BALLARD BRIEF

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The Effects of Medical Misinformation on the American Public

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Key Takeaways

- Medical misinformation is becoming an urgent issue for United States citizens—leading to increased deaths, a lack of trust in health professionals, and hate crimes and racism.
- Although this is a worldwide issue, the United States has the second highest rate of misinformation of any country, behind India.[1]
- One piece of misinformation during the COVID-19 pandemic stated that highly concentrated alcohol could disinfect the body and kill the virus.[2] Studies show that 800 people died, 5,876 were hospitalized, and 60 became completely blind from drinking methanol, thinking it would cure coronavirus.[3]
- Studies estimate that only 14% of the United States population has proficient health literacy, which makes it difficult to recognize medical misinformation.[4]
- Media literacy education is being pursued in order to combat the spread of misinformation, but more research is needed in order to understand the long-term effects of this education and what programs are best.

Summary

Medical misinformation has always existed, but it has recently become more frequent due to the development of the internet and social media. Medical misinformation can cover a wide variety of topics, and studies show that some groups are more likely to be affected by medical misinformation than others, like those with less trust in health care, less health literacy, and a more positive attitude toward alternative medicines. Aspects of the internet, like echo chambers and algorithms, have contributed to the rise of medical misinformation, along with belief in anecdotal evidence and alternative remedies that are not backed by science. Some personal beliefs and a lack of media literacy skills are also contributing to medical misinformation. Medical misinformation causes higher rates of death and negative health outcomes, a lack of trust in medical professionals, and more racism and hate crimes. One possible way to combat the spread of misinformation is education surrounding media literacy. Still, there are

gaps in this practice that must be addressed like a lack of high-quality research about different educational programs.

Key Terms

Algorithm—A complex set of rules and calculations used by social media platforms to prioritize the content that users see in their feeds.[5]

Alternative medicine—Medical modalities rarely taught in a Western medical setting, including acupuncture, Tai chi, herbal medicine, Reiki, chiropractic manipulation, etc.[6]

Anecdotal evidence—Evidence in the form of stories that people tell about what has happened to them.[7]

Confirmation bias—The tendency of a person to support information that reinforces pre-existing beliefs while neglecting opposing perspectives and viewpoints.[8]

Disinformation—Information that is not based on reality and deliberately created to harm a person, social group, organization, or country.[9]

Echo chambers—Highly personalized communication environments built around the ability of users to follow like-minded individuals.[10]

Filter bubble—An invisible mechanism that provides individuals only with information that aligns with their preferences, connecting people with similar opinions and distancing people who think differently.[11,12] See footnote 12 for more information.

Health literacy—The ability to seek, find, and understand health information from electronic sources in order to make appropriate health decisions.[13]

Ignorance—The absence of relevant knowledge.[14]

Illusory Truth Effect—Causes previous exposure to something to increase the likelihood that someone will see it as true.[15]

Infodemic—Too much information, including false or misleading information in digital and physical environments during a disease outbreak.[16]

Misinformation—Information that is based on reality and used to inflict harm on a person, organization, or country.[17]

Media conglomerate—A company that owns many other companies in various types

of mass media such as television, radio, publishing, movies, or the internet.[18]

Misinformation—A claim of fact that is currently false due to lack of scientific evidence.[19]

Propaganda—Information that may be factually correct but is delivered with the intention of gaining public support instead of presenting information.[20]

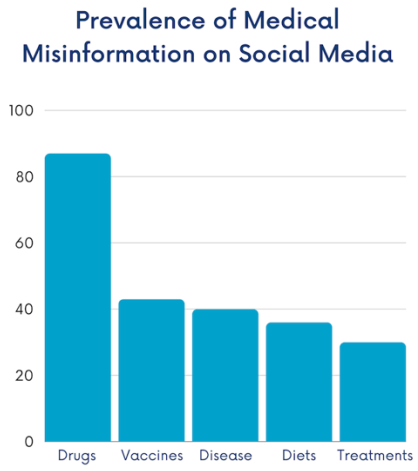
Context

Q: What is medical misinformation?

A: Medical misinformation is information about medical issues that is claimed as fact but is currently false due to a lack of scientific evidence.[21] Medical misinformation can cover a wide variety of topics, such as vaccines, chiropractics, acupuncture, pandemics, tobacco, cancer, dieting, and so on. The rise of the internet, smartphones, and the use of social media have exacerbated the issue of medical misinformation.[22] One study of a popular social media platform showed that while true news rarely reached more than 1,000 people, the top 1% of false news regularly reached between 1,000–100,000 people.[23] Robots or "bots" have also become a major concern surrounding the spread of misinformation because of testimonies before congressional committees about their role in the proliferation of fake news.[24] Despite this, research shows that robots accelerate the spread of true and false information at the same rate, which implies that false news spreads more than the truth because humans are more likely to spread it.[25,26] Scientific reports that can be trusted for accurate health information are usually backed up by statistics and facts, while medical misinformation is usually based on anecdotes, which are stories that people tell about what has happened to them.[27,28] Health topics are particularly susceptible to misinformation because they often require a level of prior knowledge and understanding that most citizens do not have.[29] One example of susceptibility to medical misinformation was seen in 1998, when a study claiming that vaccines caused autism became widespread, despite the study later being redacted due to a lack of evidence supporting the claim and conflicts of interest.[30] Four years after the study, between 20–25% of people still believed in a link between vaccines and autism, and 39–53% believed there was equal evidence on both sides of the issue.[31]

Medical misinformation is damaging to society because it can cause people to advocate for policy changes or behaviors that reflect incorrect

knowledge about issues that affect them, like parents who refuse vaccinations and end up with children suffering from preventable diseases.[32] It is also damaging because it leads to a lack of trust in healthcare professionals, racism and hate crimes, and increased death rates.[33,34,35] For example, a study done in Canada found that without medical misinformation about COVID-19, there would have been 198,000 fewer cases of the virus and 2,800 fewer deaths because people would have believed in the seriousness of the pandemic instead of claiming it as a hoax.[36]



Q: Who is most affected by medical misinformation?

A: Research shows that susceptibility to health misinformation is likely driven by multiple psychological processes.[37] This fact means that there is not one overarching identifier of those who are most affected by medical misinformation, but instead, there are multiple things that have been recognized as prevalent in these people. Studies have recognized that those who are most affected by medical misinformation have less trust in health care, a more positive attitude toward alternative medicine (medical modalities rarely taught in a Western medical setting, including acupuncture, Tai chi, herbal medicine, Reiki, chiropractic manipulation, etc.), less health literacy, and less education literacy.[38,39] These effects were seen during the COVID-19 pandemic, where people who placed more trust in information from the government and had higher levels of education were less likely to believe misinformation.[40] On the other hand, trust in news from social media, interpersonal communication, and clerics contributed to the increasing belief in COVID-19 misinformation.[41] One source provides a deeper outlook into the types of people who are susceptible to misinformation by assessing recent academic literature on the topic.[42] According to this source, four studies indicate that those with higher religiosity are more likely to believe medical misinformation. 16 studies show that those with less education are more susceptible to medical misinformation.[43] Eight studies found that being politically conservative led to belief in health misinformation.[44,45] Five studies found that being part of a racial or ethnic minority

predicted susceptibility to medical misinformation.[46] Twenty studies found that older individuals are less likely to believe health misinformation.[47]

Q: How has the issue of medical misinformation evolved over time?

A: Medical misinformation has been a common occurrence for centuries. For example, bloodletting as a medical treatment began over 3,000 years ago but was popularized by the prolific writings of Galen of Pergamum (129–200 AD) who operated on the misinformation that illness often stemmed from an excessive amount of blood. This medical misinformation continued well into the 19th century and led to many harmful instances of bloodletting, despite studies by at least six prominent physicians in the 16th, 17th, and 18th centuries that proved the ineffectiveness of the practice.[48] Medical misinformation has become more frequent in recent years through the advent of the internet and social media.[49,50] The internet has caused a massive surge in data to be available to the general public. In less than 100 years, the American public has gone from the birth of the internet to 64 zettabytes of accessible data. A zettabyte is about a trillion gigabytes.[51] One zettabyte would be equivalent to 4,229 Netflix databases, and within each database, over 6,000 different movies and series to choose from.[52] Included in all that data is the growing influence of social media that has enabled anyone to make claims, spread information, and go viral, impacting millions of people.[53,54] The COVID-19 pandemic recently brought widespread medical misinformation, with the World Health Organization coining the term "infodemic" to describe the situation.[55] An infodemic is too much information including false or misleading information in digital and physical environments during a disease outbreak.[56] This causes confusion, risk-taking behaviors that harm health, mistrust in medical authorities, and a less effective public health response. Infodemics can lengthen and intensify disease outbreaks when people are unsure about what to do to protect their health.[57]

More than 80% of Americans use the internet or social media to find healthcare information.[58] People want to share their treatment experiences with friends to find connections.[59] The Pew Research Center reported that of those seeking health information online, 16% tried to find others with similar health concerns, 26% read or watched someone else's experience with medical issues, and 30% consulted online reviews of healthcare services or treatments.[60] This drive for

connection often materializes in the form of a social media post. Research shows that information on social media from these types of posts is more likely to leave out important medical details than general information found on the internet.[61] This incomplete understanding of social media posts creates assumptions that are perpetuated as a type of misinformation. Research also shows that people are more likely to rely on medical information from friends than from a general search on the internet. This demonstrates that medical misinformation on social media is more likely to influence people than medical misinformation from search engines.[62] The average American also spends 2.5 hours a day on social media, resulting in reliance on it as a primary resource for gathering information, and research shows that medical misinformation can reach up to 28.8% of posts.[63,64] Social media has the added complication of being run by algorithms that connect people with similar interests. This leads to echo chambers where people only hear information that reinforces their current ideas, even if they are false.[65]

Q: Why focus on medical misformation in the United States?

