

# How Media Literacy, Trust of Experts and Flu Vaccine Behaviors Associated with COVID-19 Vaccine Intentions

American Journal of Health Promotion  
2022, Vol. 0(0) 1–7  
© The Author(s) 2022  
Article reuse guidelines:  
[sagepub.com/journals-permissions](https://sagepub.com/journals-permissions)  
DOI: 10.1177/08901171221132750  
[journals.sagepub.com/home/ahp](https://journals.sagepub.com/home/ahp)  
SAGE

Erica W. Austin, PhD<sup>1</sup> , Bruce W. Austin, MA, MS<sup>2</sup>, Porismita Borah, PhD<sup>3</sup> ,  
Shawn Domgaard, MA<sup>3</sup>, and Sterling M. McPherson, PhD<sup>4</sup>

## Abstract

**Purpose:** To assess how previous experiences and new information contributed to COVID-19 vaccine intentions.

**Design:** Online survey (N = 1264) with quality checks.

**Setting:** Cross-sectional U.S. survey fielded June 22-July 18, 2020.

**Sample:** U.S. residents 18+; quotas reflecting U.S. Census, limited to English speakers participating in internet panels.

**Measures:** Media literacy for news content and sources, COVID-19 knowledge; perceived usefulness of health experts; if received flu vaccine in past 12 months; vaccine willingness scale; demographics.

**Analysis:** Structural equation modelling.

**Results:** Perceived usefulness of health experts ( $b = .422, P < .001$ ) and media literacy ( $b = .162, P < .003$ ) predicted most variance in vaccine intentions (R-squared=31.5%). A significant interaction ( $b = .163, P < .001$ ) between knowledge ( $b = -.132, P = .052$ ) and getting flu shot ( $b = .185, P < .001$ ) predicted additional 3.5% of the variance in future vaccine intentions. An increase in knowledge of COVID-19 associated with a decrease in vaccine intention among those declining the flu shot.

**Conclusion:** The interaction result suggests COVID-19 knowledge had a positive association with vaccine intention for flu shot recipients but a counter-productive association for those declining it. Media literacy and trust in health experts provided strong counterbalancing influences. Survey-based findings are correlational; thus, predictions are based on theory. Future research should study these relationships with panel data or experimental designs.

## Keywords

COVID-19, media literacy, vaccine, behavior change, intention, flu, critical thinking, knowledge, news, misinformation, disinformation

## Indexing Keywords

communication, general medicine, health (social science), infectious diseases, media technology, medicine (miscellaneous), public health, environmental and occupational health

## Purpose

U.S. COVID-19 deaths exceeded 154 000 by July 2020, whereas only 24 000-62,000 people died of flu over the entire 2019-20 season.<sup>1</sup> The flu vaccine was broadly accepted, particularly in the U.S., which ranked among the top 10 nations for influenza vaccine adoption.<sup>2</sup> Because COVID-19 clearly was not just a flu, it would be essential to anticipate how to gain the confidence of enough individuals to create herd immunity when newly developed and tested vaccines became available.<sup>3</sup> The purpose of this study was

<sup>1</sup>Edward R. Murrow Center for Media & Health Promotion Research, Edward R. Murrow College of Communication, Washington State University, Pullman, WA, USA

<sup>2</sup>Department of Kinesiology and Educational Psychology, Washington State University, Pullman, WA, USA

<sup>3</sup>Edward R. Murrow College of Communication, Washington State University, Pullman, WA, USA

<sup>4</sup>Eelson S. Floyd College of Medicine, Spokane, WA, USA

## Corresponding Author:

Erica W. Austin, Edward R. Murrow Center for Media & Health Promotion Research, Edward R. Murrow College of Communication, Washington State University, PO Box 642520, Pullman, WA 99164-2520, USA.  
Email: [eaustin@wsu.edu](mailto:eaustin@wsu.edu)

to assess how people used their previous experiences with flu vaccines along with new information acquired through the media environment to develop intentions about receiving the COVID-19 vaccine when it became available.

Past behaviors should predict future behavior, but this is an imperfect relationship<sup>4</sup> and anti-vaxxers were busily promoting unlikely scenarios and falsehoods about COVID-19 vaccine risks. Moreover, despite the flu shot's relative popularity in the U.S. compared to other countries worldwide, under half of U.S. residents got a flu vaccine in 2019-20.<sup>5</sup> Indeed, research suggests<sup>6</sup> that previous influenza vaccination behavior contributed only slightly to COVID-19 vaccination intentions when general COVID-19 vaccination beliefs and attitudes were considered along with perceptions of potential adverse effects and novelty. Intentions also associated with greater perceived information sufficiency.

