DISCUSSION PAPER

Identifying Credible Sources of Health Information in Social Media: Principles and Attributes

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ABSTRACT | *Social media is widely used as a source of health information for the general public. The potential for information shared through social media to in uence health outcomes necessitates action by social media platforms to enhance access and exposure to high-quality, science-based information. This paper summarizes the work of an independent advisory group convened by the National Academy of Medicine that deliberated and gathered information to develop a set of initial principles and attributes that could inform platforms' identi cation and possible elevation of credible sources of health information. Using these principles and attributes as a framework, the authors discuss the*

tion" describes a "coordinated or deliberate" eFort to spread misinformation in order to gain "money, power, or reputation" [1]. Social media allows both misinformation and disinformation to be disseminated much more rapidly and broadly than ever before [4]. The ability for people to tailor their preferences on SMPs to see information from only the sources they select raises concerns about "bubbles" or "echo chambers" that could reinforce existing beliefs (although recent research has challenged this notion [5]). However, consumers do not have to proactively seek information that confirms their beliefs; algorithms used by SMPs and other web platforms often recommend content on the basis of users' past behaviors and expressed interests, leading to passive or incidental exposure [6]. In the case of low-quality health information, such reinforcement loops can be harmful.

The coronavirus disease 2019 (COVID-19) pandemic has demonstrated the potentially malign outcomes of this aspect of social media. Misinformation about the disease spread through social media and other online forums—often fueled by politicization of scientific information—has considerably harmed the adoption of recommended prevention and control behaviors and has decreased support for vital policies, such as vaccination [7]. Therefore, SMPs are capable of amplifying misinformation and disinformation in harmful ways, including those that may lead to poor outcomes for individual as well as population health [8]. The authors believe that these platforms have an important opportunity—and a growing responsibility—to intervene, not only to counteract these harmful trends but also to enhance consumers' access and exposure to high-quality, science-based health information. Proactive interventions by SMPs are one potential approach, although not a sole solution, to the challenge of "platform governance," an issue that has been the subject of increasing policy debate [9].

The tremendous reach of SMPs among broad and diverse audiences aFords them unique potential to support health-promoting behaviors amid the COVID-19 pandemic, as well as other current and future health challenges. For example, the two current most popular SMPs used by organizations to share health information—Facebook and YouTube—reach 2.85 billion [10] and "over 2 billion," [11] monthly active users, respectively [b]. This represents a significant portion of the world's population, estimated by the U.S. Census Bureau to be nearly 7.8 billion people in June 2021 [12]. Harnessing the power of social media to elevate high-quality information could therefore have a truly transformative eFect on health and well-being worldwide.

However, determining what constitutes high-quality health information is a complex and multidimensional process. Although SMPs are beginning to pilot strategies to elevate and label high-quality information, there are no public data available to demonstrate what works and no scientifi

by the goal of enhancing public access to evidence-based health information during the COVID-19 pandemic, although the issue has relevance beyond the current crisis.

The project involved an independent expert advisory group composed of multi-disciplinary experts in information governance, health information development, public health and health equity, social media and misinformation, and science communication (members of which also authored this paper), a public webinar, a public comment period, and other information-gathering activities. **This paper does not constitute o cial recommendations from the NAM or the National Academies of Sciences, Engineering, and Medicine (NASEM), nor does it represent an endorsement of any actions taken by YouTube or other SMPs following its publication.**

Methods

Managing Conflict of Interest

The NAM is an organization whose influence stems in part from its reputation as a credible source of health information. Further, the NAM disseminates this information in part through social media [d]. To minimize conflict of interest (COI), the NAM took steps to ensure the independence and objectivity of the advisory group and this paper. This paper represents the opinions of the authors and does not reflect a consensus position of the NAM, NASEM, or the authors' organizations. The authors did not receive payment from the NAM, NASEM, or YouTube for their contributions to this paper, and the authors' declared individual COIs are included in this paper's back matter. This paper has been revised in response to scientific peer review by individuals who were chosen for their expertise in social media, ethics, health literacy, law, communications, and policy but are unknown to the authors.

Box 1 | Takeaway Points from the NAM Webinar on "Defining the Authority of Online Providers of Health Information"

- Scientific and medical collaborations with social media companies o

Box 3 | Models for Evaluation of Source Credibility

Clinical Practice Guidelines We Can Trust. This 2011 Institute of Medicine consensus report made recommendations for identifying high-quality clinical practice guidelines (CPGs) among the nearly 27,000 then contained in the National Guideline Clearinghouse. The report committee concluded that certifying organizations with trustworthy CPG development

promoted via email to approximately 1,000 individuals who had registered to attend the webinar and/or signed up for the project mailing list, as well as shared through the NAM's social media channels. In total, the NAM received 49 comments. Fourteen of the commenters provided feedback on behalf of an organization, while the remainder commented as individuals. Three commenters were from Canada, one was from Mexico, one was from Egypt, and the remainder were from the United States. The comments were analyzed, sorted into themes, and summarized by a contractor [e]; this synthesis is available on the project webpage and presented more briefly in *Box 2*. The authors reviewed all comments received and considered them in developing this paper.