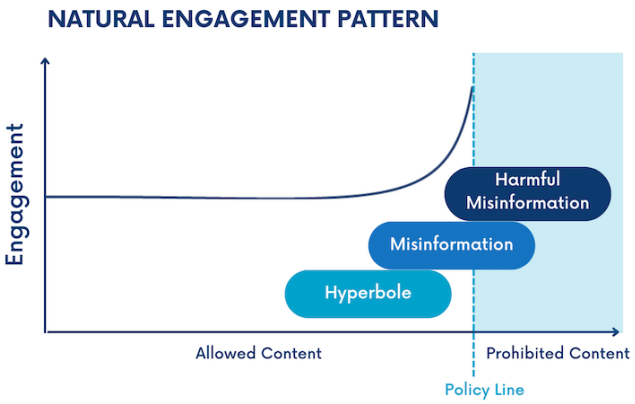
A: The rise of the internet and social media means that misinformation is accessible to anyone, anywhere in the world, as long as they have access to the internet. The World Health Organization has recognized the seriousness of medical misinformation for years, issuing a statement regarding the harms of vaccine misinformation and later emphasizing during the COVID-19 pandemic that misinformation was a threat to public health that needed to be addressed.[66,67] Although this is a worldwide issue, the United States has the second highest rate of misinformation of any country, behind India.[68] Multiple studies have found a relatively higher presence of misinformation in the United States than in other geographical areas.[69] Ninety-six percent of adults report hearing at least 1 of 10 different medical misinformation claims in a recent survey, and almost two-thirds of adults in the United States (64%) believe that fabricated news stories are causing a great deal of confusion about the facts of current events.[70] About 23% of citizens say that they have shared fake news stories, with 14% saying they knew it was fake at the time of posting and 16% saying that they only realized this later.[71] Although misinformation and specifically medical misinformation are a worldwide issue, this brief will focus on medical misinformation in the United States. Because the internet does not have borders, data from countries without significant political differences regarding media

usage have been utilized in this synthesis.

Contributing Factors

The Internet and Social Media

Misinformation can spread much quicker than it used to because 85% of people in the United States now have constant access to the internet and social media through apps on their smartphones.[72] Over 282.5 million Americans are mobile internet users.[73] More than 8 in 10 Americans now get their news on digital devices instead of TV, radio, or print, and among 18–29-year-olds, social media is the most common news source.[74] Many studies note that the internet and social media both assist in spreading misinformation.[75] One study found that convenient access to information is a more powerful predictor of college students' media use than a source's credibility, which is why smartphones magnify the spread of information, whether it is true or not.[76] Researchers at MIT also found that fake news can spread up to 10 times faster than factual news on social media.[77] A review of 69 studies on the prevalence of health misinformation on social media found that the most commonly studied misinformation came from Twitter (43%), YouTube (37%), and Facebook (9%).[78] Mark Zuckerberg, CEO of Facebook, has talked about the fact that content containing misinformation gets more engagement (likes, views, comments, and shares) than content containing facts. He calls this the "Natural Engagement Pattern" which shows that as content gets closer and closer to becoming harmful it gets more and more engagement on average.[79] One study has looked at the extent to which social media platforms amplify misinformation, through something they call the "Misinformation Amplification Factor" which is the ratio between how much engagement a misinformation post gets and what engagement it would be expected to get based on the historical performance of other content from the creator. Based on this definition, the average Misinformation Amplification Factor for different platforms was: Twitter—35, Tiktok—29, YouTube—6.1, Facebook—4.2, and Instagram—2.9.[80] This finding means that well-crafted misinformation posts on Twitter received about 35 times as much engagement as content that did not include misinformation.[81]



Anecdotal Evidence

The internet and social media provide an opportunity for the spread of anecdotal evidence that is often rife with misinformation because blogs and social media provide a place for stories that people tell about what has happened to them medically.[82,83] In an analysis of anti-vaccine websites, one study found that 30.6% of them used anecdotes to support their claims, while 30.2% used hard science.[84,85] This shows that anecdotes and hard science are prioritized at about the same rate, even though anecdotes are not able to be applied to all populations.[86]

Many studies indicate that people are more persuaded by anecdotal evidence than by statistical evidence.[87] An analysis of 61 studies found that when emotional engagement is high, like during a discussion of medical issues, statistical evidence was less influential than anecdotal evidence.[88] People overestimate the representativeness of anecdotal evidence and underestimate the representativeness of scientific data, which causes people to be more influenced by anecdotes than by statistics.[89] People also pay less attention to statistics and science when anecdotes are present. For example, when people read about fictitious scientific findings, the inclusion of anecdotes made it less likely that people would detect errors in the study and made the flawed studies more believable.[90]

One example of the way that anecdotes contribute to medical misinformation was seen in the case of Parker Beck, a 4-year-old who displayed symptoms of autism. He underwent an endoscopy to find the source of diarrhea and vomiting and received intravenous secretion as part of the process. His parents then noticed a rapid change for the better in his autism symptoms. This story aired on NBC's Dateline and received a dramatic response from thousands of parents who demanded this treatment for their autistic children.[91] Fourteen randomized control trials were then performed to prove that secretin was not an effective treatment for autism.[92] Instead of being able to focus on proven therapies to manage symptoms, parents were distracted by trying to apply anecdotal evidence to their children that was ultimately misinformation and a waste of

time and resources.

Echo Chambers and Algorithms

Echo chambers and algorithms contribute to the perpetuation of medical misinformation because they keep people from exposure to beliefs outside their own and may reinforce misinformation. Currently, many media conglomerates (companies that own many other companies in various types of mass media such as television, radio, publishing, movies, or the internet) are leaning toward reporting from a point of view that pleases management and shareholders instead of striving for a middle ground.[93,94] This polarized reporting makes it easier for people to seek out what makes them comfortable, effectively creating their own echo chambers (highly personalized communication environments built around the ability of users to follow like-minded individuals).[95,96] Algorithms (a complex set of rules and calculations used by social media platforms to prioritize the content that users see in their feeds) amplify the effects of this behavior, and the consequences of these phenomena are becoming more and more widespread.[97,98] Algorithms reward those who share content the most by showing their posts to a higher number of people, earning them more engagement through views, likes, comments, and shares.[99] Because highly emotional information that shocks, excites, or infuriates people gets more engagement, creators are led to share posts with misinformation to get these reactions and gain a greater audience. This process is how algorithms can fuel the spread of misinformation.[100] For example, one study showed that 15% of frequent social media posters were behind up to 40% of the fake news on Facebook.[101] Over half of blog readers search for blogs that support their views, while only 22% search for opposing viewpoints. Echo chambers keep people from exposure to those who are different from them, and this in turn inhibits decision-making capabilities.[102] Political partisanship also plays a role in echo chambers and the psychology of why people believe misinformation, as people are more likely to believe news that aligns with their political party over news that does not.[103]

The illusory truth effect also makes a difference

in what people believe. This effect causes previous exposure to something to increase the likelihood that someone will see it as true. One study found that prior exposure to misinformation increased misinformation promotion by 18%.[104] Even just one prior exposure to a headline with misinformation increases later belief in the headline, even if the headline is inconsistent with one's political beliefs or if the headline is highly implausible. People's intentions to share false headlines were 91% higher than assessments of the truth of the headlines, which shows that many people were willing to share content that they knew was not accurate.[105] Another study showed that 32.4% more people were willing to share false headlines than rated them as accurate.[106] Technological phenomena like echo chambers and algorithms and psychological phenomena like the illusory truth effect and confirmation bias contribute to the spread of medical misinformation.[107] Technology can make it harder for people to recognize misinformation A lack of exposure to the full realm of psychological patterns causes people to believe in familiar claims, even if they are incorrect.

Alternative Remedies

Alternative medicine refers to a variety of medical modalities that are rarely taught in Western medical settings but are instead supported by traditional practices, often from ancient Eastern origin. Some of these include acupuncture, Tai chi, herbal medicine, Reiki, and chiropractic.[108] The umbrella term of "alternative medicine" was created in the 1800s to distinguish these practices as an "alternative" to Western medicine.[109] Today this type of treatment is also often referred to as CAM, which stands for complementary and alternative medicine, in order to emphasize that these modalities can also be used in conjunction with Western practices and not just as an alternative.[110] Western medicine focuses on symptom-specific treatment through pharmacologic or invasive techniques that seek to remove the cause of the disease. Alternative medicine on the other hand focuses on the whole body and the ability of the body to heal itself through energy alignment, herbal supplements, or other techniques that seek to balance the body.[111] Tradition and anecdotal evidence support alternative medicine and science supports Western medicine, and today many physicians are seeking to implement Integrative Medicine that combines aspects of both alternative and Western medicine.[112] In an analysis of multiple studies, six reasons emerged

explaining why people turn to alternative medicine. These reasons are dissatisfaction with the health outcomes of Western medicine, dissatisfaction with the doctor-patient relationship or medical encounter, preference for the way alternative therapists treated their patients (caring, individualized attention, abundant information or time), a new philosophy around holism due to postmodern values, the heterogeneity of an individual's social network and the resulting exposure to a wider range of information and values, and alternative medicine fulfilling a psychological need as the influence of religion lessens, providing an alternate framework for making sense of illness and suffering.[113]

Misinformation about alternative remedies is pervasive on the internet and social media, and those who hold positive views of alternative remedies are more likely to believe medical misinformation.[114] Of the first 50 websites that come up when "weight loss diets" are searched, only 3 were shown to have sound dietary advice based on science, while most focused on dietary supplements or slimming aids without physiological evidence.[115,116] Beyond seemingly innocuous alternative remedies to do with dieting, misinformation can influence much more deadly behavior. For example, cancer patients using alternative remedies are more likely than other patients to refuse evidence-based treatment and have a higher mortality rate.[117] About 39% of people in the United States will be diagnosed with cancer at some point. Furthermore, 39% of Americans believe alternative medicine alone can cure cancer. Those who choose this route are 2.5 times more likely to experience death.[118] Overall, people who believe and trust in alternative remedies are more likely to believe and share medical misinformation.

