickwar, S., Tang, M. Y., Epton, T., Howlett, N., Jenkinson, E., ... & Keyworth, C. (2021). What influences people's responses to public health messages for managing risks and preventing infectious diseases? A rapid systematic review of the evidence and recommendations. *BMJ Open*, 11(11), e048750.

- ¹⁸⁶ Englund TR, Zhou M, Hedrick VE, Kraak VI. How Branded Marketing and Media Campaigns Can Support a Healthy Diet and Food Well-Being for Americans: Evidence for 13 Campaigns in the United States. *J Nutr Educ Behav*. 2020 Jan;52(1):87-95. doi: 10.1016/j.jneb.2019.09.018. Epub 2019 Oct 29. PMID: 31672282.
- ¹⁸⁷ Rice, R. E., & Atkin, C. K. (2012). Theory and principles of public communication campaigns. *Public Communication Campaigns*, 3-19.
- ¹⁸⁸ Kreps, G. L. (2012). Strategic communication for cancer prevention and control: reaching and influencing vulnerable audiences. *Cancer Prevention*, 375-388.
- ¹⁸⁹ Atkin, C. K., & Freimuth, V. (2013). Guidelines for formative evaluation research in campaign design. *Public Communication Campaigns*, 4, 53-68.
- ¹⁹⁰ Rice, R. E., & Atkin, C. K. (2012). Theory and principles of public communication campaigns. *Public Communication Campaigns*, 3-19.
- ¹⁹¹ Conley, C. C., Otto, A. K., McDonnell, G. A., & Tercyak, K. P. (2021). Multiple approaches to enhancing cancer communication in the next decade: translating research into practice and policy. *Translational Behavioral Medicine*, 11(11), 2018-2032.
- ¹⁹² Kite, J., Chan, L., MacKay, K., Corbett, L., Reyes-Marcelino, G., Nguyen, B., ... & Freeman, B. (2023). A model of social media effects in public health communication campaigns: systematic review. *Journal of Medical Internet Research*, 25, e46345.
- ¹⁹³ Getachew-Smith, H., King, A. J., Marshall, C., & Scherr, C. L. (2022). Process evaluation in health communication media campaigns: A systematic review. *American Journal of Health Promotion*, 36(2), 367-378.
- ¹⁹⁴ Atkin, C. K., & Freimuth, V. (2013). Guidelines for formative evaluation research in campaign design. *Public Communication Campaigns*, 4, 53-68.
- ¹⁹⁵ Noar, S. M. (2006). A 10-year retrospective of research in health mass media campaigns: where do we go from here?. *Journal of Health Communication*, 11(1), 21-42.
- ¹⁹⁶ Randolph, W., & Viswanath, K. (2004). Lessons learned from public health mass media campaigns: marketing health in a crowded media world. *Annu. Rev. Public Health*, 25, 419-437.
- ¹⁹⁷ Rice, R. E., & Atkin, C. K. (2012). Theory and principles of public communication campaigns. *Public Communication Campaigns*, 3-19.
- ¹⁹⁸ Snyder, L. B., Hamilton, M. A., Mitchell, E. W., et al. (2004). A meta-analysis of the effect of mediated health communication campaigns on behavior change in the United States. *Journal of Health Communication*, 9(S1), 71-96.
- ¹⁹⁹ Wakefield, M. A., Loken, B., & Hornik, R. C. (2010). Use of mass media campaigns to change health behaviour. *The Lancet*, 376(9748), 1261-1271. doi: 10.1016/S0140-6736(10)60809-4. PMID: 20933263; PMCID: PMC4248563.
- ²⁰⁰ Firestone, R., Rowe, C. J., Modi, S. N., & Sievers, D. (2017). The effectiveness of social marketing in global health: a systematic review. *Health Policy and Planning*, 32(1), 110-124.
- ²⁰¹ Lankford, T., Wallace, J., Brown, D., Soares, J., Epping, J. N., & Fridinger, F. (2014). Analysis of physical activity mass media campaign design. *Journal of Physical Activity and Health*, 11(6), 1065-1069.
- ²⁰² Centers for Disease Control and Prevention (2023). Plain Language Checklist. <https://www.cdc.gov/healthliteracy/developmaterials/plainlanguage.html#Checklist>.
- ²⁰³ Centers for Disease Control and Prevention (2019). The CDC Clear Communication Index. <https://www.cdc.gov/ccindex/index.html>.
- ²⁰⁴ Centers for Disease Control and Prevention (2009). Simply Put: A guide for creating easy-to-understand materials.
- ²⁰⁵ National Cancer Institute (2009). Making Health Communications Programs Work. <https://www.cancer.gov/publications/health-communication/pink-book.pdf>.
- ²⁰⁶ World Health Organization (2017). WHO Strategic Communications Framework for effective communications. <https://www.humanitarianlibrary.org/resource/who-strategic-communications-framework-effective-communications>.
- ²⁰⁷ George Washington University Cancer Center (2021). Cancer Prevention Month and World Cancer Day Social Media Toolkit. https://cancercontroptap.smhs.gwu.edu/sites/g/files/zaskib661/files/2021-11/World%20Cancer%20Day%20and%20National%20Cancer%20Prevention%20Month%20Social%20Media%20Toolkit%202021%20FINAL_508%20in%20progress.pdf.