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Social Media, Conspiracy Beliefs, and COVID-19 Vaccines: A Survey Study of Emerging and Middle-Aged Adults in the United States

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Abstract: This study examined the connections between social media use and behaviors, COVID-19 vaccine conspiracy beliefs, and COVID-19 vaccine uptake in 809 emerging and middle-aged adults. Emerging adults reported more overall social media use, active and passive social media behaviors, and use of most platforms (i.e., Instagram, Snapchat, TikTok, Twitter/X, Reddit, and YouTube), whereas middle-aged adults reported more Facebook use and higher vaccine uptake. COVID-19 vaccine conspiracy beliefs were linked to lower vaccine uptake, with this association unexpectedly stronger among individuals who reported less social media use and fewer active and passive social media behaviors. Active social media behaviors were associated with stronger vaccine conspiracy beliefs, whereas passive social media behaviors and overall use did not show a similar association. Exploratory analyses of platform-specific effects revealed nuanced patterns: TikTok use was associated with stronger vaccine conspiracy beliefs, Instagram use was associated with higher vaccine uptake, and Snapchat use was associated with lower vaccine uptake. Our findings highlight the complex, platform-specific influences of social media use and behaviors on COVID-19 vaccine conspiracy beliefs and vaccine uptake. Future studies are needed to investigate the role of specific social media platforms in spreading, perpetuating, or countering misinformation about the COVID-19 vaccine.



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Keywords: age differences; conspiracy theories; COVID-19; health behaviors; social media; vaccines

1. Introduction

Social media platforms play an important role in shaping health-related beliefs and behaviors, especially related to the COVID-19 pandemic (Chen and Wang 2021). In fact, surveys have estimated an increase of about 20% in worldwide social media usage since the start of the COVID-19 pandemic (Dixon 2023). Beyond serving as a source of entertainment and interpersonal connection, social media platforms also provide access to information and misinformation about current events, including the COVID-19 vaccine (Lim et al. 2022). Recent studies have implicated social media use as one potential factor contributing to persistent vaccine hesitancy (Puri et al. 2020), in part, because of the prevalence of strong anti-vaccination sentiments and conspiracy beliefs in online communities (Piedrahita-Valdés et al. 2021). Conspiracy beliefs refer to explanations about the world that involve the existence of a powerful and covert group orchestrating important events with underlying malevolent motivations (Van Prooijen and Douglas 2018).

Health-related conspiracy theories thrive in online spaces. One study conducted prior to the COVID-19 pandemic estimated that 40% of social media posts related to common diseases contained false information (Waszak et al. 2018). People who obtain information about COVID-19 on social media are more frequently exposed to this content, more likely to believe conspiracy theories presented in social media posts (Allington et al. 2021; Buturoiu et al. 2021), and more likely to share this misinformation with others (Ahmed and Rasul 2022). Past studies suggest that posts containing fabricated information are 70% more likely to be retweeted due in part to their unconventional messages (Thorakkattil et al. 2022), which may garner more natural interest than factual news (Vosoughi et al. 2018). Greater exposure to fabricated information on social media may subsequently decrease the likelihood of following public health recommendations (Islam et al. 2021; Nicholls and Yitbarek 2022). These relationships are compounded by the fact that individuals are more likely to interact with content that reflects their ideals on social media, creating an echo chamber effect where their content is curated to match their beliefs (Puri et al. 2020). This effect can be seen on platforms like TikTok and Instagram's Explore Page, where the more a user interacts with a certain type of content, the more their feeds will present them with similar content. Given that COVID-19 vaccine hesitancy continues to pose a significant public health threat (Troiano and Nardi 2021), it is crucial to further explore how social media use influences the development of COVID-19 vaccine conspiracy beliefs and hesitancy, as well as how this impact varies according to the type of social media behavior or platform.

This investigation was guided by the complementary theoretical frameworks of uses and gratifications theory (Katz et al. 1973; Sundar and Limperos 2013; Whiting and Williams 2013) and social cognitive theory (Bandura 1986). First, uses and gratifications theory posits that individuals seek out and engage with media content that meets their psychological needs (e.g., information, social connection, entertainment) (Katz et al. 1973; Whiting and Williams 2013). In the context of social media use and health-related conspiracies, this theory suggests that individuals may be more likely to engage with health-related content that aligns with their pre-existing beliefs and viewpoints, such as those relating to vaccination and COVID-19. This implies that individual exposure to vaccine-related content on social media is not random, but rather shaped by individuals' motivations for using social media (Sundar and Limperos 2013). Second, social cognitive theory extends this framework by identifying the key psychological mechanisms through which exposure to social media content influences beliefs and behavior, such as observational learning, informational support, and social reinforcement (Bandura 1986). Together, these theories provide a foundation for understanding how social media use and behaviors may influence COVID-19 vaccine-related beliefs and behaviors.

1.1. Age Differences in Social Media Use and Vaccine Conspiracy Beliefs

Younger adults have lower uptake of the COVID-19 vaccine than older adults in the United States (Center for Disease Control 2024). However, there has been less work directly testing whether social media use and COVID-19 vaccine conspiracy beliefs also differ by age. For social media use, one recent survey of U.S. adults found that emerging adults (ages 18–29) were more likely than middle-aged adults (ages 50–64) to use many specific types of social media platforms with the largest differences observed in the use of Instagram, Snapchat, and TikTok; in contrast, there were only minor differences in emerging adults' and middle-aged adults' use of Facebook and LinkedIn (Gottfried 2024). According to uses and gratifications theory, these age-related differences in platform use suggest that younger adults may be more motivated than middle-aged adults to engage with media that fulfills psychological needs like social connection and entertainment. For

vaccine conspiracy beliefs, several studies have found that younger adults are more likely to endorse COVID-19 conspiracies than older adults (Duplaga 2020; Freeman et al. 2022). Most relevant to the current investigation, Furlan et al. (2024) reported that emerging adults in the U.S. were less likely to report vaccine conspiracy beliefs than middle-aged adults. However, we are unaware of any prior work that has examined age differences in conspiracy beliefs specific to the COVID-19 vaccine.