Personal and Cultural Beliefs

Cultural and ideological beliefs also play a role in spreading medical misinformation. People often refer to credible experts when it comes to science, but the experts whom the average person sees as credible are those who seem to share their values.[119] This was seen in a study done about the HPV vaccine. Fictional male experts were dressed to look like they had distinct cultural perspectives (gray-haired and wearing a suit versus bearded and wearing a denim shirt) and given publications titled to match their assigned cultural perspective. When the first expert, seen as individual and hierarchical, criticized the CDC recommendation, people who were already likely to see the vaccine as risky became even more opposed to it.

When the second expert, seen as egalitarian and communitarian, defended the CDC recommendation, people with the same values became more supportive of it.[120] People are more susceptible to misinformation that supports their worldview and preexisting beliefs, and another way that this is seen is through politics and polarization. For example, when people were shown evidence that type two diabetes can be caused by social circumstances, subsequent endorsement of policy options to solve this declined among Republicans but increased among Democrats.[121,122] Research shows that those with strong partisan identities, high levels of religiosity, and a minority racial or ethnic status are much more susceptible to misinformation than others.[123]

Ethnic minority populations and immigrants from other countries are particularly susceptible to medical misinformation, typically due to disadvantages like a lack of resources or past mistreatment. In a study looking at social media use by migrants and ethnic minorities during COVID-19 and the resulting healthcare implications, data from 21 sources in multiple countries showed that these migrant and ethnic minority populations consistently used social media platforms to obtain COVID-19 information.[124] This reliance on social media was attributed to the difficulty in accessing information about the pandemic in their native language or from sources they trusted and a need for connection with others. Misinformation on social media was associated with lower participation in preventative health measures like vaccination for these groups. This hesitancy was amplified by safety concerns, negative stories, and personal knowledge that had been influenced by misinformation exposure through social media use.[125] Another study of blacks, Latinos, non-Hispanic whites, and Asians examined beliefs about the origin of HIV as a genocidal conspiracy. Women, blacks, and Latinos demonstrated the highest prevalence of conspiracy belief, with over a quarter of blacks and over a fifth of Latinos falling into this category. About one-fifth of whites exhibited conspiracy belief, while Asians had the lowest prevalence at less than 1 in 10.[126] The study found that among black men, belief in the HIV conspiracy was associated with lower reported condom use. This finding is likely due to mistrust of medical professionals that has developed through racism fueled by misinformation, such as with the Tuskegee syphilis study.[127] Similar conspiracy beliefs were found among blacks and Latinos in another study on HIV vaccine acceptability. Approximately 55% of Latinos and 50% of Blacks reported believing that the government secretly had an HIV

vaccine.[128] While personal and cultural beliefs indicate a person's likelihood to believe medical misinformation, minority racial and ethnic groups are more vulnerable to misinformation because of past racist medical policies and practices.

Poor Media Literacy

A lack of education leads to the spread of misinformation because those who are undereducated are not likely to recognize misinformation and therefore are more likely to spread it. A study showed that for those with the same age, gender, education, household income, political view, campaign interest, exposure to fake news, media literacy, and digital literacy, it was estimated that a person with more information and news literacy (the ability to recognize and judge sources of information and news) had a significant positive impact on the ability to recognize misinformation.[129] Therefore the opposite is true as well—as people struggle to accurately discern news sources, their ability to recognize misinformation decreases. This finding means that susceptible groups such as middle school, high school, and college students struggle to effectively evaluate online claims, sources, and evidence; one study showed that 46% of undergraduate students surveyed were unable to correctly identify at least 4 out of 5 news articles shown as real or fake.[130] Public education regarding misinformation is highly lacking and this creates a population that is much more vulnerable to belief in incorrect information.[131] Studies estimate that only 14% of the United States population has proficient health literacy.[132] The estimated economic effects of this low health literacy could reach up to $238 billion dollars annually.[133] Those with low health literacy have higher mortality rates, poorer health status, more hospitalizations and readmissions, greater use of emergency services, lower vaccination rates, higher rates of improper medication-taking, and are more likely to delay or avoid receiving health care.[134,135] They are also more likely to trust medical information from the media than from medical professionals.[136] During the COVID-19 pandemic, research found that the risk of being "anti-vaccination" or "hesitant" to vaccinate was higher for those reporting worse detection of fake news. The risk of being "hesitant" rather than "pro-vaccination" was also higher among those with a lower health literacy score.[137] The COVID-19 virus impacted people with poor health literacy more severely and more frequently than those with adequate health literacy, due to those with poor health literacy having difficulties finding healthcare providers

and services, sharing their medical condition and history with providers, seeking preventative healthcare, understanding directions on prescriptions, and recognizing the connection between risky behaviors and health outcomes.[138]

Only 14% of the United States population has proficient health literacy.

Consequences

Negative Health Outcomes including Increased Death Rates

Medical misinformation leads to increased death and poor health outcomes because acting on incorrect health information negatively affects a person's health and well-being. This principle has been demonstrated through false advertising, pandemics, epidemics, faulty alternative medicine, and in many other ways throughout history. For example, at the start of the HIV epidemic, misinformation claiming that HIV did not exist and that its treatment was toxic resulted in people refusing treatment in South Africa. The government then promoted traditional medicine which fueled the transmission of HIV and ended up costing over 300,000 lives.[139] Alternative medicine has also cost lives, with medical misinformation surrounding alternative remedies leading cancer patients to a higher mortality rate.[140] One study shows that those who refuse scientifically backed medical treatment for their cancer and focus solely on alternative remedies are more than twice as likely to die from their illness.[141] One of these remedies claiming that apricot seeds cure cancer has recently circulated, leading to high consumption and resultant cyanide poisoning.[142,143]

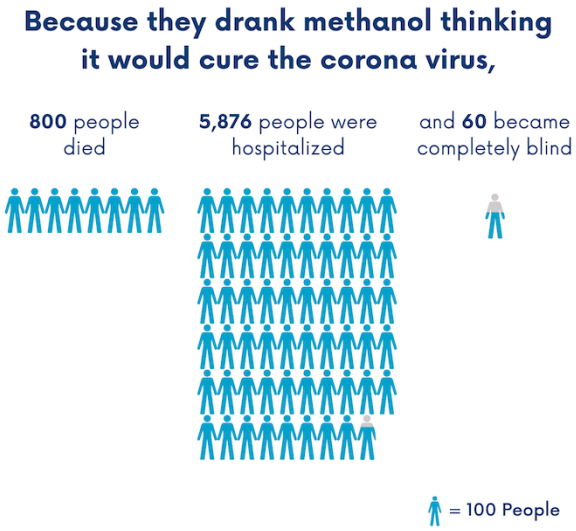
Misinformation surrounding e-cigarettes has also had a negative impact on the health of many of the 2.55 million youth who used them.[144] Sixty-three percent of youth who used the JUUL e-cigarette did not know that it contains nicotine, and some believed that the nicotine in e-cigarettes was artificial and harmless, despite much evidence to the contrary.[145] Additionally, there has been a long

history of targeted efforts by the tobacco industry to market to vulnerable populations such as black communities, sexual and gender minorities, and the homeless who are often less likely to have media literacy skills because of their disadvantages.[146] During crisis situations in communities, people often spread rumors and misinformation while waiting for facts to be made available. This often makes rescue and relief operations more difficult. For example, during the 2018 floods in the South-Indian state of Kerala, a fake video of dam leakage caused panic among citizens and made flood rescues more difficult.[147]

The recent COVID-19 pandemic also provided many examples of how medical misinformation has led to increased death and negative health outcomes. One popular piece of misinformation stated that highly concentrated alcohol could disinfect the body and kill the virus.[148] Studies show that 800 people died, 5,876 were hospitalized, and 60 became completely blind from drinking methanol, thinking it would cure coronavirus.[149] Beyond this specific misinformation about alcohol, it was found that over 6,000 people were hospitalized due to misinformation related to the pandemic in the first 3 months of 2020.[150] Thirty-nine percent of people interviewed in one survey during the pandemic reported engaging in at least one high-risk practice not recommended by the CDC for prevention of the virus. Nineteen percent applied bleach to food items, 18% used household cleaning products and disinfectants on hands or skin, 10% misted their body with a cleaning or disinfectant spray, 6% inhaled vapors from household cleaners or disinfectants, and 4% drank or gargled diluted bleach solutions, cleaning and disinfectant solutions, or soapy water.[151] Among the more than 1 million confirmed COVID-19-related deaths (as of January 2023), over a third were considered preventable if public health recommendations had been followed, which is less likely if medical misinformation is widespread.[152] One study in Canada estimated that without medical misinformation about the pandemic, there would have been 2,800 fewer deaths, 198,000 fewer cases of COVID-19, 13,000 fewer hospitalizations, 3,5000 fewer ICU patients, and $299 million dollars saved in hospital expenses.[153]

The United States accounts for more than 800,000 deaths from COVID-19, which is more than any other country.[154] The US has less than 5% of the world's population but more than 20% of the deaths were reported during the pandemic, and this issue is exacerbated through the spread of misinformation that allows the spread of the disease to continue and more deaths to occur.[155] Increased deaths and negative health outcomes are a clear consequence of medical misinformation, whether the misinformation is focused on cancer, e-cigarettes, the COVID-19 pandemic, or a myriad of

other health issues.



