An Ecologically and Externally Valid Approach to Assessing Belief in Popular Misinformation

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Abstract

Measuring belief in online misinformation has become an increasingly important topic of inquiry across disciplines, but most studies measuring this phenomenon have not accounted for how many individuals consume misinformation online. Recent survey-based research utilizes out-of-date political headlines and ledes that researchers have chosen themselves, which diverges from how we observe online misinformation consumption in the wild and, as a result, has introduced concerns of ecological and external validity. These decisions have the potential to bias our understanding of how often people believe misinformation, as well as the individual covariates associated with belief. Integrating advances in research on how individuals consume online information, we develop novel survey instruments to measure real-time belief in popular misinformation, and identify who is most likely to believe misinformation. We also compare how three elements of survey design — topic coverage, temporality, and form of exposure (headline/lede or full article) — affect measured levels of belief. To this end, we field four studies in which we asked representative samples of Americans to evaluate popular misinformation chosen by a pre-registered algorithm within 48 hours of their publication. Using this approach, we find a substantially higher level of belief in misinformation than reported by previous studies: misinformation is rated as true 33.2% of the time, and approximately 90% of individuals coded at least one item of misinformation as true when given a set of four false items to evaluate. By running parallel studies, we find that specific elements in past survey instruments—only showing respondents headline/ledes and article sampling decisions—affect average levels of belief in misinformation and . The results from these studies can both inform the methodology of future studies and provide important new insights for the growing body of literature measuring belief in misinformation and intervention efficacy.

Introduction

Misinformation poses serious societal challenges, including to democratic governance (Watts, Rothschild, and Mobius 2021; Persily 2017), climate action (Hornesy and Fielding 2020), and public health (Southwell et al. 2019; Kata 2010). While misinformation can introduce second-order effects, such as its impact on mainstream media coverage (Jamieson 2018), a primary concern is its ability to directly deceive people. Indeed, belief in misinformation has recently contributed to dangerous attitudes and behaviors, such as vaccine refusal and political insurrection.[1] Given the potential significance of believing misinformation, proper measurement has become an important area of inquiry in the behavioral sciences (Guess and Lyons 2020a), as well as essential for measuring the efficacy of interventions designed to mitigate the negative effects of our evolving digital information environment.

While there has been rapid developments in the body of research studying exposure to misinformation (Lazer et al. 2018; Stella, Ferrara, and De Domenico 2018; Guess, Nyhan, and Reifler 2020), as well as sharing (Guess, Nagler, and Tucker 2019) and consumption (Allcott and Gentzkow 2017; Guess, Nyhan, and Reifler 2018) of misinformation, the current state of the study of *belief* in misinformation suffers from a number of potentially serious challenges to its ecological and external validity based on: (1) an over focus on news about politics; (2) a pre-occupation with particularly salient events such the 2020 election or Covid; (3) assessing news that is months or sometimes years old as opposed to immediately after publication; (4) a tendency to focus on headlines and ledes instead of full articles; and (5) a lack of attention to the popularity of the news articles assessed.

First, while misinformation in published news can be found on a variety of topics, such as political, science, and human interest topics (Tandoc Jr, Thomas, and Bishop 2021), most studies of people's ability to identify the veracity of news articles have restricted their sampling frame to political topics (Allcott and Gentzkow 2017; Clayton et al. 2019; Kim, P. L. Moravec, and Dennis 2019; Bronstein et al. 2019; Martel, Pennycook, and Rand 2020; Ross, Rand, and Pennycook 2021; Brashier, Pennycook, et al. 2021). Misinformation on non-political topics can be both widespread and consequential, such as misinformation about vaccines (Loomba et al. 2021). Without including misinformation covering a diversity of topics, we also cannot be sure that findings from these studies are externally valid to the consumption of different types of misinformation. Indeed, article sampling biases have already been identified as a limitation of previous studies on belief in news articles (Clemm von Hohenberg 2020).

Second, while substantial recent research has focused on misinformation about salient events, such as elections (Pennycook, Epstein, et al. 2021; Pennycook and Rand 2019; Pennycook, Cannon, and Rand 2018)

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[1] Belief in misinformation has increased hesitancy to receive the Covid-19 vaccine (Loomba et al. 2021) and is partly responsible for riots at the U.S. capitol building On January 6th, 2021 (Greenspan 2021; Ipsos 2021).

or the global pandemic (Pennycook, McPhetres, et al. 2020; J. J. Lee et al. 2020), misinformation is also written about more ordinary topics.

Third, and perhaps most importantly, most recent research has found that online misinformation is consumed quickly after publication (Vosoughi, Roy, and Aral 2018; Starbird et al. 2018), but most research on belief in misinformation asks respondents to evaluate months- or years-old misinformation that already received public professional fact-checks (Allcott and Gentzkow 2017; Bronstein et al. 2019; Clayton et al. 2019; Pennycook and Rand 2020). Results from studies that measure belief in misinformation among respondents who exist in a vastly different information environment than those who are mostly likely to consume that misinformation may therefore lack ecological validity.[2]

Fourth, although recent research on the consumption of misinformation is measured by visits to online websites (Allen et al. 2020), a number of studies of belief in misinformation restrict the materials made available to headlines/ledes, preventing individuals from accessing the full text (Allcott and Gentzkow 2017; P. Moravec, Minas, and Dennis 2018). Given that individuals have access to the full articles when they are consuming these articles online, restricting access to solely the headline/lede reduces the ecological validity of work measuring belief in misinformation.[3] Given that a headline/lede contains a finite amount of diagnostic and textual cues that news consumers use to evaluate the veracity of an article (Chen, Conroy, and Rubin 2015; Zhang et al. 2018), individuals are likely to evaluate headline/ledes differently from the full article.

Finally, it is almost axiomatically true that, on average, online users are most likely to encounter popular misinformation, but previous sampling methods enable researchers to either select misinformation for inclusion themselves regardless of their popularity (Allcott and Gentzkow 2017; Bronstein et al. 2019; Clayton et al. 2019; Pennycook and Rand 2020), or create synthetic misinformation composed by the researchers themselves (Pennycook, Cannon, and Rand 2018; P. Moravec, Minas, and Dennis 2018), potentially introducing sampling biases. By not focusing on misinformation that is the most likely to be consumed, we are possibly basing our estimates on items of misinformation rarely consumed, which also poses challenges to the external validity of these results.

Taken together, these choices across previous research designs have introduced concerns about ecological and external validity, leaving important questions as to the level of and – individual-level characteristics associated with – belief in misinformation. To expand our understanding of belief in misinformation, we therefore develop a research design that mimics how most individuals consume misinformation "in the wild." Specifically, this novel, pre-registered, and transparent sampling method sources full popular articles within

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[2]On the one hand, as time passes post-publication, more respondents could be exposed to the central claim of the article and thus may become more likely to rate it as true (Pennycook, Cannon, and Rand 2018). On the other, over time people may be exposed to fact-checks correcting the false stories, which have been shown to reduce belief in misinformation (Clayton et al. 2019).

[3]A table detailing the research designs of previous studies can be found in Section L of the Supplementary Materials

48 hours of publication and on a variety of topics, without researcher discretion or involvement. Online misinformation can be spread in multiple forms—such as online posts or messages, advertising, or news articles (Guess and Lyons 2020b)—but for the purpose of this paper, we solely focus on misinformation spread through false or misleading news articles. A key feature of this design is its replicability: future studies measuring belief in misinformation or testing interventions designed to mitigate belief can easily adopt this ecologically and externally valid design.

Using this design, we run four novel pre-registered studies to answer three fundamental questions about belief in misinformation. First, how often do individuals believe misinformation when they encounter it in real-time? Closely related, which individual characteristics, such as education or age, are associated with believing misinformation? Finally, do our results change if we adopt four elements commonly found on prior survey instruments: (1) limiting studies to political misinformation, (2) selecting misinformation about a salient event, (3) asking respondents to evaluate misinformation months after publication, and (4) restricting access to the headline/lede as opposed to the full article?[4]

Our results suggest that belief in misinformation is much higher than previous work has indicated. Recent research has reported that respondents believed the headlines of false articles were accurate around 22% of the time.[5] In our study, we find that approximately a third of individuals believe false news stories to be true, roughly 50% higher than in previous research. We also find that when asked to evaluate four items of misinformation, the vast majority of people (90%) are susceptible to believing at least one. Consistent with previous results, we find that ideological congruence and familiarity with the story are the two largest predictors of belief in false/misleading news.

We also show that the difference in between our results and results of prior research can likely be attributed to differences in study design. If we restrict our analysis to strictly political misinformation—as many studies on belief in misinformation do—belief in misinformation drops considerably. Restricting our analysis to salient political events—in our case, Covid-19 misinformation—does not change the overall level of belief in misinformation, but, interestingly, does affect who is most likely to believe it. Wealthier individuals are less likely to believe general misinformation than those with lower levels of income, but the opposite is true for misinformation about Covid-19. Although older individuals are less likely to believe general misinformation and misinformation about Covid-19 than younger respondents, the gap increased substantially for Covid-19 misinformation. A comparison of evaluations directly after publication to evalu-

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[4]Due to our research design, we are not able to compare popular articles to non-popular articles (our fifth concern about existing research), as we only included popular articles in our study by design (as explained below); comparing popular vs. non-popular articles would be a good subject for future research. For now, though, we situate all of our studies in the more ecologically valid domain of popular news stories.

[5]The median level of belief in misinformation identified by previous studies measuring belief in misinformation. A table detailing previous studies can be found in Section L of the Supplementary Materials.

ations months later suggests that using outdated misinformation may overestimate belief in misinformation and underestimate the negative correlation between age and belief. Comparing evaluations of full articles to evaluations of the headline/lede of those same articles suggests that restricting form of exposure to strictly the headline/lede may underestimate levels of belief in misinformation and the positive correlation between ideological congruence and belief.

Cumulatively, our findings show that improving the external and ecological validity of studies of belief in misinformation results in considerably different findings. These results suggest that previous studies have been systematically underestimating people's belief in online misinformation and the association of certain covariates with belief. This provides us with important new insights into belief in misinformation across different contexts, as well as recommendations for future research designs studying misinformation.

Research Design

To correct for ecological and external validity concerns in past studies, we created a transparent, replicable, and pre-registered sampling process that sourced popular true and false/misleading articles from across the ideological spectrum to be evaluated by respondents within 48 hours of their publication. Specifically, we sourced one article per day from each of the following five news streams: liberal mainstream news domains; conservative mainstream news domains; liberal low-quality news domains; conservative low-quality news domains; and low-quality news domains with no clear political orientation. Each day we chose the most popular online articles from each of these five streams that had appeared in the previous 24 hours and sent them to respondents who had been recruited by the survey firm Qualtrics.[6] Collecting and distributing the most popular articles directly after publication is a key innovation that enabled us to measure a phenomenon that has thus far eluded precise measurement: belief in online misinformation during the period in which people are most likely to consume it.

To generate our streams of mainstream news, we collected the top 100 news sites by U.S. consumption identified by Microsoft Research's Project Ratio between 2016 and 2019.[7] To classify these websites as liberal or conservative, we used scores of media partisanship from Eady et al. (2020), who assign ideological estimates to websites based on the URL sharing behavior of social media users: websites with a score of below zero were classified as liberal and those above zero were classified as conservative. The top ten websites by consumption in each group were then chosen to create a liberal mainstream and conservative mainstream news feed.[8] For our low quality news sources, we relied on the list from Allcott, Gentzkow, and Yu (2019) that

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[6]In Section G of the Supplementary Materials we explain the sampling technique, why we chose it, and why we believe our results from these surveys can be generalized.

[7]https://www.microsoft.com/en-us/research/project/project-ratio/

[8]The list of the sources in each mainstream stream is provided in Section A1 of the Supplementary Materials.

were still active at the start of our study in November 2019, which we then subsequently classified into three streams: liberal leaning sources, conservative leaning sources, and those with no clear partisan orientation.[9] To construct these streams, three independent annotators rated each source as either conservative, liberal, or unclear. The modal evaluation of these annotators was used to classify each source (If there was no mode, the source was rated as unclear.).[10]

On each day of our four studies, except for Study III, we selected the most popular article from the past 24 hours from each of the five streams. To do so, we used CrowdTangle, a content discovery and social monitoring platform that tracks the popularity of URLs on Facebook pages, for the mainstream sources, and RSS feeds for the low-quality ones.[11] Articles chosen by this algorithm therefore represent the most popular credible and low quality news from across the ideological spectrum.[12] By selecting the most popular articles from different sources, the design ensures that we capture the most popular topics rather than predetermine a limited topical frame.[13] In addition, this article selection process is easily replicated and can be updated with new mainstream or low-quality sources in future research to ensure that sources lists remain current.

Study I was carried out from November 2019 to February 2020. We sent out an online survey to respondents who were asked a battery of questions related to articles that had been selected on that day by our article selection protocol.[14] On each day of the study, this survey was completed by between 140 and 160 American respondents balanced on age, gender, and education approximating 2010 census proportions.[15] Every respondent evaluated three articles randomly selected from the five articles being evaluated that day. Each article was therefore assessed by approximately 90 respondents who were required to complete the survey within 24 hours from when we selected the articles, which resulted in respondents evaluating articles within 48 hours of the article's publication. No respondent was allowed to take the survey more than once (except during a separate panel survey in which we recontacted a reduced sample of individuals).

Respondents evaluated each article using a variety of criteria, the most germane of which was a categorical evaluation question: "What is your assessment of the central claim in the article?" to which respondents could choose from three responses: (1) True (2) Misleading/False (3) Could Not Determine. Respondents were also asked to assess the accuracy of the news article on a 7-point veracity scale ranging from 1 (definitely

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[9]The list of the sources in each low-quality stream is provided provided in Section A2 of the Supplementary Materials.

[10]Further explanation for how the partisanship of these sources were determined is provided in Section A4 of the Supplementary Materials and Methods.

[11]We used RSS feeds for the low quality sources instead of CrowdTangle because most low-quality sources' Facebook pages had been banned and thus were not tracked by CrowdTangle.

[12]The number of public Twitter posts and public Facebook group posts that contained each article in Study I is provided in Section B3 of the Supplementary Materials.

[13]All the articles evaluated can be found in Section B1 of the Supplementary Materials.

[14]While they completed the survey within the Qualtrics platform, they viewed the articles directly on the website where they had been originally published. In other studies, respondents were often only asked to evaluate the headline/lede, rather than the full article. Providing the full article in its online form captures how respondents engage with this content online.

[15]In Section M of the Supplementary Materials we present balance tables for each analysis. In Section H of the Supplementary Materials we present the average difference between groups of respondents in each pair of studies we compare.

not true) to 7 (definitely true). We run our analyses using both categorical responses and the veracity scale, but only report our results for categorical responses in the main text. We provide the results from every model presented in the text substituting the veracity scale for the categorical scale in Section H of the Supplementary Materials and find substantively similar results.[16] To assess the reliability and validity of both measures, we predict the rating of an article on a 7-point scale using a dummy variable measuring whether that respondent rated that article as true using the categorical measure. Using a simple linear regression we find that rating an article as true on average increases the veracity scale rating by 2.5 (nearly 1.5 standard deviations of the veracity scale).[17] To ensure that responses we use were actually from respondents who evaluated articles in good faith, two attention checks for each article were used. If a respondent failed any of these attention checks, all of their evaluations were omitted from this analysis.[18]

One of the key challenges in this study was determining the veracity of the article in the period directly after publication. Whereas many studies use source quality as a proxy for article veracity, not all articles from suspect news sites are actually false (Allcott, Gentzkow, and Yu 2019). Other studies have relied upon professional fact checking organizations such as Snopes or Politifact to identify misinformation (Clayton et al. 2019, Pennycook, McPhetres, et al. 2020). However, the use of evaluations from these organization is impossible when sourcing articles in real-time because we have no way of knowing whether these articles will ever be checked by such organizations. As an alternative mechanism, we hired six professional fact checkers from leading national media organizations to assess each article during the same 24 hour period as respondents.[19] We use the modal response of the professional fact checkers to determine whether we code an article as 'true', 'false/misleading', or 'could not determine'. We were then able to assess the level of belief in misinformation by strictly assessing respondents ratings of articles that received a modal classification of false/misleading from professional fact-checkers. Articles rated as "false/misleading" constitute a piece of misinformation based on previous definitions of misinformation: news with a central claim "that contradicts or distorts common understandings of verifiable facts" (Guess and Lyons 2020b). Therefore, in this paper, "items of misinformation" strictly refers to these news articles rated as false/misleading by the modal number of fact-checkers. In Study I, fact-checker evaluations did not have unanimity across every article; we fully

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[16]We focus on the categorical results in the text for two reasons. First, categorical measures do not suffer from the interpretation issues that veracity scales do. Individuals hold varying interpretations of each number on the veracity scale, which can make interpretation difficult. Second, veracity scales are generally used to capture uncertainty in respondent evaluations; however, by providing "Could Not Determine", we are able to capture uncertainty. Taken together, we think that the categorical measure is a much more interpretable measure for evaluations of article veracity.

[17]Results of this model can be found in Section H of the Supplementary Materials.

[18]Directly after they were asked to evaluate the article, we asked two basic questions about access to the article. These questions do not depend on any ability to discern veracity and only measure if they are attempting to evaluate the article that we asked them to evaluate. They can be found in Section H of the Supplementary Materials.

[19]These professional fact-checkers were recruited from a diverse group of reputable publications (none of which were included in our source lists to avoid conflicts of interest) and paid $10.00 per article. The modal response of the professional fact checkers yielded 37 false/misleading, 102 true, and 16 indeterminate articles from Study I. Most articles were evaluated by five fact-checkers; a few were evaluated by four or six.

detail these differences in Section I of the Supplementary Materials.

Altogether, we sourced 155 articles over 31 days in Study I.[20] Of those articles, 37 were rated as false/misleading by the professional fact-checkers. We collected 3,394 responses for false/misleading articles from 2,751 unique respondents.[21] We collected demographic information (age, education, gender, and income) from respondents as well as information about four specific characteristics that had previously been shown to affect belief in misinformation: cognitive reflection (Pennycook and Rand 2019), political ideology (Allcott and Gentzkow 2017; P. Moravec, Minas, and Dennis 2018), familiarity with the evaluated story (Pennycook and Rand 2018), and digital literacy (N. M. Lee 2018; McDougall et al. 2019).[22] To determine the proportion of people who may believe at least one item of misinformation if they evaluate multiple articles, we recontacted a random sample of respondents over the final 29 days of the survey and invited them to participate in an additional day's survey (we kept these results separate from our main analysis). On each of these days, approximately 50 respondents who had already taken a previous survey took that day's survey, thus giving us a collection of respondents who evaluated more than three articles and increasing the possibility that these respondents would be exposed to multiple items of misinformation.

To test if there is a difference in belief in misinformation among articles that are strictly focused on different topics, we compared general belief in misinformation and the demographic correlates of belief in misinformation among political and non-political articles in Study I. We also compared our results in Study I to a second study that solely collected misinformation about the Covid-19 pandemic. To this end, our second study (Study II) ran for eight days over May and June 2020 and restricted our article selection protocol to those covering the Covid-19 pandemic, but otherwise followed the same methodology as Study I. Study II resulted in 1,117 responses from 836 unique respondents evaluating 13 false or misleading articles, which can be found in Section B2 in the Supplementary Materials.

To test whether two of our survey instrument innovations affect the level of and covariates associated with belief in popular misinformation, we ran two experimental studies to test if the time (immediately or months) after publication (Study III) or whether seeing the headline/lead or the full article impacts our results (Study IV). In Study III, we ran the the same survey design and use the same articles sourced in Study I, but sent articles to be evaluated by a different set of unique respondents between three and six months after publication. We collected 3,348 responses from 2,732 unique respondents for the same 37 items of misinformation and compared the responses across Studies I and III. In Study IV, we ran a randomized

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[20]All the articles evaluated during Study I and their fact-checker rating can be found in Section B1 of the Supplementary Materials.