People's trust of scientific experts also matters for vaccine acceptance. Yet, according to Gallup research polls, trust in elite institutions and in science has plummeted.<sup>7</sup> This has direct ramifications for following public health recommendations for vaccines.<sup>8</sup> Some mistrust is understandable, however, given actual historical instances of forced vaccination programs targeted minorities and other situations that have compromised institutional credibility.<sup>9</sup>

Knowledge about COVID-19 also is important because beliefs about the impact of performing a behavior will inform people's decisions to adopt or reject it. Indeed, lack of knowledge has associated with distrust in the COVID-19 vaccine.<sup>10</sup> Yet, overcoming emotional or social barriers of vaccines can be difficult, so presenting new information to increase knowledge alone has not been enough.<sup>11</sup>

According to social cognitive theory, as people make health decisions, they incorporate new information along with past experiences in a triadic process of reciprocal causation involving intrapersonal, behavioral, and environmental influences.<sup>12</sup> Because information must be interpreted in the social milieu, information-seeking behaviors and media literacy skills can affect the message interpretation process.<sup>13</sup>

We therefore constructed a model to predict flu shot intention that represents past behavior as it interacts with knowledge (intrapersonal) and then incorporates generalized trust of health experts (environmental) and media literacy skills (behavioral) for acquiring additional information. This model demonstrates how people would filter previous experiences and knowledge through a toxic information environment to decide whether they would accept the COVID-19 vaccine when it became available. It assesses the extent to which media literacy, recent use of the influenza vaccine, perceived usefulness of expert health information sources, and knowledge about COVID-19 together contributed to U.S. residents' intentions in 2020 to receive the COVID-19 vaccine. We explain the steps of the model as follows.

Providing a new vaccine to the public is a multi-step process, including the development of the vaccine, trials and testing, approval from the U.S. Food and Drug

Administration (FDA), manufacturing, and distribution of the vaccine, and encouraging adoption.<sup>14</sup> The COVID-19 vaccine likewise navigated three phases of rigorous clinical trials to ensure safety, aided by past research on existing vaccines for SARS and MERS.<sup>14</sup> The result has produced a strong safety record.<sup>15</sup> Yet vaccination producers have had a challenging credibility problem despite this strong safety record.

Perceptions drive behavior, and misinformation vied with expert information to drive perceptions about the COVID-19 vaccine development.<sup>16</sup> Due to the rapid development of the COVID-19 vaccine, for example, some people had concerns that a rushed process would compromise safety.<sup>17</sup> As the information environment constantly evolved amidst the public health crisis, people navigated uncertainty and unfamiliar sources to make important decisions for themselves and their families. We therefore hypothesized that this situation made media literacy a crucial element in decision making because individuals had to make sense of previous experience, sources, and information content that may or may not be accurate, complete or unbiased.

Media literacy skills are manifested through a two-step process that includes first becoming aware that it is important to assess a message source and then by establishing if the message requires fact checking.<sup>18</sup> A variety of studies, both survey-based and experimentally based, have verified that critical thinking about sources motivates critical thinking about message content and that these skills can be learned.<sup>13,19,20</sup> When seeking vaccine information for instance, people often turn to the internet for guidance, which can provide a variety of credible and non-credible sites with health information.<sup>21</sup> Research has also shown that forewarning about a source's credibility or persuasive intent can inspire critical thinking about sources, helping to reduce the influence of affect on decision making.<sup>20</sup> The skills in media literacy applied to a source can then motivate critical thinking about the message content.<sup>22-24</sup> Determining whether a source is credible, and then critically thinking about the message content, is a necessary skill to make evidence-based decision making in health.<sup>25</sup> Media literacy therefore influences beliefs, attitudes, and behaviors.<sup>26</sup>

Decision making about vaccines, therefore, should begin with media literacy about sources for news. Forewarning about a source's credibility or persuasive intent can inspire critical thinking about sources, helping to reduce affect's influence on decision making.<sup>20</sup> This is important because disinformation campaigns make use of principles of persuasion, including emotional appeals, to encourage sharing of social media posts without fact checking.<sup>27</sup> In the case of the COVID-19 pandemic, the World Health Organization<sup>16</sup> declared an infodemic due to the extent of disinformation circulating the globe.

