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COVID-19 Vaccine Disparities and Attitudes

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Cover Page Footnote

Chowkwanyun, M. (2020). Racial Health Disparities and COVID-19 -- Caution and Context. The New England Journal of Medicine, 201-203 Agarwal, R., Dugas, M., Ramaprasad, J., Luo, J., Li, G., & Gao, G. (2021, July 29). Socioeconomic privilege and political ideology are associated with racial disparity in COVID-19 vaccination. College Park, Maryland, United States. Epstein, M.D., A. M., & Ayanian, M.D., M.P.P, J. Z. (2001). Racial Disparities in Medical Care. New England Journal of Medicine, 1471-1473. Kristen Bibbins-Domingo, P. M. (2020). This Time Must Be Different: Disparities During the COVID-19 Pandemic. Annals of Internal Medicine, 233-234 FDA. (2021, November 04). Pfizer-BioNTech COVID-19 Vaccine Frequently Asked Questions. Retrieved from FDA.gov: https://www.fda.gov/emergency-preparedness-and-response/coronavirus-disease-2019-covid-19/pfizer-biontech-covid-19-vaccine-frequently-asked-questions#:~:text=The%20vaccine%20was%2095%20percent,were%20classified%20as%20severe IBM. 2022. IBM SPSS Statistics. April 12. https://www.ibm.com/products/spss-statistics. StataCorp LLC. n.d. Stata Features. Accessed April 12, 2022. https://www.stata.com/features/. Smith County Insider. 2020. November 3, 2020 General Election Results. November 3. Accessed April 12, 2022. https://smithcountyinsider.com/home-page-featured/november-3-2020-general-election-results/. Bunch, Lauren. 2021. A Tale of Two Crises: Addressing COVID-19 Vaccine Hesitancy as Promoting Racial Justice. Columbus, Georgia, January 3.

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COVID-19 Vaccine Disparities and Attitudes

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Abstract

Introduction: The past couple of years have caused so much uncertainty and grief amidst the global pandemic. The goal of this study is to explore the attitudes behind COVID-19 vaccination to address the cause of vaccine disparities and help minimize health disparities in the United States.

Methods: The study considers two multivariable regressions in SPSS of the social factors on vaccination status and vaccine confidence. This model studies the relationship between one's ethnicity, race, education level, education specialization, household income, political ideology, and media source on vaccine confidence and vaccination status on an East Texas college campus. A campus-wide survey was conducted to explore the attitudes behind the COVID-19 vaccine. These survey questions provide reasoning from different demographic backgrounds, political ideologies, socioeconomic levels, etc.

Results: The survey results show that news sources, political ideology, and majors have great effects on vaccination trust/hesitancy.

Key Words: COVID-19, Vaccination, Health Disparities, Hesitancy, Socioeconomic status, Political ideology, Vaccine confidence, Education major

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Introduction

The COVID-19 pandemic has forever altered our society's perspectives, morals, and attitudes in many aspects of life. The year 2020 presented unforeseen, historical challenges for the United States. The COVID-19 pandemic forced the economy to shut down and sent Americans into months of isolation, but the time alone was not necessarily for the worst. It made everyone more adaptable to situations never presented before, and it allowed some people to spend much-needed time to spend with their families and connect. Most importantly, the year 2020 brought great progression in the movement toward racial justice. Nationally, there has been a great effort toward inclusivity, diversity, and racial equality. However, one short period is not enough to truly promote and achieve racial equality in America. The COVID-19 pandemic has highlighted the racial inequities throughout society, through the lens of healthcare disparities. This study strives to explore the disparities in the COVID-19 vaccine and try to understand the determinants of vaccine hesitancy to mitigate the hesitancy for future vaccinations/pandemics. Imperatively, to rebuild trust in medical care among minorities, we must listen to those most disadvantaged, acknowledge their reasons for mistrust, and maintain transparency of medical procedures, medicines, and side effects.

Many studies have shown the disparities between Black and White Americans in vaccine hesitancy. One study considers the issue of place-based risks and resource deficits that further explain the variance in vaccination (Chowkwanyun and Reed, 2020). The uneven geographic distribution of preventative care services leads to low-income neighborhoods having to travel farther from their home in comparison to higher-income communities, which presents a barrier to healthcare access and therefore further explains these disparities concerning socioeconomic status. A similar explanation considers the concentration of respiratory hazards and toxic sites in low socioeconomic status, minority-heavy areas. Also, food insecurity, unstable/substandard housing, and unemployment which were worsened by the pandemic can further perpetuate disparities in COVID-19.

One study focused on socioeconomic privilege and political ideology with COVID-19 vaccination (Agarwal et al., 2021). The five dimensions of social determinants of health for that study were: economic stability (median income), education access and quality (graduation rate), healthcare access and quality, neighborhood and built environment, and social/community context. The study found that higher overall median incomes were associated with lower COVID-19 vaccination disparities (CVD), speaking to the possibility of higher-income counties having more access to

additional resources in comparison to lower-income counties. The Republican vote share is negatively associated with CVD (stronger association in comparison to the influenza vaccination disparity, putting a sharp focus on the political discourse surrounding the pandemic). Counties with a greater proportion of Black residents had less disparity in COVID-19 vaccination rates, which allows the study to suggest that the hesitancy among Black Americans may not necessarily be due to mistrust in medical establishments but instead a result of socioeconomic and political factors. Another study also suggests that racial disparities in medical care are unlikely caused by racial biases of medical professionals, but by other subtle biases on social factors that can affect physician judgment on certain procedures and treatments (Epstein and Ayanian, 2001).