Review of Existing Models for Evaluation of Source Credibility

The authors performed a scan of existing models for evaluating source credibility and/or information quality (see *Box 3* and *Appendix A*). Major themes that emerge across these models include the importance of independence from profit motivations and bias; rigorous content review processes; transparency and accountability; and mission-driven policies.

Scope

Given the complexity of the task—including the volume of health information shared through social media and the controversial nature of evolving content moderation policies—the authors limit their guidance to what they believe is a feasible first step toward enhancing

conflict of interest and promote transparency and accountability." The principles that inform this definition are explained in the following section.

High-Quality Information

As noted in the Introduction, *high-quality information* is that which is "science-based" or consistent with the best scientific evidence available at the time. The state of science and knowledge is always evolving, so the marker of time is an important component of this definition. The evolution of knowledge is also the reason that more absolute terms, such as *accurate*, are less appropriate. Although this paper does not consider information quality directly, increasing access to high-quality information is the goal of the approach under discussion.

Health Information

The authors define *health information* as content pertaining to health conditions (physical and mental), behaviors aFecting health, public health, population health, health care, health policy, or biomedical science.

Source

For the purposes of this paper, a *source* is an entity that oFers health information through one or more social media channels branded to that entity. A channel is a proprietary forum where a source can share content (text, visual, video, or audio) and interact with social media users who choose to "follow" or "subscribe" to that channel, as well as users who discover the content through search engines or SMPs' "recommended content" algorithms.

Credible Source of Health Information

Building on the definitions and discussion previously mentioned, the authors define *credible source of health information* as "a source that is likely to oFer high-quality information and employ processes to reduce conflict

Box 4 | The Relationship Between Trust and Credibility

Trusted is not synonymous with *credible*. Sources considered credible by the authors' definition may not be trusted by all individuals and groups, while sources that are widely trusted may not be credible. However, trust aFects the *perception* of credibility, and by extension, the influence of credible sources of health information. For example, according to a survey by the RAND Corporation, trust in the Centers for Disease Control and Prevention (CDC) declined by about 10 percent during the COVID-19 pandemic. The authors of the survey suggest that "public trust in federal government agencies has never been as

tribute is not necessarily of equal weight or importance. Instead, SMPs and consumers of health information could consider these principles and attributes as a framework to inform their own assessments of a source's credibility. Further, sources of health information could consider using *Table 1* as a roadmap to assess and potentially enhance their own credibility.

To avoid perfection paralysis, the authors believe that *general* alignment with the principles and attributes listed in *Table 1*, coupled with full disclosure of any deviations, could serve as a reliable initial signal of a source's credibility. As noted in the sections that follow, some types of sources are subject to pre-existing, standardized vetting mechanisms that signal such alignment. However, there remain credibility concerns with these source types as a whole. *All* sources should publicly disclose deviations from the principles and attributes and be subject to other strategies to ensure information quality (described later in this paper).

Identifying Credible Sources of Health Information

Categorization

A very wide range of U.S. nonpro

Foundational Principle	Attributes
Science-Based: Sources should provide information that is consistent with the best scientific evidence available at the time and meet standards for the creation, review, and presentation of scientific content.	• Acknowledges the limitations and evolution of knowledge (e.g., early or incomplete knowledge, as seen in the COVID-19 pandemic; small sample size; correlation versus causation, etc.) • Clearly labels information with the date it was last updated and strives to reassess and update content • Demonstrates subjecuon, rePeci1.8 0 1 Tf6.2717 l316D.036(avai/TT4
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Together, accredited organizations, accreditors, and collaborator organizations function as a network that supports consistent and high performance standards, continuous evaluation and improvement, and public transparency and accountability—although these characteristics are not specific to the context of sharing health information through social media.

Categories of accredited organizations that serve as sources of health information for the public include educational institutions (universities and health professions schools), health care organizations, health plans, and public health departments (see *Box 5* for a summary and *Appendix Table B-1* for a list of accreditors and what accreditation signifies for organizations in each category).