1.2. Social Media Behaviors and Platforms

Specific social media platforms and behaviors may have different impacts on COVID-19 vaccine conspiracy beliefs and uptake. Common functions of social media platforms include short-form video content (e.g., TikTok, Instagram Reels), image-based sharing (e.g., Facebook, Instagram), “story” sharing content (e.g., Snapchat, Instagram), long-form video content (e.g., YouTube, TikTok), direct messaging (e.g., Snapchat, Facebook Messenger), and forum-based content (e.g., Reddit, Facebook). Researchers have suggested that social media platforms can be grouped into four categories based on their primary function: relationship (profile-based), self-media (profile-based with self-management), creative outlet (content-based with sharing individual creativity), and collaboration (content-based with forum functions) (Voorveld et al. 2018). Although many social media platforms have come to adopt similar characteristics, each platform still possesses unique qualities that drive the way its users behave and interact. These distinct qualities of specific platforms may differentially influence individuals’ vaccine conspiracy beliefs and vaccine uptake. According to uses and gratifications theory, individuals may gravitate toward specific social media platforms and behaviors based on their perceived ability to meet psychological needs, such as information-seeking, entertainment, social connection, or creative self-expression. This perspective would suggest that the distinct functions and features of specific platforms could play a key role in shaping users’ exposure to and engagement with vaccine-related content.

Social media behaviors can be categorized as either passive or active. Passive social media behaviors are those which do not foster true social interaction or connection with content (e.g., scrolling through a feed or homepage), whereas active social media behaviors contribute to greater reciprocity and feelings of social connectedness (e.g., posting photos or comments) (Verduyn et al. 2022). Past research has shown that active social media behavior is a more conscious form of social media use (Kaye et al. 2024) that has a stronger impact on users’ self-reflection (Krause et al. 2022). However, there has been no prior research to our knowledge examining whether active and passive social media behaviors have a different impact on vaccine conspiracy beliefs and vaccine uptake. From the perspective of social cognitive theory, active and passive social media behaviors may influence vaccine beliefs and decision making through distinct mechanisms. For example, active behaviors like posting or commenting may offer social reinforcement and validation for users’ pre-existing attitudes, such as those related to the COVID-19 vaccine. In contrast, passive behaviors like scrolling through a feed may facilitate observational learning and provide informational support by exposing individuals to a broader range of viewpoints, which could potentially challenge their pre-existing attitudes and beliefs.

1.3. Current Study

The current study examined the associations between age, social media use, active and passive social media behaviors, COVID-19 vaccine conspiracy beliefs, and COVID-19 vaccine uptake. The first aim was to assess whether emerging adults and middle-aged adults differed in their social media use and behaviors, COVID-19 vaccine conspiracy beliefs, and COVID-19 vaccine uptake. We hypothesized that emerging adults would report greater social media use, active and passive social media behaviors, and COVID-19

vaccine conspiracy beliefs than middle-aged adults, while middle-aged adults would report greater COVID-19 vaccine uptake than emerging adults (Hypothesis 1).

The second aim was to evaluate whether COVID-19 vaccine conspiracy beliefs were associated with COVID-19 vaccine uptake and whether social media use and behaviors moderated this relationship. We hypothesized that COVID-19 vaccine conspiracy beliefs would decrease COVID-19 vaccine uptake (Hypothesis 2a), and that this relationship would be moderated by social media use and behaviors. Specifically, we predicted that the relationship between COVID-19 vaccine conspiracy beliefs and vaccine uptake would be stronger for participants who reported more social media use and behaviors (Hypothesis 2b).

The third aim was to investigate whether social media use and behaviors were associated with COVID-19 vaccine conspiracy beliefs and vaccine uptake. We hypothesized that greater social media use and more social media behaviors would be associated with higher COVID-19 vaccine conspiracy beliefs (Hypothesis 3a) and higher COVID-19 vaccine uptake (Hypothesis 3b). We examined both overall social media use (in our main analyses) and platform-specific social media use (in our exploratory analyses). Given the earlier evidence suggesting that active social media behaviors involve greater self-consciousness and reflection, we expected that active social media behaviors would have a stronger impact on these outcomes than passive behaviors. Given the limited research on platform-specific effects and the rapid evolution of social media platforms, we did not make specific predictions regarding the nature of platform-specific effects.

2. Materials and Methods

2.1. Participants and Procedures

Participants were recruited via Prime Panel, an online survey recruitment platform that collects data based on demographic quotas by aggregating opt-in market research panels. Our target populations were emerging adults and middle-aged adults in the United States. Inclusion criteria were being 20–30 or 50–60 years old, being fluent in English, and residing in the United States. Participants received financial compensation for completing the study that depended on the platform used to access the survey. This study was approved by the Institutional Review Board at Trinity College (ID #3155). After providing informed consent, participants were directed to a Qualtrics survey which assessed social media use and behaviors, COVID-19 vaccine status, and COVID-19 vaccine conspiracy beliefs. Data collection occurred between 6 March 2024 and 8 March 2024, after which the survey was closed.

2.2. Measures

2.2.1. Demographics

Participants were asked to provide their age (years), gender (male, female, non-binary, transgender, other, prefer not to say), race (American Indian/Alaskan Native, Asian or Asian American, Black or African American, Caucasian (White), Middle Eastern, Native Hawaiian or Pacific Islander, other, prefer not to say), ethnicity (Hispanic/Latino or Not Hispanic/Latino), relationship status (single, in a relationship but unmarried, married, divorced or separated, widowed), political orientation (very liberal, liberal, moderate, conservative, very conservative), annual household income (less than \$35,000, \$35,000–\$75,000, \$75,000–\$150,000, more than \$150,000), and educational attainment (less than high school, high school diploma or equivalent, some college and no degree, associate's degree, bachelor's degree, more than bachelor's degree).

2.2.2. COVID-19 Vaccine Uptake

Participants were asked to indicate their COVID-19 vaccination status (not vaccinated, vaccinated but not boosted, vaccinated and boosted at least once). This question was used to create a dichotomous measure of COVID-19 vaccine uptake that reflected whether participants were vaccinated (i.e., if they had received the COVID-19 vaccine with or without receiving a booster). Participants were also asked to indicate whether they had received the 2023–2024 COVID-19 hybrid vaccine (yes/no).