**H1.** Greater media literacy for sources of news predicts greater media literacy for content of news.

**H2.** Greater media literacy for content of news predicts a greater intention for obtaining a COVID-19 vaccine.

People also rely on their previous experiences with information sources to build networks or communities of sources they admire or believe they can trust generally or for certain topics. This might include experts in a relevant field,<sup>28</sup> medium,<sup>29</sup> or personality.<sup>30</sup> This trust can help shape intentions to get vaccinated<sup>31</sup> or can mislead when misplaced.<sup>32</sup> For example, people often turn to familiar experts in a field somewhat related to that information.<sup>28</sup> Those with more science literacy are better able to adapt to changes made based on scientific evidence and more likely to follow proper health guidelines in the future.<sup>33</sup> Unfortunately, Gallup found that 10% of Americans believe vaccines cause autism, up 4% from 2014, and 46% said they were unsure if it does or not.<sup>8</sup> A lack of trust in health experts therefore can heighten vulnerability to misinformation about science and potential mistrust in a new vaccine. Those with better media literacy skills for discerning this have been shown to make more appropriate health decisions in prevention and diagnosis.<sup>34</sup>

Conversely, misplaced trust in the wrong experts also creates problems. Consider that when some people seek information online, they may have mixed success finding credible sources, such as a credible academic article or newspaper. This can be successful when the perceived expert has relevant expertise and can help them make viable health decisions, such as for being vaccinated.<sup>31</sup> When this perception is inaccurate, however, message quality is warped by purposeful disinformation or misinformation due to a source's lack of relevant expertise. The author of the information may be an expert in one field but may not have expertise in topics of health despite writing about it. Thus, an otherwise credible source can accidentally perpetuate misinformation by speaking on matters on which they are not an expert. Health decision-making can be misled.<sup>32</sup>

**H3.** An increased belief in the usefulness of health experts predicts a greater intention for obtaining a COVID-19 vaccine.

In addition to including critical thinking skills for evaluating media sources and content, an individual's decision making requires skills for considering why and how content matters for their behavioral choices.<sup>18</sup> Social Cognitive Theory holds that intentions for health decisions will incorporate new information in the context of past experiences, interpreted while being influenced by the environmental and social environment. Critical thinking about a message's health content therefore can lead to skeptical use of information when building health beliefs and intentions, but past experience also can lead to motivated reasoning instead of entirely logical reasoning.<sup>35</sup> Thus, we hypothesize that flu vaccine status may moderate how knowledge is associated with COVID-19 vaccine intention. Specifically, a willingness to be vaccinated for flu, along with a better understanding of COVID-19, could positively associate with COVID-19 vaccine intention, when compared with those who have COVID-19 knowledge but do not have a history of flu vaccination.

**H4.** Having previously received a flu shot moderates the impact of knowledge of COVID-19 on future COVID-19 vaccine intention

In sum, although health theories show that people make health decisions based on intentions that incorporate beliefs, skills and barriers, these theories do not explain how people go about filtering through the information environment to interpret new information in the context of past experiences to accomplish this. This model newly hypothesizes that while people anticipated the upcoming life-critical health decision of the new COVID-19 vaccine, they incorporated updated information along with past experiences in the social milieu in which health experts existed amongst a variety of sometimes toxic information sources. This required media literacy to sort through which sources to believe and what information to internalize. Individuals then incorporated past behavior with their new knowledge amidst the ongoing information flow to create their intentions about whether to receive the COVID-19 vaccine when it would become available.

## Methods

### Design

An online survey (N = 1264, 18 + years) declared exempt by the University's Institutional Review Board, protocol #18213, June 11, 2020 was fielded between June 22 and July 18, 2020. Participants provided informed consent by clicking on a radio button that followed information about the study and contact information for further information. A debrief statement at the end of the survey provided links to more public health information about COVID-19.

### Sample

A Qualtrics opt-in panel included an over-sample of Washington state residents for a different study (N = 416) and used zip codes to achieve demographic and regional quotas based on the 2019 U.S. Census. Panel-based sampling with quality checks can produce high quality data<sup>36</sup> and random-digit-dialing survey response rates can be 4-6%.<sup>37</sup> Prior to analysis, post-stratified sample weights adjusted for the Washington state oversample to ensure that regional samples reflected 2019 census estimates.<sup>38</sup> The survey had 76.4% of the participants in urban zip codes, reflective of the U.S. Census.<sup>39</sup>