Lack of Trust in Medical Professionals

Health misinformation creates a lack of trust in medical professionals because when people believe incorrect information, they are much less willing to follow the professional advice of someone who believes differently. Research shows that those who did not trust the healthcare system were more likely to believe medical misinformation, and the number of people who lack trust was increasing.[156] From 2017 to 2018 alone, there was a 20% reduction in general trust in healthcare in the United States, which was the second biggest drop behind Colombia.[157,158] This is likely due in part because of the high distrust in pharmaceuticals that comes from aggressive opioid marketing and the high cost of drugs.[159] A Gallup poll about confidence in institutions from 2023 shows that only 34% of Americans had a "great deal" or "quite a lot" of confidence in the medical system.[160] Thirty-nine percent had some confidence, 25% had very little confidence, and 1% had no confidence.[161] In comparison to recent years, in 2021, 44% of citizens had a great deal or quite a lot of confidence, and in 2022, 38% of Americans had this level of confidence.[162] That finding means that in just 2 years, the percentage of people who have a great deal or quite a lot of confidence in the medical system has gone down 10%.

This lack of trust is manifesting itself in multiple parts of the healthcare world, including refusal of vaccinations, turning to alternative medicine, and ignoring professional recommendations during disease outbreaks to name a few. For example, trust in science, medical professionals, and the government can support increased COVID-19 risk perception, and this is not as likely to happen if this trust is waning.[163] According to one study, only about half of people (52%) felt that the best scientific evidence influences research on child vaccination most of the time. Thirty-six percent of people said that the best science has to offer influences child vaccination research some of the time and 9% said this seldom or never

happens.[164] Medical knowledge has been shown to not be the main reason why parents vaccinate their children. Instead, it is trust (or lack thereof) and relationships, especially with healthcare providers.[165] As has been discussed throughout this brief, those who are primarily reliant on alternative medicine are more distrustful of standard practices of care backed by science.[166] During the Ebola outbreak, there was misinformation going around that medical professionals were purposely spreading the virus, which may have made it more difficult for healthcare workers to do their jobs.[167] Not only does a lack of trust in medical professionals hurt patients, it also makes the medical field a more difficult place to work in. Medical misinformation harms the credibility of health professionals, leading to more poor decisions from patients and greater negative health outcomes.[168] More sick people in hospitals lead to staffing issues and shortages of equipment that make it much more difficult for medical professionals to do their jobs.[169]

Racism and Hate Crimes

Medical misinformation leads to racism and hate crimes because misinformation about the spread of disease can cause people to target specific groups. Racist assumptions based on medical misinformation can also cause healthcare professionals to act in a way that perpetuates inequality. Research has shown that relative to white patients, black patients are less likely to be given pain medications and more likely to receive them in lower quantities if given them.[170] In one study, it was found that black patients were only 57% likely to receive painkillers for fractures in the emergency room, while white patients were 74% likely to get this medicine despite reporting similar pain levels.[171] This difference in treatment was found even among children. A study of one million children with appendicitis revealed that black children were less likely to receive any pain medication for moderate pain and less likely to receive opioids for severe pain than white children.[172]

Although racism and hate crimes motivated by medical misinformation have been seen throughout the world, these examples all share many similarities with the type of racially motivated hate that has taken place in the United States for hundreds of years. At the beginning of the COVID-19 pandemic, in India, there was misinformation that linked the virus to a religious group. This medical misinformation was widely shared on social media and, as a result, physical violence and other discrimination took place.[173] The former Deputy Prime Minister of Italy linked COVID-19 to

African asylum seekers and called for border closures.[174] There were physical attacks against Asians in predominantly white countries during the COVID-19 pandemic, fueled in part by government officials characterizing COVID as the "Wuhan" or "Chinese virus" despite it having no medical racial or ethnic link.[175] A Pew Research Center survey from 2020 found that 29% of Americans believe that the virus was developed in a lab, with many of them identifying Wuhan, China as the location. President Trump gave legitimacy to this theory despite scientific consensus and US Intelligence Services reporting that the virus is not man-made.[176]

The COVID-19 pandemic is not the only instance where large-scale consequences occurred because of medical misinformation. In the Democratic Republic of the Congo in 2019, misinformation about Ebola was linked to violence and targeted attacks on healthcare providers.[177] During the Chinese SARS outbreak of 2002 and 2003, anxiety about contracting the virus caused stigma against Asians.[178] Chinatown communities across the country lost tourist attention, Chinese restaurants lost clients, and many other Chinese-affiliated businesses lost revenue.[179] One Massachusetts family adopted a child from China during the outbreak, and despite having no exposure to the disease and correctly following all protocols, the children's schools requested that the family stay home for ten days even though they had no symptoms. The father of the family then sought treatment for a rash after spending time in their hot tub (a rash is not a primary symptom of SARS) but was refused treatment by his physician and forced to go to an emergency room where he was only allowed to enter through a private door.[180]

Racism and prejudice due to medical misinformation is not a new phenomenon. The spread of disease is associated with higher levels of ethnocentrism and greater intolerance and punitive views towards out-groups. This leads to discrimination and violence against groups that are already stigmatized.[181] The spread of the bubonic plague led to widespread violence in Europe with over 1,000 communities destroyed, and a particularly violent focus appearing against Jews and the Catalans in Sicily.[182] In 1900, a Chinese man was suspected of dying of the bubonic plague in San Francisco. The city immediately ordered that Chinatown be put under quarantine and that all the whites from the area be removed. As it turns out, this man most likely died from gonorrhea, typhoid, or venereal disease. As a consequence of the racist shutdown of Chinatown, many business owners lost customers. A few months later, 4 suspicious deaths were reported in Chinatown over the span of 3 days, and the

secretary of the treasury ordered a restriction on travel for Asians.[183]

Practices

Education has been widely recognized as an obvious solution to pursue in order to combat the spread of misinformation. Multiple organizations have undertaken this cause and made it their own including the Center for Media Literacy, Media Literacy Now, and the News Literacy Project. The Center for Media Literacy was founded in 1989 and is an independent, self-sustaining, for-profit organization.[184,185] It offers a "CML MediaLit Kit" that aims to teach media literacy to students, parents, and community members.[186] A study done on one of their curriculums showed that at the first post-test, after the curriculum was implemented, students reported increased knowledge of five core concepts of media literacy.[187] Media Literacy Now is a nonprofit that was founded in 2013 and focuses on influencing policymakers to create laws mandating media literacy education in public schools throughout the country.[188]

Every year they publish a US Media Literacy Policy Report that shows the status of media literacy education laws in K–12 schools. As of their most recent report, 18 states have media literacy education language on the books, but only Delaware, New Jersey, and Texas are required by law to include media literacy education in K-12 classrooms.[189] The News Literacy Project is a nonprofit that was founded in 2008 to give middle and high school teachers tools to teach their students about news literacy.[190] One of these tools is called "Checkology," and according to their website, 96% of teachers said that it was better than other news or media literacy resources they used in the classroom. During the 2022–2023 school year, after completing Checkology lessons 87% of students were able to correctly identify fairness as a standard of quality journalism, compared to only 70% before Checkology. Eighty-five percent of students who completed the lessons recognized that conspiracy theories appeal to people because they provide a sense of belonging and community, compared to only 58% of students before the lessons. And 8% more students were able to recognize when a

social media post did not provide credible evidence after completing Checkology.[191]

Impact

Beyond the impacts of these three organizations, there have been many other studies conducted in order to observe the effects of education in combating misinformation. In 24 different studies, knowledge and skills surrounding assessing claims about health interventions were better for those who participated in educational interventions rather than those who did not.[192] In another study about the effects of education in evaluating medical information, seventh-grade students who engaged in active learning were 71% more likely to demonstrate basic knowledge of causality in health research as compared to those who received authoritative instruction. Students who were exposed to the active learning approaches in media literacy rated their ability to evaluate evidence significantly higher than those who were exposed to traditional methods. Despite this, only two students from the active learning group could use their education about health claims to understand an authentic media report two weeks after the instruction, and none of the authoritatively taught children could.[193] In another study, 8th graders from low socioeconomic status backgrounds who were taught about causal reasoning were almost two times as likely to recognize that cancer outcomes are influenced by multiple variables when compared to a group of students from a high socioeconomic background who were not taught this causal reasoning.[194] Experts recommend an increased focus on health, science, and media literacy including efforts to raise awareness of techniques that are often used to spread misinformation, like cherry-picking data. They hope that this focus on health and science literacy will help more people gain a healthy sense of skepticism towards claims they come across that seem overly simplistic.[195] In another study, of those who had been given media and information literacy training, 73.3% could accurately identify fake information, while of those who had not undergone the training, only 53.6% could identify fake information. Those who were trained in this media and information literacy program were also less likely to share inaccurate stories, thus helping to curb the spread of misinformation.[196] This principle has been seen through curriculum changes at school, after-school programs, special workshops, and even the development of educational games.[197,198] For example, teaching strategies like checking authors' sources have improved discernment between facts and misinformation.[199] Those who report high levels of media literacy learning opportunities are also

much more likely to rate evidence-based posts as accurate than to rate posts with misinformation as accurate—even when both posts align with their prior perspectives.[200]