[21]102 articles were rated as true by fact-checkers, and we collected 10,024 responses for true articles from 5,000 unique respondents. As our focus here is on people's ability to identity misinformation, we do not utilize the these evaluations in the current manuscript.

[22]Details on measurement are provided in Section A3 of the Supplementary Materials and Methods on page 10.

controlled trial for ten days during Study I in which we asked a different group of respondents to evaluate the same articles in the same 24-hour window, but respondents were only given access to the headline/lede rather than the full article. Over these ten days, eight articles were rated as false/misleading by the professional fact-checkers,[23] for which we collected 841 responses from 693 unique respondents when the respondent was given access to the full article. We collected 884 responses from 708 unique respondents for these eight items of misinformation when the respondent was only given access to the headline/lede.[24]

Results

Study I: How often do people believe misinformation and who believes it?

Using our results from Study I, we begin by assessing the proportion of people who believe misinformation in real-time. Figure 1 illustrates the breakdown of how accurately respondents evaluated articles from November 2019 to February 2020. Across the 31 days of our study, about *one third* of all evaluations (33.2%; Figure 1a) for items of misinformation incorrectly rated these articles as true, marginally exceeding the proportion of evaluations that correctly rated these same articles as false/misleading (32.9%; Figure 1a). This level of belief in misinformation is 50% higher than previous work has suggested. As a point of comparison, respondents were much more likely to accurately rate true articles as true (62.0%; Figure 1b) than rate them as false/misleading (14.6%; Figure 1b). To validate these results, for ten days during Study I we asked a separate set of respondents to evaluate the same articles during the same 24 hour time period and using the same survey instrument, but we told respondents we would pay them an extra $1.00 for every correct answer, an amount higher than has been previously shown to improve performance in factual survey questions (Bullock et al. 2013). We find very little difference in their responses, except for a slight increase in how many respondents evaluated misinformation as true.[25] Individuals paid more for the correct answer were more likely to rate misinformation as true by three percentage points (statistically significant at the 95% level). This indicates that our results are not caused by a lack of effort from respondents. Increasing incentives to correctly evaluate misinformation actually increases the level of belief in misinformation.

We also find evidence that the vast majority of our respondents believed at least one piece of misinformation when exposed to multiple false/misleading articles. We recontacted a random sample of our original respondents and enabled them to take additional surveys over multiple days. This allowed us to measure the performance of individuals rather than just of groups. Figure 1c displays the proportion of individuals in our repeater group who evaluated an item of misinformation as true by how many they evaluated. Of those

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[23]These articles can be found in Section B3 in the Supplementary Materials

[24]We present examples of the headline/lede that was shown to respondents in Section J the Supplementary Materials.

[25]Explanation of this study and the results can be found in Section D of the Supplementary Materials.

who evaluated four or more items of misinformation (84 respondents), roughly 90% classified at least one as true. Strikingly, this result holds for respondents with a college degree (roughly half of the respondents have a college degree).

Figure 1: The level of belief in misinformation in real-time. Panel A presents the proportion of evaluations for misinformation (CND = Could Not Determine). Panel B presents the proportion of evaluations for true news. Panel C presents the proportion of respondents that evaluated at least one item of misinformation as true by the number of items of misinformation they evaluated.
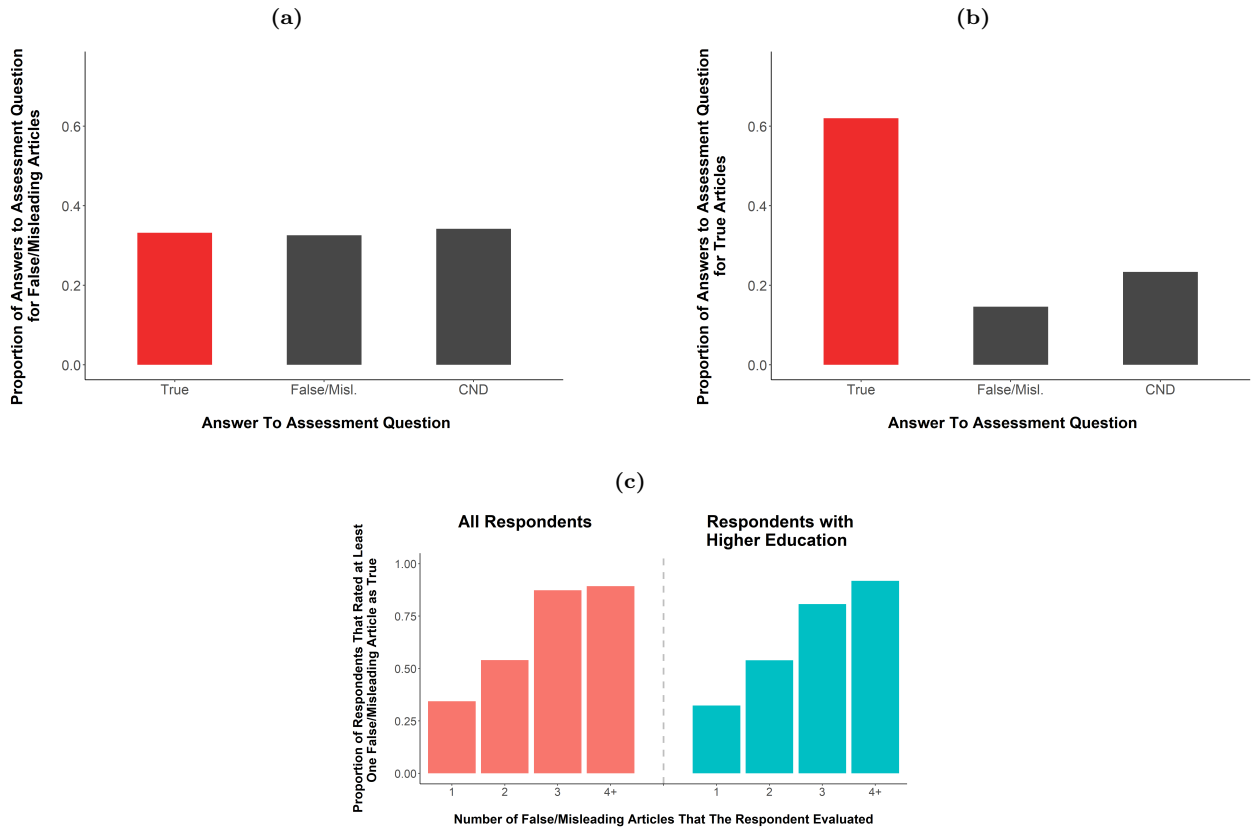
Having demonstrated that belief in online misinformation is more widespread than reported in previous studies, we next turn to examining if previous findings that certain groups are more susceptible to believing misinformation than others also hold true. We test whether basic demographics (age, education, gender, and income) are associated with a higher probability of believing misinformation and test four pre-registered hypotheses about determinants of belief in misinformation rooted in previous work:[26]

Hypothesis 1. Individuals who measure higher on our cognitive reflection index are less likely to rate misinformation as true than those who measure lower on our cognitive reflection index. This is identified as a characteristic of interest by Pennycook and Rand (2019).

Hypothesis 2. Individuals who measure higher on our digital literacy measure are less likely to rate misinformation as true than those who measure lower on our digital literacy measure. This is identified as a characteristic of interest by Guess, Lerner, et al. (2020). Recent research shows that those with lower levels of digital literacy are more likely to believe misinformation (Sirlin et al. 2021).

Hypothesis 3. Individuals who have previously heard of a piece of misinformation will be more likely to rate this story as true than respondents who have not previously heard of that false news story. This is identified as a characteristic of interest by Pennycook and Rand (2020).

Hypothesis 4. Individuals are more likely to rate a piece of misinformation as true when its ideological perspective matches the respondent's ideology than when its ideological perspective does not match the individual's ideology. This is identified as a characteristic of interest by a number of studies (Allcott and Gentzkow 2017; Kahan 2017; Van Bavel and Pereira 2018; P. Moravec, Minas, and Dennis 2018).

To explore which basic demographic factors and characteristics outlined in these hypotheses are associated with belief in misinformation, we fit an OLS regression model with article-level fixed effects and standard errors clustered at the respondent and article level to predict belief in misinformation (i.e., rating a false or misleading story as true with Yes=1 and No=0). For our dichotomous outcome, OLS or logistic regressions produce similar results and are both appropriate. An OLS regression is the preferred specification because it provides unbiased, reliable estimates of a variable's average effect (Allison 1999; Greene, Han, and Schmidt 2002 ; Hellevik 2009 ; Mood 2010 ; Baetschmann, Staub, and Winkelmann 2015).[27] We use this model for all following analyses in this paper.[28]

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[26]The pre-registration is located here: https://osf.io/dp8ze/. The details on measurement are provided in Section A3 of the Supplementary Materials.

[27]Summary statistics of variables in this model are provided in Section H of the Supplementary Materials.

[28]Our pre-registration specified that all analyses testing our pre-registered hypotheses would be performed at the level of the individual item (that is, one data point per item per participant) using linear regression with standard errors clustered on the participant. However, such an analysis does not account for the likely heterogenous treatment effect across articles evaluated. Given this, we deviated from our pre-registered plan and controlled for the likely heterogeneity in our treatment effect across articles by adding article fixed effects and clustering standard errors at the article-level (**abadie2017should**) in addition to

However, as a robustness test, we reanalyze all of our models with a logit specification and provide results in Section H of the Supplementary Materials; results from these analyses all lead to substantively similar conclusions. Figure 2a presents the effect of a one standard deviation increase of each variable on the probability of believing misinformation.[29] Demographic factors such as education, gender, and income are not strongly associated with an individual believing misinformation—all coefficients have effects that are small and not statistically significant. We also found that older Americans are actually less likely to rate misinformation as true than younger Americans. An increase of age by 10 years, conditional on other covariates, decreases the probability of rating misinformation as true by roughly 0.03. This adds important context to the existing findings that older Americans are more likely to share misinformation on Facebook (Guess, Nagler, and Tucker 2019), suggesting that sharing behavior may be divorced from actual belief, or that older Americans may be exposed to substantially more misinformation. While work (Brashier and Schacter 2020) has emphasized the need to tailor interventions to older Americans, younger Americans appear more susceptible to believing misinformation. Figure 2b presents the proportion of those that rated misinformation as true by age and education group.

In regards to our four hypotheses that test previous theories surrounding misinformation, we find that individuals who score higher on a cognitive reflection score are less likely to rate misinformation as true (see Figure 2b). For a point increase in the cognitive reflection score (coded on a 0-4 scale), conditional on other covariates, the probability of rating misinformation as true decreases by 0.02. We did not find support for the hypothesis that individuals who score higher on a digital literacy score are less likely to rate misinformation as true, [30] but we did find support for the third hypothesis that individuals who have previously heard of a piece of misinformation are more likely to believe it. If a respondent had heard of the misinformation, the probability they rated misinformation as true increased by 0.22. We also found support for our fourth hypothesis: ideological congruence (i.e., the article has the same ideological slant as the respondent's self-reported ideology) is associated with an increase of 0.16 in the probability of believing a false or misleading

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the individual-level. We also replaced the ideology variable with a dummy variable that accounts for whether an individual's ideological perspective is congruent with the article's perspective. Given that it is whether one's ideological perspective is congruent to the piece of misinformation, not ideology in itself, that affects belief in misinformation, this is the proper variable to use. Although we deviate from these aspects of the pre-registered analysis, our results do not differ from results produced by the pre-registered model. We replicate Figure 2a in this paper using this pre-registered model in Section N of the Supplementary Materials and find that the results are no different than those reported in the model used here.

[29]Detailed results from this model is provided in Section H of the Supplementary Materials. Results from a logistic regression is provided in Section H of the Supplementary Materials. Results from the same OLS model, but replacing the dependent variable with a veracity scale, are provided in Section H of the Supplementary Materials. Results from the same OLS model, but only using misinformation with a robust mode, are provided in Section F of the Supplementary Materials. Results from these analyses lead to substantively similar conclusions.

[30]The absence of a digital literacy effect supports recent work by Jones-Jang, Mortensen, and Liu (2021) who also did not find any effect and contradicts recent research that finds that those with lower levels of digital literacy are more likely to believe misinformation (Sirlin et al. 2021). When determining the effect of digital literacy, we ran a separate model and removed the age variable, given possible multicollinearity issues (Munger et al. 2019). Results from this model are provided in Section H in the Supplementary Materials. Results from a logistic regression is provided in Section H of the Supplementary Materials. Results from the same OLS model, but replacing the dependent variable with a veracity scale is also provided in Section H of the Supplementary Materials. Results from these analyses lead to substantively similar conclusions.

Figure 2: The individual level characteristics associated with believing misinformation. Panel A presents the effect sizes and 95 percent confidence intervals for linear regression models that identify the effect of individual-level covariates on belief in misinformation. Panel B presents the proportion (with 95 percent confidence intervals) of true evaluations for items of misinformation by age group and education level. Red line denotes proportion of true evaluations for everyone (0.337). Panel C presents the proportion (with 95 percent confidence intervals) of true evaluations for misinformation with different ideological perspectives.
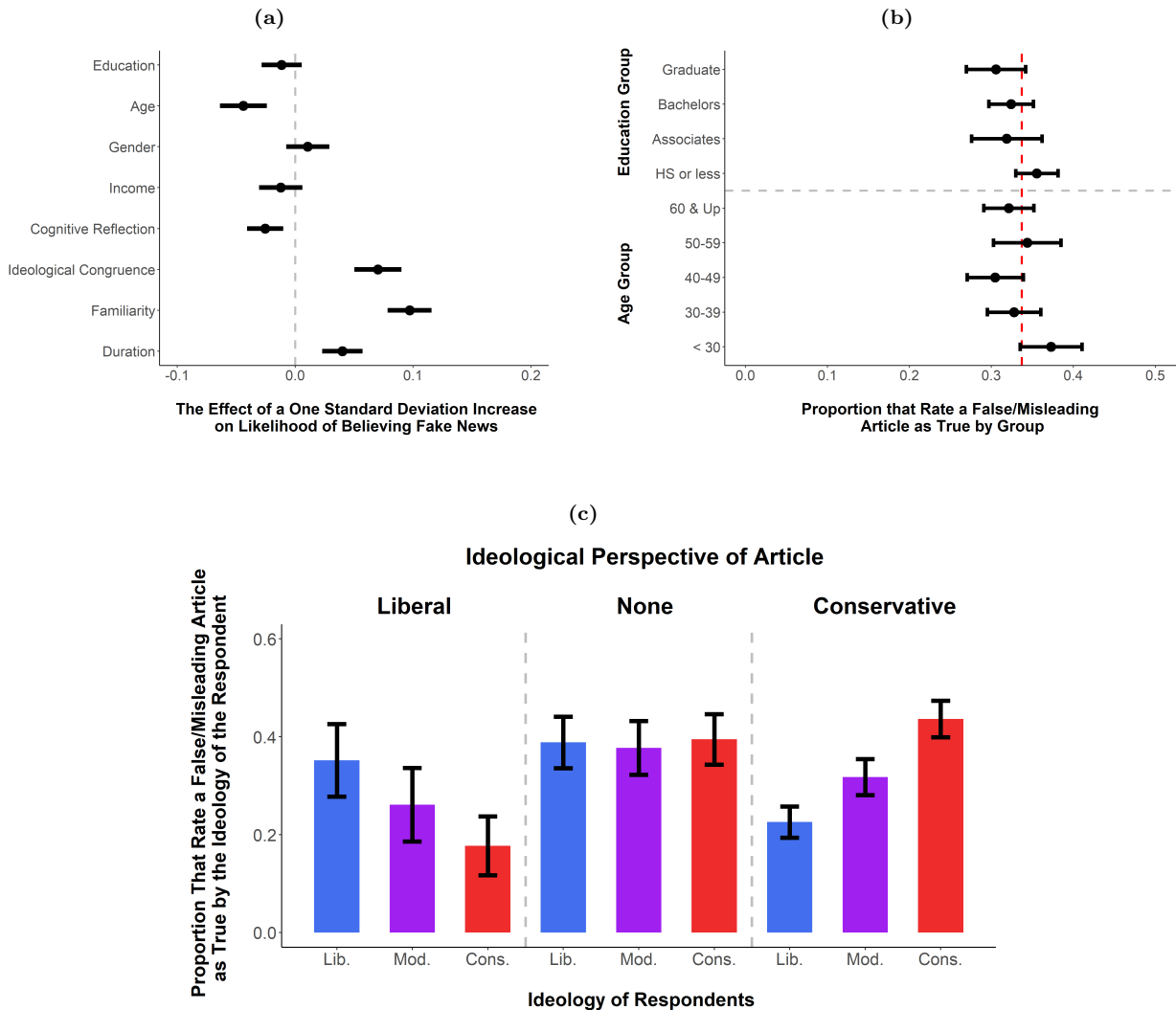
article (see Figure 2a). Given that the probability an average respondent rated a false or misleading article as true was 0.337, both familiarity and ideological congruence are associated with substantial increases in the probability of believing misinformation.

When we run the same model as above but bifurcate the ideological congruence variable into two separate variables by the ideology of the article and respondent,[31] we find that both covariates increase the probability

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[31](1) Liberal ideological congruence: The respondent self-identifies as liberal and is evaluating misinformation with a liberal perspective (2) Conservative ideological congruence: The respondent self-identifies as conservative and is evaluating misinformation with a conservative perspective

of rating misinformation as true at similar levels.[32] This is an important distinction given work that has shown that conservatives are more likely to believe misinformation than liberals (Economist 2020) and that conservatives are more likely to share (Guess, Nagler, and Tucker 2019) and be exposed to (Grinberg et al. 2019) misinformation. Our results suggest that conservatives are not more likely to believe ideologically congruent misinformation than are liberals, emphasizing the importance of supply dynamics in the prevelance of conservative misinformation relative to liberal misinformation (Allcott, Gentzkow, and Yu 2019; Guess, Nyhan, and Reifler 2020). Figure 2c presents the level of belief in misinformation by the ideology of the respondent (liberal, moderate, or conservative) and the ideological perspective of the article.[33]

Studies I-IV: Do Our Results Change When We Change Our Survey Design?

In Study I, we report much higher levels of belief in misinformation than in previous surveys. Our survey design differs from previous work measuring belief in misinformation on four factors that have limited their ecological and external validity: topic coverage, temporality, stimulus type, and sampling bias. To determine if the first three of the four elements may have resulted in our difference in results, we run three analyses.[34] Using our results from Study I and a second study (Study II), we measure the effect of focusing on certain topics of misinformation. By running a third study (Study III), we analyze the effect of asking individuals to evaluate misinformation 3-6 months after publication. And in a final study (Study IV), we measure the effect of limiting respondents' access to strictly headline/ledes on our results.

Study I & II: Measuring the Effect of Restricting Analysis to Political Articles or a Salient Event

Past studies measuring belief in misinformation have asked respondents to evaluate exclusively political misinformation, limiting the external validity of their results to other misinformation topics. To complement our understanding of belief in political misinformation, we expand our article selection mechanism to source popular articles without a topical limitation. We find that of the most popular daily items of misinformation roughly 65% made claims about politics, while the rest were classified as science (25%) or human interest

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[32]Results from this model are provided in Section H of the Supplementary Materials. Results from the same model, but with a veracity scale, instead of categorical measure of belief is provided in the Section H of the Supplementary Materials. Results from these analyses lead to substantively similar conclusions.

[33]Details on how the ideological perspective of the article was identified is provided in Section A4 of the Supplementary Materials.