2.2.3. Social Media Use and Behaviors

We used an adapted version of the Social Networking Activity Intensity Scale (Li et al. 2016) to assess participants' social media use and behaviors. Social media use was measured using seven items that asked participants how often they used each of seven social media platforms (Facebook, Instagram, Snapchat, TikTok, Twitter/(X), Reddit, YouTube) in the past week on a five-point scale: 0 (never), 1 (1–2 days), 2 (3–4 days), 3 (5–6 days), and 4 (everyday). We calculated a composite variable representing overall social media use by averaging participants' responses to these seven items ($\alpha = 0.66$). Individual item responses were used to assess platform-specific social media use.

Social media behaviors were assessed using ten items that asked participants to indicate how many hours per day they spend performing certain actions on social media on a six-point scale of 0–1, 2–3, 4–5, 6–7, 8–9, or 10+. These actions were: (1) sending messages to friends on message boards, (2) chatting with friends via instant messaging functions, (3) replying to comments made by social networking friends, (4) commenting on friends' status/logs/photos, (5) sharing or reposting content, (6) browsing others' logs/photos/statuses/albums, (7) posting photos/videos on personal web profile, (8) shopping on social media platforms, (9) surfing entertainment, and (10) surfing current news. We calculated a seven-item composite variable representing active social media behaviors ($\alpha = 0.89$; items 1–5 and 7–8) and a three-item composite variable representing passive social media behaviors ($\alpha = 0.75$; items 6, 9, and 10) by averaging participants' responses to these items.

2.2.4. COVID-19 Vaccine Conspiracy Beliefs

COVID-19 vaccine conspiracy beliefs were measured using an adaptation of the Vaccine Conspiracy Beliefs Questions Scale by Shapiro et al. (2016) which asked participants to rate how much they agree with the following three statements: "The existence of the COVID-19 virus is fabricated by the government," "COVID-19 vaccine safety data is often fabricated," and "COVID-19 vaccine efficacy data is often fabricated," using a scale from 1 (very strongly disagree) to 7 (very strongly agree). We averaged these items to create a composite measure of COVID-19 vaccine conspiracy beliefs ($\alpha = 0.90$).

2.3. Data Analysis

We tested the dimensional structure of the social media behaviors scale using confirmatory factor analysis with R and the lavaan package (Rosseel 2012). Specifically, we evaluated whether the ten-item scale could be explained by a two-dimensional measurement model with factors corresponding to active social media behaviors (items 1–5 and 7–8) and passive social media behaviors (items 6, 9, and 10). Model fit was assessed using the Comparative Fit Index, Tucker–Lewis index, and Standardized Root Mean Square Residual.

We tested Aim 1 by using independent samples *t*-tests to evaluate whether emerging adults and middle-aged adults differed in their social media use and behaviors, COVID-19 vaccine conspiracy beliefs, and COVID-19 vaccine uptake.

We tested Hypothesis 2a by using logistic regression to examine whether COVID-19 vaccine conspiracy beliefs were associated with COVID-19 vaccine uptake when controlling for covariates. We tested Hypothesis 2b by using Model 1 of the PROCESS macro to examine whether social media use or behaviors moderated the association between COVID-19 vaccine conspiracy beliefs and COVID-19 vaccine uptake when controlling for covariates. We investigated statistically significant interactions by estimating the covariate-adjusted simple main effect of COVID-19 vaccine conspiracy beliefs on COVID-19 vaccine uptake at one standard deviation above and below the mean value of social media use and behaviors.

We tested Hypothesis 3a by using linear regression to examine whether social media use and behaviors were associated with COVID-19 vaccine conspiracy beliefs when controlling for covariates. We tested Hypothesis 3b by using logistic regression to examine whether social media use and behaviors were associated with COVID-19 vaccine uptake when controlling for covariates. We tested our exploratory aims by using linear and logistic regression to examine whether use of specific social media platforms was associated with COVID-19 vaccine conspiracy beliefs and COVID-19 vaccine uptake when controlling for covariates.

3. Results

3.1. Descriptive Results

Our initial sample consisted of 810 participants, but one participant did not provide complete demographic data and was removed from the analyses resulting in a final sample of $N = 809$. The mean score on the COVID-19 vaccine conspiracy belief scale was 3.58 ($SD = 1.91$) and the overall rate of COVID-19 vaccine uptake was 70.2%. One-quarter of the sample (24.7%) reported that they had received the 2023–2024 COVID-19 hybrid vaccine. Demographic characteristics of the study sample are shown in Table 1.

Table 1. Demographic characteristics of the study sample ($N = 809$).

Characteristic	% (N)
Age Cohort	
20–30 years old	48.3 (391)
50–60 years old	51.7 (418)
Gender	
Female	48.9 (396)
Male	49.4 (400)
Non-binary	1.3 (11)
Prefer not to say	0.2 (2)
Race	
White	64.5 (522)
Black or African American	18.0 (146)
Asian or Asian American	4.1 (33)
American Indian or Alaska Native	2.1 (17)
Native Hawaiian or Pacific Islander	0.4 (3)
Middle Eastern	0.4 (3)
Multiple Races	5.1 (41)
Other Race	3.8 (31)
Prefer not to say	1.6 (13)
Ethnicity	
Hispanic or Latino	13.7 (111)
Not Hispanic or Latino	86.3 (698)
Relationship Status	
Married	31.3 (253)
In a relationship but unmarried	15.2 (123)
Single	40.9 (331)
Divorced or separated	10.4 (84)

Table 1. *Cont.*

Characteristic	% (N)
Widowed	2.2 (18)
Political Orientation	
Very conservative	10.1 (82)
Conservative	17.9 (145)
Moderate	45.1 (365)
Liberal	18.0 (146)
Very liberal	8.8 (71)
Household Income	
Less than 35,000 USD	37.9 (307)
35,000–75,000 USD	32.3 (261)
75,000–150,000 USD	23.9 (193)
More than 150,000 USD	5.9 (48)
Education	
Less than high school	4.3 (35)
High school or equivalent	32.6 (264)
Some college, no degree	23.6 (191)
Associate’s degree	11.2 (91)
Bachelor’s degree	19.0 (154)
Advanced degree	9.1 (74)
Vaccination Status	
Not vaccinated	29.8 (241)
Vaccinated but not boosted	22.2 (180)
Vaccinated and boosted at least once	48.0 (388)

We conducted a confirmatory factor analysis to test the fit of the hypothesized two-factor model of social media behaviors, distinguishing between active and passive social media behaviors. The comparative fit index was 0.93, the Tucker–Lewis index was 0.91, and the Standardized Root Mean Square Residual was 0.05, all of which suggested a good model fit. Based on these results, we proceeded with further investigation of two factors: active social media behaviors and passive social media behaviors.