### Procedure

Qualtrics recruits broadly, such as from websites, social media, and gaming, providing survey invitations with a link and validating identities through third-party verification measures. An algorithm deployed by Qualtrics eliminates duplicates, illogical patterns, speeders (survey completions in less than a third of median of the overall survey duration),

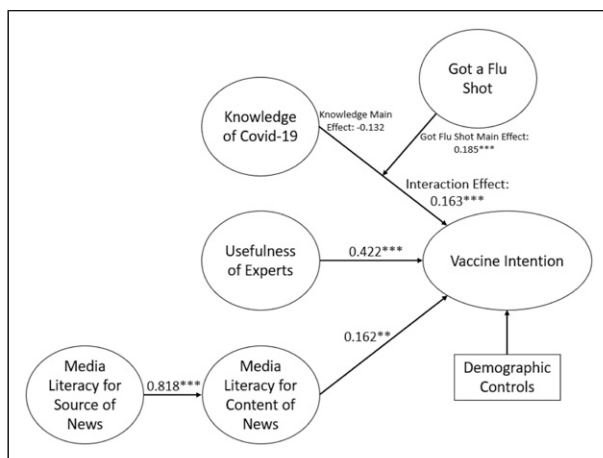
incompletes and other poor-quality responses before providing the data for analysis. Additional review eliminated 5 speeders and 4 who wrote gibberish and answered in patterns.

## Measures

The full list of measures and background sources for this study can be found in the [Supplemental File Table 1](#), Measures Comprising the Constructs in the Structural Model. Descriptive statistics are available in [Supplemental Table 2](#), Descriptive statistics for demographics and constructs. Respondents were asked media literacy questions regarding their sources of news (eg, about checking identity, purpose, other sources, techniques used; Cronbach's alpha = .90) and about the content of their news (eg, about checking accuracy, currency, completeness; alpha = .88), their knowledge about COVID-19 (alpha = .76), their recent flu shot behavior, and how useful they found different health experts (CDC, WHO, National Institute of Infectious Diseases, Local Health Departments; alpha = .84), adapted from sources using similar scales, and the knowledge scales were built using information from the World Health Organization, The Centers for Disease Control and Prevention and another contemporary survey.

## Analysis

A structural equation model (SEM) tested the hypotheses with vaccine intention as the primary outcome, a latent variable. Predictors included self-reported recent flu shot and latent-variable constructs for knowledge of COVID-19, usefulness of health experts, media literacy for content of news (MLCN), and media literacy for sources of news (MLSN). An interaction term for the moderating effect of knowledge of COVID-19 on vaccine intention also was estimated.



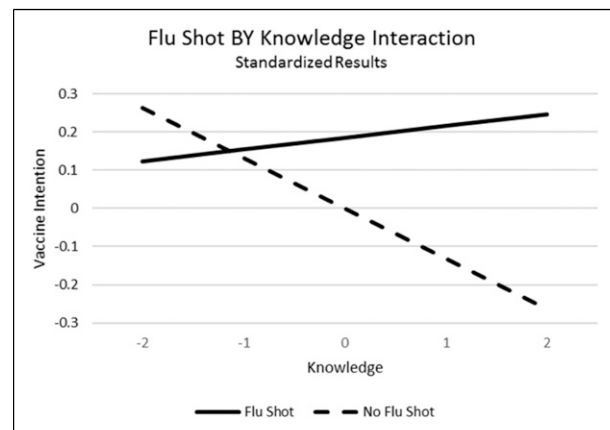
**Figure 1.** The structural model with standardized coefficients. \*\*  $P < .01$ . \*\*\*  $P < .001$ .

Control variables included gender, age, education (1-no formal education to 9-doctorate degree), income (1-\$0 to 8-\$150,000 and greater), political orientation (1-very liberal to 5-very conservative). Analyses were performed using Mplus 8.1. Variance explained for endogenous terms helped judge model fit.

## Results

[Figure 1](#) reports the standardized estimates for the structural model, providing support for hypotheses 1 through 3: MLSN significantly predicts MLCN ( $H1: b = .818, P < .001$ ), MLCN significantly predicts vaccine intention ( $H2: b = .162, P = .003$ ); usefulness of health experts significantly predicts vaccine intention ( $H3: b = .422, P < .001$ ). Standardized coefficients also can be found in the [Supplemental File Table 3](#), Standardized Coefficients for the Structural Model.