[34]It is difficult to measure the effect of article sampling bias, as we cannot replicate exactly how previous studies chose the items of misinformation they used.

stories (10%). Figure 3a displays overall levels of belief in misinformation by topic and shows that, of the main topics of misinformation (Political, Science, and Human Interest), political misinformation has the lowest levels of belief. To estimate the effect of evaluating political misinformation relative to misinformation about other topics, we fit an OLS regression model with standard errors clustered at the respondent level to predict belief in misinformation (that is, rating a false or misleading article as true). We control for demographic variables, such as age, gender, education, income, and ideological congruence with the ideological perspective of the item of misinformation in this model. In Figure 3b we present the effect of evaluating political misinformation on the probability of believing misinformation.[35] Figure 3b shows that the probability of rating an article as true is reduced by .095, or about 30%, if misinformation is about politics. This indicates that studies that strictly use political misinformation are likely underestimating belief in misinformation more broadly. Future research should be clear about what kind of misinformation they are studying. If the goal of a research design is to measure belief in misinformation in general, one must incorporate belief in a broader range of misinformation, such as popular misinformation about non-political events. Misinformation about other topics are heavily consumed and can have major societal implications, such as hesitancy to take the Covid-19 vaccine (Loomba et al. 2021).[36] Studying belief in strictly political misinformation is important, but studies that rely solely on this type of misinformation should note that these studies will report much lower levels of belief in misinformation than those using a representative sample of popular misinformation about other topics.

In addition to focusing exclusively on political misinformation many studies of misinformation focus on specific salient events on which misinformation quickly proliferates about. As an example, recently a number of studies investigated belief in misinformation surrounding the the Covid-19 pandemic (Roozenbeek et al. 2020; J. J. Lee et al. 2020). To measure if focusing specifically on misinformation surrounding a salient event impacts levels of belief, we compared belief in pandemic-related misinformation to general misinformation by running a second study (Study II). We found a slightly higher level of belief in false or misleading stories related to Covid-19 (35.1% of evaluations rated a false or misleading article as true) relative to our general articles in Study I (33.7%). To test if the measured effects of key covariates differed, we fit an OLS regression model with article-level fixed effects and standard errors clustered at the respondent and article level to predict belief in misinformation. Figure 3c presents the effect of a one standard deviation increase of each variable on the probability of believing misinformation for Covid-19 misinformation and general

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[35]Detailed results are provided in the Section H of the Supplementary Materials. As a robustness check, we also provide results from a logit specification of the model in Section H of the Supplementary Materials. Results from the same OLS model, but with a veracity scale instead of categorical measure of belief, is provided in Section H of the Supplementary Materials. Results from these analyses lead to substantively similar conclusions.

[36]In Study II of this paper we show that belief in Covid-19 misinformation is just as high and different individual characteristics correlate with belief in this type of misinformation relative to general misinformation.

misinformation. Results were strikingly similar barring two exceptions. In Study I, individuals with more self-reported income are less likely to believe general misinformation than those with lower self-reported income. However, the opposite is true in Study II. While in Study I and II, older individuals are less likely to believe general misinformation and misinformation about Covid-19 than younger respondents, the gap increased for Covid-19 misinformation (Study II). Importantly, we still find a large, albeit slightly smaller, ideological congruence effect for articles about Covid-19 as compared to our original study. Overall, we find that high levels of belief in misinformation and the large effect of ideological congruence extend to a crisis environment defined by rapidly changing information and high issue salience.

Our findings from Studies I and II show that focusing solely on political misinformation lacks external validity to other misinformation topics and is likely underestimating belief in misinformation. While belief in misinformation about a salient event, in our case the Covid-19 pandemic, may be quite similar to belief in general misinformation, the correlation between specific demographics and belief in misinformation differ.

Study III: Measuring the Effect of Temporality

We also tested if the level of or covariates associated with belief in misinformation changes months after publication in our third study (Study III). To this end, we sent the same articles evaluated in Study I out to be evaluated again by a different set of unique respondents between three and six months after publication. To estimate the effect of evaluating articles well after publication, we fit the same OLS regression model as in the previous section. In Figure 3d we present the effect of a delayed evaluation (three to six months after publication) on the probability of believing misinformation.[37] Evaluating an article well after publication increased the probability a respondent rated an item of misinformation as true by 0.034, a 10% increase relative to evaluation in the 48 hours after publication. We also find that when comparing who believes misinformation in each of these time periods, we find similar magnitudes of effects from different demographic factors, except for age. It appears that months after publication, the difference in belief in misinformation between younger and older respondents is much smaller. More specifically, while younger respondents are no more likely to believe misinformation months later, older respondents are.

This may be because older respondents are more likely to be exposed to misinformation over time. Observational research has shown that older social media users are more likely to be exposed to misinformation (Guess, Nagler, and Tucker 2019). To understand whether familiarity with false stories may be driving this increased belief, we predict familiarity with an item of misinformation using demographic variables in Study

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[37]Detailed results are provided in the Section H of the Supplementary Materials. As a robustness check, we also provide results from a logit specification of the model in Section H of the Supplementary Materials. Results from the same OLS model, but with a veracity scale, instead of categorical measure of belief is provided in Section H of the Supplementary Materials. Results from these analyses lead to substantively similar conclusions.

I and Study III.[38] We find age is a much larger positive predictor of familiarity when individuals evaluate misinformation months after publication (Study III).

Figure 3: Panel A presents the proportion of respondents who rated misinformation as true across topic. Details on how the topic and ideological perspective of the article was chosen is provided in Section A4 of the Supplementary Materials and Methods on page 9. Panel B compares results effect sizes and 95 percent confidence intervals for the same linear regression model testing what covariates affect belief in political misinformation and other misinformation. Panel C presents the effect of evaluating misinformation only about Covid-19 and compares effect sizes and 95 percent confidence intervals for the same linear regression model testing what covariates affect belief in misinformation during Study I and Study II (solely Covid-19 articles). Panel D presents the effect of being shown only the headline/lede relative to the full article and compares effect sizes and 95 percent confidence intervals for the same linear regression model testing what covariates affect belief in misinformation in the control (Respondents have access to the full article) and treatment group (Respondents only are shown the headline/lede of the article) during Study III.
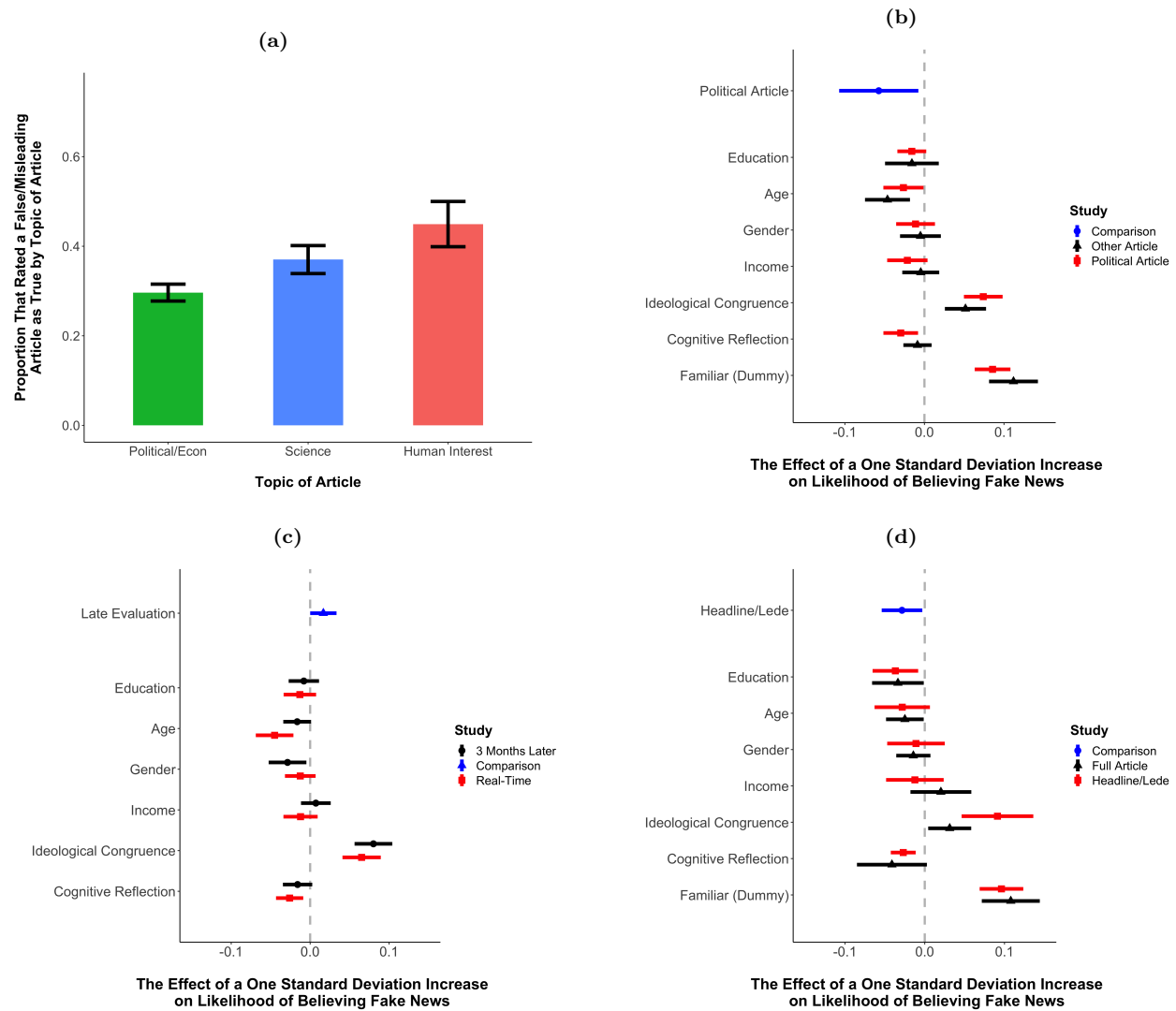
[38]Results from these models can be found in Section L of the Supplementary Materials.

Figure 4: This figure presents the effect of being shown only the headline/lede relative to the full article during Study IV. It also presents the effect sizes and 95 percent confidence intervals for the same linear regression model testing what covariates affect belief in misinformation in the control (Respondents have access to the full article) and treatment group (Respondents only shown the headline/lede of the article) during Study IV.

**The Effect of a One Standard Deviation Increase
on Likelihood of Believing Fake News**
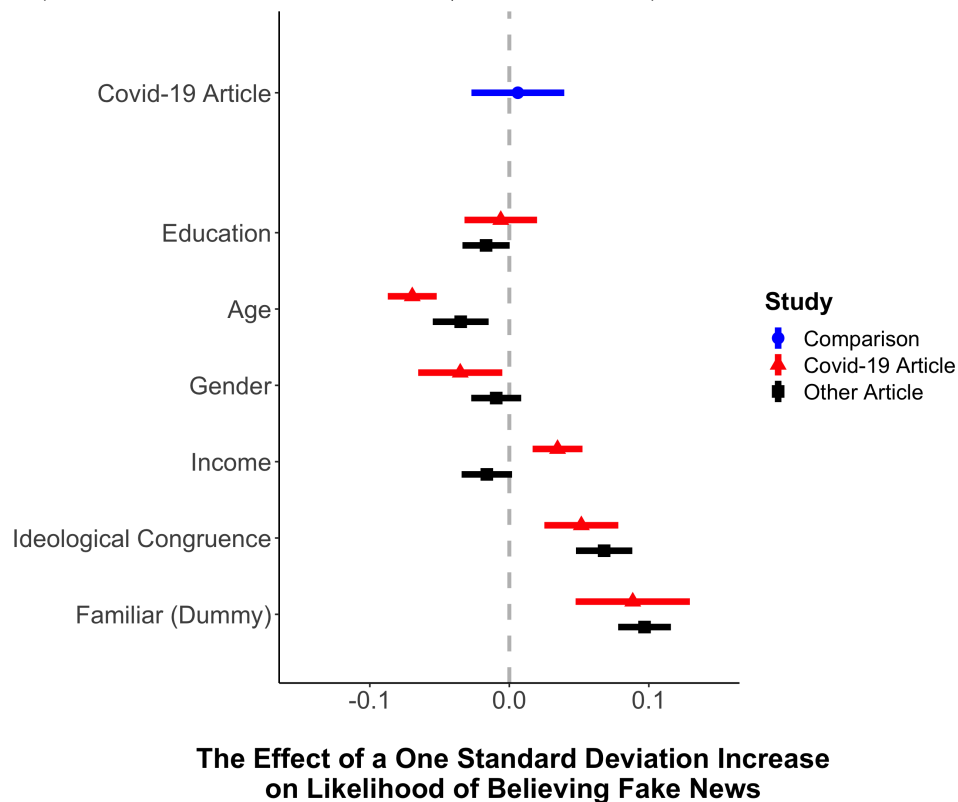
Study IV: Measuring the Effect of Only Showing Respondents the Headline?

In our final study, we ran an experiment (Study IV) in which we asked a different group of respondents to evaluate the same articles in the same 24-hour window, but respondents were restricted to the headline/lede rather than the full article. We estimate the treatment effect of being restricted to the headline/lede by fitting the same OLS regression model as in the previous section. In Figure 4 we present the treatment effect of only being exposed to the headline/lede on the probability of believing misinformation.[39] Only being shown the headline reduced the probability respondents rated a false or misleading article as true by 0.055, which corresponds to a nearly 15% reduction relative to being shown a full article. We also find that when comparing who believes misinformation when given the full article relative to only the headline/lede, we find similar magnitudes of effects from different demographic factors, except for ideological congruence. It appears that association between ideological congruence and belief in misinformation is less than half as strong when respondents are only shown the headline/lede. Our results suggest that studies which only

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[39]Detailed results are provided in the Section H of the Supplementary Materials. As a robustness check, we also provide results from a logit specification of the model in Section H of the Supplementary Materials. Results from the same OLS model, but with a veracity scale, instead of categorical measure of belief is provided in Section H of the Supplementary Materials. Results from these analyses lead to substantively similar conclusions.

measure belief in headline/ledes of misinformation likely underestimate the level of belief in misinformation and the effect of ideological congruence on belief in misinformation.

Discussion

Using a novel approach for collecting evaluations of popular news in real-time, we find high levels of belief in misinformation. Across Study I, which included 3,394 evaluations of false or misleading article from 2,751 unique respondents, we find that 33.2% of the time individuals viewed misinformation, they evaluated it as true. This level of belief in misinformation is 50% higher than previous work has suggested. When asked to evaluate four or more pieces of popular misinformation, over 90% of respondents believed at least one piece of misinformation. Alarmingly, this level of belief extended to misinformation about Covid-19 in the early months of the pandemic. Consistent with previous studies, we also identified a significant negative correlation between belief in misinformation and age, as well as a significant positive correlation between belief in misinformation and both familiarity and congruence with an article's ideological perspective.

We believe that past studies have underestimated belief in misinformation and the effect of these covariates due to four elements that we correct for in our study: limiting the sampling frame to political misinformation, not measuring the phenomenon in real time, restricting access to the headline/lede, and using hand-selected or synthetic pieces of misinformation. By only selecting political misinformation, research ignored the diversity of topics that appear "in the wild". By not measuring the phenomenon in real time, past studies measured belief in misinformation in an information context that was vastly different from the context in which individuals actually consumed that misinformation. By limiting the form of exposure to strictly the headline/lede, survey designs concealed information contained in the full article that individuals have access to when they normally consume misinformation.. Finally, by using hand-selected or synthetic pieces of misinformation—rather than the most popular pieces of misinformation—previous work measured belief in a likely less-read and unrepresentative sample of misinformation. Taken together, these elements introduced concerns regarding the ecological and external validity of these results, which we address in our novel study design.

The importance of research design also applies to a similar line of scholarly inquiry that tests the efficacy of interventions designed to reduce belief in or the spread of misinformation (Vraga and Bode 2017; P. Moravec, Minas, and Dennis 2018; Clayton et al. 2019; Guess, Lerner, et al. 2020). These studies are crucial to reducing the harms of the digital media environment, but without testing interventions using a design that mirrors online environments, measurement of their efficacy may run into similar challenges. We show that reported effects change when the survey instrument more closely mimics real-world conditions, and there is

no reason to believe this would not also be the case in measuring the effectiveness of interventions.

In sum, our study, which introduces a transparent and replicable survey design, finds that current studies in the field are likely underestimating the level of belief in misinformation, the negative effect of age, and the positive effect of ideological congruence. This design, informed by recent innovations in the study of exposure to and consumption of online information, improves our ability to mimic the environment in which individuals are exposed to online misinformation online. A key feature of this design is the ease which it can be adopted and updated with new sources and media types for future research, providing much more consistent and comparable results across studies and with greater explanatory power for belief in online misinformation.

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Supplementary Materials: A New Approach To Measuring Belief in Misinformation

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Contents

A Article Selection Process

A.1 Mainstream Sources

Mainstream Liberal News Sites:

- Yahoo News
- The New York Times
- The Huffington Post
- NBC News
- Politico
- CNN
- The Washington Post
- The Guardian
- USA Today
- CBS News

Mainstream Conservative News Sites:[1]

- Fox News
- The New York Post
- Real Clear Politics
- IJR
- The Washington Times
- CNBC
- The Wall Street Journal
- Newsmax
- Townhall

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[1]Note that the conservative news group contains only nine websites. The Drudge report did not have a Facebook page, and therefore could not be followed on CrowdTangle. Since there were only ten conservative leaning websites in the top 100 list, we used the only nine that had Facebook pages.

A.2 Low-Quality Sources

Table 1: Low-Quality Conservative Sources

Number	Domain
1	dailywire.com
2	dailycaller.com
3	express.co.uk
4	redstatewatcher.com
5	thepoliticalinsider.com
6	thefederalistpapers.org
7	rightwingnews.com
8	madworldnews.com
9	yournewswire.com
10	uschronicle.com
11	louderwithcrowder.com
12	100percentfedup.com
13	angrypatriotmovement.com
14	ilovemyfreedom.org
15	clashdaily.com
16	joeforamerica.com
17	conservativedailypost.com
18	americasfreedomfighters.com
19	babylonbee.com
20	teaparty.org
21	judicialwatch.org
22	conservativepost.com
23	thegatewaypundit.com
24	infowars.com
25	eaglerising.com
26	en-volve.com
27	wnd.com
28	bb4sp.com
29	concealednation.org
30	theconservativetreehouse.com
31	dcclothesline.com
32	conservativefiringline.com
33	frontpagemag.com
34	endtimeheadlines.org
35	downtrend.com
36	nowtheendbegins.com
37	wearechange.org
38	neonnettle.com
39	powderedwigsociety.com
40	americanjournalreview.com
41	thehornnews.com
42	barenakedislam.com
43	rickwells.us

Table 2: Low-Quality Conservative Sources (Continued)

Number	Domain
44	ahtribune.com
45	ipatriot.com
46	afa.net
47	eutimes.net
48	thepeoplescube.com
49	stateofthenation2012.com
50	fellowshipoftheminds.com
51	trunews.com
52	freerepublic.com
53	mediamass.net
54	endoftheamericandream.com
55	2ndvote.com
56	iotwreport.com
57	puppetstringnews.com
58	dailyheadlines.net
59	thenationalpatriot.com
60	rogue-nation3.com
61	veteransfordonaldtrump.com

Table 3: Low-Quality Liberal Sources

Number	Domain
1	occupydemocrats.com
2	bipartisanreport.com
3	palmerreport.com
4	crooksandliars.com
5	democraticunderground.com
6	halfwaypost.com

Table 4: Low-Quality Unclear Sources

Number	Domain
1	ijr.com
2	anonhq.com
3	inquisitr.com
4	worldtruth.tv
5	collective-evolution.com
6	tribunist.com
7	naturalnews.com
8	worldnewsdailyreport.com
9	trueactivist.com
10	firstpost.com
11	zerohedge.com
12	disclose.tv
13	dailysnark.com
14	postcard.news
15	higherperspectives.com
16	dailypost.ng
17	davidwolfe.com
18	noticias-frescas.com
19	healthnutnews.com
20	beforeitsnews.com
21	truthuncensored.net
22	awarenessact.com
23	duffelblog.com
24	nation.com.pk
25	actualidadpanamericana.com
26	themindunleashed.com
27	huzlers.com
28	dennismichaellynch.com
29	rearfront.com
30	actualite.co
31	activistpost.com
32	newzmagazine.com
33	12minutos.com
34	dailyoccupation.com
35	newsrescue.com
36	the-postillon.com
37	burrardstreetjournal.com
38	empirenews.net
39	medicalkidnap.com
40	friendsofsyria.wordpress.com
41	realnewsrightnow.com
42	adobochronicles.com
43	anonews.co

Table 5: Low-Quality Unclear Sources (Continued)

Number	Domain
44	thenationalmarijuananews.com
45	en.mediamass.net
46	daily-sun.com
47	whatdoesitmean.com
48	therooster.com
49	thelastamericanvagabond.com
50	stillnessinthestorm.com
51	independentminute.com
52	newsbiscuit.com
53	attitude.co.uk
54	onlysimchas.com
55	dailyfeed.news
56	newsjustforyou1.blogspot.com
57	thebreakingnews.co
58	usanewstoday.com

A.3 Measuring Variables of Interest

Cognitive Reflection: Cognitive Reflection is measured using four questions from a cognitive reflection test used by Thomson and Oppenheimer (2016). Each respondent answers this set of questions once. The variable starts at 0 and one unit is added to the variable for each correct answer (A value of one is assigned to this variable if the respondent has one correct answer ; A value of two is assigned to this variable if the respondent has two correct answers, etc.).