Credibility Concerns

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Academic Health and Medical Journals

Academic journals are scholarly periodicals that publish research or reports specific to a profession or field of study. Many journals promote their publications through social media; in addition, journalists summarize journal articles and share their topline findings through social media. Academic journals are generally affiliated with educational institutions or professional associations. Although they exercise editorial independence, many are owned by for-profit publishing corpo-

Government Organizations

Federal, state, and local government organizations operate under a number of provisions that support their credibility as sources of health information—primarily in the areas of transparency and accountability. As part of the system of checks and balances built into the U.S. government, the Constitution gives the legislative and judiciary branches oversight over the executive

in mask-wearing guidance during the COVID-19 pandemic [26].

Credibility Concerns

Trust in the federal government is low among some groups, compromising its influence as a credible source of health information. According to a survey from the Pew Research Center, only 24 percent of Americans trust the federal government "to do what is right just about always or most of the time" [27] (this statistic refers to the federal government in general, not as a source of health information). Trends in trust of the government vary among political party affiliation as well as race and ethnicity, suggesting that perception of government credibility may vary across population groups [28].

Furthermore, provisions for transparency and accountability are important attributes of credible sources but are not a guarantee of high-quality information. Recent events have raised further concern, as in the example of the CDC's removal of scientific guidance after allegations of undue political pressure on the agency's staff [29]. Clearly, the degree of transparency and accountability upheld by the government at all levels is influenced by the leaders currently in office. Politicization can bias or limit the information that government organizations release. Government organizations may also withhold complete information because of privacy or security concerns, which may result in fragmented or distorted perceptions of issues. Therefore, although the authors believe that government organizations can generally be treated as credible sources, the principles and attributes identified in this paper should apply to them as well, and gaps in credibility should be further examined.

Nonprofit Organizations Not Subject to Standardized Vetting Mechanisms

Many categories of nonprofit organizations that are not subject to standardized vetting mechanisms serve as sources of health information. Some adhere to rigorous standards that align with the principles and attributes outlined in this paper, and some do not. There is no pre-existing, standardized mechanism for evaluating the credibility of sources in this category (although individual mechanisms exist). Therefore, SMPs that wish to assess the credibility of such sources should develop a standardized process for assessing alignment with the principles and attributes identified in this paper.

Table 2 lists types of organizations that share health information (excluding health care organizations, health plans, government organizations, and public health departments), along with the authors' general observations about the credibility of organizations in each category, drawing from the principles and attributes.

Credibility Assessment Steps

To assess the credibility of sources not subject to pre-existing, standardized vetting mechanisms that align with the authors' principles and attributes, SMPs would need to collect and evaluate a standardized set of data. The means of data collection could be either primary or secondary (i.e., SMPs could undertake their own discovery process or rely on information provided by a source). For example, primary data collection might mean using technology to "crawl" a source's website for evidence of citations, peer review processes, COI disclosures, etc. Secondary data collection might take the form of a credibility attributes and disclosures section that a source could provide to an SMP and post publicly on the homepage of its social media channel(s). This latter approach would require sources to self-regulate and comply with an informal "honor system" or "code of ethics." For example, a source would have to decide whether the content of an advertisement posted alongside health information constitutes a conflict of interest that could compromise the quality of that information.

On the other hand, as previously mentioned, sources that *are* subject to such standardized vetting mechanisms can be afforded a preliminary assumption of credibility, as well as government organizations by virtue of their strict accountability practices. However, even sources in these groups should strive to display a preponderance of the authors' credibility attributes and publicly disclose any deviations (as well as be subject to parallel content evaluation, as described in the following).

For any source type, SMPs' approach to credibility assessment should include a human-led quality assurance (QA) program. Algorithms and other automated technologies are likely not capable of evaluating every nuance of the credibility attributes. The QA system should verify alignment with source credibility attributes as well *as the quality of the information shared.* To ensure that consumers are accessing high-quality health information, some form of content assessment is essential as a supplement to source assessment.

TABLE 2 | Other Nonprofit Entities That Share Health Information (Excluding Health Care Organizations, Health Plans, Government Organizations, and Public Health Departments)