The interaction effect of COVID-19 knowledge and recent flu shot was statistically significant ( $b = .163, P < .001$ ) supporting hypothesis H4. Calculations of interaction effects, as shown in [Figure 2](#), require the use of both the main effects for flu shot and knowledge, regardless of their  $p$ -values, as well the interaction effect. [Figure 2](#) shows that vaccine intention was, on average, .185 standard deviations higher for the flu-shot group than the no-flu-shot group, although non-significant ( $P = .052$ ). For very low levels of Knowledge (between  $-2$  and  $-1$  in [Figure 2](#)) the vaccine intention of the no-flu-shot group appears to be slightly higher than the flu-shot group although not statistically significant ( $P > .05$ ). [Figure 2](#) shows that as knowledge of COVID-19 increases, vaccine intention gradually increases for those who have received a flu shot (slope = .031) with the opposite occurring for those declining a flu shot (slope =  $-.132$ ). Thus, an increase in knowledge of COVID-19 corresponds to a decrease in vaccine intention for respondents declining a flu shot.



**Figure 2.** Interaction between knowledge of COVID-19 and having received a flu shot. Note: the difference in vaccine intention for those individuals in both groups with knowledge levels less than  $-1$  standard deviations was not statistically significant.



Lastly, only one control variable—income—was significant, and it was positively related to vaccine intention ( $b = .081$ ,  $P = .028$ ).

Variance explained for the endogenous variables was used to judge the fit of the SEM model. The variance explained (R-squared) was 35% for vaccine intention and 67% for media literacy for content of news. The R-squared value of 67% for ML for content of news is an excellent value that aligns with expectations and results from other studies of the close relationship between the two media literacy constructs ( $r = .81$ ). The variance explained of 35% for our primary outcome of vaccine intent is moderate for a self-report instrument but is also an indication that additional explanatory variables will likely contribute to the model.

## Discussion

This study assessed how media literacy for news sources and for news content, a recent flu vaccine, usefulness of health experts, and knowledge about COVID-19 contributed to U.S. residents' intentions to receive the COVID-19 vaccine when it became available. Knowledge is often insufficient to predict behavior and previous behavior could provide a helpful clue. Nevertheless, pervasive misinformation created a major potential barrier to vaccine acceptance. We investigated how useful media literacy skills might be alongside these other influences.

The combined associations of media literacy and usefulness of expert health sources with vaccine intentions were greater than the associations of knowledge and previous flu shot behavior with intentions, suggesting that the ability to manage the current information environment may play a greater role in individuals' decision-making than their past behavior and knowledge base. Perceived usefulness of health experts, measured as government and health organizations, scientists and medical professionals, and local health departments, demonstrated the single strongest association with vaccine intentions.

The results highlight the importance of individuals' attempts to verify the information obtained from information sources in addition to the value of their having trust in health experts. After perceived usefulness of health experts, self-reported media literacy for news content had the strongest association with vaccine intention. Critical thinking about information sources predicted critical thinking about content, showing its importance because information can be obtained through news, entertainment, or persuasive messages. It also is a skill that can be taught through education and interventions.<sup>19</sup>

Interestingly, a counter-productive association was revealed in the association of knowledge with intention for individuals who did not recently receive a flu shot. Those with more knowledge who had not received a recent flu shot were less likely to express the intention to receive a

COVID-19 vaccine in the future, whereas those who recently had received a flu shot were more likely to express the intention to receive the COVID-19 vaccine in the future. People who have rejected a vaccine in the past and possess some knowledge about COVID-19 may perceive a threat to their freedom from promotions to receive the new vaccine, increasing reactance and thereby creating a backlash against anticipated advocacy for it. Similarly, previous studies have found that repetition of evidence can be counterproductive due to motivated reasoning.<sup>35</sup> This illustrates that anti-vaccine sentiments can be difficult to change, whether based on accurate knowledge or on misinformation.

Our findings are from a cross sectional survey, which means the relationships are correlational not causal. Future research should study these relationships with panel data or with experimental designs. Additional predictors could boost model fit for the structural model, but the variance explained is consistent with media literacy interventions generally.<sup>26</sup> An important finding is how an increase in knowledge about COVID-19 can associate with a reduction in vaccine intention. The significant income control variable could suggest not just that lower-income individuals are more vaccine hesitant, but also that they may be more vulnerable to misinformation. Also, when knowledge of COVID-19 is high among certain vaccine-hesitant individuals, their exposure to misinformation can be strong enough emotionally to counter factual information about the disease. Political orientation was nonsignificant although it bordered on significance towards the conservative end of the spectrum, perhaps foreshadowing the increasing role it played as the pandemic progressed.