Digital Literacy: Digital literacy is measured by asking for respondent's familiarity with the following terms: Phishing ; Hashtag ; Preference Setting ; Wiki ; PDF ; Malware ; RSS ; BCC (on email) ; Tablet ; Tagging. We ask them for their familiarity on a five point scale (1 representing no understanding and 5 representing full understanding). The digital literacy score for each respondent is the average of the scores across these categories.

Ideology of respondent: We ask individuals to self-identify their ideology using the following question. The score they receive on the ideological scale is in parentheses next to the answer they give.

Question: Where would you place yourself on this scale?

(A) Extremely Conservative (3)
(B) Conservative (2)
(C) Slightly Conservative (1)
(D) Moderate (0)
(E) Slightly Liberal (-1)
(F) Liberal (-2)
(G) Extremely Liberal (-3)
(H) Haven't Thought Much About it (NA)

Education: We ask individuals to self-identify their highest degree earned and attribute the following numeric value to each answer: No High School education (0) ; High School Education (1) ; Associates Degree (2) ; Bachelors Degree (3) ; Masters Degree (4) ; Doctorate Degree

Income: We ask individuals to self-identify their income from last year and attribute the following numeric value to each answer: $0 - $50,000 (0) ; $50,000 - $100,000 (1) ; $100,000 - $150,000 (2) ; $150,000 plus (3)

Familiarity with an Article: For each article we ask the respondent the following question.
Have you seen or heard of this story before?
(A) Yes
(B) No
(C) Not Sure

If a respondent answers "Yes", they are familiar with the story and the variable $Familiarity\_Dummy_{ij}$ is assigned a value of 1. Otherwise it is assigned a zero.

A.4 Partisan Lean of The Source

We determine the partisan lean of the low-quality domains by asking three independent coders to determine the partisan perspective of the website (conservative, liberal, and unclear). Coders were asked to use the headlines, the content of its articles, as well as the websites domain and about page to make this determination, and to classify websites that had a clear partisan affiliation based on this information accordingly. Websites were not classified as liberal or conservative unless at least 50% of their content appeared to have a partisan or political nature. If websites did not meet this threshold they were classified as unclear. If the coders did not unanimously agree a fourth coder was asked to evaluate the website, and the majority decision was used (split cases were included as active). There was over 75% level agreement among the coders and we can report a .705 Fleiss' Kappa. In total, six domains were placed in the liberal low-quality news stream, fifty domains were placed in the conservative low-quality news stream, and forty-three domains were placed in the unclear low-quality news stream. The prevalence of conservative and unclear low-quality news streams is in line with previous research that provides evidence for the asymmetric production of false/misleading news (Guess, Nyhan, and Reifler 2020).

B Articles

B.1 Articles Selected for Studies I and III

Table 6: Headlines for Articles Chosen from the Low Quality Liberal News Stream in Studies I and III

	Date	Headline	Modal Fact Checker Rating	Topic	Lean of Article
1	11/18/19	Doctor Tells CNN Trump's Walter Reed Medical Visit Was Fishy	False/Misleading	Political/Economy	Liberal
2	11/19/19	Rudy Giuliani has completely berserk meltdown as Feds close in on him	No Mode	Political/Economy	Liberal
3	11/20/19	Lt. Col. Vindman: 'This Is America...Here, Right Matters'	True	Political/Economy	Liberal
4	11/21/19	Sondland's testimony directly implicates Trump, Pence and Pompeo in Ukraine quid pro quo plot	True	Political/Economy	Liberal
5	12/2/19	Senator Announces Impeach Vote Hint That Has Trump Fuming	No Mode	Political/Economy	Liberal
6	12/3/19	The sealed "Indictment A" that Donald Trump needs to worry about more than ever	False/Misleading	Political/Economy	Liberal
7	12/4/19	Devin Nunes Shamelessly Lies When Hannity Asks About Lev Parnas	False/Misleading	Political/Economy	Liberal
8	12/5/19	Trump caught by reporters patting himself on back for insulting Justin Trudeau	True	Political/Economy	Liberal
9	12/9/19	Ex-Intel Slam Trump For Sucking Up To Saudis After Navy Shooting	True	Political/Economy	Liberal
10	12/10/19	Nancy Pelosi knows something we don't	False/Misleading	Political/Economy	Neutral
11	12/11/19	Tucker Carlson's White Power Hour Guest: AOC's District Is The 'Least American'	True	Political/Economy	Liberal
12	12/12/19	Bush's ethics chief: Trumps are an "organized crime family," we need to "go after all of them"	True	Political/Economy	Liberal
13	12/16/19	Trump Attacks Congresswoman For Not Having His Back	True	Political/Economy	Liberal
14	12/17/19	Donald Trump caught retweeting bizarre fake account	No Mode	Political/Economy	Liberal
15	12/18/19	No Punches Pulled In Climate-Themed Campaign Ad	True	Political/Economy	Liberal
16	12/19/19	Shaken Trump vows Democrats will see backlash at "the box office" after impeachment verdict	True	Political/Economy	Liberal
17	1/6/20	Schiff Hammers President & GOP Over Impeachment Trial Obstruction	True	Political/Economy	Liberal
18	1/7/20	Everything is falling apart for Donald Trump in real time	True	Political/Economy	Liberal
19	1/8/20	Trump bewilders nation by tweeting "all is well" and "so far so good" after Iran's missile strike	True	Political/Economy	Liberal
20	1/9/20	John Bolton Will Testify If Subpoenaed, So Why Aren't House Dems Doing That?	No Mode	Political/Economy	Liberal
21	1/13/20	New Trump Approval Poll Released Confirms Massive 2020 Blue Wave	False/Misleading	Political/Economy	Liberal
22	1/14/20	Donald Trump's GOP Senate allies have just been backed into a no-win corner	No Mode	Political/Economy	Liberal
23	1/15/20	Newly released texts from Giuliani collaborator appear to show them stalking Amb. Yovanovich	True	Political/Economy	Liberal
24	1/21/20	Even C-SPAN Is Cut Off From Covering Senate Impeachment Trial	True	Political/Economy	Liberal
25	1/22/20	Schiff Opening Impeachment Trial Statement To Go Down In History	True	Political/Economy	Liberal
26	1/23/20	Donald Trump just screwed up and blew a gaping hole in his own impeachment trial strategy	No Mode	Political/Economy	Liberal
27	1/27/20	Damning potential John Bolton Ukraine impeachment testimony revealed in early leak of book draft	True	Political/Economy	Liberal
28	1/28/20	Joni Ernst Gives Away The Ballgame On Joe Biden	No Mode	Political/Economy	Liberal
29	2/4/20	Donald Trump's sham acquittal is already blowing up in Senate Republicans' faces	No Mode	Political/Economy	Liberal
30	2/5/20	Susan Collins Betrays The Country With Vote To Acquit	True	Political/Economy	Liberal
31	2/6/20	Jennifer Granholm Catches Rick Santorum Shamelessly Lying About Pre-Existing Conditions	False/Misleading	Political/Economy	Liberal

Table 7: Headlines for Articles Chosen from the Low Quality Conservative News Stream in Studies I and III

	Date	Headline	Modal Fact Checker Rating	Topic	Lean of Article
1	11/18/19	KANYE WEST AND HIS SUNDAY SERVICE SHOW PERFORM WITH ILLUMINATI ALL-SEEING EYE OF HORUS STAGE SET AT LAKEWOOD CHURCH TO SOLD OUT CROWD	False/Misleading	Human Interest	Unclear
2	11/19/19	Schiff Named in WH Official's Defamation Lawsuit, Leaked Lies To Politico To Push Impeachment	False/Misleading	Political/Economy	Conservative
3	11/20/19	No Shots Fired! Citizen with a Gun Ends Gunman's Attack at Oklahoma Walmart	False/Misleading	Political/Economy	Conservative
4	11/21/19	Indictment Against Head Of Burisma Reveals 'Hunter Biden Was Receiving Payments From Money Raised Through Criminal Means, Siphoned, Laundered From Ukraine'	False/Misleading	Political/Economy	Conservative
5	12/2/19	Montana Gov. Bullock Drops Out Of 2020 Presidential Race	True	Political/Economy	Neutral
6	12/3/19	Donald Trump SLAMS Corbyn's NHS lies 'We want nothing to do with it!'	False/Misleading	Political/Economy	Neutral
7	12/4/19	In 2018, 86% of Those Arrested for Violent Crime in Los Angeles Were Non-White (5% Were White): the City Is 28% White	False/Misleading	Political/Economy	Conservative
8	12/5/19	DING! DING! DING! First Muslim woman elected to Pennsylvania House of Representatives has been ARRESTED for stealing $500,000 from a charity	True	Political/Economy	Conservative
9	12/9/19	NEVER TRUMPER RICK WILSON SUGGESTS PUTTING ANTI-VAXXERS IN "RE-EDUCATION CAMPS"	True	Political/Economy	Conservative
10	12/10/19	Breaking: Ukrainian Official Reveals Six Criminal Cases Opened In Ukraine Involving The Bidens	False/Misleading	Political/Economy	Conservative
11	12/11/19	Ukraine Advisor Disputes Key Point In Impeachment Testimony — Is This Bad News For Democrats?	False/Misleading	Political/Economy	Conservative
12	12/12/19	NYC's De Blasio Deports Thousands of Homeless Families Across America	False/Misleading	Political/Economy	Conservative
13	12/16/19	Trans Activists Target Olympic Cyclist Inga Thompson For Saying Women Shouldn't Have To Compete With Biological Men	False/Misleading	Human Interest	Conservative
14	12/17/19	Back Home In Pelosi's San Francisco: Homeless Drug Addicts Are Now Taking Dumps In The Supermarket Aisles	False/Misleading	Political/Economy	Conservative
15	12/18/19	Video of the Day: Dem Rep Raskin thanks Congressman helping form rules for sham impeachment of Trump who was impeached for bribery	False/Misleading	Political/Economy	Conservative
16	12/19/19	These Democrats Voted AGAINST Impeaching Trump	False/Misleading	Political/Economy	Conservative
17	1/6/20	NEARLY 200 PEOPLE ARRESTED ACROSS AUSTRALIA FOR DELIBERATELY STARTING BUSHFIRES	False/Misleading	Science	Conservative
18	1/7/20	Iran stampede: '35 dead' and dozens injured after huge crush at Qassem Soleimani funeral	True	Political/Economy	Neutral
19	1/8/20	Muslim Teen Accused Of Starting Aussie Grass Fire Laughs As He Leaves Court On Tuesday	False/Misleading	Science	Conservative
20	1/9/20	Third busiest abortion facility in Massachusetts could soon shut its doors	True	Political/Economy	Conservative
21	1/13/20	Why Are Volcanoes All Over The Globe Suddenly Shooting Giant Clouds Of Ash Miles Into The Air?	False/Misleading	Science	Neutral
22	1/14/20	Wisconsin Judge Orders Up to 209,000 Listings Purged from Voter Rolls — Finds 3 in Contempt, Orders Fines for Delay	True	Political/Economy	Conservative
23	1/15/20	Bloomberg Draws Paltry Crowd Of 45 At Heavily Advertised Rally	Could Not Determine	Political/Economy	Conservative
24	1/21/20	Pentagon bans Bible verses on dog tags, while Pres. Trump upholds right to pray in public schools	False/Misleading	Political/Economy	Conservative
25	1/22/20	LEAKED FRENCH INTERNAL INTELLIGENCE REPORT CLAIMS 150 NEIGHBORHOODS 'HELD' BY RADICAL ISLAMISTS	No Mode	Political/Economy	Conservative
26	1/23/20	Coronavirus outbreak: China seals off SECOND major city - 18m people on lockdown	True	Science	Neutral
27	1/27/20	Lawmakers Pushing to Make Michigan a 2nd Amendment Sanctuary STATE	True	Political/Economy	Conservative
28	1/28/20	Holy Moses! More Than 175,000 Tickets Requested To See President Trump In New Jersey — Supporters Line Up 48 Hours Early	False/Misleading	Political/Economy	Conservative
29	2/4/20	Ilhan Omar's Dirty Money Hustle Blows Wide Open, Reports Say She Gave 40% Of Her Campaign Spending Went To Loverboy's Firm	False/Misleading	Political/Economy	Conservative
30	2/5/20	DEMS RELEASE ONLY 62% OF IOWA CAUCUS RESULTS — JUST ENOUGH TO HAVE 'MAYOR CHEAT' IN THE LEAD	False/Misleading	Political/Economy	Conservative
31	2/6/20	John Kerry Says That The ENTIRE Obama Admin Was Trying To Get Rid Of The Burisma Prosecutor	No Mode	Political/Economy	Conservative

Table 8: Headlines for Articles Chosen from the Mainstream Conservative News Stream in Studies I and III

	Date	Headline	Modal Fact Checker Rating	Topic	Lean of Article
1	11/18/19	Hyundai launches car with a roof-based solar charging system	True	Science	Neutral
2	11/19/19	Pelosi: Trump 's Actions 'Worse' Than Nixon	True	Political/Economy	Neutral
3	11/20/19	Key impeachment witness dodges GOP questions to protect whistleblower	True	Political/Economy	Neutral
4	11/21/19	Smollet Claims He Suffered 'Extreme Emotional Distress' in Malicious Prosecution Lawsuit Against Chicago	True	Human Interest	Neutral
5	12/2/19	'F–K WHITE PEOPLE' graffiti found outside Queens home	True	Human Interest	Neutral
6	12/3/19	Marine veteran turned congressional candidate calls Kaepernick a 'national disgrace'	True	Political/Economy	Conservative
7	12/4/19	Devin Nunes slaps CNN with $435 million defamation lawsuit	True	Political/Economy	Neutral
8	12/5/19	Angry Melania Slams Impeachment Witness for Joking About Son	True	Political/Economy	Conservative
9	12/9/19	Walmart apologizes for sweater featuring Santa with cocaine	True	Human Interest	Neutral
10	12/10/19	Joe Biden Claims No One Told Him About Potential Conflict of Interest With Hunter's Job at Burisma	True	Political/Economy	Conservative
11	12/11/19	House Democrats announce articles of impeachment against Trump: Abuse of power, obstruction of Congress	True	Political/Economy	Neutral
12	12/12/19	Pastors, worship leaders pray for Trump in Oval Office amid impeachment fight	True	Political/Economy	Conservative
13	12/16/19	I was wrong': James Comey admits 'real sloppiness' in Russia probe	True	Political/Economy	Unclear
14	12/17/19	Schiff Says He Would Vote to Impeach Obama If He Engaged in Similar Conduct	True	Political/Economy	Neutral
15	12/18/19	Teen Karol Sanchez staged her own Bronx kidnapping: police sources	True	Human Interest	Neutral
16	12/19/19	President Trump is impeached in a historic vote by the House, will face trial in the Senate	True	Political/Economy	Neutral
17	1/6/20	Ricky Gervais blasts Hollywood figures as unprincipled, ignorant at Golden Globes	True	Human Interest	Neutral
18	1/7/20	Pelosi Says the House Will Vote on a Resolution to Limit Trump's Military Actions Regarding Iran	True	Political/Economy	Neutral
19	1/8/20	Climate Change? Turns Out Two Dozen Arrested for Setting Australia's Fires	False/Misleading	Science	Conservative
20	1/9/20	Cardi B bashes Trump, says she's seeking Nigerian citizenship amid tensions with Iran	True	Political/Economy	Neutral
21	1/13/20	Bill Gates: My $109 billion net worth shows the economy is not fair	True	Political/Economy	Neutral
22	1/14/20	Trump, first lady cheered at national championship game	True	Political/Economy	Neutral
23	1/15/20	President Trump Gets Thunderous Applause at Clemson and LSU National Championship Game	True	Political/Economy	Conservative
24	1/21/20	Virginia's Capitol flooded with gun rights activists for Second Amendment rally	True	Political/Economy	Conservative
25	1/22/20	CDC confirms first US case of coronavirus that has killed 9 in China	True	Science	Neutral
26	1/23/20	Three US firefighters killed in plane crash while battling wildfires in Australia	True	Science	Neutral
27	1/27/20	Coronavirus may have originated in lab linked to China's biowarfare program	No Mode	Science	Neutral
28	1/28/20	Dershowitz calls out House Dems in Trump's Senate impeachment trial after Bolton shock waves	True	Political/Economy	Conservative
29	2/4/20	Democratic White House Race off to Messy Start as 'Inconsistencies' Delay Iowa Results	True	Political/Economy	Neutral
30	2/5/20	Macy's to close 125 stores, cut 2,000 corporate jobs, in hunt for growth	True	Political/Economy	Neutral
31	2/6/20	Trump acquitted on all charges in Senate impeachment trial	True	Political/Economy	Neutral

Table 9: Headlines for Articles Chosen from the Mainstream Liberal News Stream in Studies I and III