Organization Type	Definition	Credibility Observations [a]
Independent organizations or advisory panels that create evidence-based guidance (e.g., "blue ribbon" panels	Entities in this category produce evidence-based conclusions or recommendations at the request of the government or other entities to inform the development of public or organizational policy and practice. An example of an organization in this category is the U.S. Preventive Services Task Force.	These entities generally synthesize information from multiple sources and incorporate consensus processes, peer review, and measures to address bias and conflict of interest. These organizations typically do not engage in lobbying or advertising and maintain strict independence from funding organizations.
Professional associations or societies [b]	Organizations in this category exist to advance the interests of a given field through development of professional standards, supportive policies, and research, among other functions. Most have paying members. An example of an organization in this category is the American Public Health Association.	Many professional associations and societies engage in research or analysis that generally meets the standards for the creation, review, and presentation of scientific content. These organizations also tend to follow rigorous process to maintain transparency and accountability to their members and others in their field. However, many engage in advocacy or lobbying activities on behalf of member interests or mission-specific issues. Credibility assessments should ensure these activities are disclosed and kept separate from the presentation of relevant health information.
Advisory organizations or think tanks	Organizations in this category employ experts and researchers in order to comprehensively monitor and provide opinions and guidance on a given subject or group of subjects. Opinions and guidance are given in the form of media interviews, speeches, news articles, journal articles, books and reports, and beyond. Some may use consensus or peer review processes. An example of an organization in this category is the RAND Corporation.	Many of these organizations engage in research or analysis that generally meets the standards for the creation, review, and presentation of scientific content. However, many think tanks have political biases. Further, many employ scholars or experts who share personal opinions without content oversight from the organization. Credibility assessments should ensure these activities are disclosed and strive to separate ideological messages from relevant health information, as well as examine the knowledge generation processes of these organizations.

Health industry groups	Organizations in this category exist to advance the interest of a given health industry through development of standards, supportive	

Community health organizations	Organizations in this category exist to advance the health of a given community by raising awareness, fostering engagement, and connecting community members with resources, among other functions. In many cases, these groups focus on culturally competent communication and involve community members in planning and decision making. An example of an organization in this category is DC Health Matters.	Community health organizations may command a high degree of trust among their constituents and therefore serve as important sources of health information. However, there is tremendous variation among these organizations, requiring a high degree of granularity in credibility assessments.
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[a] This chart is developed for credibility assessment of nonprofit and government organiza-

could also incorporate consumer feedback. Sources that do not demonstrate ongoing adherence should lose any public signal of credibility, and that loss should be made visible to consumers. SMPs may have or could develop lists of sources that are known proponents of harmful information, and these should be made public for the benefit of consumers.

SMPs should also monitor the policies of peer social media companies, both to be aware of how their own content may be repackaged on other platforms (i.e., perhaps stripped of important contextual information) and to learn, share, and reach alignment on approaches to common challenges.

Parallel Strategies to Supplement Source Assessment

SMPs' approaches to source assessment should continue to be refined and improved, and, importantly, should be supplemented by other strategies (as called for in public comments; see *Box 2*).

Content Assessment

Once again, although a reasonable starting point, evaluation of source credibility alone is not an adequate tool to ensure social media users' access to high-quality health information. SMPs must supplement source assessment strategies with an equally robust system for content evaluation. In the interim, SMPs should clearly explain the limitations of source credibility to consumers (i.e., a source deemed credible is *likely* to share high-quality information, but not guaranteed). Ultimately, source credibility and information quality should be integrated under a single, streamlined assessment system to maximize clarity and usability for both sources and consumers.

Management of Misinformation

The elevation of credible sources of health information, while an important contribution, is not enough on its own to counteract the harms of misinformation and disinformation. SMPs should maintain parallel strategies to address such false and inaccurate information, as well as sources that deliberately promulgate such information. Admittedly, management of misinformation is a highly complex challenge, both politically and legally, making the elevation of credible sources and high-quality information a potentially more feasible priority.

As noted previously, the state of science and knowledge is always evolving, and information that was once consistent with the best available evidence at the time can quickly become outdated. Credible sources can avoid the perception of misinformation by using clear date labels and striving to update content regularly.

Health Literacy, Culturally Competent Communication, and Community Relationships

Regardless of the eventual system for elevating credible sources and high-quality information, consumers will still make their own judgments about which sources and information to trust. In fact, one of the major themes from the public comment period, summarized in *Box 2*, was that SMPs must protect freedom of speech and the autonomy of users in accessing the information that they choose.

Users seeking health information may not be satisfied with an SMP's assessment of source credibility or information quality. As explained by Lisa Fitzpatrick, founder and CEO of the Washington, DC-based community organization Grapevine Health, people are resourceful and often consult many sources, both online and o H ine, before reaching a conclusion [31]. Resourcefulness is an asset if people are empowered and provided with ready access to high-quality health information. Although many people have a high degree of health literacy, a large-scale eFort is needed to ensure that resources are in place to support and educate *all* people to become savvy, informed, and science-literate users of social media. This concept is an important aspect of information equity [i] (across literacy levels, preferred languages, location/locality, etc.)—and, by extension, health equity.

Therefore, SMPs should invest in evidence-based health literacy and consumer education strategies to support the success of their in-house approaches to elevating credible sources and high-quality information. Such strategies could be designed and executed by the platforms themselves, but a better approach may be to delegate to independent third parties.