The relationships found in this study, while significant, were not large: but the pandemic was in its early stages, the vaccine was not yet developed, and the findings may have foreshadowed how attitudes were developing. Misinformation can be difficult to combat because it is attention-getting, has emotional appeal, and can be difficult to correct once it has taken hold. Events have shown how hardened attitudes have become since the summer of 2020, with a good portion of the U.S. population still unwilling to receive a COVID-19 vaccine despite the vaccine's wide availability and ongoing promotional information campaign efforts.

This study's results help to explain why public health advocates cannot depend on previous behaviors and on knowledge to support public health promotional efforts in an environment of pervasive misinformation, disinformation, public suspicion, and motivated reasoning. Public health campaigns need to respect the freedom of the individual to decide for themselves, while also helping them to decide based on evidence-based information. This study suggests that media literacy campaigns promoting how to discern credible sources of accurate health information may provide a crucial tool for future vaccination promotion and could support other behavior change campaigns.

## So What?

### What is Already Known on this Topic?

A person's future acceptance of a vaccine is only partially predicted by their previous vaccine behavior, trust in experts, and knowledge of vaccines. Both knowledge and misinformation may deepen pre-existing resistance.

### What Does this Article Add?

This structural model-based analysis of survey data assessed how COVID-19 vaccine intentions of U.S. residents in 2020 incorporated recent flu shot behavior, expert source usefulness, COVID-19 knowledge, and media literacy. Knowledgeable respondents who recently had declined a flu shot reported lower intentions to receive a future COVID-19 vaccine compared to those with less knowledge. The largest positive predictors of vaccine intention were expert source usefulness and media literacy.

### What Are the Implications for Health Promotion Practice or Research?

The results highlight the importance of individuals' attempts to verify information obtained from information sources in addition to the value of cultivating their trust in health experts. Public health campaigns that respect individuals' freedom to make decisions for themselves must help them to do so based on accurate information from credible sources. Thus, tools to coach how to identify trustworthy sources of reliable health information may provide crucial strategies to support future vaccination promotion and other behavior change campaigns.

## Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

## Ethics

Study procedures were declared exempt by the University's Institutional Review Board, protocol #18213.

## Author Responsibility Statement

All authors contributed to the study design, drafting/editing of the manuscript, interpreting the data analyses, and approved the version to be published. In addition, Erica Austin led conceptualization of the study and collaborated on analyses. Bruce Austin led data analyses. Porismita Borah and Sterling McPherson consulted on data analysis.

## ORCID iDs

Erica W. Austin  <https://orcid.org/0000-0003-2334-8918>

Porismita Borah  <https://orcid.org/0000-0002-1140-4233>

## Supplemental Material

Supplemental material for this article is available online.

## References

1. Prevention CfDC. 2019-2020 U.S. Flu Season: Preliminary In-Season Burden Estimates, 2020. <https://www.cdc.gov/flu/about/burden/preliminary-in-season-estimates.htm?web=1&wdLOR=c2C21911B-75EA-4232-8B24-EF61F30EED37>.
2. van Essen GA, Palache AM, Forleo E, Fedson DS. Influenza vaccination in 2000: Recommendations and vaccine use in 50 developed and rapidly developing countries. *Vaccine*. 2003; 21(16):1780-1785. doi:10.1016/S0264-410x(03)00072-0
3. Lee BY. *How Effective Does a COVID-19 Coronavirus Vaccine Need to Be to Stop the Pandemic? A New Study Has Answers*. The Conversation. <https://theconversation.com/how-effective-does-a-covid-19-coronavirus-vaccine-need-to-be-to-stop-the-pandemic-a-new-study-has-answers-142468>.
4. Hagger MS, Polet J, Lintunen T. The reasoned action approach applied to health behavior: Role of past behavior and tests of some key moderators using meta-analytic structural equation modeling. *Soc Sci Med*. 2018;213:85-94. doi:10.1016/j.socscimed.2018.07.038
5. Prevention CfDC. *Flu Vaccination Coverage, United States, 2019-20 Influenza Season*; 2020. <https://www.cdc.gov/flu/fluview/coverage-1920estimates.htm>
6. Sherman SM, Smith LE, Sim J, et al. COVID-19 vaccination intention in the UK: results from the COVID-19 vaccination acceptability study (CoVAccS), a nationally representative cross-sectional survey. *Hum Vacc Immunother*. 2021;17(6): 1612-1621. doi:10.1080/21645515.2020.1846397
7. Jones JM. *Democratic, Republican Confidence in Science Diverges*. Gallup. <https://news.gallup.com/poll/352397/democratic-republican-confidence-science-diverges.aspx>
8. Reinhart RJ. *Fewer in U.S. Continue to See Vaccines as Important*. Gallup. <https://news.gallup.com/poll/276929/fewer-continue-vaccines-important.aspx>
9. Jaiswal J, LoSchiavo C, Perlman DC. Disinformation, misinformation and inequality-driven mistrust in the time of COVID-19: Lessons unlearned from AIDS denialism. *AIDS Behav*. 2020;24(10):2776-2780. doi:10.1007/s10461-020-02925-y
10. Paul E, Steptoe A, Fancourt D. *Attitudes towards Vaccines and Intention to Vaccinate against COVID-19: Implications for*

