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Regular Article

Knowledge is Power…to misinform: Examining how knowledge gaps affect engagement with COVID-19 misinformation

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ABSTRACT

This study examined how the knowledge gap hypothesis (KGH), the belief gap hypothesis (BGH), partisan media use, and interpersonal discussion affected COVID-19 knowledge and social media engagement (SME) with related misinformation. The KGH partially affected knowledge and reduced SME with misinformation regarding income. The BGH increased knowledge and reduced SME with misinformation among Liberals. Right-leaning media use and interpersonal discussion increased SME with misinformation respectively. Overall, knowledge was inversely associated with SME with misinformation.

1. Introduction

Misinformation, which involves the purposeful or inadvertent sharing of falsities (Howard, Neudert, Prakash, & Vosloo, 2021), plagued social media long before the COVID-19 pandemic (Allcott & Gentzkow, 2017). However, the pandemic ushered a new phase of misinformation that not only affected public dialogue about COVID-19 (Aratani, 2020, para. 15), but also affected knowledge about the disease (Maloy & De Vynck, 2021; para. 12). Early in the pandemic, social media was a popular source of information (Liu, 2021), but also a source of misinformation (Jurkowitz & Mitchell, 2020). This hampered efforts by health officials to educate the public about the disease (Guzman, 2020, para. 2, 7). The fact that the health experts were barely learning about the emergent virus only exacerbated the situation (Williams, 2020). The resultant misinformation, confusion, and problematic messaging not only reduced trust in public health officials (Simmons--Duffin, 2020, para. 1), but it also opened conduits through which COVID-19 misinformation spread (Tyson & Funk, 2022, para. 2).

Research shows that health knowledge and health literacy play important roles in public health (Bryant, 2002). Additionally, possessing factual knowledge reduces the susceptibility to misinformation (Bolisani, Cegarra Navarro, & Garcia-Perez, 2021). This effect is uniquely important to a study examining misinformation during a pandemic. Such knowledge plays a bigger role in the public health system during outbreaks (Sheather, 2020, para. 7, 8; Wang, He, Liu, Wang, & Sun, 2020, para. 2) where misinformation is more likely to spread (van Prooijen & Douglas, 2017). However, as the knowledge gap hypothesis (KGH) posits, socioeconomic factors affect the diffusion of knowledge in society with disadvantages among those in the lower tiers (Tichenor, Donohue, & Olien, 1970). Research also shows that misinformation spreads faster during crises (van Prooijen & Douglas, 2017), and that those in lower socioeconomic tiers are more susceptible (Lee et al., 2020; Juanchich, Sirota, Jolles, & Whiley, 2021).

Ideology and exposure to partisan media also affected COVID-19 knowledge (Cakanlar, Trudel, & White, 2020; Pasquini & Saks, 2022) and susceptibility to related misinformation (Calvillo, Ross, Garcia, Smelter, & Rutchick, 2020). These ideologically related knowledge gaps reflect the belief gap hypothesis (BGH). The theory holds that ideological orientation explains knowledge gaps regarding contentious topics such as climate change, same-sex marriage, and immigration better than the KGH does (Gaziano & Gaziano, 1999; Hindman, 2009, 2012). Undoubtedly, COVID-19 and the related mandates and protocols are equally contentious and divisive topics (Moira, Fagan, & Connaughton, 2021). The KGH and BGH affect knowledge and susceptibility to misinformation alongside other variables such as interpersonal discussions. Generally, misinformation transmitted via interpersonal discussions worsens the misperceptions of the related falsities (Xiao, 2022). Additionally, echo chambers increase beliefs in falsities during discussions with like-minded people (Rhodes, 2022).

This study uniquely examines the combined effects of knowledge, ideology, partisan media use, SME, and interpersonal discussion on COVID-19 misinformation susceptibility. As I discuss later, scholars have studied these variables singularly or in limited combination even though pertinent literature suggests a wider nexus of effects.

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Importantly, data based on this combined approach better informs stakeholders and policymakers on the most appropriate methods to combat misinformation. Considering the above-discussed, this study examines whether the KGH, the BGH, partisan media use, and interpersonal discussion affect knowledge about COVID-19 and whether these variables also affect social media engagement (SME) with COVID-19 misinformation. SME is how people interact with online content by sharing, commenting, liking, and retweeting it, among other methods (Li & Xie, 2020; Wasike, 2022). This approach is unique given that is deploys two knowledge gap theories that scholars generally examine separately. Second, by examining these variables in the age of pandemic-related social media misinformation, the study is timely. Third, examining the role of partisan media use and interpersonal discussion only bolsters the study's comprehensiveness.