Consumers' evaluation of the credibility of online information goes beyond source and content characteristics to considerations of design, or the way information is presented [3]. A source's credibility is of little relevance if it fails to connect with its audience. As an illustration, Fitzpatrick shared a quote from a community member: "I don't understand what doctors are saying, and if I don't understand you, I can't trust you" [31]. Several of the public comments the authors received echoed this point, noting that credible sources may not always present information in a manner that is appealing, engaging, or culturally competent.

"Cultural competence" refers to the ability to interact eFectively with diverse audiences by recognizing and responding to variations in social, cultural, and linguis-

Structural Bias

BIPOC have historically been underrepresented in many institutions that enjoy a reputation for credibility today. For example, racial segregation persisted in U.S. universities until the latter half of the 20th century, and more insidious forms of prejudice endure to this day [37]. BIPOC researchers and their research insights are underrepresented in clinical and biomedical fields and are less likely to receive federal funding than their White counterparts [38]. According to 2020 data from the U.S. Office of Personnel Management, Black and other people of color made up 38 percent of the federal workforce but only 22 percent of Senior Executive Service positions [39]. This historic and ongoing underrepresentation of BIPOC and others in positions of influence in academia, science, health care, and government means information shared by these institutions may not always reflect the experiences of or resonate with these groups— thereby perpetuating underrepresentation and information inequity.

To counter this bias and increase equity and representation, SMPs should make a concerted effort to identify and promote sources that are not only credible but also trusted and utilized by diverse audiences, including BIPOC and other groups, such as new immigrants, LGBTQIA+ individuals, religious minorities, and people with disabilities. SMPs should assess consumer data to identify sources that are heavily utilized by marginalized groups and prioritize them for credibility evaluation and potential elevation. Partnerships with groups that represent the rights and health of such groups will be essential to the success of this effort.

Financial Conflict

A system that elevates credible sources of health information may create a new "credibility brand" that is profitable for both sources and SMPs themselves. As set forth in the authors' principles and criteria, credible sources should take steps to ensure that financial and ideological interests do not compromise the presentation of science-based health information. However, financial gain and enhanced influence may be unavoidable collateral effects of designation as a credible source in social media channels.

SMPs should support research to understand the impact of credibility designations on the quality of information shared by sources, on sources' level of influence both inside and outside social media, and on sources' financial status. Advertisements should not be attached to high-quality health information shared through SMPs, both to minimize financial conflicts of interest and to avoid compromising the quality and accessibility of the information (e.g., with distracting and potentially misleading ads).

To uphold their integrity, SMPs should separate their own profit motives as much as possible from efforts to elevate credible sources of health information. One way to achieve this would be for platforms to work with independent third parties to design and implement source and content evaluation and moderation strategies.

Feasibility and Appropriateness of SMPs' Role

This paper has made significant asks of SMPs beyond the initial task of identifying and elevating credible sources of health information. In addition to a quality assurance system for source evaluation, these include parallel strategies for content assessment and misinformation management, as well as collaborative efforts to promote equity and support public health research. Such activities will require a considerable investment of time and resources, and SMPs do not necessarily have a financial incentive to make this investment [41]. Some argue that platforms are actually disincentivized from interventions that could dampen pro

Older people, adolescents, people with lower education and income levels, and racial and ethnic minority groups are more likely to face challenges related to limited health literacy [43]. Therefore, eForts to foster health literacy, engage in culturally competent communication, and build and sustain community relationships and trusted networks—as called for by the authors as a supplemental strategy to elevating credible sources—are supportive of health equity. SMPs should be sure to use accessible language when defining and explaining policies related to credible sources of information. SMPs should also consider digital literacy and strategies to address equity in access to high-quality digital information—a challenge referred to as the "digital divide."

The digital divide is defined as "disparities in technology access and use [that have] compounding effects on existing inequities along income, educational, racial, and geographic dimensions" [44]. Although approximately three-quarters of Americans have access to high-speed broadband internet at home, rates vary significantly by education level and income. In 2019, only 46 percent of people with less than a high school education had broadband, compared with 93 percent of college graduates. In 2021, the rates were 57 percent for people making less than $30,000 annually and 92 percent for people making more than $75,000. Disparities by race and ethnicity are less dramatic but still significant: 80, 71, and 65 percent for white, Black, and Hispanic people, respectively, in 2021 [44]. Despite this, Black and Hispanic people are more deeply engaged in social media than whites across some dimensions [45].

The digital divide is an important consideration for SMPs as well as other platforms that facilitate the sharing of health information. If eForts to increase access to high-quality health information disproportionately benefit highly educated, wealthy, and white people, then they are cementing health and information inequities.