3.2. Aim 1: Age Differences in Social Media Use and Behaviors and COVID-19 Vaccine Conspiracy Beliefs and Vaccine Uptake

We used independent samples *t*-tests to evaluate whether emerging adults and middle-aged adults differed in their overall and platform-specific social media use, active and passive social media behaviors, COVID-19 vaccine conspiracy beliefs, and COVID-19 vaccine uptake. As shown in Table 2, emerging adults reported more overall social media use, less use of Facebook, more use of all other specific platforms (Instagram, Snapchat, TikTok, Twitter/X, Reddit, YouTube), more active and passive social media behaviors, and lower COVID-19 vaccine uptake than middle-aged adults. Contrary to Hypothesis 1, we did not observe age differences in COVID-19 vaccine conspiracy beliefs.

Table 2. Results of independent samples *t*-tests evaluating age differences in social media use and COVID-19 vaccine outcomes.

	Emerging Adults	Middle-Aged Adults	<i>t</i> -Test Statistic	df	Two-Sided <i>p</i> -Value	Cohen’s <i>d</i>
Overall Social Media Use	1.9 (0.9)	1.1 (0.7)	12.8	761.7	<0.001	0.91
Facebook Use	1.8 (1.6)	2.6 (1.6)	−6.3	804.4	<0.001	−0.44
Instagram Use	2.2 (1.6)	1.1 (1.6)	9.6	803.3	<0.001	0.68

Table 2. Cont.

	Emerging Adults	Middle-Aged Adults	t-Test Statistic	df	Two-Sided p-Value	Cohen's d
Snapchat Use	1.7 (1.6)	0.3 (1.0)	13.9	625.4	<0.001	0.99
TikTok Use	2.0 (1.7)	0.7 (1.3)	12.2	741.7	<0.001	0.87
Twitter/X Use	1.4 (1.5)	0.7 (1.2)	7.2	750.9	<0.001	0.51
Reddit Use	1.1 (1.3)	0.4 (0.9)	9.0	675.3	<0.001	0.64
YouTube Use	2.9 (1.3)	2.2 (1.6)	6.2	800.4	<0.001	0.44
Social Media Behaviors						
Active	0.9 (1.0)	0.3 (0.5)	11.9	560.6	<0.001	0.85
Passive	1.5 (1.1)	0.6 (0.9)	13.4	745.4	<0.001	0.95
COVID-19 Vaccine Conspiracy Beliefs	3.6 (1.7)	3.5 (2.0)	0.8	800.7	0.40	0.06
COVID-19 Vaccine Uptake	66.5 (47.2)	73.7 (44.1)	−2.2	792.3	0.026	−0.16

3.3. Aim 2: Testing Associations Between COVID-19 Vaccine Conspiracy Beliefs and Vaccine Uptake and Moderation by Social Media Use and Behaviors

We used logistic regression to test whether COVID-19 vaccine conspiracy beliefs were associated with COVID-19 vaccine uptake when controlling for covariates. Consistent with Hypothesis 2a, we observed a statistically significant effect of COVID-19 vaccine conspiracy beliefs on COVID-19 vaccine uptake. In this model, participants were also more likely to be vaccinated if they were middle-aged, had a higher household income, and had higher educational attainment, and less likely to be vaccinated if they were partnered, previously married, or more conservative. Other covariates were not associated with COVID-19 vaccine uptake. Full model results are shown in Table 3.

Table 3. Parameter estimates for logistic regression predicting uptake of the COVID-19 vaccine by COVID-19 vaccine conspiracy beliefs and covariates.

Parameter	Exp(B)	Wald	p	95 CI Lower	95 CI Upper
Middle-Aged Sample	2.20	15.05	<0.001	1.48	3.28
Female	1.16	0.67	0.41	0.82	1.63
Non-Binary	2.49	1.08	0.30	0.45	13.85
Black	0.95	0.05	0.82	0.60	1.49
Other Race	1.21	0.59	0.44	0.74	1.98
Hispanic	1.10	0.15	0.70	0.67	1.83
Partnered	0.66	4.27	0.039	0.44	0.98
Previously Married	0.54	4.20	0.040	0.30	0.97
Political Conservatism	0.64	22.74	<0.001	0.53	0.77
Household Income	1.26	4.71	0.030	1.02	1.56
Educational Attainment	1.21	8.21	0.004	1.06	1.39
COVID-19 Vaccine Conspiracy Beliefs	0.72	45.60	<0.001	0.65	0.79

Note. Age, gender, race, and relationship status were dummy coded with reference to participants who were emerging adults, male, White, and single.

Next, we tested whether social media use or behaviors moderated the association between COVID-19 vaccine conspiracy beliefs and COVID-19 vaccine uptake when controlling for covariates. We found statistically significant interactions between COVID-19 vaccine conspiracy beliefs and social media use ($p = 0.002$), active social media behaviors ($p < 0.001$), and passive social media behaviors ($p = 0.002$). We examined the covariate-adjusted simple effect of COVID-19 vaccine conspiracy beliefs on COVID-19 vaccine uptake at one standard deviation above and below the mean value of social media use, active social media behaviors, and passive social media behaviors (see Figure 1). Contrary to Hypothesis

2b, COVID-19 vaccine conspiracy beliefs were more strongly associated with COVID-19 vaccine uptake for individuals with less frequent social media use ($B = -0.48$, $SE = 0.07$, $p < 0.001$) than for individuals with more frequent social media use ($B = -0.19$, $SE = 0.07$, $p = 0.005$), for individuals with less active social media behaviors ($B = -0.45$, $SE = 0.06$, $p < 0.001$) than for individuals with more active social media behaviors ($B = -0.15$, $SE = 0.07$, $p = 0.038$), and for individuals with less passive social media behaviors ($B = -0.45$, $SE = 0.06$, $p < 0.001$) than for individuals with more passive social media behaviors ($B = -0.20$, $SE = 0.07$, $p = 0.002$).