2. The knowledge gap hypothesis

The KGH posits that the infusion of information in society does not benefit all equally. Those with high socioeconomic status acquire information faster (Tichenor et al., 1970). Recent studies have found that the KGH existed regarding knowledge about COVID-19. Here, Gerosa, Gui, Hargittai, and Minh (2021) found that not only did a knowledge gap exist between high and low-education people, but exposure to certain media types exacerbated the gap. The frequent use of radio, print, and social media decreased such knowledge among some. Furthermore, the frequent use of these media sources increased the likelihood of believing COVID-19-related falsities. Wang, Li, Wu, and Gao (2021) also found that more educated people possessed more COVID-19 knowledge than less educated people. Other research shows that socioeconomic factors affect knowledge about influenza and its vaccines (Yin, You, Wu, & Jin, 2022). Regarding science technology information, Ho, Looi, Leung, Bekalu, and Viswanath (2020) report similar results in a cross-cultural study comparing subjects in Singapore and the U.S. Here, they found an education-related knowledge gap in both countries, but only in the U.S. due to income differences. However, unlike the Gerosa et al. findings, their study found that social media use increased knowledge about nanotechnology, as did attention to TV news among subjects in both countries.

Discussing topics and issues with other people also affects the KGH. In the above-mentioned study, Ho et al. report that conversations with family, friends, and co-workers about nanotechnology reduced knowledge about that topic among U.S. subjects but not among Singaporeans. The Wang et al. and Yin et al. studies also found that interpersonal discussion improved COVID-19 knowledge. Interpersonal discussion, education, and exposure to local media also influenced knowledge about chronic illnesses such as breast cancer and diabetes in Kim et al.'s (2011) study of community storytelling networks among minorities in Los Angeles. Namely, interpersonal discussion improved knowledge about these illnesses as did education and exposure to local media. Likewise, Ho (2012) found that interpersonal discussion as well as attention to TV news reduced the KGH in Singapore regarding knowledge about the H1N1 virus. However, educational attainment did not affect such knowledge, indicating that the KGH is not uniform across countries. Given the discussion above, I query whether the KGH and interpersonal discussion affect knowledge about COVID-19.

RQ1: Does the knowledge gap hypothesis affect knowledge about COVID-19?
RQ2: Does interpersonal discussion affect knowledge about COVID-19?

3. The belief gap hypothesis

The BGH emerged from a criticism of the suitability of the KGH to explain knowledge gaps. Specifically, the criticism was that educational attainment did not fully explain the KGH (Hwang & Jeong, 2009) and that Tichenor, Donohue, and Olien's conceptualization of the KGH lacked context-specificity (Gaziano & Gaziano, 1999; Hindman, 2009). To examine the context-specificity of the KGH, Hindman (2009) therefore tested the effect of the KGH on climate change, a polarizing topic. The study showed that ideological orientation, defined as self-identified political identification and affiliation, better explained the climate change knowledge gap than education did. Hindman (2012) later confirmed that not only did ideology explain the KGH better than education, but that ideology also explained longitudinal gaps in knowledge better than the KGH did.

The BGH's central tenet is that ideology explains knowledge gaps better than education does with polarizing topics (Gaziano, 2014; Hindman, 2009). Research shows this to be true regarding climate change, global warming, health care reform, same-sex marriage, abstinence, and immigration, among other topics. The forementioned Hindman (2009) study first introduced the BGH, and that study found that ideology better explained the gaps regarding climate change knowledge between Liberals and Conservatives than education did. Specifically, ideology was by far a better predictor than education of knowledge about the evidence of why the earth was warming and if this trend was caused by human activity. Likewise, ideology better predicted knowledge about healthcare reform in Hindman's (2012) follow-up study of the BGH. Here, not only did ideology better predict knowledge about the value of access to healthcare and details of healthcare reform legislation, but it also predicted these partisan differences over time. Education did not predict the longitudinal knowledge gaps.

