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COVID-19 Vaccine Information Seeking Patterns and Vaccine Hesitancy: A Latent Class Analysis to Inform Practice

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ABSTRACT

Context: Throughout the COVID-19 pandemic, state and local health departments served as risk communicators to the public; however, public health practitioners have limited resources at their disposal when trying to communicate information, especially when guidance is rapidly changing. Identifying how the population gathers information across channels and which subsets of the population utilize which channels can help practitioners make the best use of these limited resources.

Objective: To identify how individuals utilized different information channels to get COVID-19–related information and determine its effect on one COVID-19–related action: vaccine intentions.

Design: This study applies latent class analysis to utilization of information channels to characterize information consumption patterns during the COVID-19 infodemic and then explores the relationship between these patterns and vaccine hesitancy.

Setting: The data were collected from the *COVID-19 Vaccine Hesitancy Survey,* which is a nationally representative sample of US adults 18 years and older recruited from Social Science Research Solutions (SSRS)'s Opinion Panel.

Participants: The online survey was conducted between April 7 and April 11, 2021, after the COVID-19 vaccine was available to all adults and enrolled more than 3000 respondents (n = 3014).

Main Outcome Measure(s): Respondents were asked about their frequency of information seeking related to the COVID-19 vaccine, sociodemographics, and vaccine perceptions.

Results: Based on fit statistics and prior research, we identified 6 latent classes that characterize information seeking: Nonseekers, Legacy, Legacy + Facebook/Instagram, Traditional Omnivore, Omnivore + Broad Social Media, and Twitter. Sociodemographics, political, economic, and COVID-19 exposure variables are associated with different patterns of seeking information about COVID-19. Membership in 3 of these classes was associated with higher rates of vaccine refusal and vaccine hesitancy.

Discussion: The study has implications for public health officials and policymakers who use media channels to share news and health information with the public. Information should be tailored to the sociodemographic profiles of those users who are likely consuming information across multiple different channels.

KEY WORDS: COVID-19, latent class analysis, public health preparedness, risk communication

Communication is one of the 10 essential functions of public health.[1] Throughout the COVID-19 pandemic, state and local health departments served as risk communicators to the public, highlighting changing COVID-19 mitigation strategies, vaccine policies, and risks. The pandemic highlighted a critical challenge for public health practitioners—how to best communicate with the public amidst the noise of a 24-hour media cycle, social media, and mis/disinformation. Since the beginning of the pandemic, nearly every media channel—from legacy media to social media—has covered COVID-19 developments, creating extensive noise about the pandemic.[2] This volume of information, and the many options for platforms and channels, has created a challenging landscape for public health practitioners to disseminate accurate information successfully to reach the public and communicate complicated science to increase protective actions, creating practical challenges.[3,4]

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This work is supported by the National Science Foundation grant no. 2049886.

All views expressed are exclusively those of the authors.

The authors declare no conflicts of interest.

Supplemental digital content is available for this article. Direct URL citation appears in the printed text and is provided in the HTML and PDF versions of this article on the journal's Web site (http://www.JPHMP.com).

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DOI: 10.1097/PHH.0000000000001834

Prior to the pandemic, research had found that perceptions of the accuracy of messages on Twitter and in traditional media were mainly explained by the medium the information was on, rather than the content presented and that people select media channels that confirm their preexisting personal or political biases.[5-7] Schultz and colleagues[5] found that "medium mattered more than message" when examining secondary crisis reactions to the same messages from traditional media sources versus social media sources. Specifically, in an experimental study, when the researchers altered the medium of delivery, reactions shifted more than when the researchers altered the content of the message. Particular information media, social media, lend themselves to echo chambers of preexisting beliefs, as shown by Schmidt and colleagues,[6] and can promote polarization by reinforcing preexisting beliefs.[7]

During the pandemic, research focused on the role of social media channels in distributing false content.[8-13] Agley and Xiao[14] used latent class analysis (LCA) to assess belief in false COVID-19 content found on social media identifying distinct profiles of beliefs in the content, with the majority of the population (70%) falling into a profile that only believed factual content, but the other 30% split among 4 different profiles of misinformation beliefs. Their study used latent class methodology to group respondents based on their support for different true or false statements found on social media. They found that for most people, support for only factual statements prevailed, but for some, there were distinct categories of support for false statements. Their study had implications for the types of misinformation that are supported by different social media users.[14] While social media can be a useful tool to public health practitioners, it requires time and resources for public health practitioners to utilize effectively.[15]

Prior research has focused on how the public gathers information to learn about health issues, largely routine or chronic health issues. Individuals who are younger, self-identified as non-Hispanic White, and more highly educated are more likely to turn to the Internet for health information, while older adults and those of lower socioeconomic status tend to rely on traditional offline media such as broadcast television.[16-18] There has been mixed evidence regarding the use of information channels by different racial groups, with some finding that Hispanics and African Americans were more likely to rely on a provider or member of their social network for health information and less likely to use the Internet for health information[19] and others reporting null findings on this question.[16]