Gaps

There are some important gaps in the current educational practices that must be acknowledged and addressed in order to move forward and make progress in solving this social problem. One gap within these suggestions is the immense amount of time, money, and labor it would take to move educational programs and metrics to the levels necessary to truly combat medical misinformation. Prior investment from the government and the citizens must take place in order for this practice to work. This is what Media Literacy Now is focused on, but it often takes many years of hard work to see the kind of change in public education that would truly make a difference nationwide. Another gap that was widely identified in many of the studies about education's ability to combat misinformation has to do with the lack of meaningful, long-term research studies that truly represent the effects of different education programs, rather than just the immediate outcomes.[201,202] Most of the current studies available also only provide information about media literacy outcomes in the classroom, rather than what is happening in everyday contexts. Without these more robust studies, it is difficult to know which educational interventions are best to implement throughout the country.[203] Another gap in the traditional umbrella of education has to do with the older population in the United States. Without access to the educational material in public schools or universities that is supposed to help citizens learn to combat misinformation, it would be difficult to teach skills to combat misinformation to those who are solely in the workforce or retired.[204,205]

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Endnotes

1. Sayeed Al-Zaman, "Prevalence and Source Analysis of COVID-19 Misinformation in 138 Countries," *IFLA Journal* 48, no. 1 (2022): 189–204, https://doi.org/10.1177/03400352211041135.
2. Saiful Islam et al., "COVID-19-Related Infodemic and its Impact on Public Health: A Global Social Media Analysis," *The American Journal of Tropical Medicine and Hygiene* 103, no. 4 (2020): 1621, https://doi.org/10.4269/ajtmh.20-0812.
3. Saiful Islam et al., "COVID-19-Related Infodemic and its Impact on Public Health: A Global Social Media Analysis."
4. Felicia Collins, "Addressing Community Health Literacy to Improve COVID-19 Health Outcomes," *Office of Minority Health*, October 27, 2022, https://minorityhealth.hhs.gov/news/addressing-community-health-literacy-improve-covid-19-health-outcomes.
5. Chandraveer Singh, "Understanding Social Media Algorithms [2023 Complete Guide]," *Social Pilot*, September 16, 2023. https://www.socialpilot.co/blog/social-media-algorithm#:~:text=A%20social%20media%20algorithm%20is,account%20by%20social%20media%20platforms.
6. Lisa A. Kisling, and Regan A. Stiegmann, "Alternative Medicine," *National Library of Medicine,* StatPearls Publishing, July 25, 2022. https://www.ncbi.nlm.nih.gov/books/NBK538520/.
7. "Anecdotal Evidence Definition & Meaning," *Merriam-Webster*, accessed November 8, 2023. https://www.merriam-webster.com/dictionary/anecdotal%20evidence.
8. Sadiq Muhammed T and Saji K. Mathew, "The Disaster of Misinformation: A Review of Research in Social Media," *International Journal of Data Science and Analytics* 13, no. 4 (2022): 271–285, https://doi.org/10.1007/s41060-022-00311-6.
9. Rebeka F. Guarda et al., "Disinformation, Dystopia and Post-Reality in Social Media: A Semiotic-Cognitive Perspective," *Education for Information* 34, no. 3 (2018): 185–197, https://doi.org/10.3233/EFI-180209.
10. Samuel C. Rhodes, "Filter Bubbles, Echo Chambers, and Fake News: How Social Media Conditions Individuals to be Less Critical of Political Misinformation," *Political Communication* 39, no. 1 (2022): 1–22, https://doi-org.byu.idm.oclc.org/10.1080/10584609.2021.1910887.
11. Rebeka F. Guarda et al., "Disinformation, Dystopia and Post-Reality in Social Media: A Semiotic-Cognitive Perspective," *Education for Information* 34, no. 3 (2018): 185–197, https://doi.org/10.3233/EFI-180209.
12. Franziska Zimmer et al., "Fake News in Social Media: Bad Algorithms or Biased Users?" *Journal of Information Science Theory and Practice* 7, no. 2 (2019): 40–53, https://doi.org/10.1633/JISTaP.2019.7.2.4.
13. Briony Swire-Thompson and David Lazer, "Public Health and Online Misinformation: Challenges and Recommendations," *Annual Review of Public Health* 41, no. 1 (2020): 433–451, https://doi.org/10.1146/annurev-publhealth-040119-094127.
14. Stephan Lewandowsky et al., "Misinformation and Its Correction," *Psychological Science in the Public Interest* 13, no. 3 (2012): 106–131, https://doi.org/10.1177/1529100612451018.
15. Gordon Pennycook and David G. Rand, "The Psychology of Fake News," *Trends in Cognitive Sciences* 25, no. 5 (2021): 388–402, https://doi.org/10.1016/j.tics.2021.02.007.
16. Sam Bradd, "Infodemic," *World Health Organization,* accessed November 25, 2023, https://www.who.int/health-topics/infodemic#tab=tab_1.
17. Rebeka F. Guarda et al., "Disinformation, Dystopia and Post-Reality in Social Media: A Semiotic-Cognitive Perspective," *Education for Information* 34, no. 3 (2018): 185–197, https://doi.org/10.3233/EFI-180209.
18. "The Pros and Cons of Media Conglomerates," *IPL Essays,* May 26, 2020, https://www.ipl.org/essay/The-Pros-And-Cons-Of-Media-Conglomerates-P3KPYCZK6J4DR.
19. Ramez Kouzy et al., "Coronavirus Goes Viral: Quantifying the COVID-19 Misinformation Epidemic on Twitter," *Cureus* 12, no. 3 (2020), https://doi.org/10.7759/cureus.7255.
20. Joshua A. Tucker et al., *Social Media, Political Polarization, and Political Disinformation: A Review of the Scientific Literature* (Menlo Park, CA: Hewlett Foundation, March 2018), https://www.hewlett.org/wp-content/uploads/2018/03/Social-Media-Political-Polarization-and-

Political-Disinformation-Literature-Review.pdf.

21. Ramez Kouzy et al., "Coronavirus Goes Viral: Quantifying the COVID-19 Misinformation Epidemic on Twitter," *Cureus* 12, no. 3 (2020), https://doi.org/10.7759/cureus.7255.
22. Louisa Ha, Loarre Andreu Perez, and Rik Ray, "Mapping Recent Development in Scholarship on Fake News and Misinformation, 2008 to 2017: Disciplinary Contribution, Topics, and Impact," *American Behavioral Scientist* 65, no. 2 (2021): 290–315, https://doi.org/10.1177/0002764219869402.
23. Soroush Vosoughi, Deb Roy, and Sinan Aral, "The Spread of True and False News Online," *Science* 359, no. 6380 (2018): 1146–1151, https://doi.org/10.1126/science.aap9559.
24. Vosoughi, Roy, and Aral, "The Spread of True and False News Online."
25. Ibid.
26. Louisa Ha, Loarre Andreu Perez, and Rik Ray, "Mapping Recent Development in Scholarship on Fake News and Misinformation, 2008 to 2017: Disciplinary Contribution, Topics, and Impact," *American Behavioral Scientist* 65, no. 2 (2021): 290–315, https://doi.org/10.1177/0002764219869402.
27. Xiaoli Nan, Yuan Wang, and Kathryn Thier, "Why Do People Believe Health Misinformation and Who is at Risk? A Systematic Review of Individual Differences in Susceptibility to Health Misinformation," *Social Science & Medicine* 314 (December 2021), https://doi.org/10.1016/j.socscimed.2022.115398.
28. "Anecdotal Evidence Definition & Meaning," *Merriam-Webster*.
29. Louisa Ha, Loarre Andreu Perez, and Rik Ray, "Mapping Recent Development in Scholarship on Fake News and Misinformation, 2008 to 2017: Disciplinary Contribution, Topics, and Impact," *American Behavioral Scientist* 65, no. 2 (2021): 290–315, https://doi.org/10.1177/0002764219869402.
30. Lewandowsky et al., "Misinformation and Its Correction."
31. Ibid.
32. Ibid.
33. Saiful Islam et al., "COVID-19–Related Infodemic and Its Impact on Public Health: A Global Social Media Analysis," *The American Journal of Tropical Medicine and Hygiene* 103, no. 4 (2020): 1621–1629, https://doi.org/10.4269/ajtmh.20-0812.
34. Muhammed and Mathew, "The Disaster of Misinformation: A Review of Research in Social Media."
35. Islam et al., "COVID-19–Related Infodemic and Its Impact on Public Health: A Global Social Media Analysis."
36. "Fault Lines," *CCA Reports,* March 21, 2023, https://cca-reports.ca/reports/the-socioeconomic-impacts-of-health-and-science-misinformation/.
37. Xiaoli, Wang, and Thier, "Why Do People Believe Health Misinformation and Who is at Risk? A Systematic Review of Individual Differences in Susceptibility to Health Misinformation."
38. Lisa A. Kisling, and Regan A. Stiegmann, "Alternative Medicine," *National Library of Medicine,* StatPearls Publishing, July 25, 2022, https://www.ncbi.nlm.nih.gov/books/NBK538520/.
39. Laura D. Scherer et al., "Who is Susceptible to Online Health Misinformation? A Test of Four Psychosocial Hypotheses," *Health Psychology* 40, no. 4 (2021): 274, https://doi.org/10.1037/hea0000978.
40. Jad Melki et al., "Mitigating Infodemics: The Relationship Between News Exposure and Trust and Belief in COVID-19 Fake News and Social Media Spreading," *PLOS One* 16, no. 6 (2021): e0252830, https://doi.org/10.1371/journal.pone.0252830.
41. Jad Melki et al., "Mitigating Infodemics: The Relationship Between News Exposure and Trust and Belief in COVID-19 Fake News and Social Media Spreading."
42. Xiaoli, Wang, and Thier, "Why Do People Believe Health Misinformation and Who is at Risk? A Systematic Review of Individual Differences in Susceptibility to Health Misinformation."
43. Ibid.

