Why the backfire effect does not explain the durability of political misperceptions

Brendan Nyhan[a,1]

[a]Department of Government, Dartmouth College, Hanover, NH 03755

Edited by Andrew Hoffman, University of Michigan, Ann Arbor, MI, and accepted by Editorial Board Member Susan T. Fiske March 8, 2020 (received for review September 17, 2019)

Previous research indicated that corrective information can sometimes provoke a so-called "backfire effect" in which respondents more strongly endorsed a misperception about a controversial political or scientific issue when their beliefs or predispositions were challenged. I show how subsequent research and media coverage seized on this finding, distorting its generality and exaggerating its role relative to other factors in explaining the durability of political misperceptions. To the contrary, an emerging research consensus finds that corrective information is typically at least somewhat effective at increasing belief accuracy when received by respondents. However, the research that I review suggests that the accuracy-increasing effects of corrective information like fact checks often do not last or accumulate; instead, they frequently seem to decay or be overwhelmed by cues from elites and the media promoting more congenial but less accurate claims. As a result, misperceptions typically persist in public opinion for years after they have been debunked. Given these realities, the primary challenge for scientific communication is not to prevent backfire effects but instead, to understand how to target corrective information better and to make it more effective. Ultimately, however, the best approach is to disrupt the formation of linkages between group identities and false claims and to reduce the flow of cues reinforcing those claims from elites and the media. Doing so will require a shift from a strategy focused on providing information to the public to one that considers the roles of intermediaries in forming and maintaining belief systems.

misperception | backfire effect | misinformation | fake news | fact checking

Why are misperceptions about contentious issues in politics and science seemingly so persistent and difficult to correct? Scholars, journalists, and educators all struggle to overcome the prevalence of these false or unsupported beliefs, which plague issues ranging from climate change to genetically modified food (1). These beliefs, which are often closely related to identities and belief systems such as partisanship (2), can undermine the factual basis for public debate, distort mass opinion, and warp public policy.

One response to the prevalence of mistaken beliefs is to try to set the record straight by providing accurate information—for instance, by providing evidence of the scientific consensus on climate change. The failures of this approach, which is sometimes referred to as the "deficit model" in science communication, are well known (3). A particular concern is that people may be skeptical of such information when it contradicts their predispositions or existing beliefs and reason toward a preferred conclusion, especially when the issue is salient or identity relevant (4, 5). This resistance could potentially prevent such information from having the intended effect of reducing people's misperceptions.

In 2010, Jason Reifler and I published an article testing the effects of this approach in the journal *Political Behavior* which randomly varied exposure to corrective information about controversial issues in mock news articles (6). In two of the five studies that we conducted, we observed what we called a "backfire effect" in which correction exposure actually increased belief in the targeted misperception among groups that were predisposed to believe the claim. As I show below, these results were frequently interpreted as the primary explanation for why misperceptions are so persistent.

However, the scientific literature—including subsequent research that Reifler and I have conducted—does not support the interpretation that backfire effects explain the prevalence and durability of misperceptions. In this article, I first show how interpretations of our article quickly outstripped the findings in the study. I then summarize the emerging consensus that exposure to corrective information typically generates modest but significant improvements in belief accuracy. The persistence of misperceptions, I argue, is more likely to be attributable to a failure to reach people with corrective information that durably changes their mind. The interaction of elite information flows and simple heuristics like partisanship tends to incline people toward holding congenial beliefs about controversial issues. In addition, research has revealed substantial targeting problems in fact checks reaching people who hold misconceptions and rapid decay effects after correction exposure. As a result, we rarely observe consistent and systematic reduction in mistaken beliefs over time. However, I conclude by documenting communication approaches that the evidence suggests might be more effective at creating durable belief change—most notably, discouraging elites from promoting false claims or linking them to salient political and group identities.

The Prevalence and Importance of Misperceptions

Although we lack a systematic census of misperceptions or measures of their prevalence over time, surveys show that belief in salient false or unsupported factual claims seems to be widespread in the United States (7) and around the world (8, 9). These beliefs are frequently correlated with people's group identities and belief systems. In a March 2018 poll in the United States (10), for instance, 82% of Democrats but only 29% of Republicans agreed with the intelligence community conclusion that Russia created and spread fake news stories to help Donald Trump win the 2016 presidential election. Conversely, 66% of

This paper results from the Arthur M. Sackler Colloquium of the National Academy of Sciences, "Advancing the Science and Practice of Science Communication: Misinformation About Science in the Public Sphere," held April 3–4, 2019, at the Arnold and Mabel Beckman Center of the National Academies of Sciences and Engineering in Irvine, CA. NAS colloquia began in 1991 and have been published in PNAS since 1995. From February 2001 through May 2019, colloquia were supported by a generous gift from The Dame Jillian and Dr. Arthur M. Sackler Foundation for the Arts, Sciences, & Humanities, in memory of Dame Sackler's husband, Arthur M. Sackler. The complete program and video recordings of most presentations are available on the NAS website at http://www.nasonline.org/misinformation_about_science.

Author contributions: B.N. wrote the paper.

The author declares no competing interest.

This article is a PNAS Direct Submission. A.H. is a guest editor invited by the Editorial Board.

[1]Email: nyhan@dartmouth.edu.

Published April 9, 2021.

Democrats endorsed the politically congenial but unsupported claim that Russia tampered with vote tallies compared with just 18% of Republicans. Internationally, one recent global survey of 100 countries found that 32% of people who have heard of the Holocaust think that it is a myth or greatly exaggerated, including 63% in the Middle East and North Africa and 64% of Muslims in the region (11, 12). Similarly, supporters of populist parties and leaders are less likely to endorse the scientific consensus on the threat posed by climate change than other people in Europe and the United States (13).

Why do people so frequently believe these false claims? Research conducted to date suggests that cognitive and memory limitations, directional motivations to defend or support some group identity or existing belief, and messages from other people and political elites all play critical roles in the spread of misinformation (2, 14, 15). These factors may be especially difficult to overcome in the contemporary period, which combines historic levels of political polarization in the United States with communication technology that allows false information to move farther and faster than ever before (16, 17). Even though evidence indicates that most people are not trapped in "echo chambers" of like-minded information (18), misinformation may still be more likely to outrun society's defenses and to be integrated into people's belief systems under these circumstances.