Regarding the effectiveness of abstinence-only education, Hindman and Yan (2015) found that ideology better explained long-term knowledge differences than education did, with exposure to Conservative media being a contributing factor. Likewise, Veenstra et al. (2014) found that political partisanship better explained beliefs in abstinence-only education, climate change, and evolution and that exposure to right-leaning Christian media was a contributing factor. However, education predicted beliefs in the dangers of vaccines better. The interplay among ideology, education, and media exposure also emerged in Saldaña, Chacon, and Garcia-Perdomo's (2018) study of immigration beliefs and attitudes. Not only did ideology better predict beliefs in falsehoods about immigrants, but exposure to right-leaning media worsened negative attitudes toward immigrants. These findings echoed in Saldaña, McGregor, and Johnson's (2021) study of the BGH and attitudes toward climate change and immigration. Here, ideology interacted with education to affect belief in falsities about immigrants, and exposure to right-leaning media negatively affected attitudes toward immigrants. Generally, the findings discussed above were supported in Lind and Boomgaarden's (2019) metanalysis of KGH research published between 1966 and 2018, where data returned little evidence of longitudinal gaps in knowledge due to education, especially for polarizing topics. Given the literature discussed above, I query if the BGH and partisan media use affect COVID-19 knowledge.

RQ3: Does the belief gap hypothesis affect knowledge about COVID-19?
RQ4: Does partisan media use affect knowledge about COVID-19?

4. Social media engagement and health information

Central to this study is how the KGH and BGH affect how people engage with misinformation via SME, which refers to how people interact with social media content. Such interaction includes sharing, commenting, liking, retweeting, and recommending content, among other engagement methods (Li & Xie, 2020; Wasike, 2022). SME affects health-related behavior and this ranges from smoking cessation to safe sex practices. For instance, viewing positive comments on YouTube antismoking PSAs improves the chances of smoking cessation, especially among those ready to quit (Shi, Messaris, & Cappella, 2014). People who comment on, like, and share HIV awareness material are more likely to

get tested for the virus than those who do not (Cao et al., 2017). During the COVID-19 pandemic, users were more likely to engage with positive vaccine-related news articles on Facebook by sharing and commenting on them more than they did with other types of content (Al-Zaman, 2021). SME was also a means to discuss mental stress during the pandemic (Zhang, Liu, Li, & Chung, 2021). Additionally, other research shows SME's effect on health advocacy (Bail, 2016), elderly care (He, Huang, Li, Zhou, & Li, 2020), and patient literacy about plastic surgery (Fan, Graziano, Economides, Black, & Song, 2019), among other health issues.

Not all SME leads to positive outcomes. As mentioned, a few social media influencers were key spreaders of COVID-19 vaccine misinformation (Center for Countering Digital Hate, 2021; Maloy & De Vynck, 2021; para. 3). Scholarly research supports these news reports, showing that some types of SME led to beliefs in these falsities (Gibson, Sanders, & Lamm, 2021). SME is also associated with negative health outcomes such as stress, dependency, and lowered feelings of well-being (Reer, Tang, & Quandt, 2019). Given the literature discussed above, I query whether the KGH and the BGH are associated with engagement with COVID-19 misinformation and if interpersonal discussion and partisan media affect SME with misinformation.

RQ5: Does the knowledge gap hypothesis affect SME with COVID-19 misinformation?
RQ6: Does the belief gap hypothesis affect SME with COVID-19 misinformation?
RQ7: Does interpersonal discussion affect SME with COVID-19 misinformation?
RQ8: Does partisan media use affect SME with COVID-19 misinformation?
RQ9: Is there a correlation between knowledge and likelihood of SME with COVID-19 misinformation?

5. Method

5.1. Sampling

Data were collected via a survey from a random sample of social media users in the U.S. (N = 840). The sample was drawn from a Qualtrics panel that reflected U.S. Census demographics regarding age, income, gender, region, and political affiliation. Qualtrics panels are widely used and are a proven data collection method (Brandon, Long, Loraas, Mueller-Phillips, & Vansant, 2014; Gil de Zúñiga, Barnidge, & Scherman, 2017). G*power analysis based on the following parameters (effect size = 0.15; power = 0.80; alpha 0.05, two-tailed) and as advised by Faul, Erdfelder, Buchner, and Lang (2009) showed that the sample was adequately powered. Data were collected between August 1–15, 2022. All ethical protocols were observed. This includes conducting the study in accordance with the Helsinki Declaration and obtaining informed consent from the subjects before participation. Additionally, the study was approved by the author's Institutional Review Board (IRB) before data collection.