	Date	Headline	Modal Fact Checker Rating	Topic	Lean of Article
1	11/18/19	10 shot, four killed at family gathering in Fresno, California	True	Human Interest	Neutral
2	11/19/19	Kanye West calls himself "greatest artist that God has ever created" during Joel Osteen service	True	Human Interest	Neutral
3	11/20/19	Woman Saves Scorched Koala From Bushfire With Shirt Off Her Own Back	True	Science	Neutral
4	11/21/19	Almaas Elman, Somali-Canadian Activist, Is Shot Dead in Mogadishu	True	Political/Economy	Neutral
5	12/2/19	White House will not participate in Wednesday's impeachment hearing	True	Political/Economy	Neutral
6	12/3/19	Duncan Hunter To Plead Guilty In Campaign Finance Case He Called 'Witch Hunt'	True	Political/Economy	Neutral
7	12/4/19	Kamala Harris Dropping Out Of Presidential Race	True	Political/Economy	Neutral
8	12/5/19	'He Showed Us Life': Japanese Doctor Who Brought Water to Afghans Is Killed	True	Human Interest	Neutral
9	12/9/19	Caroll Spinney, legendary 'Sesame Street' puppeteer of Big Bird, dies at 85	True	Human Interest	Neutral
10	12/10/19	Megan Rapinoe is Sports Illustrated's Sportsperson of the Year, only the fourth woman chosen alone	True	Human Interest	Neutral
11	12/11/19	Police Chief Tears Into Ted Cruz, McConnell For Caring More About NRA Than Gun Victims	True	Political/Economy	Neutral
12	12/12/19	Donald Trump Jr killed rare endangered sheep in Mongolia with special permit	True	Other	Liberal
13	12/16/19	Black Women Now Hold Crowns in 5 Major Beauty Pageants	True	Human Interest	Neutral
14	12/17/19	Barack Obama: Women Ruling All Nations Would Improve 'Just About Everything'	True	Political/Economy	Neutral
15	12/18/19	Police investigating whether teen staged her own kidnapping in Bronx	True	Human Interest	Neutral
16	12/19/19	House impeaches Trump for abuse of power and obstruction in historic rebuke	True	Political/Economy	Neutral
17	1/6/20	Mike Pence Slammed After Falsely Linking Qassem Soleimani To 9/11	True	Political/Economy	Liberal
18	1/7/20	Pentagon Rules Out Striking Iranian Cultural Sites, Contradicting Trump	True	Political/Economy	Liberal
19	1/8/20	All is well,' Trump tweets after Iran targets U.S. forces in missile attack in Iraq	True	Political/Economy	Neutral
20	1/9/20	Ruth Bader Ginsburg says she is cancer-free	True	Political/Economy	Neutral
21	1/13/20	Serena Williams wins first title in 3 years — and donates prize money to Australia wildfire relief	True	Human Interest	Neutral
22	1/14/20	The first Obama-backed documentary receives an Oscar nomination	True	Human Interest	Neutral
23	1/15/20	More than 50 injured after Delta jet dumps fuel on L.A. schools during midair emergency	True	Human Interest	Neutral
24	1/21/20	Katie Sowers Is The First Female And Openly Gay Person To Coach In A Super Bowl	True	Human Interest	Neutral
25	1/22/20	Weather service issues alert for falling iguanas as temperatures drop in Florida	True	Science	Neutral
26	1/23/20	Half of Americans don't know 6m Jews were killed in Holocaust, survey says	True	Political/Economy	Neutral
27	1/27/20	Kobe Bryant's Daughter Gianna, 13, Dead Alongside Father in Calabasas Helicopter Crash	True	Human Interest	Neutral
28	1/28/20	Today really hurts': Families, friends remember those who died in Kobe Bryant crash	True	Human Interest	Neutral
29	2/4/20	State of the Union 2020: Trump addresses nation just before expected acquittal by Senate	True	Political/Economy	Neutral
30	2/5/20	Nancy Pelosi rips up copy of State of the Union speech from Trump	True	Political/Economy	Neutral
31	2/6/20	Kirk Douglas, Hollywood legend and star of Spartacus, dies aged 103	True	Human Interest	Neutral

Table 10: Headlines for Articles Chosen from the Low Quality Unclear News Stream in Study I and III

	Date	Headline	Modal Fact Checker Rating	Topic	Lean of Article
1	11/18/19	Family Facing Jail for Living in RV on Their Own Property to Repair Home After Fire	True	Human Interest	Conservative
2	11/19/19	Shooter Commits Suicide After Being Confronted by Armed Citizen at OK Walmart	False/Misleading	Human Interest	Neutral
3	11/20/19	Pounds lost doesn't mean FAT lost: You CAN lose up to 2 pounds of fat a month – but it takes consistency and patience	False/Misleading	Science	Neutral
4	11/21/19	Ukrainian MP Claims $7.4 Billion Obama-Linked Laundering, Puts Biden Group Take At $16.5 Million	False/Misleading	Political/Economy	Conservative
5	12/2/19	Bestselling Novelist Who Wrote About Vaccine Industry Deception Found Dead	False/Misleading	Human Interest	Unclear
6	12/3/19	Americans Bought Enough Guns on Black Friday to Arm the Marine Corps – Yet Again!	True	Political/Economy	Unclear
7	12/4/19	Ukrainian Neo-Nazis Help Out at Hong Kong Riots, Pan-Democrats Defend Them	Could Not Determine	Political/Economy	Unclear
8	12/5/19	China Repeats US Must Reduce Tariffs For "Phase One" Trade Deal	True	Political/Economy	Neutral
9	12/9/19	Biden Denies Wrongdoing in Ukraine During Testy Interview	True	Political/Economy	Conservative
10	12/10/19	Stressed to the Max? Deep Sleep Can Rewire the Anxious Brain	True	Science	Neutral
11	12/11/19	Since Feeding the Homeless is Illegal, Activists Carry AR-15s to Give Out Food, Supplies	False/Misleading	Political/Economy	Conservative
12	12/12/19	Russia's Only Aircraft Carrier Has Erupted In Flames	True	Political/Economy	Neutral
13	12/16/19	Trump Poised This Week to Become Third U.S. President Impeached	True	Political/Economy	Neutral
14	12/17/19	Kansas City Makes Public Transportation Free, Become The First Major City In The U.S. To Make This Progressive Change	No Mode	Political/Economy	Liberal
15	12/18/19	Wall Street Journal Investigation Finds Amazon.com Selling Dumpster Trash Food & Supplements As New	No Mode	Science	Neutral
16	12/19/19	UN Peacekeepers Fathered Hundreds of Babies With Girls in Haiti as Young as 11	True	Political/Economy	Conservative
17	1/6/20	Senate Republican Eyes Rule Change to Kick Start Trump Impeachment Trial	True	Political/Economy	Neutral
18	1/7/20	Iran Evaluating 13 Retaliation Scenarios To Inflict "Historic Nightmare" On US	True	Political/Economy	Conservative
19	1/8/20	Key Brain Region Smaller in Birth Control Pill User	True	Science	Neutral
20	1/9/20	The US Military Pollutes More 140 Countries Combined	True	Science	Liberal
21	1/13/20	Alaska man survives three weeks with little food and shelter	True	Human Interest	Neutral
22	1/14/20	Boeing Mocked Lion Air "Idiots" For Requesting Extra Training For 737 MAX	True	Human Interest	Unclear
23	1/15/20	300 Vultures Occupy Border Patrol Tower, Covering It With "Corrosive" Feces & Vomit	True	Human Interest	Neutral
24	1/21/20	PUNISHING ECONOMY: San Fran's Democrat tyrants double down on closed businesses, taxing landlords for leaving stores vacant	False/Misleading	Political/Economy	Conservative
25	1/22/20	Another Supposedly Authentic Photo Of A UFO & The Story Behind It	No Mode	Human Interest	Neutral
26	1/23/20	China Quarantines 3rd City As Wuhan Virus Spreads To Singapore	True	Science	Neutral
27	1/27/20	Nature Science Journal Warned About "Pathogens Escaping" Wuhan Level-4 Biosafety Lab (BSL-4) Before Coronavirus Outbreak	False/Misleading	Science	Unclear
28	1/28/20	Death Tolls Rises to 106 as 1,000 Americans Try to Evacuate From Coronavirus-Infected Wuhan	True	Science	Neutral
29	2/4/20	The Coronavirus Was Engineered By Scientists In A Lab Using Well Documented Genetic Engineering Vectors That Leave Behind A "Fingerprint"	False/Misleading	Science	Unclear
30	2/5/20	Earth is About to Enter a 30-Year 'Mini Ice Age' as the Sun Hibernates, Scientist Warns	False/Misleading	Science	Unclear
31	2/6/20	The lies we are being told about the Coronavirus	False/Misleading	Science	Conservative

B.2 Articles Selected for Study II

Table 11: Headlines for Articles Chosen from the Low Quality Liberal News Stream in Study II

	Date	Headline	Modal Fact Checker Rating	Topic	Lean of Article
1	5/27/20	Only 1 state has met the federal government's criteria for reopening	False/Misleading	Science	Neutral
2	6/1/20	Republican Voters Don't Expect Trump To Mourn, Because They Gave Up On Empathy Long Ago	Could Not Determine	Political/Economy	Liberal
3	6/3/20	Communities Of Color Have Been Hit Hardest By COVID-19. Now Is The Time To Fix That	True	Political/Economy	Liberal
4	6/8/20	CDC: More Americans Drinking Cleaning Products Than Ever Before	No Mode	Science	Liberal
5	6/10/20	New Zealand Is COVID-Free; Prime Minister 'Did A Little Dance'	True	Science	Neutral
6	6/15/20	Larry Kudlow: Attendees Of Trump's Tulsa Rally Should 'Probably' Wear Masks	True	Political/Economy	Liberal
7	6/17/20	Trump Touts Aids Vaccine That Does Not Exist During Tuesday Meltdown	True	Political/Economy	Liberal
8	6/22/20	COVID Infection Spike In At Least 23 States, More Young People Testing Positive	True	Other	Liberal

Table 12: Headlines for Articles Chosen from the Low Quality Conservative News Stream in Study II

	Date	Headline	Modal Fact Checker Rating	Topic	Lean of Article
1	5/27/20	Like the Soviet-Styled KGB,' Armed Police Sent To Shut Down Black Baptist Church, Pastor Says	False/Misleading	Political/Economy	Conservative
2	6/1/20	Trump pulls U.S. out of World Health Organization: Is the U.N. next?	False/Misleading	Political/Economy	Conservative
3	6/3/20	Leftie Governor Cooper Kills RNC Convention in Charlotte Due to COVID-19 Ñ Then Goes and Marches with Leftist Mob in Street (VIDEO)	False/Misleading	Political/Economy	Conservative
4	6/8/20	Forced' vaccinations will control your life, warns religious-liberty group	False/Misleading	Science	Neutral
5	6/10/20	Task Force: Expect a Spike in COVID Thanks to Protesters and Rioters	False/Misleading	Other	Conservative
6	6/15/20	CHINA LOCKS DOWN TEN MORE BEIJING NEIGHBORHOODS OVER NEW COVID-19 OUTBREAK AT WHOLESALE MARKET	True	Other	Neutral
7	6/17/20	Thousands Gather in NYC for 'Black Trans Lives Matter' Protest on Same Day Cuomo Threatens Businesses	True	Political/Economy	Conservative
8	6/22/20	Frightened' doctor warns against using hand dryers as they will spark coronavirus spike	True	Science	Neutral

Table 13: Headlines for Articles Chosen from the Low Quality Non-Partisan News Stream in Study II

	Date	Headline	Modal Fact Checker Rating	Topic	Lean of Article
1	5/27/20	Your ÒImmunity PassportÓ Future Begins To Materialize As Airlines Call For Digital ID Tracking Systems	False/Misleading	Science	Neutral
2	6/1/20	German Official Leaks Report Denouncing COVID-19 As "A Global False Alarm"	False/Misleading	Political/Economy	Conservative
3	6/3/20	CONTACT TRACING IN THE CIRCUS OF ROBOTS	False/Misleading	Other	Conservative
4	6/8/20	Bill Gates, The CDC, Fauci And Birx Now Totally Silent About The Mass Race Riots Across America Proves The COVID-19 Lockdown Was A Total Scam	False/Misleading	Other	Conservative
5	6/10/20	WHO Data Suggests ItÕs ÔVery RareÕ For COVID-19 To Spread Through Asymptomatic People	False/Misleading	Science	Conservative
6	6/15/20	Chinese Scientist, Escorted Out Of Canadian Biolab, Sent Deadly Viruses To Wuhan	False/Misleading	Science	Neutral
7	6/17/20	FOX: Cobb County man tests positive and negative for COVID-19 just hours apart	True	Science	Neutral
8	6/22/20	Dr. Meryl Nass Discovers Hydroxychloroquine Experiments Were Designed to Kill COVID Patients How Many Were Murdered?	False/Misleading	Science	Unclear

Table 14: Headlines for Articles Chosen from the Mainstream Conservative News Stream in Study II

	Date	Headline	Modal Fact Checker Rating	Topic	Lean of Article
1	5/27/20	House Republicans sue Pelosi in bid to stop proxy voting amid coronavirus concerns	True	Political/Economy	Neutral
2	6/1/20	Second wave of coronavirus infections could cause a worse economic disaster, experts warn	True	Political/Economy	Neutral
3	6/3/20	Hope: Top Italian Doctors Say COVID-19 is Losing Viral Potency, Becoming Less Deadly	True	Science	Neutral
4	6/8/20	As states reopen and protests rage, the coronavirus lays the foundation for a nasty second wave of infections this fall	True	Science	Neutral
5	6/10/20	Texas sees record number of coronavirus hospitalizations after state reopens	True	Other	Neutral
6	6/15/20	US coronavirus deaths could double, hit 200,000 by September: report	True	Science	Neutral
7	6/17/20	Scientists hail dexamethasone as Ômajor breakthroughÕ in treating coronavirus	True	Science	Neutral
8	6/22/20	U.S. reports more than 30,000 coronavirus cases two days straight, the highest number since May 1	True	Other	Neutral

Table 15: Headlines for Articles Chosen from the Mainstream Liberal News Stream in Study II

	Date	Headline	Modal Fact Checker Rating	Topic	Lean of Article
1	5/27/20	Fauci says he wears a mask to be a symbol of what 'you should be doing'	True	Science	Neutral
2	6/1/20	How a decade of privatisation and cuts exposed England to coronavirus	True	Political/Economy	Neutral
3	6/3/20	Trump slams North Carolina and says he's moving GOP convention elsewhere	True	Political/Economy	Neutral
4	6/8/20	With no active Covid-19 cases, New Zealand is lifting almost all its coronavirus restrictions	True	Other	Neutral
5	6/10/20	Majority of UK theatres and music venues 'face permanent shutdown'	True	Political/Economy	Neutral
6	6/15/20	Florida sees 2 consecutive days of 2,000-plus new COVID-19 cases as more beaches reopen	True	Other	Neutral
7	6/17/20	Trump Claims COVID-19 Will Go Away And That An AIDS Vaccine Exists. It Doesn't.	True	Political/Economy	Liberal
8	6/22/20	Trump trade adviser: Rally comment on reducing Covid testing was just a joke	True	Political/Economy	Liberal

B.3 Articles Selected for Study IV

Table 16: Headlines for Articles Chosen from the Low Quality Liberal News Stream in Study IV

	Date	Headline	Modal Fact Checker Rating	Topic	Lean of Article
1	1/8/20	Trump bewilders nation by tweeting "all is well" and "so far so good" after Iran's missile strike	True	Political/Economy	Liberal
2	1/9/20	John Bolton Will Testify If Subpoenaed, So Why Aren't House Dems Doing That?	No Mode	Political/Economy	Liberal
3	1/13/20	New Trump Approval Poll Released Confirms Massive 2020 Blue Wave	False/Misleading	Political/Economy	Liberal
4	1/14/20	Donald Trump's GOP Senate allies have just been backed into a no-win corner	No Mode	Political/Economy	Liberal
5	1/15/20	Newly released texts from Giuliani collaborator appear to show them stalking Amb. Yovanovich	True	Political/Economy	Liberal
6	1/21/20	Even C-SPAN Is Cut Off From Covering Senate Impeachment Trial	True	Political/Economy	Liberal
7	1/22/20	Schiff Opening Impeachment Trial Statement To Go Down In History	True	Political/Economy	Liberal
8	1/23/20	Donald Trump just screwed up and blew a gaping hole in his own impeachment trial strategy	No Mode	Political/Economy	Liberal
9	1/27/20	Damning potential John Bolton Ukraine impeachment testimony revealed in early leak of book draft	True	Political/Economy	Liberal
10	1/28/20	Joni Ernst Gives Away The Ballgame On Joe Biden	No Mode	Political/Economy	Liberal

Table 17: Headlines for Articles Chosen from the Low Quality Conservative News Stream in Study IV

	Date	Headline	Modal Fact Checker Rating	Topic	Lean of Article
1	1/8/20	Muslim Teen Accused Of Starting Aussie Grass Fire Laughs As He Leaves Court On Tuesday	False/Misleading	Science	Conservative
2	1/9/20	Third busiest abortion facility in Massachusetts could soon shut its doors	True	Political/Economy	Conservative
3	1/13/20	Why Are Volcanoes All Over The Globe Suddenly Shooting Giant Clouds Of Ash Miles Into The Air?	False/Misleading	Science	Neutral
4	1/14/20	Wisconsin Judge Orders Up to 209,000 Listings Purged from Voter Rolls — Finds 3 in Contempt, Orders Fines for Delay	True	Political/Economy	Conservative
5	1/15/20	Bloomberg Draws Paltry Crowd Of 45 At Heavily Advertised Rally	Could Not Determine	Political/Economy	Conservative
6	1/21/20	Pentagon bans Bible verses on dog tags, while Pres. Trump upholds right to pray in public schools	False/Misleading	Political/Economy	Conservative
7	1/22/20	LEAKED FRENCH INTERNAL INTELLIGENCE REPORT CLAIMS 150 NEIGHBORHOODS 'HELD' BY RADICAL ISLAMISTS	No Mode	Political/Economy	Conservative
8	1/23/20	Coronavirus outbreak: China seals off SECOND major city - 18m people on lockdown	True	Science	Neutral
9	1/27/20	Lawmakers Pushing to Make Michigan a 2nd Amendment Sanctuary STATE	True	Political/Economy	Conservative
10	1/28/20	Holy Moses! More Than 175,000 Tickets Requested To See President Trump In New Jersey — Supporters Line Up 48 Hours Early	False/Misleading	Political/Economy	Conservative

Table 18: Headlines for Articles Chosen from the Mainstream Conservative News Stream in Study IV

	Date	Headline	Modal Fact Checker Rating	Topic	Lean of Article
1	1/8/20	Climate Change? Turns Out Two Dozen Arrested for Setting Australia's Fires	False/Misleading	Science	Conservative
2	1/9/20	Cardi B bashes Trump, says she's seeking Nigerian citizenship amid tensions with Iran	True	Political/Economy	Neutral
3	1/13/20	Bill Gates: My $109 billion net worth shows the economy is not fair	True	Political/Economy	Neutral
4	1/14/20	Trump, first lady cheered at national championship game	True	Political/Economy	Neutral
5	1/15/20	President Trump Gets Thunderous Applause at Clemson and LSU National Championship Game	True	Political/Economy	Conservative
6	1/21/20	Virginia's Capitol flooded with gun rights activists for Second Amendment rally	True	Political/Economy	Conservative
7	1/22/20	CDC confirms first US case of coronavirus that has killed 9 in China	True	Science	Neutral
8	1/23/20	Three US firefighters killed in plane crash while battling wildfires in Australia	True	Science	Neutral
9	1/27/20	Coronavirus may have originated in lab linked to China's biowarfare program	No Mode	Science	Neutral
10	1/28/20	Dershowitz calls out House Dems in Trump's Senate impeachment trial after Bolton shock waves	True	Political/Economy	Conservative

Table 19: Headlines for Articles Chosen from the Mainstream Liberal News Stream in Study IV

	Date	Headline	Modal Fact Checker Rating	Topic	Lean of Article
1	1/8/20	All is well,' Trump tweets after Iran targets U.S. forces in missile attack in Iraq	True	Political/Economy	Neutral
2	1/9/20	Ruth Bader Ginsburg says she is cancer-free	True	Political/Economy	Neutral
3	1/13/20	Serena Williams wins first title in 3 years — and donates prize money to Australia wildfire relief	True	Human Interest	Neutral
4	1/14/20	The first Obama-backed documentary receives an Oscar nomination	True	Human Interest	Neutral
5	1/15/20	More than 50 injured after Delta jet dumps fuel on L.A. schools during midair emergency	True	Human Interest	Neutral
6	1/21/20	Katie Sowers Is The First Female And Openly Gay Person To Coach In A Super Bowl	True	Human Interest	Neutral
7	1/22/20	Weather service issues alert for falling iguanas as temperatures drop in Florida	True	Science	Neutral
8	1/23/20	Half of Americans don't know 6m Jews were killed in Holocaust, survey says	True	Political/Economy	Neutral
9	1/27/20	Kobe Bryant's Daughter Gianna, 13, Dead Alongside Father in Calabasas Helicopter Crash	True	Human Interest	Neutral
10	1/28/20	Today really hurts': Families, friends remember those who died in Kobe Bryant crash	True	Human Interest	Neutral