Public health practitioners have limited resources at their disposal when trying to communicate with the public, especially when guidance is rapidly changing. Our study is motivated by this challenge and the notion that medium of information is important to perception of the content. We sought to identify how individuals utilized different information channels to get COVID-19–related information and then determine its effect on one COVID-19–related action: vaccine intentions. Answering this question can inform communication messaging and strategies in the future and for the ongoing COVID-19 booster rollout. This study had 3 exploratory aims: (1) to characterize information consumption patterns during the COVID-19 pandemic similar to the approach taken by Agley and Xiao, using LCA, (2) to determine what demographic factors are associated with these consumption patterns, and (3) to assess the relationship between patterns of information consumption and vaccine acceptance.

Methods

Data and methods

Sample

The data were collected from the *COVID-19 Vaccine Hesitancy Survey*, which included a nationally representative sample of US adults 18 years and older recruited from Social Science Research Solutions (SSRS)'s Opinion Panel. The online survey was conducted between April 7 and April 11, 2021, after the COVID-19 vaccine was available to all adults. Further information on the study sample (n = 3014) and data collection are described elsewhere.[20] The sample included an oversample of rural dwelling and minority populations, who had some of the lowest rates of vaccination at the time of data collection. The study was reviewed and approved by the institutional review board of New York University.

Outcomes

Vaccine hesitancy was asked as a 5-point spectrum: (1) fully/partially vaccinated, (2) eager to be vaccinated, (3) wait and see, (4) undecided, and (5) refusers. Categories were combined for statistical power. We then collapsed responses to "takers" (fully/partially/vaccinated), hesitaters (wait and see/undecided), and refusers for the purpose of analytic power.

Independent variables

On a Likert scale of 1 (never) to 5 (multiple times a day), survey respondents were asked to rate how often

they sought out information about the COVID-19 vaccine from both traditional media sources, social media, or other sources (https://www.pewresearch.org/journalism/2010/05/23/new-media-old-media). Responses were treated as a continuous outcome, and the scale 1 to 5 was changed to 0 to 4 for ease of interpretation. Traditional media sources included (*a*) local television news or its Web site, (*b*) national or cable network news, (c) national newspaper or its Web site, (*d*) local newspaper or its Website, (*e*) radio, and (*f*) news portal site. Social media sources included (*a*) Facebook, (*b*) Twitter, (*c*) YouTube, (*d*) Instagram, (*e*) TikTok, (*f*) Reddit, and (*j*) communication apps such as WhatsApp. Other sources included (*a*) Web site of a government agency, (*b*) professional association or union, or (*c*) employer.

Covariates

Variables of interest included sociodemographic factors and COVID-19 exposure variables. For sociodemographic factors, age groups (18-29, 30-49, 50-64, and 65 years), gender, race/ethnicity, the highest level of education, employment status, annual income, religion, living in urban/rural, census region, health insurance, being a parent, and political affiliation were included. For COVID-19 exposure variables, we asked respondents whether they have contracted COVID-19, if they knew someone who died of COVID-19, and whether they had encountered financial hardship because of the pandemic; specifically, if they had lost income, lost a job, and/or were not able to pay for necessities such as rent.

Statistical analysis

To characterize information consumption patterns during the COVID-19 infodemic, we used LCA (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7746621). The "tidyLPA" package from R studio was used to conduct the latent profile analysis (LPA). To determine the appropriate number of latent classes, we took a data-driven approach to comparing different numbers of classes and compared their fit statistics including the Akaike Information Criteria (AIC), Bayesian Information Criteria (BIC), entropy, and bootstrapped likelihood ratio test (BLRT) *P* values. We also used the *compare solutions* function from R to compare the fit of several estimated models with varying numbers of profiles and model specifications. We applied our understanding of the media environment to name and categorize the results of the class solutions that were statistically sound based on these criteria. After determining the number of latent classes, we then calculated the mean and range values of the Likert-like response variables for each source of information for each class.

We calculated descriptive statistics for each of the classes identified. Chi-squared tests evaluated the strength of associations between the 6 classes of media consumers and the predictors. Next, multinomial logistic regression models evaluated the relationship between predictors and class membership. Because of a small number of sample respondents in each age group, the age group was dichotomized into ages 18-49 and 50 years and older for the multinomial logistic regressions. We then used unadjusted and adjusted logistic regression models to assess the relationship between class membership and vaccine hesitancy, controlling for sociodemographics and COVID-19 experience. All regression models were conducted using Stata/SE 17.

Results

Identifying latent groups

The fit statistics for LPA (Table 1) led us to select a class less than 8, based on the *P* values of BLRT. Next, we compared AIC, BIC, as well as entropy, and selected the 6 latent classes to be the best model based on all 4 statistical criteria as well as the interpretability based on existing research.