Misperceptions can also play an important role in debates over public policy. One of the most well-known examples is climate change, where the United States is an outlier both in the proportion of the population that believes that human activity is its primary cause and in its support for measures to address the crisis (19, 20). Although definitively establishing the relationship between misperception belief and national climate policy is difficult, research indicates that this association holds at the individual level and that experimentally induced changes in belief in climate change are associated with greater support for policy action (21). More recently, the debate over end of life care was upended by the "death panel" myth, a false claim popularized by former Alaska governor Sarah Palin (22). After this claim became widespread, a provision was withdrawn from the Affordable Care Act that would have provided Medicare coverage for voluntary meetings with doctors to discuss end of life care options (a proposal that previously attracted bipartisan support). A subsequent regulation to cover these meetings was again withdrawn after 2011 for fear of further controversy before being finally instituted in 2015 (23, 24).

The Backfire Effect: Findings vs. Interpretations

The durability of misperceptions is especially concerning. Survey evidence indicates that false beliefs about high-profile issues often persist for years or decades despite extensive efforts by journalists, scientists, and public officials to set the record straight. In the aftermath of the US invasion of Iraq in 2003, for example, the American government concluded that Saddam Hussein's government did not possess significant weapons of mass destruction (WMDs) and was not conducting an active WMD program (25). These findings were widely publicized at the time and in the years since the invasion. However, a 2015 poll found that 42% of Americans, including 51% of Republicans, still believed that US troops found WMDs in Iraq (26). A similar pattern was observed in polling about Barack Obama's religion. Even though the former president was an avowed Christian who regularly went to church, rumors circulated widely that he was a secret Muslim. Despite all of the disconfirming evidence that was available online and in media coverage, a poll conducted in 2015, the seventh year of Obama's presidency, found that only 39% of Americans identified Obama as Christian and that 29% of Americans (including 43% of Republicans) said that he was Muslim (27).

One potential explanation for the persistence of these misperceptions is that the media frequently fails to aggressively fact-check false statements by political elites or resorts to neutral "he said," "she said" coverage of factual disputes (28, 29). To examine this hypothesis, Reifler and I conducted a series of five experiments in 2005 and 2006 with undergraduates at a Catholic university in the Midwest (6). In each one, respondents were asked to read a realistic mock news article in which a prominent political figure made a dubious claim about a controversial issue, such as the war in Iraq or stem cell research. These articles were experimentally manipulated so that some included a passage debunking the statement by the elite in question. Although it is difficult to isolate the effects of directional motivations (30), the evidence that we observed was consistent with such an account—in three of five experiments, exposure to corrective information was most effective among respondents who found the correction to be ideologically congenial (e.g., liberals for a correction of George W. Bush on Iraq). In two of the studies, the estimated marginal effect of exposure to corrective information was significant in the opposite of the expected direction—a so-called backfire effect. However, this effect was not observed in the other three studies.

Based on these results, we concluded that "corrective information in news reports may fail to reduce misperceptions and can sometimes increase them for the ideological group most likely to hold those misperceptions" and called for further research on how to most effectively reduce misperceptions. In the years since the study's publication, the results have frequently been misinterpreted as showing that that all corrections are counterproductive or that backfire effects are the primary cause of the persistence of misperceptions (our findings do not support either claim). ABC News, for instance, summarized our findings as follows: "when we encounter facts that contradict those beliefs, the facts are either ignored or twisted to support our positions" (31).

Revising the Record on Backfire

Our initial backfire study has often been interpreted to mean that these effects are widespread. However, subsequent research suggests that backfire effects are extremely rare in practice. Most notably, an extensive replication and extension study conducted by other researchers found that no evidence of backfire effects in response to corrective information across numerous experiments (32). Reifler and I collaborated with those authors in a subsequent study, which similarly found that exposure to corrective information contradicting a statement by President Trump reduced misperceptions about the prevalence of crime regardless of which candidate respondents supported (33).

Subsequent studies have shown that corrective information can also increase belief accuracy when conveyed in fact-checking articles as well as novel presentation formats, such as graphics, corrections that provide alternate causal explanations, and fact-checking labels on social media platforms (34–36). These findings are consistent with meta-analyses showing that corrections are moderately effective in improving the accuracy of people's factual beliefs, although effects are reduced when the information provided concerns real-world politics and may be inflated by publication bias (37, 38). Notably, exposure to information about the scientific consensus supporting anthropogenic climate change leads to greater expressed belief in these facts (21). Similarly, recent research has found that people's self-awareness of their (lack of) knowledge is greater than earlier research indicated, although the least informed people are most likely to overestimate their performance (39–41). This meta-awareness of one's lack of knowledge would similarly suggest that people can in some cases recognize what they do not know when presented with contradictory or uncongenial information.

If people will often update their beliefs based on factual information when presented with it directly, why are opinions so polarized? First, misperceptions do not necessarily cause opinion polarization; in many cases, people may accept false claims because they are congenial to their opinions and predispositions. Second, people who are misinformed will often update their beliefs somewhat. Recent studies indicate that exposure to factual information often induces parallel changes in opinions across partisan and ideological groups rather than backlash (42). In these studies, respondents often update their beliefs but interpret the information that they receive in an attitude-consistent manner—for instance, by assigning blame or responsibility for the facts in question in a manner that is consistent with their political views (43–45) or by expressing distrust in the credibility of the information that they have learned (33, 46). As a result of dissonance-reducing processes like these and/or a lack of willingness to reexamine one's views, people's opinions about an issue sometimes do not change even if their factual beliefs become more accurate, although findings vary on this point (21, 33, 47, 48). Future research must do more to identify the types of issues and contexts that encourage opinion change rather than motivated interpretations of evidence, which may depend on issue salience, prior issue knowledge, or even differences in levels of partisan polarization between countries (39, 47, 49).