Table 20: Headlines for Articles Chosen from the Low Quality Unclear News Stream in Study IV

	Date	Headline	Modal Fact Checker Rating	Topic	Lean of Article
1	1/8/20	Key Brain Region Smaller in Birth Control Pill User	True	Science	Neutral
2	1/9/20	The US Military Pollutes More 140 Countries Combined	True	Science	Liberal
3	1/13/20	Alaska man survives three weeks with little food and shelter	True	Human Interest	Neutral
4	1/14/20	Boeing Mocked Lion Air "Idiots" For Requesting Extra Training For 737 MAX	True	Human Interest	Unclear
5	1/15/20	300 Vultures Occupy Border Patrol Tower, Covering It With "Corrosive" Feces & Vomit	True	Human Interest	Neutral
6	1/21/20	PUNISHING ECONOMY: San Fran's Democrat tyrants double down on closed businesses, taxing landlords for leaving stores vacant	False/Misleading	Political/Economy	Conservative
7	1/22/20	Another Supposedly Authentic Photo Of A UFO & The Story Behind It	No Mode	Human Interest	Neutral
8	1/23/20	China Quarantines 3rd City As Wuhan Virus Spreads To Singapore	True	Science	Neutral
9	1/27/20	Nature Science Journal Warned About "Pathogens Escaping" Wuhan Level-4 Biosafety Lab (BSL-4) Before Coronavirus Outbreak	False/Misleading	Science	Unclear
10	1/28/20	Death Tolls Rises to 106 as 1,000 Americans Try to Evacuate From Coronavirus-Infected Wuhan	True	Science	Neutral

B.4 Ideological Perspective and Topic of The Article

We determine the partisan lean of the articles by asking four independent coders to determine the partisan perspective of the article (conservative, liberal, neutral and unclear). The partisan lean was determined by taking the modal evaluation of the coders. When there was no modal evaluation, or there was a tie, the evaluation of a graduate student was used as the tiebreaker. Coders were asked to use only the headline and content of the article to make their determination. The following guidance was given to raters for selecting the partisan perspective:

Articles that are clearly written from a partisan perspective should be classified according to whichever direction that is, even if the article is not completely supportive of the political party that shares that ideology. Articles that are clearly advocating for one side of the political spectrum should be classified as leaning that way. Importantly, just because partisans may feel differently about an article, does not mean the article does not have a neutral perspective. For example, "Trump Impeached" may induce very different reactions among liberals and conservatives, but the article could still be neutral so long as it reports on this event objectively. Conversely, "Trump is a Crook" likely has a liberal perspective. Importantly, neutral articles are those where the perspective is balanced and appears to show no bias. Unclear articles are those where the perspective does not appear to be any of the three above or you are unable to make a clear determination.

We determine the topic of the articles by asking four independent coders to determine the partisan perspective of the article (conservative, liberal, neutral and unclear). The topic was determined by taking the modal evaluation of the coders. When there was no modal evaluation, or there was a tie, the evaluation of a graduate student was used as the tiebreaker. Coders were asked to use only the headline and content of the article to make their determination. The following guidance was given to raters for selecting the topic of the article:

Please select the primary topic of the article. Human interests are articles like the death of Kobe Bryant, the first female NFL coach, or other stories unrelated to national events or issues. Other is for any articles that cannot fit into a (Politics or Economics) ,b (Science - including natural disasters, health), or (Human Interest).

Table 21: Inter-Rater Reliability Statistics for Topic and Ideological Perspective of Article

Coding Task	Group of Articles	Agreement	Fleiss Kappa
Main topics of articles (4 categories)	Study I	69.03	0.64
Partisan lean of of articles (4 categories)	Study I	56.13	0.63

B.5 Social Media Presence of Articles Selected in Study I

Table 22: Summary Statistics For Twitter Posts (within 48 hours of publication) Per News Stream

News Stream	Mean	Median	Max	Min
Conservative Low-Quality	90.1	14	1577	0
Liberal Low-Quality	223	52	2687	0
Unclear Low-Quality	1570.2	14	42696	0
Conservative Mainstream	999.5	197	5270	0
Liberal Mainstream	1270.2	1198	6702	0
All Low-Quality	627.8	21	42696	0
All Mainstream	1134.8	308	6702	0
All Articles	830.6	52	42696	0

Table 23: Summary Statistics For Facebook Shares Per News Stream

News Stream	Mean	Median	Max	Min
Conservative Low-Quality	587.5	116	5421	0
Liberal Low-Quality	917.4	265	9050	16
Unclear Low-Quality	9222.8	135	147127	0
Conservative Mainstream	26200.5	10643	190157	0
Liberal Mainstream	25808	16372	117365	195
All Low-Quality	3186.4	205	147127	0
All Mainstream	25990.7	13711	190157	0
All Articles	12308.2	1109	190157	0

C   Correlation Between Ordinal and Categorical Measures of Veracity

Table 24: Measuring Effect of Ordinal Veracity Scale on Rating an Article as True (OLS) - Study 1

	Dependent variable:
	Rating a False/Misleading Article as True
Rating An Article as True	2.506***
	(0.046)
Intercept	3.273***
	(0.026)
Observations	3,550
R^2	0.457
Adjusted R^2	0.457
Residual Std. Error	1.286 (df = 3548)
F Statistic	2,990.147*** (df = 1; 3548)
Note:	*p<0.05; **p<0.01; ***p<0.001

D Financial Incentive Experiment

Over ten days during Study I (December 16th, 2019 - February 6th, 2020) thirteen different false/misleading articles were evaluated by individuals in our control group (N = 1,250) and those who were given a financial incentive for the correct answer (N = 1,249) we found very little difference in the number of individuals that rated the false/misleading article as true. To estimate the treatment effect of being offered a substantial financial incentive for correct answers, we fit an OLS regression model with article-level fixed effects and standard errors clustered at the respondent and article level to predict belief in misinformation (that is, rating a false or misleading article as true).[2] We control for basic demographic factors, ideological congruence, and familiarity with the news story. We find that the likelihood of rating a false/misleading article as true increased by 0.0XX when respondents were offered a financial incentive for the correct answer. We also compare the proportion of responses in the control and treatment group in Figure ??.

Table 25: Measuring Effect of Rating an Article as True on the Rating given on the Ordinal Veracity Scale (OLS)

	Dependent variable:
	Rate As True (Likelihood)
Financial Incentive	0.031*
	(0.014)
Education	-0.010
	(0.010)
Age	-0.001
	(0.001)
Gender	-0.040*
	(0.020)
Income	-0.0001
	(0.011)
Ideological Congruence	0.135***
	(0.036)
Familiarity	0.204***
	(0.029)
Observations	2735
R-squared	0.141
Adj. R-squared	0.135
F-Statistic	5.073***
Note:	*p<0.05; **p<0.01; ***p<0.001

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[2]As note previously, for our dichotomous outcome, rating a false/misleading story as true (1=Yes ; 0=No).

Figure 1: This figure presents the proportion of evaluations for false/misleading articles for those given extra financial incentive and those not given an extra financial incentive.
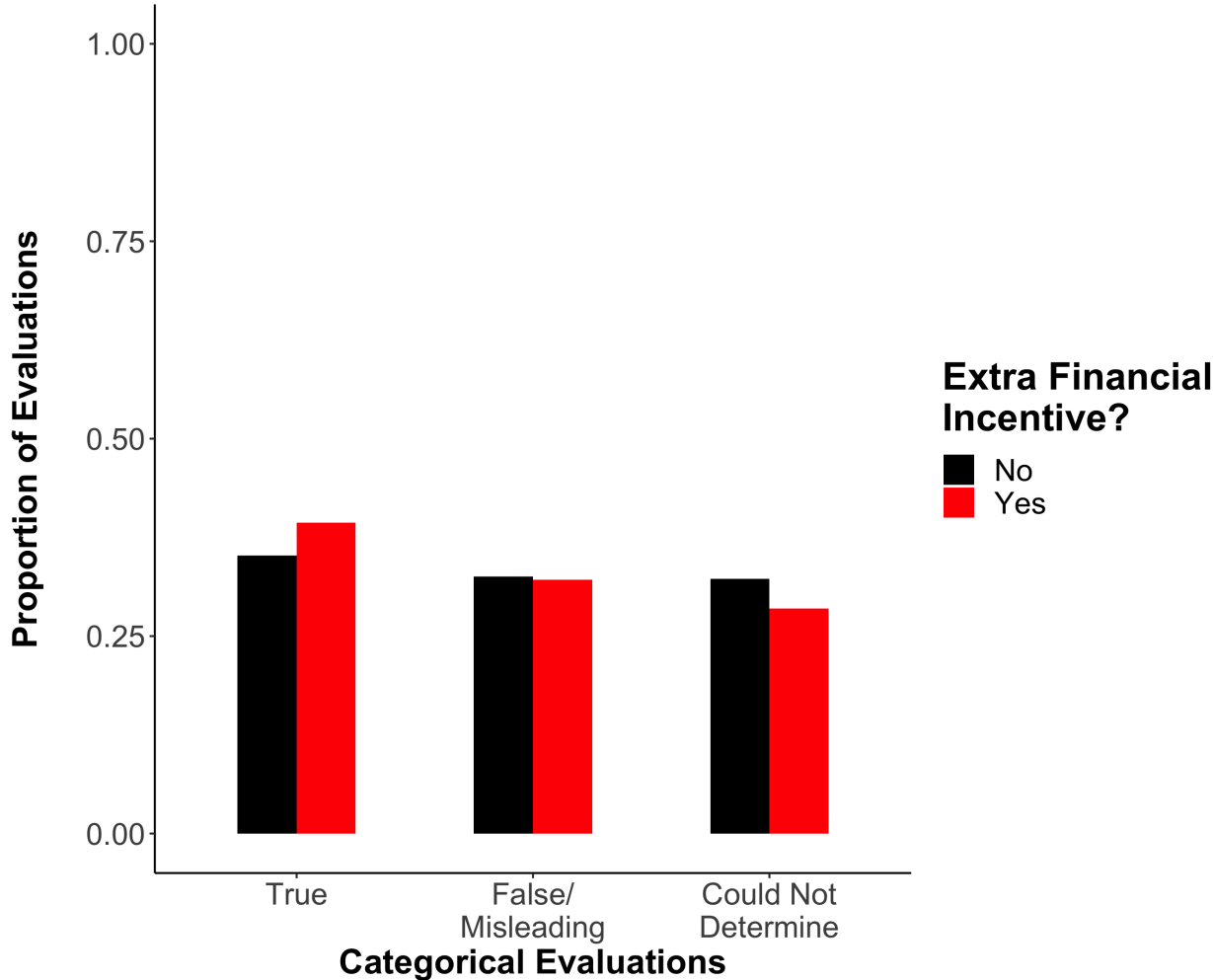
Figure 2: This figure presents the proportion of evaluations for false/misleading articles *with a Robust mode* for those given extra financial incentive and those not given an extra financial incentive. Only Articles with a Robust mode are apart of this analysis.
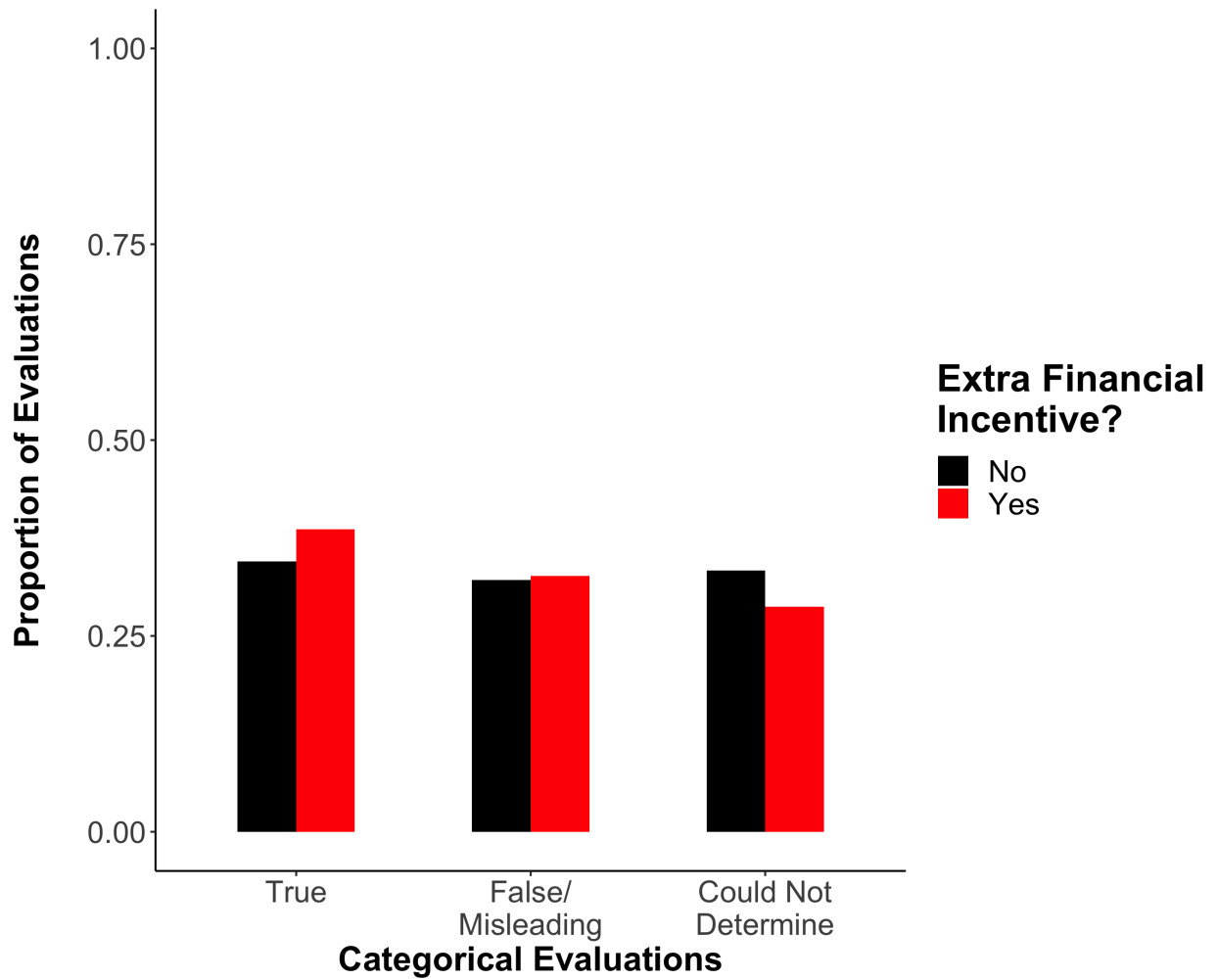
E Attention Checks

(1) Was it possible to access the article using the link provided?

(A) Yes (Correct)
(B) No (Incorrect)

(2) Is the full article blocked by some paywall or require a subscription (the website asks you to pay for article, or it requires a subscription to access the article and you do not have one)?

(A) Yes (Incorrect)
(B) No (Correct)

F Figures in Main Paper, but Only Using Articles That Received A Robust Fact-Checking Measure

Figure 3: The level of belief in misinformation in real-time.. Panel A presents the proportion of evaluations for false/misleading articles. Panel B presents the proportion of evaluations for true articles. Panel C presents the proportion (with 95 percent confidence intervals) of true evaluations for false/misleading articles by source perspectives. Panel D presents the proportion (with 95 percent confidence intervals) of true evaluations for false/misleading articles by topic. Panel E presents the proportion of respondents that evaluated at least one false/misleading article as true.

(a)

(b)