Classes were distinguished by varying mean values of the Likert scale-like response variables for each class (Table 2). A higher mean value indicates the more frequent use of the corresponding media source for seeking out COVID-19 vaccine-related information. These mean values were used to define each media user group.

Legacy and Facebook/Instagram users had high mean response values of greater than 2 for local and national TV news and Facebook and Instagram (Table 2). *Traditional omnivores* had high mean response values for all the traditional media sources including local and national TV news, newspaper, radio, and news portal sites. *Legacy* media users had high mean response values for local and national TV news. *Broad social media* users had the highest mean values for social media sources among the latent profiles and still showed high values for local and national TV news. *Nonseekers* had very low mean response values for all media sources, indicating that this group does not seek out information often about the COVID-19 vaccine from the media sources that we listed in our survey. *Twitter* users had a high response value of 2.56 for Twitter, while all the other media sources were below 2. The majority of sample respondents were nonseekers, followed

TABLE 1
Fit Indices of Different Latent Class Models

	AIC	BIC	Entropy[a]	BLRT_*p*[b]
1-class	131 317.74	131 510.03	NA	. . .
2-class	122 352.21	122 646.65	0.99	.01
3-class	118 301.99	118 698.59	0.89	.01
4-class	117 161.99	117 660.74	0.91	.01
5-class	115 979.02	116 579.92	0.86	.01
6-class	112 120.79	112 823.85	0.88	.01
7-class	111 857.17	112 662.38	0.89	.01
8-class	112 195.00	113 102.37	0.79	1.00

Abbreviations: AIC, Akaike Information Criteria; BIC, Bayesian Information Criteria; NA, not available.

[a] *Entropy is a standardized index of model-based classification accuracy, with higher values indicating more precise assignment of individuals to latent profiles.*

[b] *Bootstrap likelihood ratio test* P *value.*

by legacy users, traditional omnivores, legacy and Facebook/Instagram users, and Twitter users.

Sociodemographic factors associated with each class

Each latent class was demographically distinct (Table 3).

Class 1: Legacy and Facebook/Instagram users (n = 156; 5.2% of total sample)

Legacy and Facebook/Instagram users differed little from the total sample population. However, compared with the total sample, a larger proportion of respondents were non-Hispanic Black people, and a higher percentage made less than $25 000 per year. In addition, a larger share of respondents was parents and knew someone who died of COVID-19 compared with the total sample.

Class 2: Traditional omnivores (n = 280; 9.3% of total sample)

Compared with the total sample, a larger portion of traditional omnivores were female, were Democrats (49.6%), and personally knew someone who died of COVID-19. In addition, more respondents were either fully or partially vaccinated and fewer respondents were in the undecided or refusers group. Among all the latent classes, traditional omnivores had the highest proportion (32.6%) of the sample in the age group of 50 to 64 years.

Class 3: Legacy users (n = 907; 30.2% of total sample)

Compared with the total sample, more legacy users were either fully or partially vaccinated and fewer were undecided or refusers compared with the overall population. Legacy users had the highest proportion of people 65 years or older and the highest proportion of people who were unemployed compared with the other latent classes.

Class 4: Broad social media users (n = 132; 4.4% of total sample)

In contrast to other classes and the total sample, more than 50% of respondents in this profile were between 18 and 29 years and only 2.3% were 65 years and older. The highest proportion of males and the highest share of Hispanic people belonged to this group. Notably, the majority of made less than $25 000 per year and a little over 30% were Catholics.

Class 5: Nonseekers (n = 1380; 45.9% of total sample)

Compared with the total sample, nonusers had an equal share of Republicans and Independents. Fewer respondents in this group were either fully or partially vaccinated and more respondents were hesitaters or refusers of the COVID-19 vaccine compared with the total sample.

Class 6: Twitter users (n = 153; 5.1% of total sample)

Compared with the total sample, Twitter users had a larger portion of females, about 60% of the respondents were Democrats, and only 6.5% were Republicans. Twitter users were younger than the general population. More than 75% of respondents of this profile were in the age group of either 18-29 or 30-49 years. Compared with the total sample, more respondents were vaccine takers.

TABLE 2
The Mean Response Values of the 6 Latent Profiles[a]