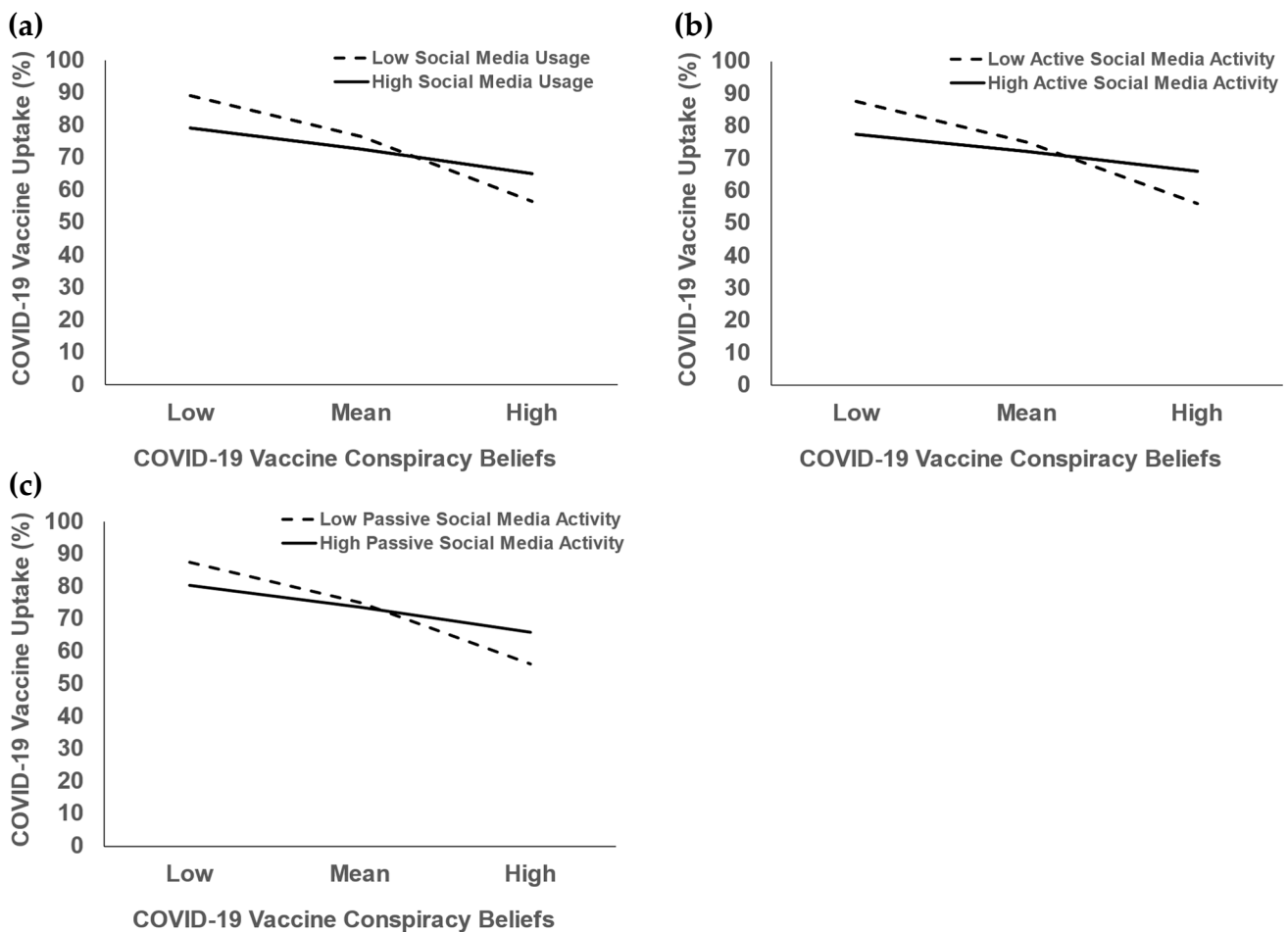


Figure 1. Moderation of the association between COVID-19 vaccine conspiracy beliefs and COVID-19 vaccine uptake by: (a) social media use; (b) active social media behaviors; (c) passive social media behaviors.

3.4. Aim 3: Social Media Use and Behaviors as Predictors of COVID-19 Vaccine Uptake and Conspiracy Beliefs

We used linear regression to test whether social media use, active social media behaviors, and passive social media behaviors predicted COVID-19 vaccine conspiracy beliefs when controlling for covariates. Consistent with Hypothesis 3a, we found that individuals with more active social media behaviors reported greater COVID-19 vaccine conspiracy beliefs. Contrary to Hypothesis 3a, social media use and passive social media behaviors were not associated with COVID-19 vaccine conspiracy beliefs. In this model, identifying as Hispanic and greater levels of political conservatism were associated with greater vaccine conspiracy beliefs. Full model results are shown in Table 4.

We used a logistic regression model to test whether frequency of social media use and social media behaviors were associated with COVID-19 vaccine and booster uptake

when controlling for covariates. Contrary to Hypothesis 3b, social media use and behaviors were not associated with COVID-19 vaccine uptake. In this model, participants were also more likely to be vaccinated if they were middle-aged, had a higher household income and had higher educational attainment, and less likely to be vaccinated if they were partnered, previously married, or more conservative. Other covariates were not associated with COVID-19 vaccine uptake. Full model results are shown in Table 5.

Table 4. Parameter estimates for linear regression predicting COVID-19 vaccine conspiracy beliefs from social media variables and covariates.

Parameter	B	SE	t	p	95 CI Lower	95 CI Upper
Intercept	1.34	0.33	4.11	<0.001	0.70	1.98
Middle-Aged Sample	−0.25	0.16	−1.56	0.12	−0.56	0.06
Female	0.13	0.13	1.01	0.31	−0.12	0.38
Non-Binary	−0.40	0.51	−0.79	0.43	−1.41	0.60
Black	0.22	0.17	1.27	0.20	−0.12	0.56
Other Race	0.18	0.18	0.99	0.32	−0.17	0.53
Hispanic	0.40	0.19	2.11	0.035	0.03	0.78
Partnered	0.20	0.15	1.32	0.19	−0.09	0.48
Previously Married	0.27	0.22	1.27	0.21	−0.15	0.70
Political Conservatism	0.67	0.06	10.96	<0.001	0.55	0.79
Household Income	−0.05	0.08	−0.66	0.51	−0.20	0.10
Educational Attainment	−0.00	0.05	−0.05	0.96	−0.10	0.09
Active Social Media Behaviors	0.44	0.10	4.34	<0.001	0.24	0.64
Passive Social Media Behaviors	−0.10	0.08	−1.23	0.22	−0.26	0.06
Social Media Use	−0.02	0.08	−0.23	0.82	−0.18	0.14

Note. Age, gender, race, and relationship status were dummy coded with reference to participants who were emerging adults, male, White, and single.