(c)
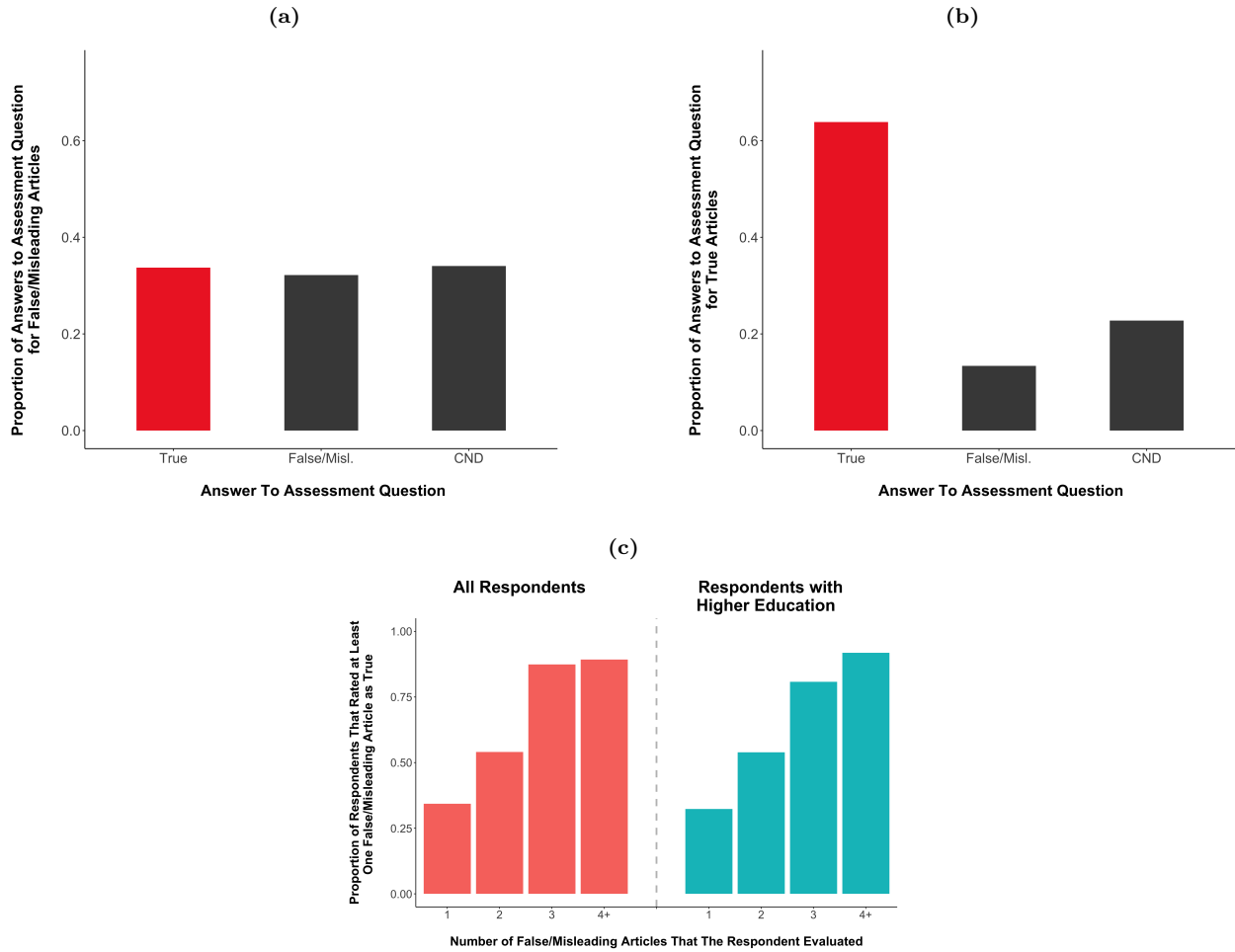
Figure 4: The individual level characteristics associated with believing misinformation. Panel A presents the effect sizes and 95 percent confidence intervals for linear regression models that identify the effect of individual-level covariates on belief in misinformation. Panel B presents the proportion (with 95 percent confidence intervals) of true evaluations for false/misleading articles by age group and education level. Red line denotes proportion of true evaluations for everyone (0.337). Panel C presents the proportion (with 95 percent confidence intervals) of true evaluations for false/misleading articles with different ideological perspectives
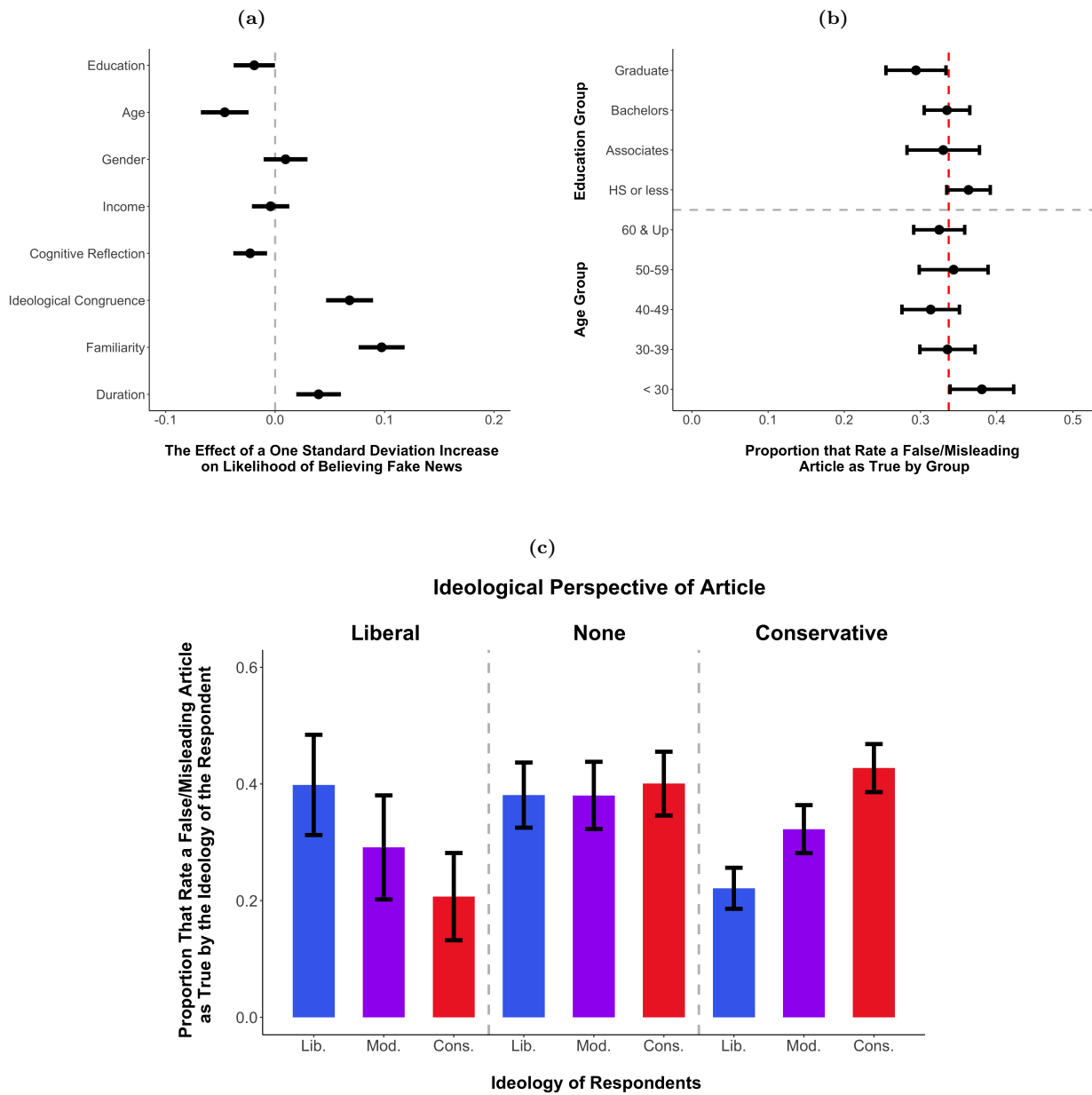
Figure 5: Panel A presents the proportion of respondents who rated false/misleading articles as true across topic.[3] Panel B compares results effect sizes and 95 percent confidence intervals for the same linear regression model testing what covariates affect belief in political misinformation and other misinformation. We also present the the effect of being shown only the headline/lede relative to the full article during Study IV. Panel C compares results effect sizes and 95 percent confidence intervals for the same linear regression model testing what covariates affect belief in misinformation during Study I and Study II. In addition, it compares the effect of evaluating articles over three months after publication relative to directly after publication. Panel D compares results effect sizes and 95 percent confidence intervals for the same linear regression model testing what covariates affect belief in misinformation in the control (Respondents have access to the full article) and treatment group (Respondents only are shown the headline/lede of the article) during Study III. We also present the the effect of being shown only the headline/lede relative to the full article during Study IV.
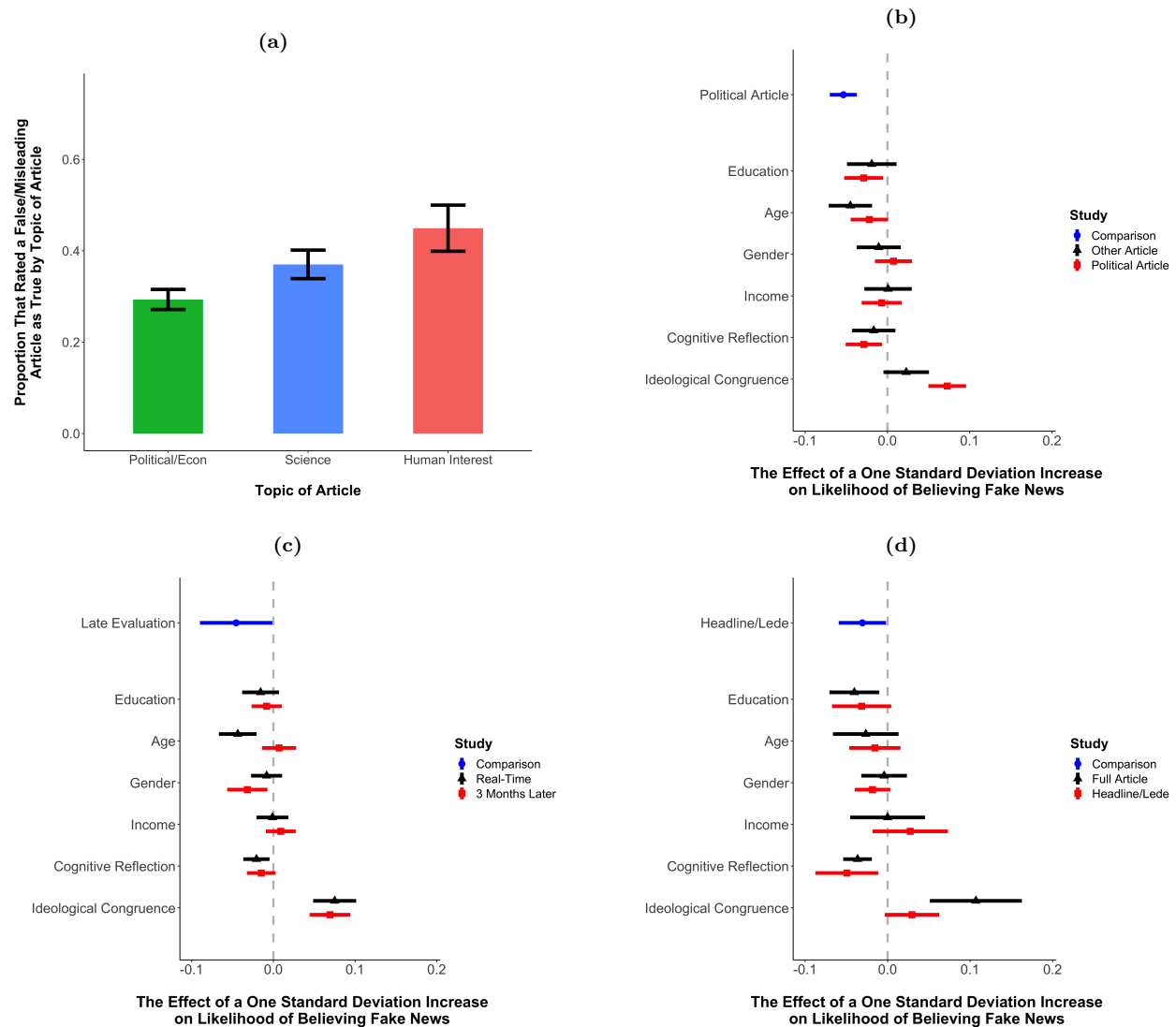
Figure 6: This figure presents the effect of being shown only the headline/lede relative to the full article during Study IV. It also presents the effect sizes and 95 percent confidence intervals for the same linear regression model testing what covariates affect belief in misinformation in the control (Respondents have access to the full article) and treatment group (Respondents only shown the headline/lede of the article) during Study IV. (Robust mode only)

The Effect of a One Standard Deviation Increase
on Likelihood of Believing Fake News
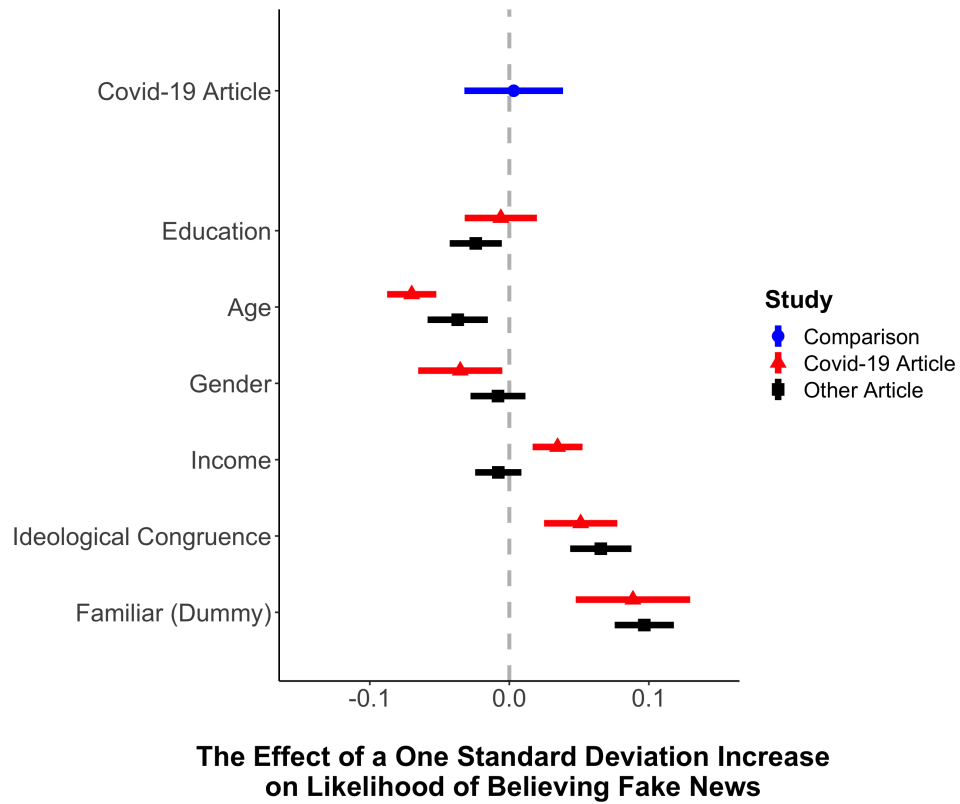
G   Explanation of Sampling Technique

Given that internet surveys using opt-in panels are the less accurate than probability sampling (MacInnis et al. 2018), we must be cautious presenting both general percentages of belief in misinformation as well as our experimental results using non-probability sampling from Qualtrics. We only report results from analyses with that we can using non-probability sampling allows us to. For example, we do not include any estimates based on self-identified race or ethnicity in our models since online probability samples are particularly poor at reporting estimates based on African Americans and Hispanics in America (C. Kennedy et al. 2016) Using non-probability sampling cannot guarantee that our results are generalizable to the greater U.S. population (Mullinix et al. 2015), so when using this sampling strategy one must choose one that fits closest to the study at hand (Baker et al. 2013). This project measures the level of belief in online misinformation, so we chosen to run an online survey that likely only includes frequent users of the internet for which we expect would consume online misinformation instead of other recruiting techniques (phone or in-person surveys) which may include individuals that are not a part of our population of interest. Given that this is an opt-in survey we expect the behavior of these respondents who self-selected in into the survey to differ from those drawn with known probability from a well-specified population. Therefore it is possible and likely this convenience sample is different in possibly unmeasured ways and we must be cautious when making experimental inferences using an opt-in non-probability samples from Qualtrics, previous work has found that about 90% of effects identified using a gold-standard probability sample are indistinguishable from effects identified by an opt-in Qualtrics panel and an opt-in Qualtrics sample is more suitable to non-experimental research than other panels, such as Amazon's MTurk (Zack, J. Kennedy, and Long 2019). The behaviors of those who opt-in to and join multiple panels to earn incentives may put much less effort into tasks at hand and are more likely to guess in order to save time and maximize their payment. To test if this would affect our main results we ran a parallel survey and paid respondents additional payments for correct answers to our veracity question, but did not find much of any difference in their responses. Therefore we do not believe that a lack of effort explain the results we find. Recent work has also shown that experimental results from these non-probability samples are often comparable to those found in population samples (Mullinix et al. 2015), so the results we present are not likely to be different if we had used probability-sampling.

H Results from Statistical Models and Summary Statistics

H.1 Study I: Linear Regression Model Standard Errors Clustered at the Article and Respondent Level:

Balance Table

Table 26: Summary statistics

Variables	N	Mean	Standard Dev.	Max	Min
Rating a false/misleading article as true	3394	0.337	0.473	1	0
Perceived Veracity (Ordinal Scale)	3394	4.11	1.754	7	0
Education	3394	2.342	1.227	5	0
Age	3394	46.065	15.937	85	18
Gender (Male)	3394	0.507	0.5	1	0
Income	3394	0.952	0.977	3	0
Cognitive Reflection	3394	1.558	1.147	4	0
Ideological Congruence	3394	0.249	0.432	1	0
Familiarity	3394	0.258	0.437	1	0
Ideological Congruence (Liberal)	3394	0.048	0.213	1	0
Ideological Congruence (Conservative)	3394	0.201	0.401	1	0

Linear Model (Categorical)

Table 27: Measuring Effect of Individual Determinants on Belief in Fake News using Categorical Measure (OLS)

	Dependent variable:		
	Rating a False/Misleading Article as True		
	(1)	(2)	(3)
Education	-0.009	-0.012	-0.009
	(0.007)	(0.007)	(0.007)
Age	-0.003***		-0.003***
	(0.001)		(0.001)
Gender (Male)	0.021	0.013	0.021
	(0.019)	(0.020)	(0.019)
Income	-0.013	-0.016	-0.013
	(0.010)	(0.010)	(0.009)
Cognitive Reflection	-0.022**	-0.020**	-0.022**
	(0.007)	(0.007)	(0.007)
Ideological Congruence	0.162***	0.151***	
	(0.024)	(0.025)	
Familiarity	0.222***	0.214***	0.222***
	(0.022)	(0.022)	(0.022)
Duration	0.032***	0.023***	0.032***
	(0.007)	(0.007)	(0.007)
Digital Literacy		0.012	
		(0.011)	
Ideological Congruence (Liberal)			0.128**
			(0.043)
Ideological Congruence (Conservative)			0.171***
			(0.027)
Observations	3394	3394	3394
R-squared	0.156	0.149	0.157
Adj. R-squared	0.145	0.138	0.145
F-Statistic	14.106***	13.3337***	13.809***

Note: *p<0.05; **p<0.01; ***p<0.001

Linear Model (Ordinal)

Table 28: Measuring Effect of Individual Determinants on Belief in Fake News using Veracity Scale Measure (OLS)

	Dependent variable:		
	Rating a False/Misleading Article as True		
	(1)	(2)	(3)
Education	-0.041	-0.041	-0.041
	(0.026)	(0.027)	(0.026)
Age	-0.007**		-0.007**
	(0.002)		(0.002)
Gender (Male)	-0.053	-0.070	-0.054
	(0.059)	(0.055)	(0.058)
Income	-0.049	-0.051	-0.049*
	(0.025)	(0.027)	(0.025)
Cognitive Reflection	-0.083***	-0.077**	-0.083***
	(0.024)	(0.024)	(0.024)
Ideological Congruence	0.797***	0.763***	
	(0.094)	(0.094)	
Familiarity	0.721***	0.706***	0.721***
	(0.097)	(0.097)	(0.097)
Duration	0.112***	0.090***	0.112***
	(0.023)	(0.022)	(0.023)
Digital Literacy		-0.030	
		(0.036)	
Ideological Congruence (Liberal)			0.739***
			(0.168)
Ideological Congruence (Conservative)			0.812***
			(0.108)
Observations	3394	3394	3394
R-squared	0.151	0.148	0.151
Adj. R-squared	0.14	0.137	0.14
F-Statistic	13.534***	13.2025***	13.234***

Note: *p<0.05; **p<0.01; ***p<0.001

Logistic Model (Categorical)

Table 29: Measuring Effect of Individual Determinants on Belief in Fake News using Categorical Measure (Logistic Regression)

	Dependent variable:		
	Rating a False/Misleading Article as True		
	(1)	(2)	(3)
Education	-0.048	-0.063	-0.047
	(0.038)	(0.037)	(0.037)
Age	-0.015***		-0.015***
	(0.003)		(0.003)
Gender (Male)	0.114	0.072	0.113
	(0.100)	(0.104)	(0.100)
Income	-0.074	-0.087	-0.075
	(0.052)	(0.055)	(0.052)
Cognitive Reflection	-0.117**	-0.105**	-0.117**
	(0.036)	(0.036)	(0.036)
Ideological Congruence	0.839***	0.768***	
	(0.120)	(0.126)	
Familiarity	1.116***	1.056***	1.115***
	(0.099)	(0.101)	(0.099)
Duration	0.164***	0.119***	0.164***
	(0.035)	(0.033)	(0.035)
Digital Literacy		0.068	
		(0.055)	
Ideological Congruence (Liberal)			0.688***
			(0.203)
Ideological Congruence (Conservative)			0.873***
			(0.140)
Observations	3394	3394	3394
R-squared	0.158	0.151	0.158
Adj. R-squared	0.147	0.14	0.147
F-Statistic	NA***	NA***	NA***