44. Ibid.

45. Gordon Pennycook and David G. Rand, "The Psychology of Fake News," *Trends in Cognitive Sciences* 25, no. 5 (2021): 388–402, https://doi.org/10.1016/j.tics.2021.02.007.

46. Xiaoli, Wang, and Thier, "Why Do People Believe Health Misinformation and Who is at Risk? A Systematic Review of Individual Differences in Susceptibility to Health Misinformation."

47. Ibid.

48. Gerry Greenstone et al., "The History of Bloodletting," *BC Medical Journal* 52, no. 1 (2010): 12–14, https://bcmj.org/premise/history-bloodletting#:~:text=By%3A%20Gerry%20Greenstone%2C%20MD%2C,a%20treatment%20for%20most%20ailments.

49. Joanna M. Burkhardt, "History of Fake News," *Library Technology Reports* 53, no. 8 (2017): 5–9, https://www.proquest.com/scholarly-journals/history-fake-news/docview/1967322040/se-2.

50. Julie Posetti and Alice Matthews, *A Short Guide to the History of 'Fake News' and Disinformation* (International Center for Journalists, 2018), https://www.icfj.org/news/short-guide-history-fake-news-and-disinformation-new-icfj-learning-module.

51. "How Big Is the Internet, and How Do We Measure It?" *Health IT*, June 2023, https://healthit.com.au/how-big-is-the-internet-and-how-do-we-measure-it/.

52. "55 Percent of Netflix US Comprises Netflix Originals; Currently Streaming over 6,600 Titles," *The Economic Times*, July 2023, https://economictimes.indiatimes.com/news/international/us/55-percent-of-netflix-us-comprises-netflix-originals-currently-streaming-over-6600-titles/articleshow/101734313.cms.

53. Burkhardt, "History of Fake News."

54. Posetti and Matthews, "A Short Guide to the History of 'Fake News' and Disinformation."

55. Gordon Pennycook and David G. Rand, "The Psychology of Fake News," *Trends in Cognitive Sciences* 25, no. 5 (2021): 388–402, https://doi.org/10.1016/j.tics.2021.02.007.

56. Sam Bradd, "Infodemic," *World Health Organization,* accessed November 25, 2023, https://www.who.int/health-topics/infodemic#tab=tab_1.

57. Bradd, "Infodemic."

58. Justin T. Brady, Molly E. Kelly, and Sharon L. Stein, "The Trump Effect: With No Peer Review, How Do We Know What to Really Believe on Social Media?" *Clinics in Colon and Rectal Surgery* 30, no. 4 (2017): 270–276, https://doi.org/10.1055/s-0037-1604256.

59. Yang-Jun Li et al., *Health Misinformation on Social Media: a Literature Review* (Xi'an, China: AIS Electronic Library, PACIS 2019 Proceedings, June 2019), https://core.ac.uk/download/pdf/326833387.pdf.

60. Yuehua Zhao and Jin Zhang, "Consumer Health Information Seeking in Social Media: A Literature Review," *Health Information & Libraries Journal* 34, no. 4 (2017): 268–283, https://doi.org/10.1111/hir.12192.

61. Yang-Jun Li et al., *Health Misinformation on Social Media: a Literature Review*.

62. Ibid.

63. Josh Howarth, "Worldwide Daily Social Media Usage (New 2023 Data)," *Exploding Topics,* April 10, 2023, https://explodingtopics.com/blog/social-media-usage.

64. Israel Junior Borges Do Nascimento et al., "Infodemics and Health Misinformation: A Systematic Review of Reviews," *Bulletin of the World Health Organization* 100, no. 9 (2022): 544, https://doi.org/10.2471/BLT.21.287654.

65. Yang-Jun Li et al., *Health Misinformation on Social Media: A Literature Review*.

66. Tedros Adhanom Ghebreyesus, "Vaccine Misinformation: Statement by WHO Director-General on Facebook and Instagram," *World Health Organization*, September 2019, https://www.who.int/news/item/04-09-2019-vaccine-misinformation-statement-by-who-director-general-on-facebook-and-instagram.

67. John Robert Bautista, Yan Zhang, and Jacek Gwizdka, "US Physicians' and Nurses' Motivations, Barriers, and Recommendations for Correcting Health Misinformation on Social Media: Qualitative Interview Study," *JMIR Public Health and Surveillance* 7, no. 9 (2021):

e27715, https://doi.org/10.2196/27715.

68. Sayeed Al-Zaman, "Prevalence and Source Analysis of COVID-19 Misinformation in 138 Countries," *IFLA Journal* 48, no. 1 (2022): 189–204, https://doi.org/10.1177/03400352211041135.

69. Sihong Zhao et al., "The Prevalence, Features, Influencing Factors, and Solutions for COVID-19 Vaccine Misinformation: Systematic Review," *JMIR Public Health and Surveillance* 9, no. 1 (2023): e40201, https://doi.org/10.2196/40201.

70. Lunna Lopes et al., "KFF Health Misinformation Tracking Poll Pilot," *KFF*, August 2023, https://www.kff.org/coronavirus-covid-19/poll-finding/kff-health-misinformation-tracking-poll-pilot/.

71. Michael Barthel, "Many Americans Believe Fake News Is Sowing Confusion," *Pew Research Center's Journalism Project*, December 2016, https://www.pewresearch.org/journalism/2016/12/15/many-americans-believe-fake-news-is-sowing-confusion/.

72. "Mobile Fact Sheet," *Pew Research Center: Internet, Science & Tech*, April 2021, https://www.pewresearch.org/internet/fact-sheet/mobile/.

73. Laura Ceci, "Mobile Internet Usage in the United States - Statistics & Facts," *Statista*, August 2023, https://www.statista.com/topics/3124/mobile-internet-usage-in-the-united-states/#topicOverview.

74. Anastasia Micich and R.J. Cross, "How Misinformation on Social Media Has Changed News," *US PIRG Education Fund,* November 2023, https://pirg.org/edfund/articles/misinformation-on-social-media/#:~:text=By%20nudging%20frequent%20users%20to,fake%20news%20circulating%20on%20Facebook.

75. Louisa Ha, Loarre Andreu Perez, and Rik Ray, "Mapping Recent Development in Scholarship on Fake News and Misinformation, 2008 to 2017: Disciplinary Contribution, Topics, and Impact," *American Behavioral Scientist* 65, no. 2 (2021): 290–315, https://doi.org/10.1177/0002764219869402.

76. Ibid.

77. Anastasia Micich and R.J. Cross, "How Misinformation on Social Media Has Changed News," *US PIRG Education Fund*, November 22, 2023, https://pirg.org/edfund/articles/misinformation-on-social-media/#:~:text=By%20nudging%20frequent%20users%20to,fake%20news%20circulating%20on%20Facebook.

78. Suarez-Lledo, Victor, and Javier Alvarez-Galvez, "Prevalence of Health Misinformation on Social Media: Systematic Review," *Journal of Medical Internet Research* 23, no. 1 (2021): e17187.

79. Jeff Allen, "Misinformation Amplification Analysis and Tracking Dashboard," *Integrity Institute,* March 14, 2023, https://integrityinstitute.org/blog/misinformation-amplification-tracking-dashboard.

80. Ibid.

81. Ibid.

82. "Anecdotal Evidence Definition & Meaning," *Merriam-Webster*.

83. Xiaoli, Wang, and Thier, "Why Do People Believe Health Misinformation and Who is at Risk? A Systematic Review of Individual Differences in Susceptibility to Health Misinformation."

84. Ibid.

85. Meghan Bridgid Moran et al., "What Makes Anti-Vaccine Websites Persuasive? A Content Analysis of Techniques used by Anti-Vaccine Websites to Engender Anti-Vaccine Sentiment," *Journal of Communication in Healthcare* 9, no. 3 (2016): 151–163.

86. Robin Nunn, "Mere Anecdote: Evidence and Stories in Medicine," *Journal of Evaluation in Clinical Practice* 17, no. 5 (2011): 920–26, https://doi.org/10.1111/j.1365-2753.2011.01727.x.

87. Audrey L. Michal, Yiwen Zhong, and Priti Shah, "When and Why do People Act on Flawed Science? Effects of Anecdotes and Prior Beliefs on Evidence-Based Decision-Making," *Cognitive Research: Principles and Implications* 6 (2021): 1–23.

88. Traci H. Freling et al., "When Poignant Stories Outweigh Cold Hard Facts: A Meta-Analysis of the Anecdotal Bias," *Organizational Behavior and Human Decision Processes* 160 (2020): 51–67.

89. Michal, Zhong, and Shah, "When and Why do People Act on Flawed Science? Effects of Anecdotes and Prior Beliefs on Evidence-Based

Decision-Making."

90. Ibid.

91. Susan Petryk, "In Children with Autism, is Intravenous Secretin more Effective than Placebo in Improving Social Skills, Communication, Behaviour or Global Functioning? Part A: Evidence-Based Answer and Summary," *Paediatrics & Child Health* 9, no. 4 (2004): 244–245.

92. Jilleen Kosko et al., "Evidence-Based Medicine and the Anecdote: Uneasy Bedfellows or Ideal Couple?" *Paediatrics & Child Health* 11, no. 10 (2006): 665–668.

93. "The Pros and Cons of Media Conglomerates," *IPL Essays,* May 26, 2020, https://www.ipl.org/essay/The-Pros-And-Cons-Of-Media-Conglomerates-P3KPYCZK6J4DR.