Other Potential Explanations for Misperception Persistence

If backfire effects do not explain the persistence of misperceptions, what does? Why do the encouraging results that are often observed in studies of corrective information not translate more often into reduced belief in false claims among the public as a whole? Although questions about causes of effects are not easy to answer directly (50), other factors should instead be considered, and further research should be conducted to evaluate their effects on misperception persistence. As I argue below, expressive survey responses do not seem to play a major role, whereas over-time decay in the effects of corrective information, problems in targeting it to people who consume misinformation, ongoing flows of misperception-enhancing cues from political elites, and failures in cognitive ability and processing effort all seem to be significant factors.

Expressive Responding. One potential explanation is that respondents are responding expressively, providing answers in surveys that indicate what they would like to be true or trolling rather than indicating what they sincerely believe (51). A minority of respondents are clearly willing to express views that they later disavow or that clearly indicate an expressive response (52, 53). A common approach to try to isolate this so-called partisan cheerleading is to pay people for correct answers to factual knowledge questions (46, 54, 55). These studies typically find reduced levels of partisan belief polarization when incentives are offered, leading the authors to infer that the expressed levels of partisan polarization that we often observe in factual beliefs reflect expressive responding. However, the mechanism for these findings is unclear. For instance, prior studies find mixed evidence on whether accuracy is increased by financial incentives, suggesting that respondents are not necessarily withholding what they know to be true. They may instead be exerting more cognitive effort or changing the guessing strategy that they employ in a manner that differs from what we observe in the real world, where strong accuracy incentives are typically absent. Moreover, reported misperceptions decrease only modestly in response to incentives when beliefs about more salient factual disputes are measured, suggesting that views about such matters, which are often the misperceptions of greatest substantive concern, are largely sincere (56). Similarly, costly forms of behavior in fields such as finance seem to vary in a manner consistent with sincere partisan differences in belief, suggesting that the views expressed in surveys are not merely expressive (57).

Decay Effects and Cues from Political Elites. An alternate account of the durability of false beliefs might emphasize the tendency for the effects of information exposure to dissipate over time or to be overwhelmed by cues from political elites. Corrections typically only partly diminish the prevalence of misinformation even when beliefs are measured immediately after exposure (37). These effects can last for weeks in some cases (48, 58, 59) but often fade over time. As a result, respondents tend to revert to their prior beliefs or to views that are congenial with their partisanship or group identity. By contrast, members of the public often receive ongoing flows of messages from elites who share their partisanship or ideology that promote politically congenial misperceptions (22, 60). Consider the false claims of the so-called "birther" movement that Barack Obama was not born in the United States, which created a myth that resonated among Republican identifiers and members of the public with negative racial attitudes (61). In April 2011, Obama released his long-form birth certificate from the state of Hawaii, providing further proof of his eligibility to serve as president. Belief that he was born in the United States accordingly increased immediately after the birth certificate's release but reverted to prior levels by 2012 even though the myth had been falsified in an unusually definitive manner (62, 63).

Failures in Targeting Corrective Information. These elite messaging and decay effects are likely compounded by targeting problems in delivering corrective information. With the exception of a few high-profile controversies, people rarely receive ongoing exposure to fact checks or news reports that debunk false claims, which often are disseminated widely by political elites or on social media (2, 64). As a result, the audience for fact checks does not seem to be matched to the people who are exposed to the claims in question. In the weeks before the 2016 election, for instance, fewer than half of the Americans who visited an untrustworthy website also visited one of the major national fact-checking websites. Moreover, only 3% of those who read an article from an untrustworthy website that had been fact checked also read the fact check (65). By contrast, the volume of information that a minority of Americans consume from these websites, which frequently promote misperceptions, can be extreme—untrustworthy websites constituted approximately 20% of the news diets of Americans with the most conservative information diets in the preelection period in 2016 (65) (vs. a vanishingly small percentage for the rest of the population). This set of highly politically interested individuals makes up a relatively small portion of the population but may be especially visible or influential in conversations with others conducted in person and online (66, 67). For example, the combination of sparse exposure to corrective information in the mainstream media that most people consume and intense flows of congenial misinformation in allied media outlets (e.g., Fox News) might help explain the persistence of climate change denial in a large fraction of the public (68).

Failures of Cognitive Ability and Processing Effort. Finally, people may often fall victim to misperceptions because of failures of cognitive ability and processing effort rather than motivated processing of corrective information. Recent studies indicate that lower levels of analytic thinking (as measured by the Cognitive Reflection test) are associated with higher accuracy ratings for false news headlines (69, 70). In addition, prior exposure to news headlines leads to greater perceptions of their accuracy due to the use of a low-effort heuristic in which truth is

inferred from feelings of familiarity (71). Conversely, people who are encouraged to engage in deliberation are less likely to believe false headlines than those who respond immediately, suggesting that greater cognitive effort helps respondents identify false claims. These findings raise important questions about the relative roles of analytic thinking and directionally motivated reasoning in misperception belief. One important factor may be the difference between news articles (as tested in the backfire effect research) and headlines. The latter, which are more commonly encountered in the era of social media and which convey less information, may be especially likely to be processed using heuristics that require little cognitive effort or distorted via social transmission (72). By contrast, highly salient issues and engaging stimuli may more commonly provoke respondents to engage in effortful forms of processing, especially if heuristic cues suggest politically uncongenial conclusions that motivated respondents wish to avoid (5). The relationships between levels of processing effort, analytical ability, and updating based on corrective information are important topics for future research.

Alternate Strategies for Reducing Misperceptions

The findings described above suggest that fact checks and other types of corrective information are at least somewhat effective. Contrary to media coverage of the backfire effect, subsequent research finds that people are often willing to revise mistaken beliefs when given accurate information. However, these findings do not always cumulate into lasting reductions in many prominent false beliefs. To better achieve this goal, scientists, journalists, and educators should pursue alternate communication approaches that research suggests might more effectively counter misinformation—minimizing false claims and partisan and ideological cues in discussion of factual disputes and highlighting corrective information that is hard for people to avoid or deny.