	Profiles					
	Nonseekers (n = 1380; 45.9%)	Legacy (n = 907; 30.2%)	Legacy + Facebook/ Instagram (n = 156; 5.2%)	Traditional Omnivore (n = 280; 9.3%)	Omnivore + Broad Social Media (n = 132; 4.4%)	Twitter (n = 153; 5.1%)
Local television news or its Web site	0.44	2.34	2.47	2.82	2.33	1.54
National or cable network news (on television or on the Web, eg, *CNN*, *Fox*, *MSNBC*)	0.42	2.34	2.44	2.73	2.30	1.77
National newspaper, *such as The New York Times, Wall Street Journal, or USA Today* or its Web site	0.36	1.04	1.87	2.04	1.85	1.72
My local newspaper or its Web site	0.31	1.17	1.96	2.32	1.85	1.29
Radio	0.32	0.85	1.60	1.92	1.89	0.91
News portal site such as Yahoo! or MSN	0.32	1.07	1.80	2.55	1.77	1.10
Facebook	0.23	0.49	2.15	1.35	2.37	0.72
Twitter	0.04	0.04	0.99	0.09	1.48	2.56
YouTube	0.18	0.23	1.62	0.76	1.93	0.77
Instagram	0.04	0.06	2.62	0.10	2.13	0.25
TikTok	0.02	0.01	0.13	0.02	2.86	0.05
Reddit	0.08	0.05	0.56	0.15	1.00	0.61
Web site of a government agency (eg, CDC, local or state health department)	0.81	1.21	1.81	1.93	1.81	1.65
Professional association or union	0.15	0.18	0.78	0.62	0.97	0.33
Employer	0.42	0.50	1.29	1.15	1.53	0.76
Communication apps (Parler, Signal, Telegram, WhatsApp)	0.08	0.07	1.05	0.34	1.32	0.19

Abbreviation: CDC, Centers for Disease Control and Prevention.

[a] *The question asked how often a respondent sought out information about the COVID-19 vaccine and the mean response ranges from 0 to 4, with 0 being "never" and 4 being "multiple times a day."*

TABLE 3

Sociodemographic and COVID-19 Exposure Variables by Latent Profiles of Media Consumers—Column %

	All (N = 3008)	Nonseekers (n = 1380; 45.9%)	Legacy (n = 907; 30.2%)	Legacy + Facebook/ Instagram (n = 156; 5.2%)	Traditional Omnivore (n = 280; 9.3%)	Omnivore + Broad Social Media (n = 132; 4.4%)	Twitter (n = 153; 5.1%)	*P*
Age groups								<.001
18-29 y	475 (15.9%)	231 (16.8%)	65 (7.2%)	39 (25.0%)	24 (8.6%)	67 (51.2%)	49 (32.7%)	
30-49 y	1111 (37.1%)	516 (37.5%)	281 (31.2%)	91 (58.3%)	107 (38.4%)	51 (38.9%)	65 (43.3%)	
50-64 y	785 (26.2%)	372 (27.0%)	263 (29.3%)	21 (13.5%)	91 (32.6%)	10 (7.6%)	28 (18.7%)	
65+ y	621 (20.8%)	257 (18.7%)	291 (32.3%)	5 (3.2%)	57 (20.4%)	3 (2.3%)	8 (5.3%)	
Gender								<.001
Female	1369 (45.8%)	635 (46.4%)	416 (46.1%)	53 (34.0%)	145 (52.0%)	39 (29.6%)	81 (53.3%)	
Male	1622 (54.2%)	735 (53.7%)	486 (53.9%)	103 (66.0%)	134 (48.0%)	93 (70.5%)	71 (46.7%)	
Race/ethnicity								
Non-Hispanic White	1679 (56.3%)	897 (65.6%)	540 (59.9%)	39 (25.2%)	111 (39.6%)	30 (22.9%)	62 (41.9%)	
Non-Hispanic Black	569 (19.1%)	205 (15.0%)	162 (18.0%)	49 (31.6%)	87 (31.1%)	35 (26.7%)	31 (21.0%)	
Hispanic	531 (17.8%)	190 (13.9%)	147 (16.3%)	47 (30.3%)	56 (20.0%)	54 (41.2%)	37 (25.0%)	
Other	204 (6.8%)	75 (5.5%)	53 (5.9%)	20 (12.9%)	26 (9.3%)	12 (9.2%)	18 (12.2%)	
Education								<.001
Less than/graduated high school	614 (20.4%)	302 (21.9%)	160 (17.6%)	33 (21.2%)	51 (18.2%)	50 (37.9%)	18 (11.8%)	
Some college or graduated college	1549 (51.5%)	739 (53.5%)	454 (50.1%)	83 (53.2%)	116 (41.4%)	73 (55.3%)	85 (55.6%)	
Postgraduate/professional	844 (28.1%)	339 (24.6%)	293 (32.3%)	40 (25.6%)	113 (40.4%)	9 (6.8%)	50 (32.7%)	
Employment status								<.001
Unemployed	1067 (35.5%)	462 (33.5%)	386 (42.6%)	46 (29.5%)	90 (32.1%)	46 (34.9%)	37 (24.2%)	
Employed (full- or part-time)	1939 (64.5%)	917 (66.5%)	520 (57.4%)	110 (70.5%)	190 (67.9%)	86 (65.2%)	116 (75.8%)	
Annual income								<.001
<$25 000	513 (17.1%)	217 (15.7%)	127 (14.0%)	49 (31.4%)	37 (13.2%)	58 (44.3%)	25 (16.5%)	
$25 000 to <$50 000	655 (21.8%)	296 (21.5%)	205 (22.6%)	36 (23.1%)	54 (19.3%)	38 (29.0%)	26 (17.1%)	
$50 000 to <$75 000	572 (19.0%)	2587 (18.6%)	181 (20.0%)	27 (17.3%)	61 (21.8%)	16 (12.2%)	30 (19.7%)	
$75 000 to <$100 000	463 (15.4%)	235 (17.0%)	135 (14.9%)	17 (10.9%)	45 (16.1%)	13 (9.9%)	18 (11.8%)	
≥$100 000	802 (26.7%)	374 (27.1%)	259 (28.6%)	27 (17.3%)	83 (29.6%)	6 (4.6%)	53 (34.9%)	