94. Felix Hamborg, Karsten Donnay, and Bela Gipp, "Automated Identification of Media Bias in News Articles: An Interdisciplinary Literature Review," *International Journal on Digital Libraries* 20, no. 4 (2019): 391–415.

95. Samuel C. Rhodes, "Filter Bubbles, Echo Chambers, and Fake News: How Social Media Conditions Individuals to be Less Critical of Political Misinformation," *Political Communication* 39, no. 1 (2022): 1–22, https://doi-org.byu.idm.oclc.org/10.1080/10584609.2021.1910887.

96. Lewandowsky et al., "Misinformation and Its Correction."

97. Chandraveer Singh, "Understanding Social Media Algorithms [2023 Complete Guide]," *Social Pilot*, September 16, 2023, https://www.socialpilot.co/blog/social-media-algorithm#:~:text=A%20social%20media%20algorithm%20is,account%20by%20social%20media%20platforms.

98. Franziska Zimmer et al., "Fake News in Social Media: Bad Algorithms or Biased Users?" *Journal of Information Science Theory and Practice* 7, no. 2 (2019): 40–53, https://doi.org/10.1633/JISTaP.2019.7.2.4.

99. Anastasia Micich and R.J. Cross, "How Misinformation on Social Media Has Changed News."

100. Ibid.

101. Ibid.

102. Rebeka F. Guarda et al., "Disinformation, Dystopia and Post-Reality in Social Media: A Semiotic-Cognitive Perspective," *Education for Information* 34, no. 3 (2018): 185–197, https://doi.org/10.3233/EFI-180209.

103. Pennycook and Rand, "The Psychology of Fake News."

104. Douglas MacFarlane et al., "Refuting Spurious COVID-19 Treatment Claims Reduces Demand and Misinformation Sharing," *Journal of Applied Research in Memory and Cognition* 10, no. 2 (2021): 248–258.

105. Pennycook and Rand "The Psychology of Fake News"

106. Ibid.

107. Muhammed and Mathew, "The Disaster of Misinformation: A Review of Research in Social Media."

108. Lisa A. Kisling, and Regan A. Stiegmann, "Alternative Medicine," *National Library of Medicine,* StatPearls Publishing, July 25, 2022, https://www.ncbi.nlm.nih.gov/books/NBK538520/.

109. Ibid.

110. Ibid.

111. Ibid.

112. Ibid.

113. Nicola Gale, "The Sociology of Traditional, Complementary and Alternative Medicine," *Sociology Compass* 8, no. 6 (2014): 805–822.

114. Kimberly Drake, "Why Do Some People Believe Health Misinformation?" *Medical News Today*, March 2021, https://www.medicalnewstoday.com/articles/why-do-some-people-believe-health-misinformation.

115. Lewandowsky et al., "Misinformation and Its Correction."

116. John Miles, Catherine Petrie, and Michael Steel, "Slimming on the Internet," *Journal of the Royal Society of Medicine* 93, no. 5 (2000): 254–257, https://doi.org/10.1177/014107680009300510.

117. Raina M. Merchant and David A. Asch, "Protecting the Value of Medical Science in the Age of Social Media and 'Fake News,'" *JAMA* 320, no.

23 (2018): 2415–6, https://doi.org/10.1001/jama.2018.18416.

118. Briony Swire-Thompson and David Lazer, "Public Health and Online Misinformation: Challenges and Recommendations," *Annual Review of Public Health* 41, no. 1 (2020): 433–451, https://doi.org/10.1146/annurev-publhealth-040119-094127.

119. Dan Kahan, "Fixing the Communications Failure," *Nature* 463, no. 7279 (2010): 296–297, https://doi.org/10.1038/463296a.

120. Kahan, "Fixing the Communications Failure."

121. Laura D. Scherer and Gordon Pennycook, "Who is Susceptible to Online Health Misinformation?" *American Journal of Public Health* 110, no. S3 (2020): S276–S277, https://doi.org/10.2105/AJPH.2020.305908.

122. Lewandowsky et al., "Misinformation and Its Correction."

123. James Druckman et al. "The Role of Race, Religion, and Partisanship in Misinformation About COVID-19," *Group Processes & Intergroup Relations* 24, no. 4 (2020): 638–657, https://doi.org/10.1177/1368430220985912.

124. Lucy Pollyanna Goldsmith et al., "Use of Social Media Platforms by Migrant and Ethnic Minority Populations During the COVID-19 Pandemic: A Systematic Review," *BMJ Open* 12, no. 11 (2022): e061896, https://doi.org/10.1136/bmjopen-2022-061896.

125. Lucy Pollyanna Goldsmith et al., "Use of Social Media Platforms by Migrant and Ethnic Minority Populations During the COVID-19 Pandemic: A Systematic Review."

126. Michael W. Ross, E. James Essien, and Isabel Torres, "Conspiracy Beliefs About the Origin of HIV/AIDS in Four Racial/Ethnic Groups," *Journal of Acquired Immune Deficiency Syndromes* 41, no. 3 (2006): 342, https://doi.org/10.1097/01.qai.0000209897.59384.52.

127. Ross, Essien, and Torres, "Conspiracy Beliefs About the Origin of HIV/AIDS in Four Racial/Ethnic Groups."

128. Ibid.

129. S. M. Jones-Jang, T. Mortensen, and J. Liu, "Does Media Literacy Help Identification of Fake News? Information Literacy Helps, but Other Literacies Don't," *American Behavioral Scientist* 65, no. 2 (2021): 371–388, https://doi.org/10.1177/0002764219869406.

130. I. B. Gaultney, T. Sherron, and C. Boden "Political Polarization, Misinformation, and Media Literacy," *Journal of Media Literacy Education* 14, no. 1 (2022): 59–81, https://doi.org/10.23860/JMLE-2022-14-1-5.

131. Sarah McGrew et al., "Can Students Evaluate Online Sources? Learning From Assessments of Civic Online Reasoning," *Theory & Research in Social Education* 46, no. 2 (2018): 165–193, https://doi.org/10.1080/00933104.2017.1416320.

132. Felicia Collins, "Addressing Community Health Literacy to Improve COVID-19 Health Outcomes," *Office of Minority Health,* October 2022, https://minorityhealth.hhs.gov/news/addressing-community-health-literacy-improve-covid-19-health-outcomes.

133. Thompson and Lazer, "Public Health and Online Misinformation: Challenges and Recommendations."

134. Ibid.

135. Salman Bin Naeem and Maged N. Kamel Boulos, "COVID-19 Misinformation Online and Health Literacy: A Brief Overview," *International Journal of Environmental Research and Public Health* 18, no. 15 (2021): 8091, https://doi.org/10.3390/ijerph18158091.

136. Xuewei Chen et al., "Health Literacy and Use and Trust in Health Information," *Journal of Health Communication* 23, no. 8 (2018): 724–734.

137. Ilaria Montagni et al., "Acceptance of a Covid-19 Vaccine is Associated with Ability to Detect Fake News and Health Literacy," *Journal of Public Health* 43, no. 4 (2021): 695–702.

138. Salman Bin Naeem and Maged N. Kamel Boulos, "COVID-19 Misinformation Online and Health Literacy: A Brief Overview," *International Journal of Environmental Research and Public Health* 18, no. 15 (2021): 8091, https://doi.org/10.3390/ijerph18158091.

139. Saiful Islam et al., "COVID-19-Related Infodemic and Its Impact on Public Health: A Global Social Media Analysis," *The American Journal of Tropical Medicine and Hygiene* 103, no. 4 (2020): 1621–1629, https://doi.org/10.4269/ajtmh.20-0812.

140. Raina M. Merchant and David A. Asch, "Protecting the Value of Medical Science in the Age of Social Media and "Fake News."

141. Briony Swire-Thompson and David Lazer, "Public Health and Online Misinformation: Challenges and Recommendations," *Annual Review of Public Health* 41, no. 1 (2020): 433–451, https://doi.org/10.1146/annurev-publhealth-040119-094127.

142. "Can Eating Apricot Kernels Cure Cancer?" *Cancer Council*, accessed January 2, 2024, https://www.cancer.org.au/iheard/can-eating-

apricot-kernels-cure-cancer.

143. Brian G. Southwell et al., "Health Misinformation Exposure and Health Disparities: Observations and Opportunities," *Annual Review of Public Health* 44 (2023): 113–130, https://doi.org/10.1146/annurev-publhealth-071321-03111.

144. "More than 2.5 Million Youth Reported e-Cigarette Use in 2022," *Centers for Disease Control and Prevention*, October 2022, https://www.cdc.gov/media/releases/2022/p1007-e-cigarette-use.html.

145. Jaime E Sidani et al., "E-Cigarette-Related Nicotine Misinformation on Social Media," *Substance Use & Misuse* 57, no. 4 (2022): 588–594, https://doi.org/10.1080/10826084.2022.2026963.

146. Southwell et al., "Health Misinformation Exposure and Health Disparities: Observations and Opportunities."

147. Muhammed and Mathew, "The Disaster of Misinformation: A Review of Research in Social Media."

148. Saiful Islam et al., "COVID-19-Related Infodemic and Its Impact on Public Health: A Global Social Media Analysis," *The American Journal of Tropical Medicine and Hygiene* 103, no. 4 (2020): 1621–1629, https://doi.org/10.4269/ajtmh.20-0812.