Minimize Elite Misinformation and Partisan Cues. Any effort to counter misperceptions must first recognize the role that elites play in promoting false beliefs and linking them to people's political identities. A case in point is climate change, an issue on which beliefs have polarized in a manner consistent with a process of elite-led opinion leadership (73). Most notably, belief polarization is highest among people who are the most politically attentive and thus most likely to receive and accept cues from elites who share their worldview (60). These messages from partisan elites, which have seemingly become more polarized over time, are likely to diminish the effects of fact checking either by encouraging directionally motivated reasoning or by shaping the priors of group members in a manner that reduces their responsiveness to corrective information (30, 74). Indeed, it is the people with the highest levels of science knowledge who are most polarized on climate change, which suggests that the cues that these more sophisticated individuals receive about the beliefs held by the political group with which they identify trump the evidence that they might otherwise consider (75).

News coverage should, therefore, seek to avoid amplifying false claims and reduce the incidence of partisan and ideological cues when discussing matters of fact and science—for instance, by resisting the habit of balancing messages from experts on issues where scientific consensus exists with citations to polarizing opponents (68). Party cues have become more common, for instance, in media coverage of climate change (60, 74), which encourages people to side with adherents of their preferred party or ideology rather than evaluating the facts dispassionately (76). These kinds of cues may be especially common in "balanced" reporting, which tends to overrepresent the prevalence of unsupported perspectives in factual disputes like climate change where a strong consensus of expert opinion and evidence exists (28).

Instead, reporters and science communicators should emphasize the views of nonpartisan experts. An ABC News story on the death panel myth in 2009, for instance, only briefly mentioned the partisan sources of the claim (77). Instead, the headline stated that "Experts debunk health care reform bill's 'death panel' rule," noting that "Doctors agree health bill has no 'death panel' requirement for the elderly." The second paragraph of the story further noted the presence of surprising expert sources contradicting the claim, stating that "even [experts] who do not support the version of the health care reform bill now being discussed" believe "these accusations are shocking, inflammatory and incorrect."

Make Corrections Harder to Avoid or Deny. These strategies are likely to prove most effective when applied to sources and contexts in which people cannot easily avoid or disbelieve uncongenial information. Partisans tend to diverge in how they view the state of the economy but to converge when it is unusually strong or weak, which creates a reality that is hard for either side to deny (44, 78). Similarly, most Americans have been forced to recognize that extreme weather events are becoming more common, although they still diverge in whether they believe that anthropogenic climate change is the primary cause (79). Messages drawing attention to potentially unwelcome facts like these may also be more credible when coming from unexpected or trusted sources like local weather forecasters (on climate change) (80) or internal tobacco company documents (on how smoking causes cancer). Finally, personal experiences can be similarly powerful—many Americans attribute their changed views on gay marriage to personal experiences with people that they know who identify as gay or lesbian (81). It is likely that many people have also known someone with a smoking-related illness given the mortality and morbidity associated with tobacco use, which could contribute to the overwhelming consensus among the public that smoking causes cancer (82).

An Intermediary-Focused Approach to Fighting False Beliefs

The strategies described above are not enough, however. Corrective information seems to only rarely cause backfire effects among the public, but its effects are often modest, decay relatively quickly, and fail to cumulate into sustained decreases in many common misperceptions. Fact checkers, journalists, and science communicators should thus complement their public-facing efforts with what I call an intermediary-focused approach that targets the political elites who play a critical role in belief and opinion formation.

One important strategy is to increase the political costs of making false claims by sanctioning political elites who do so in a more salient and public manner. Elected officials are very responsive to the threat of negative news coverage (83–86). Applying high-profile scrutiny to elite rhetoric can thus potentially help to deter them from promoting misinformation. One field experiment found that state legislators who were sent reminders of the reputational threat posed by fact checkers in their state were less likely to make claims that were fact checked or whose accuracy was questioned publicly (87). There are many potential ways of accomplishing this goal. For example, providing fact-check statistics showing that a politician has repeatedly made false statements is more damaging to their standing with the public than a fact check of a single false claim (88). Conducting live fact checking during political programming, integrating fact checks into mainstream news coverage rather than relegating it to specialized websites and sidebar articles, and prominently featuring fact checks in online search results could similarly increase the salience of fact checks and

the potential damage that they could inflict on politicians' reputations. In some cases, endorsing a discredited claim may become sufficiently costly that politicians are forced to repudiate it. In fall 2016, for instance, Donald Trump finally disavowed the birther myth, which seemed to help reduce false beliefs among the public that Barack Obama was not born in the United States (89).

It would also be valuable to disrupt the process within parties and ideological groups by which false claims become established components in group messages—for example, by giving voice to stakeholders who possess credibility inside a party to communicate the relevant evidence or science. Consider the issue of genetically modified organisms (GMOs), an issue on which factual beliefs could become polarized along partisan lines. The majority of the public in the United States questions the safety of GMO foods despite the scientific consensus that they are safe to eat (90), but these views are relatively low salience and there is no consistent divide between partisans in the United States in doubts about the safety of GMOs (91). However, the status quo seems vulnerable to a process that could deepen these misperceptions and link them more closely to public policy. Activism in support of GMO-labeling initiatives is heavily concentrated among Democrats and liberals (92). It is plausible that the issue could be politicized in the United States through a process of "conflict extension" in which activists promote a new issue to allied elected officials, which in turn motivates other activists to adopt similar views (93). After these views become consensus positions among activists and elites, they often generate countervailing opposition among the opposition party. This process of polarization among activists and elites can then induce a similar process among attentive party identifiers, creating a widening public divide on issues that did not previously separate the parties and encouraging efforts by elites to make corresponding changes in public policy (94). In practice, the process of conflict extension often includes not just positions on policy issues but also associated factual claims. Just as opposition to proposed measures to climate change was often bundled with denial of its existence, so too may support for mandatory GMO-labeling initiatives become bundled with unsupported claims about the risks of eating GMO foods.