A majority of the sample was female (66%), and the average age was 45.86 years. Demographically, the sample was: Non-Hispanic white = 57.9%, Non-Hispanic Black = 9%, Hispanic = 14.6%, Asian = 4.3%, Native Hawaiian or Pacific islander = 0.7%, American Indian or Alaska Native = 2.1%, other = 0.5%, and other = 4.3%. Liberal made up 30.1% of the sample while Independents were 29.4% of the sample and Conservatives were 28.2% of the sample, with other at 12.3%. The education attainment numbers were: Less than high school = 2.5%, Earned a high school diploma = 25.2%, earned an associate degree or some college education = 25.5%, Earned a bachelor's degree = 26.8%, and earned an advanced degree = 20%. The income categories were: Lower income = 20.1%, lower middle income = 14.9%, upper middle income = 28.7%, and upper income 36.3%.

6. Data collection

To get a sample of social media users, respondents indicated how often they used social media. Those who used social media rarely or never where dropped from the survey. Respondents then answered a series of demographic questions after which they answered a set of questions to measure their COVID-19 knowledge. To test for the likelihood of SME with misinformation, subjects viewed a Twitter-based meme embedded in the survey. The meme displayed false information about COVID-19 vaccines – see Fig. 1. Subjects then indicated how likely they were to like, share, retweet, and post a comment to the meme.

6.1. Variable measurement

Covid-19 Knowledge. This variable measured how much the subjects knew about COVID-19. The five COVID-19 questions were selected from quizzes by the CDC (2021) and John Hopkins Medicine (n.d.) and asked general questions about COVID-19 and related vaccines. Each correct answer was worth one point and a wrong answer was zero points, for a maximum knowledge score of 5 points. This reflects scoring methods from prior studies (Gerosa et al., 2021; Ho, 2012).

The Knowledge Gap Hypothesis. Education and income were used to measure this variable. Educational attainment was measured as: High school or less, some college, and college degree or higher (Gerosa, et al., 2021). Income was based on the annual household income in U.S. dollars (Ho et al., 2020) and was categorized as: Low income ($29,000 and less), lower middle income ($30,000–49,000), middle income (50, 000–89,00), and high income (90,000 and above). Because income was measured as a categorical variable, each income tier was dummy-coded (yes = 1 and no = 0) for the OLS regression analysis (as shown in Tables 2 and 3. This approach captures the main effect of a particular attribute of a categorical variable during regression analysis (Berry, Mielke, & Iyer, 1998; Miller & Erickson, 1974).

The Belief Gap Hypothesis. Like in prior studies (Hindman, 2009; Hindman, 2012; Veenstra, 2014), subjects were asked about their ideological orientation (lean Liberal, lean Independent, lean Conservative, or other). Like the income variable, each ideology category was dummy coded (yes = 1 and no = 0).

Interpersonal Discussion. Subjects were asked questions about how often they engaged in conversations and discussion with family and friends, co-workers and acquittances, and strangers about the COVID-19 pandemic (Ho, 2012; Ho et al., 2020; Kim, Wilkin, & Ball-Rokeach, 2011). The questions were based on a 1–10 scale where 1 = never and

Fig. 1. Twitter page with COVID-19 misinformation.

10 = very often. A composite interpersonal discussion score was then computed based on the average of the scores (Cronbach's alpha = 0.87, 5 items).

Partisan Media Use. Two questions measured this variable. Based on previous studies (Saldaña, McGregor, & Johnson, 2021; Veenstra, 2014), subjects were first asked how often they got their news from right-leaning sources (Fox News, Breitbart, Conservative talk radio, etc.). They were then asked the same about left-leaning sources (MSNBC, Huffington Post, Salon, Liberal talk radio, etc.). Responses for each question were captured on a 1–10 scale where 1 = never and 10 = very often. A partisan media use score was then computed from the average of the responses to each question resulting in separate Conservative and Liberal media use scores.

Social Media Engagement. As mentioned, subjects viewed a meme depicting false information about COVID-19 vaccines and were then asked how likely they were to like, share, retweet, and post a comment to the meme, as done in previous studies (Cao et al., 2017; Li & Xie, 2020). The author created the meme using Photoshop and the meme was designed to resemble real memes on Twitter as done in other studies (Wasike, 2022). The SME responses were based on a 1–10 scale where 1 = not at all likely and 10 = very likely. A composite SME score was then computed based on the average of the scores (Cronbach's alpha = 0.96, 4 items).