149. Saiful Islam et al., "COVID-19-Related Infodemic and Its Impact on Public Health: A Global Social Media Analysis."

150. Muhammed and Mathew, "The Disaster of Misinformation: A Review of Research in Social Media."

151. Radhika Gharpure et al., "Knowledge and Practices Regarding Safe Household Cleaning and Disinfection for Covid-19 Prevention — United States, May 2020," *Centers for Disease Control and Prevention*, June 2020, https://www.cdc.gov/mmwr/volumes/69/wr/mm6923e2.htm?s_cid=mm6923e2_w#suggestedcitation.

152. Sahana Sule et al., "Communication of COVID-19 Misinformation on Social Media by Physicians in the US," *JAMA Network Open* 6, no. 8 (2023): e2328928, https://doi.org/10.1001/jamanetworkopen.2023.28928.

153. "Fault Lines," *CCA Reports*, March 2023, https://cca-reports.ca/reports/the-socioeconomic-impacts-of-health-and-science-misinformation/.

154. Alessandra Perez, "Compassion Fatigue in an Infodemic: A Physician's Duty to Treat in the Age of Misinformation," *University of Miami International and Comparative Law Review* 30, no. 2 (2023): 236, https://repository.law.miami.edu/umiclr/vol30/iss2/9.

155. Alessandra Perez, "Compassion Fatigue in an Infodemic: A Physician's Duty to Treat in the Age of Misinformation."

156. Kimberly Drake, "Why Do Some People Believe Health Misinformation?"

157. Ibid.

158. Samantha DiGrande, "Survey Shows Trust in Healthcare Systems Declining Globally," *Center for Biosimilars,* June 2018, https://www.centerforbiosimilars.com/view/survey-shows-trust-in-healthcare-systems-declining-globally.

159. Samantha DiGrande, "Survey Shows Trust in Healthcare Systems Declining Globally."

160. "Confidence in Institutions," *Gallup,* August 2023, https://news.gallup.com/poll/1597/confidence-institutions.aspx.

161. "Confidence in Institutions," Gallup.

162. Ibid.

163. Timothy M. Lenton, Chris A. Boulton, and Marten Scheffer, "Resilience of Countries to COVID-19 Correlated With Trust," *Scientific Reports* 12, no. 1 (2022): 75, https://doi.org/10.1038/s41598-021-03358-w.

164. Cary Funk, "Mixed Messages about Public Trust in Science." *Issues in Science and Technology* 34, no.1 (2017): 86–88, https://byu.idm.oclc.org/login/?url=https://www.proquest.com/scholarly-journals/mixed-messages-about-public-trust-science/docview/2177530522/se-2.

165. Andrea L. Benin et al., "Qualitative Analysis of Mothers' Decision-Making About Vaccines for Infants: The Importance of Trust," *Pediatrics* 117, no. 5 (2006): 1532–1541, https://doi.org/10.1542/peds.2005-1728.

166. John A. Astin, "Why Patients Use Alternative Medicine: Results of a National Study," *JAMA* 279, no. 19 (1998): 1548–1553, https://doi.org/10.1001/jama.279.19.1548.

167. Saiful Islam et al., "COVID-19-Related Infodemic and Its Impact on Public Health: A Global Social Media Analysis," *The American Journal of Tropical Medicine and Hygiene* 103, no. 4 (2020): 1621–1629, https://doi.org/10.4269/ajtmh.20-0812.

168. Alessandra Perez, "Compassion Fatigue in an Infodemic: A Physician's Duty to Treat in the Age of Misinformation."
169. Ibid.
170. Kelly M. Hoffman et al., "Racial Bias in Pain Assessment and Treatment Recommendations, and False Beliefs About Biological Differences Between Blacks and Whites," *Proceedings of the National Academy of Sciences* 113, no. 16 (2016): 4296–4301, https://doi.org/10.1073/pnas.1516047113.
171. Hoffman et al., "Racial Bias in Pain Assessment and Treatment Recommendations, and False Beliefs About Biological Differences Between Blacks and Whites."
172. Ibid.
173. Muhammed and Mathew, "The Disaster of Misinformation: A Review of Research in Social Media."
174. Delan Devakumar et al., "Racism and Discrimination in COVID-19 Responses," *The Lancet* 395, no. 10231 (2020): 1194, https://doi.org/10.1016/S0140-6736(20)30792-3.
175. Jay J. Van Bavel et al., "Using Social and Behavioural Science to Support COVID-19 Pandemic Response," *Nature Human Behaviour* 4, no. 5 (2020): 460–471, https://doi.org/10.1038/s41562-020-0884-z.
176. Jessica Jaiswal et al., "Disinformation, Misinformation and Inequality-Driven Mistrust in the Time of COVID-19: Lessons Unlearned from AIDS Denialism," *AIDS and Behavior* 24 (2020): 2776–2780, https://doi.org/10.1007/s10461-020-02925-y.
177. Saiful Islam et al., "COVID-19-Related Infodemic and Its Impact on Public Health: A Global Social Media Analysis," *The American Journal of Tropical Medicine and Hygiene* 103, no. 4 (2020): 1621–1629, https://doi.org/10.4269/ajtmh.20-0812.
178. Ibid.
179. Da Zheng, "Encountering the Other: SARS, Public Health, and Race Relations," *Americana: The Journal of American Pop Culture* 4, no. 1 (2005), https://americanpopularculture.com/journal/articles/spring_2005/zheng.htm.
180. Ibid.
181. Bavel et al., "Using Social and Behavioural Science to Support COVID-19 Pandemic Response."
182. Ibid.
183. Zheng, "Encountering the Other: SARS, Public Health, and Race Relations."
184. Sarah Evelyn Bordac, "Introduction to Media Literacy History," *Journal of Media Literacy Education* 6, no. 1 (2014): 1–2, https://digitalcommons.uri.edu/jmle/vol6/iss2/.
185. "FAQ," *Center for Media Literacy*, accessed December 2023, https://www.medialit.org/faq.
186. "CML Framework," *Center for Media Literacy,* accessed December 2023, https://www.medialit.org/cml-framework.
187. Kathryn R. Fingar and Tessa Jolls, "Evaluation of a School-Based Violence Prevention Media Literacy Curriculum," *Injury Prevention* 20, no. 3 (2014): 183–190, https://doi.org/10.1136/injuryprev-2013-040815.
188. "Mission & What We Do," *Media Literacy Now,* June 2023, https://medialiteracynow.org/about/mission/.
189. "Media Literacy Policy Report," *Media Literacy Now,* May 2023, https://medialiteracynow.org/policyreport/.
190. "Founder," *News Literacy Project,* February 6, 2023, https://newslit.org/founder/.
191. "Mission Statement," *News Literacy Project*, August 2023, https://newslit.org/about/mission/#nlp-mission.
192. Leila Cusack, "Educational Interventions to Improve People's Understanding of Key Concepts in Assessing the Effects of Health Interventions: A Systematic Review," *Systematic Reviews* 7 (2018): 1–12, https://doi.org/10.1186/s13643-018-0719-4.
193. Lena V. Nordheim et al., "Effects of School-Based Educational Interventions for Enhancing Adolescents Abilities in Critical Appraisal of Health Claims: A Systematic Review," *PloS One* 11, no. 8 (2016): e0161485, https://doi.org/10.1371/journal.pone.0161485.
194. Nordheim et al., "Effects of School-Based Educational Interventions for Enhancing Adolescents Abilities in Critical Appraisal of Health Claims: A Systematic Review."
195. Sylvia Chou et al., "Where We Go From Here: Health Misinformation on Social Media," *American Journal of Public Health* 110, no. S3 (2020): S273–S275, https://doi.org/10.2105/AJPH.2020.305905.

196. Theodora Dame Adjin-Tettey, "Combating Fake News, Disinformation, and Misinformation: Experimental Evidence for Media Literacy Education," *Cogent Arts & Humanities* 9, no. 1 (2022): 2037229, https://doi.org/10.1080/23311983.2022.2037229.

197. Todd S. Cherner and Kristal Curry, "Preparing Pre-Service Teachers to Teach Media Literacy: A Response to 'Fake News,'" *The Journal of Media Literacy Education* 11, no. 1 (2019): 1–31, https://doi.org/10.23860/JMLE-2019-11-1-1.

198. Jon Roozenbeek and Sander van der Linden. "The Fake News Game: Actively Inoculating Against the Risk of Misinformation," *Journal of Risk Research* 22, no. 5 (2019): 570–580, https://doi.org/10.1080/13669877.2018.1443491.

199. Michael V. Bronstein and Sophia Vinogradov, "Education Alone is Insufficient to Combat Online Medical Misinformation," *EMBO Reports* 22, no. 3 (2021), https://doi.org/10.15252/embr.202052282.

200. Joseph Kahne and Benjamin Bowyer, "Educating for Democracy in a Partisan Age: Confronting the Challenges of Motivated Reasoning and Misinformation," *American Education Research Journal* 54, no.1 (2017), https://doi.org/10.3102/0002831216679817.

201. Nordheim et al., "Effects of School-Based Educational Interventions for Enhancing Adolescents Abilities in Critical Appraisal of Health Claims: A Systematic Review."

202. Briony Swire-Thompson and David Lazer, "Public Health and Online Misinformation: Challenges and Recommendations," *Annual Review of Public Health* 41, no. 1 (2020): 433–451, https://doi.org/10.1146/annurev-publhealth-040119-094127.

203. Nordheim et al., "Effects of School-Based Educational Interventions for Enhancing Adolescents Abilities in Critical Appraisal of Health Claims: A Systematic Review."

204. Alexis Wojtowicz, "Addressing Health Misinformation with Health Literacy Strategies," *National Academies of Sciences, Engineering, and Medicine* (2020), https://doi.org/10.17226/26021.

205. Briony Swire-Thompson and David Lazer, "Public Health and Online Misinformation: Challenges and Recommendations."