(*continues*)

TABLE 3
Sociodemographic and COVID-19 Exposure Variables by Latent Profiles of Media Consumers—Column % (*Continued*)

	All (N = 3008)	Nonseekers (n = 1380; 45.9%)	Legacy (n = 907; 30.2%)	Legacy + Facebook/ Instagram (n = 156; 5.2%)	Traditional Omnivore (n = 280; 9.3%)	Omnivore + Broad Social Media (n = 132; 4.4%)	Twitter (n = 153; 5.1%)	*P*
Religion								<.001
Protestant	650 (21.7%)	320 (23.2%)	182 (20.2%)	36 (23.1%)	64 (22.9%)	23 (17.4%)	25 (16.5%)	
Evangelical	192 (6.4%)	104 (7.6%)	46 (5.1%)	11 (7.1%)	18 (6.4%)	6 (4.6%)	7 (4.6%)	
Catholic, Roman Catholic	632 (21.1%)	229 (16.6%)	234 (25.9%)	32 (20.5%)	64 (22.9%)	40 (30.3%)	33 (21.7%)	
Other	633 (21.1%)	297 (21.6%)	188 (20.8%)	33 (21.2%)	65 (23.2%)	27 (20.5%)	23 (15.1%)	
Nothing in particular/Atheist/Agnostic	893 (29.8%)	427 (31.0%)	253 (28.0%)	44 (28.2%)	69 (24.6%)	36 (27.3%)	64 (42.1%)	
Metro status								<.001
Nonmetro	534 (18.0%)	290 (21.3%)	154 (17.3%)	22 (14.4%)	36 (13.0%)	14 (10.9%)	17 (11.1%)	
Metro	2439 (82.0%)	1072 (78.7%)	743 (82.7%)	131 (85.6%)	242 (87.1%)	115 (89.2%)	136 (88.9%)	
Census region								.002
Northeast	545 (18.3%)	225 (16.4%)	189 (21.0%)	25 (16.3%)	60 (21.5%)	20 (15.3%)	26 (17.0%)	
North Central	624 (20.9%)	319 (23.3%)	170 (18.9%)	34 (22.2%)	58 (20.8%)	18 (13.7%)	25 (16.3%)	
South	1157 (38.8%)	515 (37.6%)	354 (39.3%)	65 (42.5%)	113 (40.6%)	48 (36.6%)	62 (40.5%)	
West	659 (22.1%)	310 (22.6%)	187 (20.8%)	29 (19.0%)	48 (17.2%)	45 (34.4%)	40 (26.1%)	
Health insurance								<.001
Private	1565 (52.1%)	762 (55.3%)	413 (45.5%)	87 (55.8%)	154 (55.0%)	54 (40.9%)	95 (62.1%)	
Medicare	661 (22.0%)	268 (19.4%)	298 (32.9%)	14 (9.0%)	56 (20.0%)	11 (8.3%)	14 (9.2%)	
Medicaid	401 (13.3%)	171 (12.4%)	104 (11.5%)	29 (18.6%)	32 (11.4%)	42 (31.8%)	23 (15.0%)	
TRICARE/VA/Indian Health Service/Other	187 (6.2%)	90 (6.5%)	42 (4.6%)	13 (8.3%)	22 (7.9%)	8 (6.1%)	12 (7.8%)	
Uninsured	193 (6.4%)	88 (6.4%)	50 (5.5%)	13 (8.3%)	16 (5.7%)	17 (12.9%)	9 (5.9%)	
Parent								<.001
No	2104 (70.4%)	957 (69.7%)	685 (75.9%)	90 (57.7%)	187 (68.0%)	74 (57.4%)	109 (71.7%)	
Yes	886 (29.6%)	416 (30.3%)	217 (24.1%)	66 (42.3%)	88 (32.0%)	55 (42.6%)	43 (28.3%)	

(*continues*)

TABLE 3
Sociodemographic and COVID-19 Exposure Variables by Latent Profiles of Media Consumers—Column % (*Continued*)