Contribution to Public Health Research

SMPs can be important partners in improving public health, but only if they agree to share data (e.g. backend data, algorithms and use engagement metrics, content moderation processes) with researchers. This paper provides guidance that is intended to increase access to high-quality health information and thereby promote individual and population health. However, SMPs alone have access to data that could form the basis of important health and behavioral research about how policies such as those discussed herein would actually aFect the consumption of high-quality health information, as well as whether enhanced access to such information would favorably impact o н ine outcomes.

In addition to sharing such data as outlined previously, SMPs should be transparent about the methods they use to promote consumption of high-quality health information (e.g., through algorithmic recommendations), as well as the full scope of their policies and processes with regard to health information of any quality. As noted earlier, health misinformation and disinformation spread through social media can negatively impact health outcomes, and SMPs should take responsibility for and develop solutions to mitigate elements of their systems that enable such information to flourish.

SMPs' reluctance or failure to share such data and moderation methods would prevent fully productive collaborations with the public health and behavioral science communities. To be considered credible themselves, platforms should make a public and highly visible commitment to transparency and accountability, especially with regard to data, policies and methods that could impact public health.

Conclusion

Increasing access to high-quality health information in social media is a complex challenge that requires navigating tremendous volume and variation among sources and information; the continuous evolution of science and knowledge; and significant ethical quandaries—chief among them, the need to protect free speech and consumers' right to autonomy while minimizing the risk of harm from misinformation. To date, attempts at social media content moderation have been met with controversy and calls for federal regulation from both sides of the aisle [47]. Nevertheless, the potential influence of health information shared through social media on health outcomes, at both an individual and population level, compels action, even with the knowledge that such action will be incomplete at first.

This paper has presented guidance that could be leveraged by SMPs in identifying credible sources of health information—an incremental step toward the goal of enhancing access to high-quality health information. Although the scope of this discussion has been limited to U.S.-based nonprofit or government sources only, it is likely that many of the principles, attributes, and considerations can be applied to for-profit sources or individuals, as well as sources outside the United States. EForts to fully assess the credibility of these

sources, many of which are highly influential, should be an urgent priority for SMPs.

However, source evaluation is not a comprehensive solution. Several parallel strategies are required to ensure information quality and combat the risks of health misinformation, as detailed earlier. Foremost among these is a strategy to assess information quality and develop content moderation plans in response. The authors acknowledge the infeasibility of evaluating the accuracy and balance of every piece of health information on social media. However, a system of "spot checks" for quality and integrity, supported by machine learning technology but supplemented by expert human evaluation, is within reach. SMPs should invest in developing principles, guidelines, and applications for content assessment alongside strategies for source evaluation. Ultimately, the two approaches should be consolidated in a single system for the identification and elevation of high-quality health information. As previously noted, SMPs' eForts in these areas should be supplemented by government regulation or delegation to independent third parties.

SMPs cannot, and should not, tackle this challenge alone. As those ultimately impacted by social media source or content curation strategies, consumers must be engaged in developing such strategies. Public engagement is also essential to promote transparency, foster trust, and minimize perceptions of censorship or paternalism. Organizations that use social media to share information have an important role as well, and should hold themselves publicly accountable to a set of principles that supports the quality of the information they share, as well as their own institutional credibility. Together, the actions taken by consumers, organizations, and SMPs can move toward greater availability and accessibility of high-quality health information.

Finally, consumers and organizations that utilize social media deserve to understand the mechanics and the outcomes of policies that aFect the information they receive and share. Therefore, SMPs should make their source and content moderation practices (e.g., algorithms) and relevant data accessible to independent behavioral and public health researchers to analyze the eFects on information consumption as well as offline behaviors. Without such information, consumers and organizations that collaborate with SMPs will have no way of knowing whether policies are justified or effective. To be eFective partners in improving health, SMPs must make a firm commitment to transparency and accountability.

Notes

a] Social media platforms are for-profit companies that allow people and organizations to create profiles, interact with other users, share information, form groups or networks, and promote businesses or causes through various means.

[b] Facebook owns Instagram and Whatsapp (see https://about.facebook.com/company-info). YouTube is owned by Alphabet Inc., the parent company of Google (see https://abc.xyz).

[c] For an overview of the NAM project, see https://nam.edu/programs/principles-for-defining-and-verifying-the-authority-of-online-providers-of-health-information. YouTube provided funding totaling $100,000 to oFset the NAM's operational expenses in facilitating the project. Karen DeSalvo, Chief Health O ̧cer, Google Health, is an NAM member and serves on the NAM's governing Council (YouTube is owned by Alphabet Inc., the parent company for Google). Garth Graham, Director and Global Head of Healthcare and Public Health Partnerships, is an NAM member (see https://blog.youtube/news-and-events/new-health-content-coming-youtube).