Table 5. Parameter estimates for logistic regression predicting uptake of the COVID-19 vaccine by social media use and behaviors and covariates.

Parameter	Exp(B)	Wald	p	95 CI Lower	95 CI Upper
Middle-Aged Sample	2.25	13.98	<0.001	1.47	3.45
Female	1.09	0.26	0.61	0.78	1.53
Non-Binary	2.30	1.01	0.32	0.45	11.62
Black	0.91	0.16	0.69	0.58	1.43
Other Race	1.15	0.33	0.56	0.71	1.85
Hispanic	0.96	0.02	0.88	0.59	1.57
Partnered	0.65	4.53	0.033	0.44	0.97
Previously Married	0.53	4.76	0.029	0.30	0.94
Political Conservatism	0.54	49.73	<0.001	0.45	0.64
Household Income	1.26	4.88	0.027	1.03	1.54
Educational Attainment	1.21	8.14	0.004	1.06	1.37
Active Social Media Behaviors	1.01	0.01	0.92	0.78	1.32
Passive Social Media Behaviors	1.02	0.03	0.86	0.83	1.26
Social Media Use	0.92	0.52	0.59	0.74	1.15

Note. Age, gender, race, and relationship status were dummy coded with reference to participants who were emerging adults, male, White, and single.

3.5. Exploratory Aim: Examining Effects of Specific Social Media Platforms

We conducted exploratory analyses to examine whether the use of specific social media platforms was associated with COVID-19 vaccine conspiracy beliefs or COVID-19 vaccine uptake.

First, we conducted linear regression to test whether the use of specific social media platforms was associated with COVID-19 vaccine conspiracy beliefs when controlling

for covariates. We observed that more frequent TikTok use was associated with greater vaccine conspiracy beliefs. However, the frequency of using Facebook, Instagram, Snapchat, Twitter/X, Reddit, and YouTube was not associated with COVID-19 vaccine conspiracy beliefs. The full model results are shown in Table 6.

Table 6. Parameter estimates for linear regression predicting vaccine conspiracy beliefs from frequency of using specific social media platforms and covariates.

Parameter	B	SE	t	p	95 CI Lower	95 CI Upper
Intercept	1.42	0.34	4.20	<0.001	0.76	2.09
Middle-Aged Sample	−0.28	0.17	−1.68	0.09	−0.62	0.05
Female	0.09	0.13	0.70	0.49	−0.17	0.35
Non-Binary	−0.43	0.52	−0.84	0.40	−1.45	0.58
Black	0.29	0.18	1.61	0.11	−0.06	0.64
Other Race	0.18	0.18	1.00	0.32	−0.17	0.53
Hispanic	0.43	0.19	2.23	0.026	0.05	0.81
Partnered	0.11	0.15	0.73	0.47	−0.19	0.40
Previously Married	0.27	0.22	1.25	0.21	−0.16	0.70
Political Conservatism	0.68	0.06	10.80	<0.001	0.56	0.80
Household Income	−0.03	0.08	−0.41	0.68	−0.18	0.12
Educational Attainment	−0.02	0.05	−0.44	0.66	−0.12	0.07
Facebook Use	−0.02	0.04	−0.42	0.67	−0.10	0.06
Instagram Use	0.03	0.05	0.62	0.54	−0.06	0.12
Snapchat Use	0.04	0.05	0.70	0.49	−0.07	0.15
TikTok Use	0.10	0.05	2.00	0.046	0.00	0.19
Twitter/X Use	−0.04	0.05	−0.86	0.39	−0.14	0.06
Reddit Use	−0.09	0.06	−1.49	0.14	−0.21	0.03
YouTube Use	0.02	0.04	0.40	0.69	−0.07	0.11

Note. Age, gender, race, and relationship status were dummy coded with reference to participants who were emerging adults, male, White, and single.

Second, we conducted logistic regression to test whether the use of specific social media platforms was associated with COVID-19 vaccine uptake when controlling for covariates. We observed that greater Instagram use was associated with higher COVID-19 vaccine uptake whereas greater Snapchat use was associated with lower COVID-19 vaccine uptake. Use of Facebook, TikTok, Twitter/X, Reddit, and YouTube was not associated with COVID-19 vaccine uptake. The full model results are shown in Table 7.

Table 7. Parameter estimates for logistic regression predicting COVID-19 vaccine uptake by use of specific social media platforms and covariates.

Parameter	Exp(B)	Wald	p	95 CI Lower	95 CI Upper
Middle-Aged Sample	1.95	8.54	0.003	1.25	3.04
Female	1.14	0.52	0.47	0.80	1.61
Non-Binary	2.52	1.24	0.26	0.50	12.79
Black	0.80	0.92	0.34	0.50	1.27
Other Race	1.12	0.20	0.65	0.69	1.81
Hispanic	0.91	0.14	0.71	0.55	1.50
Partnered	0.68	3.62	0.06	0.46	1.01
Previously Married	0.53	4.67	0.031	0.30	0.94
Political Conservatism	0.53	47.27	<0.001	0.44	0.64
Household Income	1.26	4.86	0.027	1.03	1.55
Educational Attainment	1.17	5.73	0.017	1.03	1.34
Facebook Use	0.97	0.24	0.63	0.88	1.08
Instagram Use	1.19	7.21	0.007	1.05	1.36
Snapchat Use	0.80	9.91	0.002	0.69	0.92

Table 7. Cont.

Parameter	Exp(B)	Wald	p	95 CI Lower	95 CI Upper
TikTok Use	0.94	0.91	0.34	0.83	1.07
Twitter/X Use	1.14	3.50	0.06	0.99	1.32
Reddit Use	0.91	1.38	0.24	0.78	1.07
YouTube Use	0.96	0.57	0.45	0.85	1.07

Note. Age, gender, race, and relationship status were dummy coded with reference to participants who were emerging adults, male, White, and single.