	All (N = 3008)	Nonseekers (n = 1380; 45.9%)	Legacy (n = 907; 30.2%)	Legacy + Facebook/ Instagram (n = 156; 5.2%)	Traditional Omnivore (n = 280; 9.3%)	Omnivore + Broad Social Media (n = 132; 4.4%)	Twitter (n = 153; 5.1%)	*P*
Political party								<.001
Republican	712 (23.7%)	434 (31.5%)	190 (21.0%)	19 (12.2%)	45 (16.1%)	14 (10.6%)	10 (6.5%)	
Democrat	1160 (38.6%)	403 (29.2%)	395 (43.6%)	74 (47.4%)	139 (49.6%)	58 (43.9%)	91 (59.5%)	
Independent	993 (33.0%)	457 (33.1%)	298 (32.9%)	56 (35.9%)	83 (29.6%)	54 (40.9%)	45 (29.4%)	
Other	143 (4.8%)	86 (6.2%)	24 (2.7%)	7 (4.5%)	13 (4.6%)	6 (4.6%)	7 (4.6%)	
Have you had COVID-19								.42
No	2601 (86.5%)	1188 (86.1%)	800 (88.2%)	132 (84.6%)	242 (86.4%)	109 (82.6%)	130 (85.0%)	
Yes	407 (13.5%)	192 (13.9%)	107 (11.8%)	24 (15.4%)	38 (13.6%)	23 (17.4%)	23 (15.0%)	
Personally know anyone who died of COVID-19								<.001
No	1783 (59.3%)	925 (67.0%)	483 (53.3%)	83 (53.2%)	126 (45.0%)	80 (60.6%)	86 (56.2%)	
Yes	1225 (40.7%)	455 (33.0%)	424 (46.8%)	73 (46.8%)	154 (55.0%)	52 (39.4%)	67 (43.8%)	
Financial severity[a]								<.001
0	1858 (61.8%)	899 (65.2%)	588 (64.8%)	66 (42.3%)	169 (60.4%)	44 (33.3%)	92 (60.1%)	
1	841 (28.0%)	354 (25.7%)	244 (26.9%)	59 (37.8%)	85 (30.4%)	56 (42.4%)	43 (28.1%)	
2	186 (6.2%)	74 (5.4%)	51 (5.6%)	17 (10.9%)	17 (6.1%)	14 (10.6%)	13 (8.5%)	
3	123 (4.1%)	53 (3.8%)	24 (2.7%)	14 (9.0%)	9 (3.2%)	18 (13.6%)	5 (3.3%)	
Vaccine acceptance								<.001
Fully or partially vaccinated	1773 (58.9%)	689 (49.9%)	660 (72.8%)	69 (44.2%)	196 (70.0%)	50 (38.2%)	109 (71.2%)	
Eager to take	313 (10.4%)	129 (9.4%)	89 (9.8%)	20 (12.8%)	33 (11.8%)	21 (16.0%)	21 (13.7%)	
Wait and see	274 (9.1%)	145 (10.5%)	53 (5.8%)	22 (14.1%)	22 (7.9%)	21 (16.0%)	11 (7.2%)	
Undecided	310 (10.3%)	175 (12.7%)	65 (7.2%)	29 (18.6%)	14 (5.0%)	20 (15.3%)	7 (4.6%)	
Refusers	337 (11.2%)	242 (17.5%)	40 (4.4%)	16 (10.3%)	15 (5.4%)	19 (14.5%)	5 (3.3%)	

Abbreviation: VA, veterans administration.

[a] . . . .

All adjusted models estimating the relationship between each latent class and vaccine hesitancy are shown in tables (Table 4). Full models are shown in Supplement Digital Content (available at: http://links.lww.com/JPHMP/B242).

Odds of being a hesitater compared with a taker

The 2 latent classes that were significantly associated with vaccine hesitancy were legacy and Facebook/Instagram group and nonusers. The odds of being a hesitater for those who belonged to legacy and Facebook/Instagram group were 2.52 times the odds of being a hesitater for legacy users (95% CI, 1.58-4.03), while that of nonseekers were 2.07 times the odds for legacy users (95% CI, 1.58-2.71), controlling for social, economic, and demographic factors, and COVID-19 exposures.

Odds of being a refuser compared with a taker

Among the latent classes, those in Legacy and Facebook/Instagram group, broad social media group, and nonseekers had 2.69 (95% CI, 1.28-5.64), 2.64 (95% CI, 1.30-5.34), and 4.98 (95% CI, 3.35-7.39) times the odds of being a refuser compared with legacy users, respectively, controlling for all else.

Discussion

This study finds that sociodemographics, political, economic, and COVID-19 exposure variables are associated with the use of different media channels for seeking information about COVID-19. Demographics and profiles of the users of media channels are also associated with vaccine hesitancy. The results of our study suggest there may be a benefit to messaging tailored to these different groups, beyond fitting messages to the requirements of the platforms.

Social media can be a powerful tool for local health departments. However, little has been studied on local health departments' social media communication and its effect.[21] Current recommendations often focus on using social media to quickly get out "identical" information across sources and channels.[4] At times public health officials and agencies including the Centers for Disease Control and Prevention, state, and local health departments post the same content across platforms, adapted only for length and format. For example, as New York State's COVID-19 inter-action report highlighted when a public service announcement is made related to vaccine availability, that same message is usually shared verbatim on Facebook and Twitter pages.[22] Our results suggests that there are different audiences across media platforms and therefore suggest that cross-posting the exact same content across social media platforms may be less effective than tailoring content to the platforms. At the same time, tailoring information also requires maintaining transparency. Thus, for instance, efforts to communicate in ways that are effective for users of social media channels would also need to refer viewers/readers to further information.