- Public Health Communications*. Lancet Reg Health-Eu; 2021. [10.1016/j.lanepe.2020.100012](https://doi.org/10.1016/j.lanepe.2020.100012)
11. Chou WYS, Budenz A. Considering emotion in COVID-19 vaccine communication: Addressing vaccine hesitancy and fostering vaccine confidence. *Health Commun*. 2020;35(14):1718-1722. doi:[10.1080/10410236.2020.1838096](https://doi.org/10.1080/10410236.2020.1838096)
  12. Bandura A. On the functional properties of perceived self-efficacy revisited. *J Manag*. 2012;38(1):9-44. doi:[10.1177/0149206311410606](https://doi.org/10.1177/0149206311410606)
  13. Austin EW, Austin BW, Willoughby JF, Amram O, Domgaard S. How media literacy and science media literacy predicted the adoption of protective behaviors amidst the COVID-19 pandemic. *J Health Commun*. 2021;26(4):239-252. doi:[10.1080/10810730.2021.1899345](https://doi.org/10.1080/10810730.2021.1899345)
  14. Prevention CfDC. *Developing COVID-19 Vaccines*; 2021. <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/distributing/steps-ensure-safety.html>.
  15. Prevention CfDC. *Safety of COVID-19 Vaccines*; 2022. <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/safety/safety-of-vaccines.html>.
  16. Organization WH. *Managing the COVID-19 Infodemic: Promoting Healthy Behaviours and Mitigating the Harm from Misinformation and Disinformation*; 2020. <https://www.who.int/news/item/23-09-2020-managing-the-covid-19-infodemic-promoting-healthy-behaviours-and-mitigating-the-harm-from-misinformation-and-disinformation>.
  17. Moreira J. *How did We Develop a COVID-19 Vaccine So Quickly?* Medical News Today. <https://www.medicalnewstoday.com/articles/how-did-we-develop-a-covid-19-vaccine-so-quickly>
  18. Education NAoML. *The Core Principles of Media Literacy Education*; 2007. <https://namle.net/publications/core-principles/>
  19. Austin EW, Muldrow A, Austin BW. Examining how media literacy and personality factors predict skepticism toward alcohol advertising. *J Health Commun*. 2016;21(5):600-609. doi:[10.1080/10810730.2016.1153761](https://doi.org/10.1080/10810730.2016.1153761)
  20. Sagarin BJ, Cialdini RB, Rice WE, Serna SB. Dispelling the illusion of invulnerability: The motivations and mechanisms of resistance to persuasion. *J Pers Soc Psychol*. 2002;83(3):526-541. doi:[10.1037/0022-3514.83.3.526](https://doi.org/10.1037/0022-3514.83.3.526)
  21. Kim H, Han JY, Seo Y. Effects of facebook comments on attitude toward vaccines: The roles of perceived distributions of public opinion and perceived vaccine efficacy. *J Health Commun*. 2020;25(2):159-169. doi:[10.1080/10810730.2020.1723039](https://doi.org/10.1080/10810730.2020.1723039)
  22. Amazeen MA. Resisting covert persuasion in digital news: Comparing inoculation and reactance in the processing of native advertising disclosures and in article engagement intentions. *J Mass Commun Q*. 2021;98(4):1129-1156. doi:[10.1177/1077699020952131](https://doi.org/10.1177/1077699020952131)
  23. Austin EW, Pinkleton BE, Funabiki RP. The desirability paradox in the effects of media literacy training. *Commun Res*. 2007;34(5):483-506. doi:[10.1177/0093650207305233](https://doi.org/10.1177/0093650207305233)
  24. Wright P, Friestad M, Boush DM. The development of marketplace persuasion knowledge in children, adolescents, and young adults. *J Public Policy Mark* 2005;24(2):222-233. doi:[10.1509/jppm.2005.24.2.222](https://doi.org/10.1509/jppm.2005.24.2.222)