[d] The NAM has a presence on Facebook, Instagram, LinkedIn, Twitter, and YouTube.

[e] McCabe Message Partners, Washington, DC.

[f] It should be noted that freedom of speech has some limitations, including what is known as the "true threat" doctrine, which prohibits speech that constitutes a "clear and present danger," such as the famous example of "shouting fire in a theater." See https://fas.org/sgp/crs/misc/95-815.pdf.

[g] See http://www.icmje.org/about-icmje. The current members of the ICMJE are Annals of Internal Medicine, British Medical Journal, Bulletin of the World Health Organization, Deutsches Ärzteblatt (German Medical Journal), Ethiopian Journal of Health Sciences, JAMA (Journal of the American Medical Association), Journal of Korean Medical Science, New England Journal of Medicine, New Zealand Medical Journal, The Lancet, Revista Médica de Chile (Medical Journal of Chile), Ugeskrift for Laeger (Danish Medical Journal), the U.S. National Library of Medicine, and the World Association of Medical Editors.

[h] Proper disclosure of conflicts of interest relies on the integrity of authors and cannot be fully enforced by journals.

[i] Information equity refers to equity of people's access to information (e.g., through internet access) as well as the ability to understand and use that information to their benefit.

[j] For principles for making health information "understandable, useful, and navigable," see https://nam.edu/perspectives-2014-health-literacy-principles-guidance-for-making-information-understandable-useful-and-navigable.

APPENDIX A
Models for Assessment of Source Credibility

National Library of Medicine

The National Library of Medicine (NLM) has developed at least three major source evaluation systems that provide useful examples for the task at hand: MEDLINE indexing, MedlinePlus indexing, and the Disaster Lit database.

MEDLINE Journal Selection

The National Library of Medicine (NLM), the world's largest medical library, uses stringent criteria to determine whether a journal should be included in MEDLINE, NLM's premier bibliographic database. MEDLINE is the primary component of PubMed, a freely accessible online literature database developed and maintained by the NLM National Center for Biotechnology Information (NCBI), with new citations added daily.

In considering whether a journal merits inclusion in MEDLINE, NLM considers "the scientifi

In addition to such content considerations, MedlinePlus gives preference to pages with no advertising. If the website has advertising, it must display an advertising policy that clearly separates educational content from advertising or sponsorship. MedlinePlus will not link to web resources that present content suggesting that Medline Plus endorses certain commercial products or services. For a resource to be linked on MedlinePlus, the website must also be consistently available, include contact information for customer support, and provide current information. Furthermore, websites must not require users to register, become a member of the organization, or pay a fee to view health information. Finally, MedlinePlus criteria specify that if a website collects personal information, it must clearly display "a privacy policy that explains how information collected from users remains private and confidential. If a website displays advertising, it should prevent advertisers and sponsors from collecting any personally identifiable information from users" [5].

In addition to these criteria for resources linked to MedlinePlus, for all the pages on MedlinePlus, a "page last reviewed" date is available near the bottom of the page to indicate "when the entire topic was reviewed and updated while a "page last updated" date indicates when any information was added to or removed from the health topic page" [5]. These additional indicators allow users to verify the currency of the content they are consuming.

The CRAP Test

Molly Beestrum, education and curriculum coordinator at Northwestern University's Galter Health Sciences Library & Learning Center, developed a system known as the CRAP Test that can be used in deciding whether a website is a credible, valid source. The CRAP Test considers four major website attributes: currency, reliability, authority, and purpose. To apply Beestrum's test, Colorado Community Colleges Online suggests asking the following questions:

"Currency

- How recent is the information?
- How recently has the website been updated?
- Is it current enough for your topic?

Reliability

- What kind of information is included in the resource?
- Is content of the resource primarily opinion? Is it balanced?
- Does the creator provide references or sources for data or quotations?

Authority

- Who is the creator or author?
- What are the credentials? Can you find any information about the author's background?
- Who is the publisher or sponsor?
- Are they reputable?
- What is the publisher's interest (if any) in this information?
- Are there advertisements on the website? If so, are they clearly marked?