7. Results

IBM SPSS was used for data analysis and OLS regression was used to determine the main effects. Research questions 1–4 queried about the effect of the KGH, the BGH, partisan media use, and interpersonal discussion on COVID-19 knowledge. See Table 1 for variable means. Table 2 shows a partial KGH effect (RQ1). Only income ($\beta = -0.25$, $p < 0.002$), and not education, affected knowledge, with low income reducing COVID-19 knowledge. The BGH also affected knowledge, with Liberal and Conservative-leaning ideologies positively impacting knowledge. However, leaning Liberal increased COVID-19 knowledge ($\beta = 0.14$, $p < 0.013$) more than leaning Conservative ($\beta = 0.12$, $p < 0.028$). Leaning Independent did not have an effect. Neither partisan media use nor interpersonal discussion affected knowledge, as shown in the regression analysis results (Table 3) or the correlation results (Table 4).

Research questions 5–8 queried the effect of the KGH, the BGH, partisan media use, and interpersonal discussion on the likelihood of SME with COVID-19 misinformation. The KGH partially affected SME with misinformation as only income and not education had such an effect – see Table 3. Income had an inverse association with the likelihood of engaging with misinformation, with those in the lower income tiers more likely to do so than those in the upper tiers. Being in the lower-income tier had the biggest effect ($\beta = 0.19$, $p < 0.001$), followed by the lower middle income ($\beta = 0.16$, $p < 0.01$), and upper middle-income tier ($\beta = 0.15$, $p < 0.05$). Being in the upper income had a marginal but non-significant effect ($\beta = 0.11$). Interpersonal discussion also increased the likelihood of SME with misinformation ($\beta = 0.34$, $p < 0.001$), as did exposure to right-leaning- media ($\beta = 0.23$, $p < 0.001$), and to a lesser extent, exposure to left-leaning media ($\beta = 0.16$, $p < 0.001$). The correlations shown in Table 4 reflect these results. Interpersonal discussion ($r = 0.46$, $p < 0.01$), right-leaning media use ($r = 0.41$, $p < 0.01$), and left-leaning media use ($r = 0.33$, $p < 0.01$) were correlated with SME with misinformation.

Lastly, RQ8 queried about the effect of knowledge on SME with COVID-19 misinformation. Overall knowledge reduced SME with misinformation ($\beta = -0.10$, $p < 0.001$), and both were inversely correlated ($r = -0.15$; $p < 0.001$), as shown in Table 4. This means that having more knowledge about the disease lessened the chances of engaging in falsities about it on social media. For further analysis, I used a median split to compare high and low-knowledge subjects. First, the knowledge difference between the two groups was significant (high knowledge = 3.62, s.d. = 0.71; low knowledge = 1.83, s.d. = 0.38; $t = 36.68$, $p < 0.001$). Second, the low-knowledge subjects had a higher likelihood of SME with misinformation (mean = 3.93, s.d. = 2.90, $p < 0.001$, $t = 3.20$) than the high-knowledge subjects (mean = 3.22, s.d. = 2.90).

Table 1
Knowledge, SME, and interpersonal discussion means.

	Knowledge	S.D.	SME	S.D.	Interpersonal[a]	S.D.
Liberal	3.30	1.01	3.17	3.11	5.65	2.16
Independent	2.99	1.03	3.75	2.83	5.14	2.12
Conservative	3.20	1.00	3.31	2.88	4.98	2.32
High school or less	2.92	0.92	3.57	2.81	4.93	2.43
Some college	3.18	1.04	3.36	2.77	5.00	2.14
College or higher	3.24	1.03	3.32	3.03	5.43	2.21
Lower income	2.63	0.88	3.83	2.76	4.82	2.42
Lower middle income	3.05	1.02	3.50	2.84	4.72	2.14
Upper middle income	3.26	1.04	3.43	2.97	5.33	2.20
Upper income	3.30	0.99	3.15	2.96	5.43	2.23
Overall sample	3.12	1.02	3.42	2.91	5.18	2.26

[a] Interpersonal discussion.