4. Discussion

This study's first aim was to test whether emerging adults and middle-aged adults differed in their social media use and behaviors and COVID-19 vaccine conspiracy beliefs. Consistent with Hypothesis 1, emerging adults reported more overall social media use and more active and passive social media behaviors. Emerging adults also reported more use of nearly all specific social media platforms (i.e., Instagram, Snapchat, TikTok, Twitter, Reddit, YouTube) except for Facebook use, which was higher in middle-aged adults. This observation is consistent with a recent survey assessing the use of social media platforms across age groups (Gottfried 2024). From the perspective of uses and gratifications theory (Whiting and Williams 2013), this could suggest that emerging adults are more strongly motivated to engage with social media platforms that provide entertainment or opportunities for creative self-expression. Consistent with the nationwide trend in the United States, we also observed that emerging adults had a lower COVID-19 vaccine uptake than middle-aged adults. Given that emerging adults are more frequent social media users and their uptake of the most recent COVID-19 vaccine remains low (Lee et al. 2023), this could suggest the need for educational interventions on social media about the importance of the COVID-19 vaccine that are targeted toward this population. Contrary to our hypothesis and previous research (e.g., Furlan et al. 2024) but consistent with other earlier studies (e.g., Sallam et al. 2021), COVID-19 vaccine conspiracy beliefs did not differ between emerging adults and middle-aged adults. This was particularly unexpected because Furlan et al. (2024) hypothesized that social media use could represent a potential explanatory mechanism underlying age differences in vaccine conspiracy beliefs. It is possible that these contrasting findings could be due to our study assessing conspiracy theories specific to the COVID-19 vaccination, while Furlan et al. (2024) assessed general vaccine conspiracy beliefs. However, we believe that a more plausible explanation is the change in context as these data were collected in March 2024 whereas Furlan et al. (2024) collected their data in March 2023. Age differences in vaccine conspiracy beliefs may have disappeared during that time as these beliefs became less novel and less salient, especially because the United States' federal government declared the pandemic over in 2024.

Our second aim was to test whether COVID-19 vaccine conspiracy beliefs were associated with COVID-19 vaccine uptake and whether social media use and behaviors moderated this relationship. Consistent with Hypothesis 2a, higher COVID-19 vaccine conspiracy beliefs were associated with a lower likelihood of COVID-19 vaccine uptake. This finding is logical, as conspiracy theories about the COVID-19 vaccine often focus on its safety, efficacy, and effectiveness. It is also consistent with past research linking general conspiracy beliefs to lower COVID-19 vaccine uptake (Abu-Odah et al. 2022; Fadhel 2023; Sallam et al. 2021; Scandurra et al. 2022). Contrary to Hypothesis 2b, we observed that COVID-19 vaccine conspiracy beliefs were more strongly associated with lower COVID-19 vaccine uptake in individuals with less frequent social media use and fewer active and passive social media behaviors. These moderation effects were contrary to what we had initially predicted based on our guiding theoretical frameworks of uses and gratifications

theory and social cognitive theory. We believe that a possible explanation for this finding is that our study did not assess the use of more conservative social media platforms, such as Gettr, Gab, Parlor, and Truth Social. This omission may have contributed to the unexpected moderation findings by causing individuals who primarily use these platforms to be erroneously categorized as having low social media use. According to uses and gratifications theory and social cognitive theory, individuals with pre-existing anti-vaccination beliefs may be particularly drawn to these platforms, where their continued use and engagement may strengthen these beliefs through social reinforcement. Another possible explanation for this finding is that individuals with lower social media use and behaviors may have obtained their information about the COVID-19 vaccine from other types of media (e.g., broadcast television) that could have maintained or amplified their pre-existing vaccine conspiracy beliefs. It is important for future studies to test these potential explanations for this unexpected finding in order better understand the platforms where individuals obtain information about current health issues and how using these platforms influences health beliefs and decision making. There is a particular need for research on the impact of conservative social media platforms given that our study found greater political conservatism was associated with stronger COVID-19 vaccine conspiracy beliefs and lower COVID-19 vaccine uptake.

Our third aim was to test whether social media use and behaviors predicted COVID-19 vaccine conspiracy beliefs and vaccine uptake. Consistent with Hypothesis 3a, individuals who reported more active social media behaviors had stronger COVID-19 vaccine conspiracy beliefs, while social media use and passive social media behaviors were not associated with these beliefs. One possible explanation for this finding is that active social media behaviors, being a more conscious and intentional form of social media use (Kaye et al. 2024), may have a stronger impact on individuals' perception of and interaction with COVID-19 conspiracy content online. According to uses and gratifications theory, individuals may engage in active social media behaviors to seek content that aligns with their pre-existing beliefs and fulfills their need for social validation, potentially amplifying their exposure to conspiracy-related content. Additionally, social cognitive theory suggests that active social media behaviors, such as commenting or sharing content, could strengthen pre-existing beliefs through the psychological mechanisms of observational learning and social reinforcement. In contrast, passive social media behaviors, which involve less conscious engagement with content, may not offer the same opportunities for validation and social reinforcement. Contrary to Hypotheses 3b, social media use and behaviors were not associated with COVID-19 vaccine uptake. This observation was surprising but could be explained by the lack of conservative-specific social media in our measures. Future research could test this explanation by assessing social media platforms and behaviors that are more common among conservative individuals.

4.1. Exploratory Analyses of Platform-Specific Effects

Our exploratory aim was to investigate whether the use of specific social media platforms predicted COVID-19 vaccine conspiracy beliefs or vaccine uptake. We observed that TikTok use was associated with greater COVID-19 vaccine conspiracy beliefs, Snapchat use was associated with lower COVID-19 vaccine uptake, and Instagram use was associated with higher COVID-19 vaccine uptake. Use of other platforms was not associated with COVID-19 vaccine conspiracy beliefs or COVID-19 vaccine uptake. To our knowledge, these platform-specific findings represent a novel contribution to the literature on social media use and vaccine conspiracy beliefs.

In theory, these varied associations with COVID-19 vaccine uptake and vaccine conspiracy beliefs could be due to the specific characteristics of each social media platform.