Current approaches to reducing misperceptions about GMOs seem to suffer from similar limitations to other efforts to provide corrective information described above. Most notably, they focus on communicating factual and scientific evidence directly to the public, but this information is often unpersuasive and poorly targeted. As with climate change, these messages are often most likely to be received by and persuasive to audiences that are less likely to hold misperceptions (e.g., readers of science-oriented publications and fact-checking websites). Any effects that corrective information about GMO safety does have are likely to dissipate quickly, moreover, as people revert toward their prior views of the issue. Most fundamentally, messages targeted directly to the public may not effectively counter the flow of messages from activists and political elites that seek to link opposition to GMOs—including scientifically unsupported claims about the risks that they pose—to people's partisan and ideological worldviews. Such messages will often come from like-minded elites and as a result may have more durable effects on beliefs than summaries of facts and evidence.

An intermediary-focused approach to countering misperceptions about GMOs and preventing belief polarization on the issue would seek to amplify third parties who could speak effectively to liberal concerns. These more credible sources could include public commentators with scientific credibility and liberal sympathies (95) as well as activists and professionals who could describe applications of GMO technology that are appealing to liberal values (e.g., reducing environmental damage in crop production or increasing the food supply for vulnerable populations). For instance, exposure to a conversion narrative about a former anti-GMO activist increased perceptions of the strength of his argument about the benefits of GMO crops compared with an account that omitted his prior views (96). It would also be valuable to strengthen the incentives to accurately present GMO science among these intermediaries who are, like politicians, often sensitive to reputational concerns. However, any such fact checking will be most effective if it originates with credible sources from within their ideological, partisan, or professional communities. (A similar account can be offered on the right—farmers and businesses will be more credible in countering false GMO claims originating in the conservative movement and the Republican Party than scientists who are perceived as overwhelmingly liberal.)

All of the above strategies describe how to prevent belief polarization from emerging on an issue, but a corresponding approach could be taken to counter belief polarization when it has already taken hold. On the issue of climate change, for instance, fact checks and messaging emphasizing the scientific consensus have failed to substantially reduce belief polarization on the issue. Efforts to reduce misperceptions might instead seek to amplify credible voices who share identities or worldviews with groups whose members frequently doubt anthropogenic climate change. Notable examples include Katharine Hayhoe, an evangelical climate scientist, and Bob Inglis, a former Republican member of Congress turned climate activist. More such advocates are needed, however, such as Republican-leaning farmers and corporate leaders who could speak about how climate change is affecting their businesses or former military leaders who could discuss the threats to national security created by climate-related disruptions. While these voices may seem rare, polarization can reverse when fissures emerge in a coalition and elites disavow a previously consensus position. For instance, as evidence mounted that gay marriage posed no social threat and was becoming increasingly popular, national Republican politicians largely abandoned their messages in opposition to it, including unsupported claims about the harm that it poses. Public opinion has correspondingly shifted; beliefs that gay marriage would undermine the traditional American family declined from 56% in 2003 to 46% in 2013, while beliefs that same-sex parents can be equally good parents as heterosexual couples increased from 54% to 64% (81).

What this approach highlights is the key dynamic in countering false beliefs about politics and other controversial issues—the configuration of information flows to the public. Even if backfire effects are rare, fact checking struggles to overcome the inertia of public opinion absent unusually strong evidence that people become aware of and find difficult to deny (e.g., an economic crisis), particularly given the countervailing effects of group identity on issues for which belief polarization is common. Providing corrective information is generally worthwhile and can often improve belief accuracy on the margin, but durably reducing misperceptions will often require changing the cues that people receive from the sources that they most trust. Doing so will in turn require journalists and science communicators to focus less on communicating directly to the public and more on the intermediaries that are most credible to people who hold or are vulnerable to false beliefs.

Data Availability. This article does not use or include original data.

ACKNOWLEDGMENTS. I acknowledge support from the Carnegie Corporation of New York, Dartmouth College, and the Gerald R. Ford School of Public Policy at the University of Michigan. I thank Andy Guess, Ben Lyons, Ethan Porter, Jason Reifler, and Tom Wood for helpful comments.