8. Discussion

Health Knowledge and health literacy are key to public health (Bryant, 2002), but these are undermined by misinformation on social media (Allcott & Gentzkow, 2017). It begs scholars to study how best to combat this misinformation especially during health crises such as the COVID-19 pandemic. Therefore, this study examined how knowledge gaps and related variables affect engagement with COVID-19 misinformation. Data indicated that both the KGH and the BGH existed regarding knowledge about COVID-19. Income was positively associated with COVID-19 knowledge, and this reflects prior research (Ho, 2012; Ho et al., 2020; Kim, 2011). The BGH also emerged, with Liberal ideology having a bigger (positive) effect on COVID-19 knowledge than other ideologies. This too reflects prior BGH studies that show that ideology affects knowledge about contentious topics such as climate change, healthcare reform, and immigration in a similar pattern (Hindman, 2009, 2012; Saldaña, Chacon, & Garcia-Perdomo, 2018). Partisan media use and interpersonal discussion did not affect knowledge, which are departures from previous research (Hindman, 2009; Hindman & Yan, 2015; Saldaña et al., 2021; Veenstra, 2014; Wang et al., 2021).

Data also indicated that the KGH, the BGH, partisan media use, and interpersonal discussion affected the likelihood of SME with misinformation. Income was inversely associated with the likelihood to engage with misinformation. This reflects research that shows an inverse association between income and susceptibility to misinformation (Seo, Blomberg, Altschwager, & Vu, 2021). Partisan-media use also increased the likelihood of SME with misinformation, with right-leaning use media having a bigger effect than left-leaning media use. This too reflects research that shows that right-leaning media leads to a higher susceptibility to misinformation and a higher BGH effect (Veenstra, Hossain, & Lyons, 2014; Hindman & Yan, 2015). Also, like prior research (Ho et al., 2020; Wang et al., 2021), interpersonal discussion increased SME with misinformation.

Another important finding is that education impacted neither COVID-19 knowledge nor the likelihood of SME with misinformation. Although this contradicts prior research, it is welcome news in the current context because this suggests that there were no education-based knowledge gaps with COVID-19, and that education did not play a role in the spread of related misinformation. This reflects the above average COVID-19 knowledge score for the entire sample (mean = 3.12, s.d. = 1.02 – on a scale of 0–5). Additionally, the inverse correlation between knowledge and the likelihood of SME with

Table 2
OLS regression predicting COVID-19 knowledge.

	β	S.E.	t	p	C.I. Lower[a]	C.I. Upper	Tolerance	VIF
(Constant)		0.23	14.05	0.001	2.83	3.74		
BGH measures								
Liberal	0.14	0.12	2.49	0.01	0.06	0.55	0.36	2.77
Independent	0.03	0.12	0.63	0.53	−0.16	0.31	0.39	2.54
Conservative	0.12	0.12	2.21	0.03	0.03	0.52	0.37	2.70
KGH measures								
High school or less	−0.04	0.09	−1.08	0.28	−0.29	0.08	0.65	1.54
Some college	0.04	0.09	0.93	0.35	−0.09	0.26	0.77	1.30
Lowerincome	−0.25	0.20	−3.15	0.00	−1.04	−0.24	0.17	5.74
Lower middle income	−0.10	0.21	−1.41	0.16	−0.69	0.11	0.22	4.63
Upper middle income	−0.05	0.17	−0.65	0.51	−0.45	0.22	0.20	5.12
Upper income	−0.04	0.18	−0.49	0.62	−0.43	0.26	0.15	6.48
Right-leaning media use	−0.07	0.01	−1.75	0.08	−0.05	0.00	0.74	1.36
Left-leaning media use	0.03	0.01	0.61	0.54	−0.02	0.04	0.65	1.54
Interpersonal discussion	−0.03	0.02	−0.64	0.52	−0.05	0.02	0.74	1.35

$R^2 = 0.08$, Adjusted $R^2 = 0.07$.
The college or higher education category was excluded from analysis due to collinearity.
Multicollinearity statistics shown under the Tolerance and VIF column.
[a] Intervals at 95% confidence level.

Table 3
OLS regression predicting SME with COVID-19 misinformation.