Many of the differences that we found across these classes of media users are directly relevant to vaccine promotion. For instance, in this sample, we found that social media channels are not uniformly used. There were 3 latent classes that involved heavy social media use (legacy/Facebook/Instagram, broad social media, and Twitter) and a clear difference between those that use Facebook and Instagram compared with those that use Twitter. The class of Twitter users tended to be female, older than that of the other social media class, more predominantly Democrats, and more likely to be vaccinated. Using Twitter to reinforce the need for boosters among those vaccinated may be advantageous.

Similarly, legacy media (TV and newspapers) may be the best way to reach older adults (those 65 years and older), given the high proportion of this population that prioritized seeking information from such sources. Older adults were initially prioritized for the vaccine and have subsequently been prioritized for booster shots. Focusing on TV and newspaper ads and dissemination to promote boosters, rather than Facebook or other social media channels, could be the most efficient use of public communication resources in reaching this population.

Perhaps, most surprisingly, 50% of our sample respondents were "nonseekers," who did not seek information about COVID-19 at all, possibly due to the timing of our survey. It may be that by April 2021, many users in our sample already had sought out information about the vaccine and made their vaccine decision. At that point in time, 40% of the US population had received at least 1 dose of the vaccination, and perhaps many of those who chose to not be vaccinated were already familiar enough with the vaccine to have formed a decision.[23] Second, because information overload can lead to disengagement, a large swath of people may have chosen to not seek additional content by then.[24] Despite these considerations, it remains notable that at a time when the COVID-19 vaccine rollout was progressing and new information was becoming available about side effects, vaccine approval, and other issues, a large portion of our sample was not seeking out information about these topics from media channels. Further investigation is needed into this "nonseekers" group. Partisanship

TABLE 4
Adjusted Multinomial Multivariate Logistic Regression (Legacy Group as a Reference)

	Legacy as a Reference									
	Nonseekers		Legacy + Facebook/Instagram		Traditional Omnivore		Omnivore + Broad Social Media		Twitter	
	RRR	SE	RRR	SE	RRR	SE	RRR	SE	RRR	SE
Sociodemographic characteristics										
Age group										
18-49 y	1.62[a]	0.2	4.13[a]	1.13	0.93	0.17	8.93[a]	3.31	4.14[a]	1.07
50+ y	. . .		. . .		. . .		. . .		. . .	
Gender										
Female	. . .		. . .		. . .		. . .		. . .	
Male	1	0.1	1.16	0.24	0.66[b]	0.1	1.32	0.31	0.66[c]	0.13
Race/ethnicity										
Non-Hispanic White	. . .		. . .		. . .		. . .		. . .	
Non-Hispanic Black	0.76	0.11	2.57[b]	0.73	2.49[a]	0.52	2.17[c]	0.71	1.04	0.3
Hispanic	0.87	0.13	3.01[a]	0.86	1.86[b]	0.41	2.39[b]	0.74	1.32	0.35
Other	0.83	0.18	4.43[a]	1.54	2.07[c]	0.6	3.22[b]	1.4	1.33	0.45
Education										
Less/graduated high school	1.29	0.2	1.01	0.32	0.93	0.21	4.83[a]	2.08	0.92	0.32
Less/graduated college	1.24	0.14	1.07	0.25	0.66[b]	0.11	3.30[b]	1.27	1.14	0.25
Postgraduate/professional	. . .		. . .		. . .		. . .		. . .	
Employment										
Unemployed	0.86	0.1	0.79	0.18	0.84	0.15	0.75	0.19	0.77	0.19
Employed	. . .		. . .		. . .		. . .		. . .	
Income										
<$25 000	1.03	0.18	3.31[a]	1.04	0.99	0.27	5.23[a]	1.94	1.15	0.39
$25 000 to <$50 000	0.92	0.12	1.49	0.42	0.96	0.2	2.69[b]	0.92	0.84	0.24
$50 000 to <$75 000	0.88	0.12	1.18	0.33	1.08	0.21	1.38	0.53	0.88	0.23
$75 000+	. . .		. . .		. . .		. . .		. . .	
Religion										
Protestant	. . .		. . .		. . .		. . .		. . .	
Evangelical	0.94	0.2	1.01	0.41	1.12	0.37	0.97	0.51	0.85	0.43
Catholic	0.54[a]	0.08	0.63	0.2	0.89	0.21	1.02	0.37	0.93	0.32
Other	0.87	0.13	0.9	0.26	1.14	0.25	1.15	0.4	0.78	0.27
Nothing in particular/Atheist/Agnostic	0.89	0.13	0.79	0.22	0.96	0.22	0.84	0.28	1.37	0.41
Area of residence										
Rural	. . .		. . .		. . .		. . .		. . .	
Metro	0.97	0.12	0.88	0.25	1.07	0.23	1.28	0.44	1.41	0.44
Census region										
Northeast	. . .		. . .		. . .		. . .		. . .	
North Central	1.28	0.19	1.46	0.45	1.16	0.26	0.91	0.34	1.11	0.36
South	1.01	0.14	0.9	0.25	0.88	0.17	0.82	0.26	1.3	0.35
West	1.18	0.18	0.93	0.29	0.81	0.19	1.64	0.54	1.28	0.38
Insurance										
Private	. . .		. . .		. . .		. . .		. . .	
Medicare	0.67[b]	0.09	0.64	0.23	0.64[c]	0.14	0.73	0.31	0.46[c]	0.18
Medicaid	0.71	0.13	0.56	0.17	0.92	0.25	0.67	0.21	1.06	0.34