1. C. Funk, L. Rainie, Public and scientists' views on science and society. Pew Research Center (2015). https://www.pewresearch.org/internet/wp-content/uploads/sites/9/2015/01/PI_ScienceandSociety_Report_012915.pdf. Accessed 6 September 2019.
2. D. J. Flynn, B. Nyhan, J. Reifler, The nature and origins of misperceptions: Understanding false and unsupported beliefs about politics. *Adv. Polit. Psychol.* **38** (suppl. 1), 127–150 (2017).
3. National Academies of Sciences, Engineering, and Medicine, *Communicating Science Effectively: A Research Agenda* (National Academies Press, 2017).
4. Z. Kunda, The case for motivated reasoning. *Psychol. Bull.* **108**, 480–498 (1990).
5. D. M. Kahan, E. Peters, E. C. Dawson, P. Slovic, Motivated numeracy and enlightened self-government. *Behav. Public Policy* **1**, 54–86 (2017).
6. B. Nyhan, J. Reifler, When corrections fail: The persistence of political misperceptions. *Polit. Behav.* **32**, 303–330 (2010).
7. K. Frankovic, Belief in conspiracies largely depends on political identity. *YouGov*, 27 December 2016. https://today.yougov.com/topics/politics/articles-reports/2016/12/27/belief-conspiracies-largely-depends-political-iden. Accessed 18 December 2018.
8. M. A. Gentzkow, J. M. Shapiro, Media, education and anti-Americanism in the Muslim world. *J. Econ. Perspect.* **18**, 117–133 (2004).
9. B. Duffy, *The Perils of Perception: Why We're Wrong about Nearly Everything* (Atlantic Books, 2018).
10. K. Frankovic, Russia's impact on the election seen through partisan eyes. *YouGov*, 9 March 2018. https://today.yougov.com/topics/politics/articles-reports/2018/03/09/russias-impact-election-seen-through-partisan-eyes. Accessed 4 September 2019.
11. Anti-Defamation League, ADL Poll of Over 100 Countries Finds More Than One-Quarter of Those Surveyed Infected With Anti-Semitic Attitudes. (2014). https://www.adl.org/news/press-releases/adl-global-100-poll. Accessed 27 March 2020.
12. Anti-Defamation League, New ADL Poll Finds Dramatic Decline in Anti-Semitic Attitudes in France; Significant Drops in Germany and Belgium. (2015). https://www.adl.org/news/press-releases/new-poll-anti-semitic-attitudes-19-countries. Accessed 27 March 2020.
13. J. Poushter, C. Huang, Climate change still seen as the top global threat, but cyberattacks a rising concern. Pew Research Center, February 10 (2019). https://www.pewresearch.org/global/wp-content/uploads/sites/2/2019/02/Pew-Research-Center_Global-Threats-2018-Report_2019-02-10.pdf. Accessed 6 September 2019.
14. S. Lewandowsky, U. K. H. Ecker, C. M. Seifert, N. Schwarz, J. Cook, Misinformation and its correction: Continued influence and successful debiasing. *Psychol. Sci. Publ. Interest* **13**, 106–131 (2012).
15. D. A. Scheufele, N. M. Krause, Science audiences, misinformation, and fake news. *Proc. Natl. Acad. Sci. U.S.A.* **116**, 7662–7669 (2019).
16. S. Iyengar, D. S. Massey, Scientific communication in a post-truth society. *Proc. Natl. Acad. Sci. U.S.A.* **116**, 7656–7661 (2019).
17. B. Nyhan, Social Media, Political Polarization, and Political Disinformation: A Review of the Scientific Literature. (2018). https://www.hewlett.org/wp-content/uploads/2018/03/Social-Media-Political-Polarization-and-Political-Disinformation-Literature-Review.pdf. Accessed 27 March 2020.
18. A. Guess, B. Lyons, B. Nyhan, J. Reifler, Avoiding the echo chamber about echo chambers: Why selective exposure to like-minded political news is less prevalent than you think. Knight Foundation report, February 12 (2018). https://kf-site-production.s3.amazonaws.com/media_elements/files/000/000/133/original/Topos_KF_White-Paper_Nyhan_V1.pdf. Accessed 23 October 2018.
19. M. Roppolo, Americans more skeptical of climate change than others in global survey. *CBS News*, 23 July 2014. https://www.cbsnews.com/news/americans-more-skeptical-of-climate-change-than-others-in-global-survey/. Accessed 10 September 2019.
20. Reuters, U.S. remains outlier as G20 split over tackling climate change. 29 June 2019. https://www.reuters.com/article/us-g20-summit-climate/us-remains-outlier-as-g20-split-over-tackling-climate-change-idUSKCN1TU0DQ. Accessed 10 September 2019.
21. S. L. van der Linden, A. A. Leiserowitz, G. D. Feinberg, E. W. Maibach, The scientific consensus on climate change as a gateway belief: Experimental evidence. *PLoS One* **10**, e0118489 (2015).
22. B. Nyhan, Why the 'death panel' myth won't die: Misinformation in the health care reform debate. *Forum* **8**, 5 (2010).
23. R. Pear, U.S. alters rule on paying for end-of-life planning. *New York Times*, 4 January 2011. https://www.nytimes.com/2011/01/05/health/policy/05health.html. Accessed 10 September 2019.
24. R. Pear, New Medicare rule authorizes 'end-of-life' consultations. *New York Times*, 30 October 2015. https://www.nytimes.com/2015/10/31/us/new-medicare-rule-authorizes-end-of-life-consultations.html. Accessed 10 September 2019.
25. C. Duelfer, Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD. (2005) https://www.cia.gov/library/reports/general-reports-1/iraq_wmd_2004/. Accessed 27 March 2020.
26. K. Breitman, Poll: Half of Republicans still believe WMDs found in Iraq. *Politico*, 7 January 2015. https://www.politico.com/story/2015/01/poll-republicans-wmds-iraq-114016. Accessed 10 September 2015.
27. S. P. Bailey, A startling number of Americans still believe President Obama is a Muslim. *CNN*, 14 September 2015. https://www.washingtonpost.com/news/acts-of-faith/wp/2015/09/14/a-startling-number-of-americans-still-believe-president-obama-is-a-muslim/?utm_term=.78a9322f7dbf. Accessed 10 September 2019.
28. M. T. Boykoff, J. M. Boykoff, Balance as bias: Global warming and the US prestige press. *Global Environ. Change* **14**, 125–136 (2004).
29. B. Fritz, B. Keefer, B. Nyhan, *All the President's Spin: George W. Bush, the Media, and the Truth* (Touchstone Books, 2004).