Note: *p<0.05; **p<0.01; ***p<0.001

H.2 Comparing Belief in Misinformation Across Topics

Balance Table

Table 30: Summary statistics

Subset of Articles	Variables	N	Mean	Standard Dev.	Max	Min
All	Rating a false/misleading article as true	3394	0.337	0.473	1	0
All	Perceived Veracity (Ordinal Scale)	3394	4.11	1.754	7	0
All	Political Article (Dummy)	3394	0.634	0.482	1	0
All	Education	3394	2.342	1.227	5	0
All	Age	3394	46.065	15.937	85	18
All	Gender (Female)	3394	0.507	0.5	1	0
All	Income	3394	0.952	0.977	3	0
All	Cognitive Reflection	3394	1.558	1.147	4	0
All	Ideological Congruence	3394	0.249	0.432	1	0
Political	Rating a false/misleading article as true	1242	0.396	0.489	1	0
Political	Perceived Veracity (Ordinal Scale)	1242	4.299	1.768	7	0
Political	Education	1242	2.386	1.227	5	0
Political	Age	1242	45.992	16.125	81	18
Political	Gender (Female)	1242	0.534	0.499	1	0
Political	Income	1242	0.932	0.988	3	0
Political	Cognitive Reflection	1242	1.514	1.152	4	0
Political	Ideological Congruence	1242	0.128	0.334	1	0
Other	Rating a false/misleading article as true	2152	0.303	0.459	1	0
Other	Perceived Veracity (Ordinal Scale)	2152	4.001	1.737	7	0
Other	Education	2152	2.317	1.227	5	0
Other	Age	2152	46.107	15.831	85	18
Other	Gender (Female)	2152	0.492	0.5	1	0
Other	Income	2152	0.964	0.971	3	0
Other	Cognitive Reflection	2152	1.584	1.143	4	0
Other	Ideological Congruence	2152	0.319	0.466	1	0

Linear Model (Categorical)

Table 31: Measuring Effect of Type of Article on Belief in Fake News using Veracity Scale Measure (OLS)

	Dependent variable:		
	Perceived Accuracy of Article		
	(1)	(2)	(3)
Political Article	-0.119***		
	(0.017)		
Education	-0.011	-0.012	-0.025*
	(0.007)	(0.013)	(0.010)
Age	-0.002**	-0.003**	-0.001
	(0.001)	(0.001)	(0.001)
Gender (Female)	0.014	-0.014	0.018
	(0.016)	(0.028)	(0.023)
Income	0.054	0.264	-0.110
	(0.149)	(0.254)	(0.196)
Ideological Congruence	-0.011	0.005	-0.003
	(0.009)	(0.015)	(0.013)
Cognitive Reflection	0.145***	0.090*	0.165***
	(0.019)	(0.043)	(0.025)
CRT_Score	-0.024***	-0.016	-0.026**
	(0.007)	(0.012)	(0.010)
Observations	3394	1242	1577
R-squared	0.033	0.015	0.039
Adj. R-squared	0.031	0.01	0.034
F-Statistic	14.5522***	2.7475***	9.04***

Note: *p<0.05; **p<0.01; ***p<0.001

Linear Model (Ordinal)

Table 32: Measuring Effect of Type of Article on Belief in Fake News using Veracity Scale Measure (OLS)

	Dependent variable:		
	Perceived Accuracy of Article		
	(1)	(2)	(3)
Political Article	-0.436***		
	(0.063)		
Education	-0.047	-0.058	-0.045
	(0.026)	(0.045)	(0.033)
Age	-0.003	-0.003	-0.002
	(0.002)	(0.003)	(0.002)
Gender (Female)	-0.076	-0.203*	-0.009
	(0.060)	(0.100)	(0.074)
Income	-0.041	-0.023	-0.052
	(0.033)	(0.056)	(0.042)
Ideological Congruence	0.733***	0.500***	0.795***
	(0.067)	(0.140)	(0.077)
Cognitive Reflection	-0.088***	-0.100*	-0.082*
	(0.026)	(0.043)	(0.032)
Observations	3394	1242	2152
R-squared	0.045	0.022	0.051
Adj. R-squared	0.043	0.017	0.049
F-Statistic	22.814***	4.6339***	19.279***

Note:	*p<0.05; **p<0.01; ***p<0.001	

Logistic Model (Categorical)

Table 33: Logistic Regression: Measuring Effect of Type of Article on Belief in Fake News using a Categorical Measure (OLS)

	Dependent variable:		
	Rating a False/Misleading Article as True		
	(1)	(2)	(3)
Political Article	-0.544***		
	(0.078)		
Education	-0.050	-0.050	-0.055
	(0.034)	(0.054)	(0.044)
Age	-0.007**	-0.012**	-0.004
	(0.002)	(0.004)	(0.003)
Gender (Female)	0.064	-0.066	0.140
	(0.075)	(0.119)	(0.098)
Income	-0.052	0.019	-0.098
	(0.043)	(0.066)	(0.057)
Ideological Congruence	0.651***	0.379*	0.734***
	(0.086)	(0.174)	(0.099)
Cognitive Reflection	-0.109***	-0.066	-0.140**
	(0.033)	(0.051)	(0.043)
Observations	3394	1242	2152
R-squared	0.033	0.014	0.036
Adj. R-squared	0.031	0.01	0.033

Note: *p<0.05; **p<0.01; ***p<0.001

H.3 Comparing Belief in Misinformation Over Time

Balance Table

Table 34: Summary statistics

Time of Evaluation	Variables	N	Mean	Standard Dev.	Max	Min
All	Rating a false/misleading article as true	4487	0.343	0.475	1	0
All	Perceived Veracity (Ordinal Scale)	4487	4.108	1.75	7	0
All	LAte Evaluation (Dummy)	4487	0.492	0.5	1	0
All	Education	4487	2.343	1.214	5	0
All	Age	4487	45.76	20.544	894	18
All	Gender (Female)	4487	0.493	0.5	1	0
All	Income	4487	0.957	0.972	3	0
All	Cognitive Reflection	4487	1.57	1.149	4	0
All	Ideological Congruence	4487	0.247	0.432	1	0
Directly After	Rating a false/misleading article as true	2281	0.327	0.469	1	0
Directly After	Perceived Veracity (Ordinal Scale)	2281	4.054	1.757	7	0
Directly After	Education	2281	2.337	1.232	5	0
Directly After	Age	2281	46.359	15.911	85	18
Directly After	Gender (Female)	2281	0.494	0.5	1	0
Directly After	Income	2281	0.944	0.981	3	0
Directly After	Cognitive Reflection	2281	1.553	1.158	4	0
Directly After	Ideological Congruence	2281	0.25	0.433	1	0
3 Months or More Later	Rating a false/misleading article as true	2206	0.361	0.48	1	0
3 Months or More Later	Perceived Veracity (Ordinal Scale)	2206	4.163	1.742	7	0
3 Months or More Later	Education	2206	2.35	1.196	5	0
3 Months or More Later	Age	2206	45.141	24.416	894	18
3 Months or More Later	Gender (Female)	2206	0.493	0.5	1	0
3 Months or More Later	Income	2206	0.971	0.963	3	0
3 Months or More Later	Cognitive Reflection	2206	1.588	1.14	4	0
3 Months or More Later	Ideological Congruence	2206	0.245	0.43	1	0

Linear Model (Categorical)

Table 35: Measuring Effect of Time of Evaluation on Belief in Fake News using Categorical Measure (OLS)

	Dependent variable:		
	Rating As False/Misleading Article as True		
	(1)	(2)	(3)
Late Evaluation	0.035**		
	(0.014)		
Education	-0.009	-0.008	-0.007
	(0.006)	(0.009)	(0.009)
Age	-0.001**	-0.003***	-0.001*
	(0.0005)	(0.001)	(0.0003)
Gender (Female)	0.039**	0.017	0.062**
	(0.014)	(0.020)	(0.020)
Income	-0.003	-0.013	0.012
	(0.008)	(0.011)	(0.011)
Ideological Congruence	0.163***	0.135***	0.177***
	(0.018)	(0.023)	(0.024)
Cognitive Reflection	-0.018**	-0.024**	-0.011
	(0.006)	(0.008)	(0.009)
Observations	4487	2281	2206
R-squared	0.08	0.026	0.032
Adj. R-squared	0.074	0.023	0.029
F-Statistic	12.5203***	8.6738***	10.494***

Note: *p<0.05; **p<0.01; ***p<0.001

Linear Model (Ordinal)

Table 36: Measuring Effect of Time of Evaluation on Belief in Fake News using Veracity Scale Measure (OLS)

	Dependent variable:		
	Perceived Accuracy of Article		
	(1)	(2)	(3)
Late Evaluation	0.114*		
	(0.051)		
Education	-0.059*	-0.077*	-0.036
	(0.023)	(0.032)	(0.033)
Age	-0.003	-0.006*	-0.001
	(0.002)	(0.002)	(0.002)
Gender (Female)	0.018	0.063	-0.056
	(0.051)	(0.073)	(0.073)
Income	-0.015	-0.057	0.036
	(0.029)	(0.041)	(0.040)
Ideological Congruence	0.795***	0.684***	0.915***
	(0.057)	(0.081)	(0.080)
Cognitive Reflection	-0.090***	-0.084**	-0.094**
	(0.022)	(0.031)	(0.031)
Observations	4487	2281	2206
R-squared	0.046	0.041	0.057
Adj. R-squared	0.045	0.038	0.054
F-Statistic	30.8957***	16.0416***	21.951***

Note: $^*p<0.05$; $^{**}p<0.01$; $^{***}p<0.001$

Logistic Model (Categorical)

Table 37: Logistic Regression: Measuring Effect of Time of Evaluation on Belief in Fake News using a Categorical Measure (OLS)

	Dependent variable:		
	Rating a False/Misleading Article as True		
	(1)	(2)	(3)
Late Evaluation	0.149*		
	(0.064)		
Education	-0.036	-0.037	-0.030
	(0.029)	(0.041)	(0.040)
Age	-0.009***	-0.012***	-0.005
	(0.002)	(0.003)	(0.003)
Gender (Female)	-0.155*	-0.078	-0.266**
	(0.064)	(0.092)	(0.091)
Income	-0.008	-0.063	0.053
	(0.036)	(0.053)	(0.050)
Ideological Congruence	0.679***	0.602***	0.757***
	(0.072)	(0.102)	(0.102)
Cognitive Reflection	-0.084**	-0.112**	-0.052
	(0.028)	(0.039)	(0.040)
Observations	4487	2281	2206
R-squared	0.028	0.026	0.032
Adj. R-squared	0.026	0.023	0.03

Note: *p<0.05; **p<0.01; ***p<0.001

H.4 Comparing Belief in Misinformation By Textual Information (Headline/Lede versus Full Text)

Balance Table

Table 38: Summary statistics

Time of Evaluation	Variables	N	Mean	Standard Dev.	Max	Min
All	Rating a false/misleading article as true	1725	0.379	0.485	1	0
All	Perceived Veracity (Ordinal Scale)	1725	4.318	1.703	7	0
All	Article as Headline (Dummy)	1725	0.512	0.5	1	0
All	Education	1725	2.341	1.216	5	0
All	Age	1725	46.164	15.667	83	18
All	Gender (Female)	1725	0.486	0.5	1	0
All	Income	1725	0.917	0.952	3	0
All	Cognitive Reflection	1725	1.257	1.067	4	0
All	Ideological Congruence	1725	0.253	0.435	1	0
Full Article	Rating a false/misleading article as true	841	0.39	0.488	1	0
Full Article	Perceived Veracity (Ordinal Scale)	841	4.25	1.698	7	0
Full Article	Education	841	2.32	1.233	5	0
Full Article	Age	841	47.818	15.86	83	18
Full Article	Gender (Female)	841	0.51	0.5	1	0
Full Article	Income	841	0.937	0.972	3	0
Full Article	Cognitive Reflection	841	1.568	1.18	4	0
Full Article	Ideological Congruence	841	0.25	0.433	1	0
Headline/Lede	Rating a false/misleading article as true	884	0.368	0.482	1	0
Headline/Lede	Perceived Veracity (Ordinal Scale)	884	4.383	1.707	7	0
Headline/Lede	Education	884	2.361	1.2	5	0
Headline/Lede	Age	884	44.59	15.325	81	18
Headline/Lede	Gender (Female)	884	0.463	0.499	1	0
Headline/Lede	Income	884	0.898	0.932	3	0
Headline/Lede	Cognitive Reflection	884	0.96	0.847	3	0
Headline/Lede	Ideological Congruence	884	0.257	0.437	1	0

Linear Model (Categorical)

Table 39: Measuring Effect of Reading Only Headline/Lede on Belief in Fake News using Categorical Measure (OLS)

	Dependent variable:		
	Rating As False/Misleading Article as True		
	(1)	(2)	(3)
Headline	-0.055*		
	(0.024)		
Education	-0.025*	-0.022	-0.023
	(0.010)	(0.016)	(0.015)
Age	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)
Gender (Female)	-0.030	-0.022	-0.030
	(0.023)	(0.035)	(0.032)
Income	0.006	-0.005	0.026
	(0.013)	(0.019)	(0.020)
Ideological Congruence	0.153***	0.173***	0.044
	(0.028)	(0.039)	(0.038)
Cognitive Reflection	-0.039***	-0.033*	-0.050**
	(0.011)	(0.014)	(0.019)
Observations	1725	841	884
R-squared	0.08	0.035	0.015
Adj. R-squared	0.072	0.028	0.008
F-Statistic	10.5642***	5.0556***	2.169***

Note: *p<0.05; **p<0.01; ***p<0.001

Linear Model (Ordinal)

Table 40: Measuring Effect of Reading Only Headline/Lede on Belief in Fake News using Veracity Scale Measure (OLS)

	Dependent variable:		
	Perceived Accuracy of Article		
	(1)	(2)	(3)
Headline	0.066		
	(0.084)		
Education	-0.048	-0.124*	0.030
	(0.038)	(0.052)	(0.055)
Age	0.001	0.002	-0.001
	(0.003)	(0.004)	(0.004)
Gender (Female)	0.031	0.038	-0.054
	(0.082)	(0.116)	(0.115)
Income	0.002	-0.075	0.078
	(0.048)	(0.066)	(0.071)
Ideological Congruence	0.555***	0.720***	0.370**
	(0.091)	(0.129)	(0.130)
Cognitive Reflection	-0.117**	-0.087	-0.146*
	(0.040)	(0.050)	(0.068)
Observations	1725	841	884
R-squared	0.029	0.057	0.018
Adj. R-squared	0.025	0.051	0.012
F-Statistic	7.3994***	8.4586***	2.753***

Note: $^{*}p<0.05$; $^{**}p<0.01$; $^{***}p<0.001$

Logistic Model (Categorical)

Table 41: Logistic Regression: Measuring Effect of Reading Only Headline/Lede on Belief in Fake News using a Categorical Measure (OLS)

	Dependent variable:		
	Rating a False/Misleading Article as True		
	(1)	(2)	(3)
Headline	-0.215*		
	(0.105)		
Education	-0.096*	-0.094	-0.103
	(0.047)	(0.068)	(0.067)
Age	-0.004	-0.005	-0.004
	(0.003)	(0.005)	(0.005)
Gender (Female)	-0.095	-0.094	-0.131
	(0.101)	(0.152)	(0.142)
Income	0.039	-0.023	0.112
	(0.060)	(0.085)	(0.086)
Ideological Congruence	0.455***	0.720***	0.189
	(0.113)	(0.164)	(0.161)
Cognitive Reflection	-0.172***	-0.144*	-0.221**
	(0.050)	(0.062)	(0.086)
Observations	1725	841	884
R-squared	0.021	0.035	0.014
Adj. R-squared	0.017	0.028	0.008

Note:	*p<0.05; **p<0.01; ***p<0.001

I Fact-Checker Agreement

When measuring agreement among fact-checkers we report a Fleiss' Kappa score of 0.405.[4] This level of agreement is slightly higher than other studies that have used professional fact-checkers to rate the veracity of both credible and suspect articles using the same categorical scale our fact-checkers used (Allen et al. 2020). We also present all of the analyses in using only false/misleading articles with a robust mode—which we define as any modal response of fact-checkers that would not change if one professional fact-checker changed their response—to remove articles where there was higher levels of disagreement among professional fact-checkers. We find that our results are nearly identical when using the false/misleading articles with a robust mode.[5]

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[4]We had unanimous fact checker agreement on over 45% of the articles in Study I. We also report the article level agreement between each pair of fact-checkers and average weighted cohen kappa score between each pair of fact-checkers in Study I in the Supplementary Materials on page XX. These scores are reported for the 145 articles that were rated by five professional fact-checkers (10 articles only received a rating from four professional fact-checkers)

[5]37 articles were rated as false/misleading using solely the mode and 31 were rated as false/misleading using the robust mode.

J   Just the headline and lede of the article

Coronavirus may have originated in lab linked to China's biowarfare program

K Predicting Familiarity with Article by Demographic Variables

Table 42: Measuring Effect of Individual Determinants on Familiarity of Article using Categorical Measure (OLS)

	Dependent variable:	
	Familiarity with Article	
	Late Evaluations	Real-Time
	(1)	(2)
Age	0.004***	0.002**
	(0.001)	(0.001)
Gender (Female)	-0.061***	-0.029
	(0.014)	(0.018)
Education	0.001	0.005
	(0.007)	(0.007)
Income	0.027***	0.019*
	(0.006)	(0.008)
Ideological Congruence	0.082***	0.049*
	(0.018)	(0.023)
Observations	3446	3550
R-squared	0.207	0.196
Adj. R-squared	0.197	0.186
F-Statistic	23.1905***	23.1905***
Note:	*p<0.05; **p<0.01; ***p<0.001	

L Previous Research Designs Measuring Belief in Misinformation

Table 43 presents the research designs of recent published research measuring either the effect of belief in misinformation or interventions to mitigate belief, which have been selected from Bryanov and Vziatysheva (2021). These 10 studies use a wide array stimuli sampling methods in their survey instruments, and they report equally varied levels of belief ranging from 15% to over double that level (32%). As a result, studies of belief in misinformation have limited robustness (Clemm von Hohenberg 2020). These varied designs and results call into question our understanding of key topics of scholarly and societal importance.

Table 43: Studies that Report Belief in Misinformation

Author(s), year	Number of Respondents	Measure	Topics Used	Number of of Pieces of Misinformation	Belief in Misinformation Reported (as a percentage)
Pennycook, Epstein, et al. (2021) (Study 1)	1,015	Is it accurate (Yes or No)	Political	18	15
Guess, Lerner, et al. (2020)	3,200	4-Point	Political	8	32
Pennycook and Rand (2020) (Study 3)	1,606	4-Point	Political and Non-Political	12	21.8
Pennycook, McPhetres, et al. (2020)	2,000	Is it accurate (Yes or No)	COVID-19	15	32
Clayton et al. (2019)	2,994	4-Point	Political and Non-Political	12	23.4
Pennycook and Rand (2019) (Study 1)	800	4-Point	Political and Non-Political	15	21.8
Pennycook and Rand (2019) (Study 2)	2,644	4-Point	Political	10	18.5
Roozenbeek and Linden (2019)	15,000	7-Point	Political and Non-Political	5	22.4
Pennycook, Cannon, and Rand (2018) (Study 2)	949	4-Point	Political	12	21.2
Pennycook, Cannon, and Rand (2018) (Study 3)	940	4-Point	Political	12	24.2
Median	1,803	NA	NA	12	22.1

M Average Difference Between Groups of Respondents

Table 44: Average Difference Between Groups of Respondents

Comparison Group	Age	Education Level	Gender (Prop. ewline Female)	Income Level	Cognitive Reflection
Political Misinformation (Study I) and Other Misinformation (Study I)	-0.11	0.042*	0.07	-0.03	-0.07
General Misinformation (Study I) and Covid-19 Misinformation (Study II)	-1.86***	-0.039**	0.08*	0.07**	NA
Real-Time Evaluaton of Misinformation (Study I) and Late Evaluation of Misinformation (Study III)	-1.22*	0	0.01	0.03	0.04
Full Article Evaluaton (Study I) and Headline/Lede Evaluation (Study IV)	-3.23***	-0.047*	0.04	-0.04	-0.61***

N   Models Using Pre-Registered Model

Figure 8: The individual level characteristics associated with believing misinformation. This figure presents the effect sizes and 95 percent confidence intervals for linear regression models that identify the effect of individual-level covariates on belief in misinformation. This uses the exact pre-registered models dictated in the pre-registration.

The Effect of a One Standard Deviation Increas
on Likelihood of Believing Fake News