(*continues*)

TABLE 4
Adjusted Multinomial Multivariate Logistic Regression (Legacy Group as a Reference) (*Continued*)

	Legacy as a Reference									
	Nonseekers		Legacy + Facebook/Instagram		Traditional Omnivore		Omnivore + Broad Social Media		Twitter	
	RRR	SE	RRR	SE	RRR	SE	RRR	SE	RRR	SE
TRICARE/VA/Indian/Other	1.06	0.23	1.11	0.41	1.46	0.43	0.92	0.43	1.34	0.5
Uninsured	0.62[c]	0.14	0.43[c]	0.17	1	0.34	0.53	0.21	0.73	0.31
Parent										
No	. . .		. . .		. . .		. . .		. . .	
Yes	0.83	0.1	0.95	0.2	1.15	0.21	0.82	0.19	0.53[b]	0.12
Political party										
Democrats	. . .		. . .		. . .		. . .		. . .	
Republican	1.73[a]	0.24	0.86	0.27	0.92	0.21	0.89	0.33	0.33[b]	0.13
Independent	1.26[c]	0.14	1.07	0.23	0.87	0.15	1.13	0.27	0.71	0.16
Other	2.48[a]	0.64	1.19	0.57	1.54	0.57	0.72	0.43	1.05	0.51
COVID-19 exposure										
Know anyone died of COVID-19										
No	. . .		. . .		. . .		. . .		. . .	
Yes	0.62[a]	0.06	1.03	0.2	1.29	0.19	0.79	0.17	0.92	0.18
Severity of financial hardship	0.89	0.06	1.27[c]	0.14	1.08	0.11	1.29[c]	0.15	0.95	0.12
Vaccine acceptance										
Fully/partially vaccinated	. . .		. . .		. . .		. . .		. . .	
Eager to take	1.17	0.19	1.31	0.39	1.04	0.25	1.39	0.44	0.74	0.22
Wait and see	1.98[a]	0.37	2.10[c]	0.65	1.29	0.37	1.85	0.64	1.04	0.29
Undecided	2.03[a]	0.35	2.37[b]	0.69	0.65	0.21	1.45	0.49	0.61	0.26
Refusals	4.61[a]	0.91	2.38[c]	0.84	1.22	0.41	2.47[c]	0.9	0.86	0.44

Abbreviations: RRR, relative risk ratio; SE, standard error; VA, veterans administration.

[a]P < .001.

[b]P < .01.

[c]P < .05.

may be a factor contributing to COVID-19 information consumption and behavior.[25] This group may be more likely to engage with public health information through alternative platforms such as their own social network, community, or physicians, suggesting there is still a very much needed supplemental public health communication capacity beyond media dissemination.

Limitations

This study has several limitations. First, our sample is from an online sampling frame drawn from an address-based sample. Like most samples, there are likely selection biases that are difficult to distinguish. Our analytic sample includes an oversample for unvaccinated individuals living in rural dwelling and minority populations. While we did not see any effect of rural versus urban in describing class membership, results of the study cannot be generalized to the population at large. Next, we grouped some information channels together such as WhatsApp, Parler, and Reddit, which are not parallel channels, but there were too few users to be analyzed. The platforms individuals use has continued to evolve since we conducted this study, so follow-up would be beneficially. We also utilized the terminology of "seeking" information on the COVID-19 vaccine. We note that our study has a large portion of noninformation seekers, and respondents may not have actively sought information but received information more passively. Thus, our results speak to that portion of the population most aggressively engaged in understanding unfolding news regarding the COVID-19 pandemic. Finally, the sample size may have limited the number of categorical differences that we could observe.

Implications for Policy & Practice

- Information consumption patterns vary demographically and based on COVID-19 experience.
- Public health officials and policymakers that use media channels to share news and health information with the public could tailor that information to the profiles of those users.
- Cross-posting identical content may be less effective, particularly on a highly contentious and politicized health issue like COVID-19 vaccines.

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