Purpose

- Is this fact or opinion? Does the author list sources or cite references?
- Is it biased? Does the author seem to be trying to push an agenda or particular side?
- Is the creator/author trying to sell you something? If so, is it clearly stated?" [6]

Clinical Practice Guidelines We Can Trust

The 2011 Institute of Medicine (IOM) study *Clinical Practice Guidelines We Can Trust* is another resource that may provide useful insights into the determination process for high-quality health information in social media [7]. Clinical practice guidelines (CPGs) help to reduce the level of uncertainty in clinical practice by establishing standards of care backed by strong scientific evidence. These standards "are informed by a systematic review of

evidence and assessment of the benefits and costs of alternative care options" [7]. However, many diFerent sets of CPGs have been developed and employed, to varying degrees of success. With nearly 27,000 guidelines in the National Guideline Clearinghouse (NGC) and numerous additional commercial guidelines, it can be challenging to "identify guidelines based on high-quality development methods. Although the NGC provides a standardized summary of each CPG posting, describing its development methodology and evidence base and providing a link to the full guideline, the NGC makes no quality judgment" [7]. As a result, it can be di ɕcult for stakeholders to be confident of CPG quality.

To combat this issue, *Clinical Practice Guidelines We Can Trust* proposed eight standards for developing trustworthy CPG and called for the development of a mechanism to identify guidelines that meet these standards. These standards include: "emphasizing transparency; management of conflict of interest; systematic review—guideline development intersection; establishing evidence foundations for and rating strength of guideline recommendations; articulation of recommendations; external review; and updating" [7]. The report identifies three options in determining whether a CPG meets these standards: "1) identifying each guideline to see if it meets the specified standards; 2) certifying organizations producing guidelines that comply with quality standards; or 3) acknowledging standards compliance for each guideline production process prior to development of the guideline" [7].

Due to the large number of CPGs, the report suggests certification of organizations with trustworthy CPG development procedures rather than identification of individual trustworthy CPGs or identification of the development process for each CPG. This type of evaluation would entail "reviewing the procedures that applicant organizations use to produce various types of guidance, providing an identifiable mark to be placed on future CPGs of those organizations meeting accreditation requirements, and agreeing to maintain the approved processes during a 3-year accreditation period" [7]. This certification process "would not endorse particular drugs or treatment options for medical conditions or make clinical decisions about the guidelines it reviews" [7]. Instead, it would

APPENDIX B

TABLE B-1: Types, De

Universities	Universities are undergraduate and postgraduate educational institutions that confer academic degrees. Depart-ments or schools of biomedical sci- • NorthwestoCommissate te Col-duate1. Unirtd-1. • SouJJ-2n5Ash poluate r sCollege oduate1. • W	

Hospitals	A hospital is a health care institution that provides primarily inpatient services including medical, surgical, or psychiatric treatment [c]. Types of hospitals include academic medical centers, acute care and long-term care hospitals, critical access hospitals, and rehabilitation facilities. There are also a wide variety of specialty hospitals, including cancer, stroke, and cardiac centers; children's hospitals; psychiatric hospitals; women's hospitals; and more. This category also includes Indian Health Service (HIS) and U.S. military and veterans hospitals.	• Center for Improvement in Healthcare Quality [a] • Commission on Accreditation of Rehabilitation Facilities [a] • DNV GL Healthcare [a] • HFAP • TJC
Home-based health care providers	A home-based health care provider oFers services for illness or injury in a patient's home, including wound care, medication administration and management, nutrition counseling, and more. Home-based health care also includes hospice [c] and palliative care.	• ACHC • CHAP • Joint Commission
NONPROFIT HEALTH PLANS		
What Accreditation Signifies for Organizations in This Category: Health plans that earn accreditation have chosen to participate in a voluntary, rigorous process to demonstrate their performance against standards for quality improvement, management, credentialing, and member services and communication, among others.		
Nonprofit health plans	Nonprofit health plans provide coverage (insurance) for health and medical expenses and often provide preventive health services.	• National Committee for Quality Assurance • URAC
PUBLIC HEALTH DEPARTMENTS [e]		
What Accreditation Signifies for Organizations in This Category: Public health departments that earn accreditation have chosen to participate in a voluntary, rigorous process to demonstrate their performance against standards for ability to carry out the 10 Essential Public Health Services[f], eFective department management, and eFective communication with the governing entity (e.g., the state).		
Public health departments (state, tribal, local, territorial, and Army Installation)	Public health departments provide services including disease and injury prevention, infectious disease response, and public education and health promotion.	• Public Health Accreditation Board

NOTES: [a] CMS deeming authority

[b] See https://www.hrsa.gov/opa/eligibility-and-registration/health-centers/fqhc/index.html

[c] See https://www.cms.gov/Research-Statistics-Data-and-Systems/Research/ResearchGenInfo/Downloads/DataNav_Glossary_Alpha.pdf.

[d] Hospice care can also be provided in inpatient settings

[e] Federal health plans and public health departments are also government organizations, which are subject to additional transparency and accountability rules

[f] See https://www.cdc.gov/publichealthgateway/publichealthservices/essentialhealthservices.html

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