Uses and gratifications theory suggests that individuals choose social media platforms based on their unique features and the gratifications they provide, which may influence exposure to vaccine-related content. For example, TikTok uses an algorithm to recommend content based on a combination of a user's viewing history and the popularity of content among other users (Lang 2024). This algorithmic content delivery, combined with an emphasis on short-form videos, may increase users' exposure to sensationalized or conspiratorial content related to the COVID-19 pandemic and vaccine, similar to the echo chamber effect described in previous studies (Baines et al. 2021; Motta et al. 2020; Puri et al. 2020). For Snapchat, the content that is shared on its "Stories/Spotlight" page by publishers or media companies does not undergo the same moderation procedures as posts shared by individual users. As a result, these editorial profiles can share videos, articles, and images to a wide audience without stringent fact-checking mechanisms in place, allowing for the potential spread of misinformation (Snapchat n.d.). This lack of moderation may contribute to lower COVID-19 vaccine uptake among frequent users of this platform. Additionally, Snapchat's focus on transitory, person-to-person communication may limit users' exposure to pro-vaccination messaging, further contributing to lower vaccine uptake.

It was notable that Instagram use was positively associated with COVID-19 vaccine uptake in our sample. This was somewhat surprising, as past research has shown no significant effect of social media campaigns on vaccination efforts (Argyris et al. 2023). A speculative explanation for this finding based on uses and gratifications theory is that platform-specific characteristics of Instagram could have facilitated the sharing of information about the COVID-19 vaccine from more trustworthy sources. For example, Instagram is home to a variety of health awareness accounts, such as @preventcovid19, @CDC, and @WHO, which may have helped to disseminate medically accurate knowledge during the pandemic (Malik et al. 2021). According to social cognitive theory, these accounts may have increased users' exposure to pro-vaccine information and promoted higher vaccine uptake through observational learning. Given the exploratory nature of our platform-specific analyses, future studies should attempt to replicate these findings to provide a clearer understanding of how specific social media platforms influence decision making about vaccination and other health behaviors.

4.2. Other Predictors of COVID-19 Vaccine Outcomes

Political conservatism was associated with greater COVID-19 vaccine conspiracy beliefs and lower COVID-19 vaccine uptake in our analyses for Aim 2. These observations are supported by previous research linking conservatism and conspiracy beliefs about vaccines (Furlan et al. 2024) and the COVID-19 pandemic (Motta et al. 2020; Stecula and Pickup 2021). They are also supported by research linking consumption of conservative media with general conspiracy beliefs and lower intention to receive the COVID-19 vaccine (Lobato et al. 2020; Romer and Jamieson 2020). Earlier research has suggested that conservative conspiracy beliefs about vaccines may be rooted in concerns about individual freedoms and government control (Enders et al. 2023). These concerns may contribute to a decreased willingness to adhere to public health recommendations, such as the COVID-19 vaccine mandates. Additionally, our observations suggest that the impact of conservatism on COVID-19 vaccine conspiracy beliefs and COVID-19 vaccine uptake could not be explained by social media use or behaviors. It is possible that this result could be due to the omission of conservative-specific social media platforms in our assessment of social media use. Moreover, our assessments did not include the consumption of other types of media that can contain misinformation, such as news websites, programs on television, and podcasts. Further research is needed to better understand the broader impacts of media

and social media on COVID-19 conspiracy beliefs, extending beyond the popular social media platforms examined in this study.

4.3. Strengths, Limitations, and Future Directions

The strengths of this study include its detailed assessments of social media use and behaviors and its focus on addressing sources of COVID-19 vaccine hesitancy. However, several limitations of this study provide opportunity for future investigation. First, we assessed social media and COVID-19 vaccination variables using self-report measures that are susceptible to cognitive bias. Future studies could address this limitation by using behavioral tracking software to obtain a more accurate measure of social media use and behaviors, and by using implicit assessments of individuals' attitudes toward the COVID-19 vaccine.

Second, this study was cross-sectional and thus unable to address the issues of reverse causation and third-factor explanations. In particular, it is possible that COVID-19 vaccine conspiracy beliefs could be an antecedent rather than a consequence of active social media behaviors. Moreover, it is possible that the association of active social media behaviors and COVID-19 vaccine conspiracy beliefs could have been due to third factors that were unaccounted for, such as hostility (Harmon-Jones and Szymaniak 2023), neuroticism (Bowden-Green et al. 2021), agreeableness and openness (Gonçalves et al. 2022), or trust in science and the government (Jennings et al. 2021).

Third, this study was focused on emerging and middle-aged adults and therefore could not address the impact of social media on COVID-19 vaccine conspiracy beliefs and uptake in other age groups, including the 93% of teenagers and adolescents who report regular YouTube use, 63% who report regular TikTok use, and 60% who report regular Snapchat and Instagram use (Pew Research Center 2024). Future studies must investigate the potential impacts of social media on the COVID-19 beliefs of this impressionable population.

Finally, it is noteworthy that most participants in our study had not received any COVID-19 booster vaccination and less than one-quarter had received the most recent COVID-19 vaccine available at the time of this study (i.e., the 2023–2024 hybrid vaccine). On 22 August 2024, the Centers for Disease Control recommended that all individuals older than six months should receive an updated 2024–2025 COVID-19 vaccine and continue to receive annual COVID-19 vaccinations. Given that we observed relatively modest uptake rates for the 2023–2024 COVID-19 hybrid vaccine, there is an evident need for future research to consider whether social media platforms can be leveraged as a medium to reduce COVID-19 vaccine conspiracy beliefs and increase the uptake of annual COVID-19 vaccines.

5. Conclusions

This study has highlighted the associations between social media use and behaviors, COVID-19 vaccine conspiracy beliefs, and vaccine uptake among emerging and middle-aged adults. Emerging adults reported more frequent social media use, more active and passive social media behaviors, and lower vaccine uptake compared to middle-aged adults. While stronger COVID-19 vaccine conspiracy beliefs were linked to lower vaccine uptake across all participants, this relationship was unexpectedly stronger for individuals with less social media use and behaviors, potentially reflecting influences from alternative information sources. Additionally, active social media behaviors were associated with stronger COVID-19 vaccine conspiracy beliefs but not with vaccine uptake. These findings emphasize the need for further investigation of the platform-specific effects of social media and the development of targeted interventions to address conspiracy beliefs and vaccine hesitancy, considering key factors like age and social media use and behaviors.

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