	β	S.E.	t	p	C.I. Lower[a]	C.I. Upper	Tolerance	VIF
(Constant)		0.63	−0.52	0.60	−1.57	0.91		
BGH measures								
Liberal	−0.10	0.30	−2.08	0.04	−1.22	−0.04	0.36	2.79
Independent	0.01	0.29	0.12	0.90	−0.53	0.60	0.39	2.54
Conservative	−0.04	0.30	−0.85	0.40	−0.85	0.34	0.37	2.72
KGH measures								
High school or less	0.01	0.23	0.36	0.72	−0.37	0.53	0.65	1.54
Some college	0.03	0.22	0.76	0.45	−0.26	0.59	0.77	1.30
Lower income	0.19	0.50	2.71	0.01	0.37	2.32	0.17	5.81
Lower middle income	0.16	0.50	2.54	0.01	0.29	2.25	0.22	4.64
Upper middle income	0.15	0.41	2.28	0.02	0.13	1.75	0.20	5.12
Upper income	0.12	0.43	1.61	0.11	−0.15	1.53	0.15	6.48
Right-leaning media use	0.23	0.03	7.07	0.001	0.16	0.28	0.73	1.36
Left-leaning media use	0.16	0.03	4.41	0.001	0.08	0.21	0.65	1.54
Interpersonal discussion	0.34	0.04	1.27	0.001	0.35	0.52	0.74	1.35
COVID-19 Knowledge	−0.10	0.09	−3.43	0.001	−0.46	−0.12	0.91	1.10

$R^2 = 0.34$, Adjusted $R^2 = 0.33$.
The college or higher education category was excluded from analysis due to collinearity.
Multicollinearity statistics shown under the Tolerance and VIF column.
[a] Intervals at 95% confidence level.

Table 4
Correlations among interval-ratio variables.

	1	2	3	4	5
SME	–				
COVID-19 knowledge	−0.15[a]	–			
Interpersonal discussion	0.46[a]	0.00	–		
Right-leaning media use	0.41[a]	−0.08[b]	0.33[a]	–	
Left-leaning media use	0.33[a]	0.03	0.44[a]	0.27[a]	–

[a] $p < .01$.
[b] $p < .05$.

misinformation ($r = -0.15$, $p < 0.001$) means that increased knowledge reduced the likelihood of SME with misinformation. This suggests that public education campaigns about the coronavirus and COVID-19 were somewhat successful.

9. Implications

This study has theoretical and practical implications regarding health communication, knowledge gaps, and misinformation. First, the study enhances theory by examining the confluence between the KGH and the BGH. Most studies examine either one or the other, and here the data shows that both affect knowledge simultaneously. Additionally, the study examined these two among other related variables, namely, partisan media use and interpersonal discussion, therefore widening the theoretical contribution. Practically, the data provides timely lessons on combatting health-related misinformation. Data indicated that knowledge reduced the likelihood of SME with COVID-19 misinformation. Additionally, the above average COVID-19 knowledge score indicates that efforts to increase public awareness have been successful. But more is needed. Such effort may focus on reducing exposure to partisan media, more so, to right-leaning media, which increased the likelihood of SME with COVID-19 misinformation.

10. Limitations

The main limitation is that the study used self-reported scores on subjective questions such as ideological orientation and the likelihood of sharing information about a controversial topic. Self-reported responses carry a level of bias (Devaux & Sassi, 2016) that affects validity. The study also examined variables among a sample of social media users and did not compare these with non-social media users. It also focused on social media use and did not compare this with the use of other media

such as TV or radio. Therefore, the results are only generalizable among social media users. Age, which is associated with ideological orientation (DeSilver, 2014; Kuta, 2020, para. 10, 11), was also not considered or controlled for in the analysis. The COVID-19 pandemic was also unique and the effect of this uniqueness is unaccounted for in the data. For instance, in the U.S., the pandemic occurred in the new age of social media-driven misinformation during the 2016 presidential elections (Bovet & Makse, 2019; Grinberg, Joseph, Friedland, Swire-Thompson, & Lazer, 2019). Second, the COVID-19 pandemic is one of the few global pandemics in recorded human history (Feehan & Apostolopoulos, 2021).

Like most studies on SME, this study asked about engagement with misinformation without distinguishing between purposeful or inadvertent engagement such as commenting to correct or oppose a false social media post. Lastly, SPSS excluded the college or higher education category from the regression analysis due to collinearity. One explanation could be the high inverse correlations this category had with the other education categories, namely, high school or less ($r = -0.58$) and some college ($r = -0.54$). Therefore, the results should be interpreted within the lens of these limitations.

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The data is available from the author upon request.

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CRediT authorship contribution statement

Ben Wasike: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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