30. J. N. Druckman, M. C. McGrath, The evidence for motivated reasoning in climate change preference formation. *Nat. Clim. Change* **9**, 111–119 (2019).
31. ABC News, The conversation: Why facts don't matter. 19 July 2010. https://abcnews.go.com/WN/facts-matter-world-news-conversation/story?id=11196924. Accessed 10 September 2019.
32. T. Wood, E. Porter, The elusive backfire effect: Mass attitudes' steadfast factual adherence. *Polit. Behav.* **41**, 135–163 (2019).
33. B. Nyhan, E. Porter, J. Reifler, T. J. Wood, Taking fact-checks literally but not seriously? The effects of journalistic fact-checking on factual beliefs and candidate favorability. *Polit. Behav.*, https://doi.org/10.1007/s11109-019-09528-x (2019).
34. K. Clayton *et al.*, Real solutions for fake news? Measuring the effectiveness of general warnings and fact-check tags in reducing belief in false stories on social media. *Polit. Behav.*, https://doi.org/10.1007/s11109-019-09533-0 (2019).
35. B. Nyhan, J. Reifler, Displacing misinformation about events: An experimental test of causal corrections. *J. Exp. Polit. Sci.* **2**, 81–93 (2015).
36. B. Nyhan, J. Reifler, The roles of information deficits and identity threat in the prevalence of misperceptions. *J. Elect. Public Opin. Parties* **29**, 222–244 (2019).
37. M.-p. S. Chan, C. R. Jones, K. H. Jamieson, D. Albarracin, Debunking: A meta-analysis of the psychological efficacy of messages countering misinformation. *Psychol. Sci.* **28**, 1531–1546 (2017).
38. N. Walter, S. T. Murphy, How to unring the bell: A meta-analytic approach to correction of misinformation. *Commun. Monogr.* **85**, 423–441 (2018).
39. J. H. Kuklinski, P. J. Quirk, J. Jerit, D. Schwieder, R. F. Rich, Misinformation and the currency of democratic citizenship. *J. Polit.* **62**, 790–816 (2000).
40. M. H. Graham, Self-awareness of political knowledge. *Polit. Behav.* **42**, 305–326 (2018).
41. I. G. Anson, Partisanship, political knowledge, and the Dunning-Kruger effect. *Polit. Psychol.* **39**, 1173–1192 (2018).
42. A. Guess, A. Coppock, Does counter-attitudinal information cause backlash? Results from three large survey experiments. *Br. J. Polit. Sci.*, 10.1017/S0007123418000327 (2018).
43. B. J. Gaines, J. H. Kuklinski, P. J. Quirk, B. Peyton, J. Verkuilen, Same facts, different interpretations: Partisan motivation and opinion on Iraq. *J. Polit.* **69**, 957–974 (2007).
44. M. Bisgaard, Bias will find a way: Economic perceptions, attributions of blame, and partisan-motivated reasoning during crisis. *J. Polit.* **77**, 849–860 (2015).
45. M. Bisgaard, How getting the facts right can fuel partisan-motivated reasoning. *Am. J. Polit. Sci.* **63**, 824–839 (2019).
46. K. Khanna, G. Sood, Motivated responding in studies of factual learning. *Polit. Behav.* **40**, 79–101 (2018).
47. M. J. Aird, U. K. H. Ecker, B. Swire, A. J. Berinsky, S. Lewandowsky, Does truth matter to voters? The effects of correcting political misinformation in an Australian sample. *R. Soc. Open Sci.* **5**, 180593 (2018).
48. C. M. Dowling, M. Henderson, M. G. Miller, Knowledge persists, opinions drift: Learning and opinion change in a three-wave panel experiment. *Am. Polit. Res.* **48**, 263–274 (2020).
49. J. Sides, Stories or science? Facts, frames, and policy attitudes. *Am. Polit. Res.* **44**, 387–414 (2016).
50. P. W. Holland, Statistics and causal inference. *J. Am. Stat. Assoc.* **81**, 945–960 (1986).
51. J. G. Bullock, G. Lenz, Partisan bias in surveys. *Annu. Rev. Polit. Sci.* **22**, 325–342 (2019).
52. J. Lopez, D. Sunshine Hillygus, Why so serious?: Survey trolls and misinformation. http://dx.doi.org/10.2139/ssrn.3131087 (14 March 2018).
53. B. F. Schaffner, S. Luks, Misinformation or expressive responding? What an inauguration crowd can tell us about the source of political misinformation in surveys. *Publ. Opin. Quart.* **82**, 135–147 (2018).
54. J. G. Bullock, A. S. Gerber, S. J. Hill, G. Huber, Partisan bias in factual beliefs about politics. *Quart. J. Polit. Sci.* **10**, 519–578 (2015).
55. M. Prior, G. Sood, K. Khanna, You cannot be serious: The impact of accuracy incentives on partisan bias in reports of economic perceptions. *Quart. J. Polit. Sci.* **10**, 489–518 (2015).
56. A. J. Berinsky, Telling the truth about believing the lies? Evidence for the limited prevalence of expressive survey responding. *J. Polit.* **80**, 211–224 (2018).
57. M. Babajide Wintoki, Yaoyi. Xi, Partisan Bias in Fund Portfolios. (2019). https://www.cambridge.org/core/journals/journal-of-financial-and-quantitative-analysis/article/partisan-bias-in-fund-portfolios/CD950BE17F7D19F6C763B2C6C6BC1D6A. Accessed 27 March 2020.
58. A. J. Berinsky. Rumors and health care reform: Experiments in political misinformation. *Br. J. Polit. Sci.* **47**, 241–262 (2017).
59. B. Swire, A. J. Berinsky, S. Lewandowsky, U. K. H. Ecker, Processing political misinformation: Comprehending the trump phenomenon. *R. Soc. Open Sci.* **4**, 160802 (2017).
60. M. Tesler, Elite domination of public doubts about climate change (not evolution). *Polit. Commun.* **35**, 306–326 (2018).
61. A. Jardina, M. Traugott, The genesis of the birther rumor: Partisanship, racial attitudes, and political knowledge. *J. Race Ethn. Polit.* **4**, 60–80 (2019).
62. A. Berinsky, The birthers are back. *YouGov*, 3 February 2012. Accessed 5 September 2019.
63. A. Berinsky, The birthers are (still) back. *YouGov*, 11 July 2012. https://today.yougov.com/topics/politics/articles-reports/2012/07/11/birthers-are-still-back. Accessed 5 September 2019.
64. S. Vosoughi, D. Roy, S. Aral, The spread of true and false news online. *Science* **359**, 1146–1151, 2018.
65. A. Guess, B. Nyhan, J. Reifler, Exposure to untrustworthy websites in the 2016 US election. *Nat. Hum. Behav.*, https://doi.org/10.1038/s41562-020-0833-x (2020).
66. J. N. Druckman, M. S. Levendusky, A. McLain, No need to watch: How the effects of partisan media can spread via interpersonal discussions. *Am. J. Polit. Sci.* **62**, 99–112 (2018).