  25. Levin-Zamir D, Bertschi I. Media health literacy, eHealth literacy, and the role of the social environment in context. *Int J Env Res Pub He*. 2018;15(8):1643. doi:[10.3390/ijerph15081643](https://doi.org/10.3390/ijerph15081643)
  26. Xie XC, Gai XS, Zhou Y. A meta-analysis of media literacy interventions for deviant behaviors. *Comput Educ*. 2019;139:146-156. doi:[10.1016/j.compedu.2019.05.008](https://doi.org/10.1016/j.compedu.2019.05.008)
  27. Scannell D, Desens L, Guadagno M, et al. COVID-19 vaccine discourse on twitter: A content analysis of persuasion techniques, sentiment and mis/disinformation. *J Health Commun*. 2021;26(7):443-459. doi:[10.1080/10810730.2021.1955050](https://doi.org/10.1080/10810730.2021.1955050)
  28. Eiser JR, Stafford T, Henneberry J, Catney P. Trust me, I'm a scientist (not a developer)": Perceived expertise and motives as predictors of trust in assessment of risk from contaminated land. *Risk Anal*. 2009;29(2):288-297. doi:[10.1111/j.1539-6924.2008.01131.x](https://doi.org/10.1111/j.1539-6924.2008.01131.x)
  29. Sundar SS, Knobloch-Westerwick S, Hastall MR. News cues: Information scent and cognitive heuristics. *J Am Soc Inf Sci Tec*. 2007;58(3):366-378. doi:[10.1002/asi.20511](https://doi.org/10.1002/asi.20511)
  30. Pornpitakpan C. The persuasiveness of source credibility: A critical review of five decades' evidence. *J Appl Soc Psychol* 2004;34(2):243-281. doi: [10.1111/j.1559-1816.2004.tb02547.x](https://doi.org/10.1111/j.1559-1816.2004.tb02547.x)
  31. Wang XM, Zhou XD, Lin L, Mantwill S. The Effect of Vaccine Literacy on Parental Trust and Intention to Vaccinate after a Major Vaccine Scandal (vol 23, pg 413, 2018). *J Health Commun*. 2018; 23(5):503-503. doi:[10.1080/10810730.2018.1478524](https://doi.org/10.1080/10810730.2018.1478524)
  32. Fridman A, Gershon R, Gneezy A. COVID-19 and vaccine hesitancy: A longitudinal study. *PLoS One*. 2021;16(4):e0250123. doi:[10.1371/journal.pone.0250123](https://doi.org/10.1371/journal.pone.0250123)
  33. Van Bavel JJ, Baicker K, Boggio PS, et al. Using social and behavioural science to support COVID-19 pandemic response. *Nat Hum Behav*. 2020;4(5):460-471. doi:[10.1038/s41562-020-0884-z](https://doi.org/10.1038/s41562-020-0884-z)
  34. Austin EW, Pinkleton BE, Austin BW, Van de Vord R. The relationships of information efficacy and media literacy skills to knowledge and self-efficacy for health-related decision making. *J Am Coll Health*. 2012;60(8):548-554. doi:[10.1080/07448481.2012.726302](https://doi.org/10.1080/07448481.2012.726302)
  35. Hornsey MJ, Harris EA, Fielding KS. The psychological roots of anti-vaccination attitudes: A 24-nation investigation. *Health Psychol*. 2018;37(4):307-315. doi:[10.1037/hea0000586](https://doi.org/10.1037/hea0000586)
  36. Lau A. *Assessing the Consistency of Online Opt-In Polls*. Pew Research Center; 2021. <https://medium.com/pew-research-center-decoded/assessing-the-consistency-of-online-opt-in-polls-9f705d67e0f2>.
  37. Center PR. *Comparing Survey Sampling Strategies: Random-Digit Dial vs. Voter Files*. Pew Research Center Methods. <https://www.pewresearch.org/methods/2018/10/09/performance-of-the-samples/>.
  38. Lee ES, Forthofer RN. *Analyzing Complex Survey Data*. 2nd ed., SAGE; 2006, 1 online resource, 91.
  39. U.S. Census Bureau. *New Census Data Show Differences between Urban and Rural Populations*; 2016. <https://www.census.gov/newsroom/press-releases/2016/cb16-210.html>