67. B. E. Weeks, A. Ardèvol-Abreu, H. Gil de Zúñiga, Online influence? Social media use, opinion leadership, and political persuasion. *Int. J. Publ. Opin. Res.* **29**, 214–239 (2017).
68. E. Merkley, Are Experts (News)Worthy? Balance, Conflict and Mass Media Coverage of Expert Consensus. https://www.tandfonline.com/doi/full/10.1080/10584609.2020.1713269. (2020). Accessed 27 March 2020.
69. G. Pennycook, D. G. Rand, Lazy, not biased: Susceptibility to partisan fake news is better explained by lack of reasoning than by motivated reasoning. *Cognition* **188**, 39–50 (2019).
70. G. Pennycook, D. G. Rand, Who falls for fake news? The roles of bullshit receptivity, overclaiming, familiarity, and analytic thinking. *J. Pers.* **88**, 185–200 (2020).
71. G. Pennycook, T. D. Cannon, D. G. Rand, Prior exposure increases perceived accuracy of fake news. *J. Exp. Psychol. Gen.* **147**, 1865–1880 (2018).
72. T. N. Carlson, Through the grapevine: Informational consequences of interpersonal political communication. *Am. Polit. Sci. Rev.* **113**, 325–339 (2019).
73. A. M. McCright, R. E. Dunlap, The politicization of climate change and polarization in the American public's views of global warming, 2001–2010. *Socio. Q.* **52**, 155–194 (2011).
74. E. Merkley, D. A. Stecula, Party elites or manufactured doubt? The informational context of climate change polarization. *Sci. Commun.* **40**, 258–274 (2018).
75. D. M. Kahan, Climate-science communication and the measurement problem. *Polit. Psychol.* **36**, 1–43 (2015).
76. B. Martin, R. Slothuus, Partisan elites as culprits? How party cues shape partisan perceptual gaps. *Am. J. Polit. Sci.* **62**, 456–469 (2018).
77. K. Snow, J. Gever, D. Childs. Experts debunk health care reform bill's "death panel" rule: Doctors agree health bill has no "death panel" requirement for the elderly. (2009). https://abcnews.go.com/print?id=8295708. Accessed 12 September 2019.
78. E. Parker-Stephen, Tides of disagreement: How reality facilitates (and inhibits) partisan public opinion. *J. Polit.* **75**, 1077–1088 (2013).
79. S. Borenstein, H. Fingerhut, AP-NORC poll: Most Americans see weather disasters worsening. *Associated Press*, 5 September 2019. https://apnews.com/682f099a67ae43d0876b044f9f7f5b26. Accessed 12 September 2019.
80. B. Bloodhart, E. Maibach, T. Myers, X. Zhao, Local climate experts: The influence of local TV weather information on climate change perceptions. *PLoS One* **10**, e0141526 (2015).
81. Pew Research Center, Growing support for gay marriage: Changed minds and changing demographics. 20 March 2013. https://www.people-press.org/2013/03/20/growing-support-for-gay-marriage-changed-minds-and-changing-demographics/. Accessed 13 September 2019.
82. Associated Press, Americans not confident Big Bang or evolution is real, poll shows. *CBS News*, 21 April 2014. https://www.cbsnews.com/news/americans-big-bang-evolution-ap-poll/. Accessed 13 September 2019.
83. J. Rauch, Fact-checking the president in real time. *The Atlantic*, June 2019. https://www.theatlantic.com/magazine/archive/2019/06/fact-checking-donald-trump-ai/588028/. Accessed 12 September 2019.
84. S. Lim, A better ClaimReview to grow a global fact-check database. *Duke Reporter's Lab*, 18 April 2019. https://reporterslab.org/a-better-claimreview-to-grow-a-global-fact-check-database/. Accessed 12 September 2019.
85. R. D. Arnold, *Congress, the Press, and Political Accountability* (Princeton University Press, 2013).
86. J. M. Snyder, D. Strömberg, Press coverage and political accountability. *J. Polit. Econ.* **118**, 355–408 (2010).
87. B. Nyhan, J. Reifler, The effect of fact-checking on elites: A field experiment on U.S. state legislators. *Am. J. Polit. Sci.* **59**, 628–640 (2015).
88. A. Agadjanian *et al.*, Counting the Pinocchios: The effect of summary fact-checking data on perceived accuracy and favorability of politicians. *Res. Polit.* **6**, 2053168019870351 (2019).
89. K. Dropp, B. Nyhan, It lives. Birtherism is diminished but far from dead. *New York Times*, 23 September 2016. https://www.nytimes.com/2016/09/24/upshot/it-lives-birtherism-is-diminished-but-far-from-dead.html. Accessed 12 September 2019.
90. J. Brody, Are G.M.O. foods safe? *New York Times*, 23 April 23 2018. https://www.nytimes.com/2018/04/23/well/eat/are-gmo-foods-safe.html. Accessed 12 September 2019.
91. C. Gillam, Consumer groups demand GMO labeling, question food safety. *Reuters*, 27 March 2012. https://www.reuters.com/article/us-usa-food/consumer-groups-demand-gmo-labeling-question-food-safety-idUSBRE82Q10820120327. Accessed 12 September 2019.
92. T. Haelle. Democrats have a problem with science, too. *Politico Magazine*, 1 June 1 2014. https://www.politico.com/magazine/story/2014/06/democrats-have-a-problem-with-science-too-107270?paginate=false. Accessed 12 September 2019.
93. G. C. Layman, T. M. Carsey, J. C. Green, R. Herrera, R. Cooperman, Activists and conflict extension in American party politics. *Am. Polit. Sci. Rev.* **104**, 324–346 (2010).
94. G. C. Layman, T. M. Carsey, Party polarization and 'conflict extension' in the American electorate. *Am. J. Polit. Sci.* **46**, 786–802 (2002).
95. E. Klein, Why Neil deGrasse Tyson's dismissal of anti-GMO concerns matters. *Vox*, 1 August 2014. https://www.vox.com/2014/8/1/5954701/neil-degrasse-tyson-gmos-dangerous-safe. Accessed 12 September 2019.
96. B. A. Lyons, A. Hasell, M. Tallapragada, K. H. Jamieson, Conversion messages and attitude change: Strong arguments, not costly signals. *Publ. Understand. Sci.* **28**, 320–338 (2019).