Another study made a comparison of the COVID-19 vaccine disparities to the measles vaccination disparities (Bibbins-Domingo, 2020). The measles vaccination was "controversial" for a long time. In 1970, the gap between minority children and white children that were vaccinated for measles was as high as 18%. In 1989-1991, the measles epidemic took place, and today the gaps between minority and white children in measles vaccination don't exist. Which leads to the question: how? The elimination of the gap in vaccination was a result of a dual strategy placed by the government: boosting universal children's vaccinations and implementing targeted measures in minority communities. To reduce Black hesitancy in the COVID-19 vaccine, we must rebuild their trust in the healthcare community. These targeted measures include increased funding in urban health departments, developing local action plans, linkage of vaccination to other government-funded programs, increased reimbursement for Medicaid providers, reduced vaccine prices for Medicaid programs, annual surveys to monitor the progress, adjustment of clinic hours to meet the needs of some essential workers, and community engagement.

The literature review completed in preparation for conducting this study consisted of numerous studies completed at the start of the pandemic and through the summer of 2021. These studies focused on vaccine hesitancy because many of them were completed before the vaccine rollout (Project Warp Speed) or the development of the vaccine. We have taken this into account as an explanation for why the evidence may not be as skewed or strong, since the vaccine has been administered for a long period, giving people the time to wane on their hesitancy.

This pandemic has proven to be an uncertain time. It has forced societies and humans alike to become more adaptable and cautious. With high transmission and contraction of this virus, people must protect themselves and those surrounding them. The vaccine

is 95% effective in preventing COVID-19 vaccine (Food and Drug Administration, 2021). Vaccinating most of the population is important to reducing the risk of another lockdown or economic halt. The purpose of this research is to determine where the disparities in vaccination rates are in Texas so that they can be identified and explored. If we want to return our society and economy to pre-pandemic levels, then we need to increase vaccine confidence to lower contraction.

Materials and Method

Informed Consent Statement

Informed consent was obtained from all participants in this study before data collection.

Study Design

We used a cross-sectional online survey study design. The survey was implemented via the survey platform Google Forms, and it was limited to respondents on an east Texas college campus, both faculty, and students. Google Forms is a cloud-based data management platform provided by Google Inc. Participants were eligible if they had access to their campus email, could read English, and had access to the Internet via a mobile smartphone or desktop browser. Questions and answer choices were kept short to better group data using "yes/no", rating scales, or checkbox questions, as well as to ensure accessibility to complete via mobile phone. The survey was launched on March 18, 2022 and closed on March 25, 2022. The survey collected data on the demographics of respondents such as age, race, ethnicity, household income, and education. Additionally, we asked participants to rate their concern with infecting family members and friends and their concern with contracting COVID-19 at work or school on a 3-point Likert scale (1 = low concern to 3 = high concern). Participants were also asked to rate their confidence in the COVID-19 vaccine on a 5-point Likert scale (1 = little to no confidence to 5 = high confidence). The study protocol and survey questions were approved by the University of Texas at Tyler Institutional Review Board (IRB Protocol Number: 2022-016). Participants provided informed consent before data collection.

Dependent Variables

The data collected from the surveys resulted in two separate regressions to measure vaccine confidence and vaccine deliverance. Two multivariable linear regressions were computed to model vaccine confidence and attitudes through a Likert-type scale and a "yes/no" question, respectively. First, we will focus on the vaccine confidence dependent variable.

Vaccine Confidence (Vaccine Confidence Regression)

Respondents were asked on a scale of 1-5 for their overall confidence in the COVID-19 vaccine. Answer options were ordered as so: little to no confidence (1), relatively low confidence (2), some confidence (3), relatively high confidence (4), and high confidence (5). Results were interpreted with a range of values from 1 (low confidence) to 5 (high confidence) maintaining the original order of answer choices without grouping answers into categories.

Vaccine Deliverance (Booster Regression)

Respondents were asked if they had received a COVID-19 vaccine and were given the following answer choices: No/Yes, 1 dose/Yes, 2 doses (or 1 Johnson and Johnson)/Yes, 2 doses, and a booster shot. For normal distribution of data, we created a dummy variable for this model focusing on the boosted individuals. The dummy variable will take on zero if the answer choices are No/Yes, 1 dose/Yes, 2 doses (or 1 Johnson and Johnson) and will return a 1 if the answer choice is Yes, 2 doses, and a booster shot. This was to model the utmost confidence in the COVID-19 vaccine because the booster shot was not as heavily mandated as the initial two doses. Also, the booster was made available to the public during a time of declining COVID-19 contractions and cases, therefore people were less likely to seek out the booster shot because their concern for contraction was waning.

Independent Variables

Independent predictor variables were the same for both regression models. These predictor variables included socio-demographics such as gender, age, race, ethnicity, education level, and household income. Other predictor variables included in the model were major, political ideology, and news sources. Since there was a small sample of respondents, some demographics were grouped. Each independent variable in Table 1 will return a 1 if the respondent identifies as the corresponding demographic and a 0 for all other responses. All other independent variables were modeled as dummy variables for the simplicity of the model. For the gender dummy variable—female—the model will return a 1 if the respondent is female and a 0 for all other responses. For the race variable, the model will return a zero if the respondent is White and a 1 for all other responses. For the ethnicity variable, the model will return a zero if the respondent is non-Hispanic/Latinx and a 1 if the respondent is Hispanic/Latinx. The income variables represent the five different income levels: less than $20,000 (0), $20,000-$44,999 (1), $45,000-$99,999 (2), $100,000-$149,999 (3), and $150,000+ (5). The news variables represent four different sources of news: respondents were asked about their main source of news/updates about COVID-19, or the COVID-19 vaccine. Their responses were grouped as follows: social media (news1), radio (news2), television (news3), or newspapers (news4). The survey indicated different sources of each type of news source. Social media referred to Facebook, Twitter, Snapchat, TikTok, etc. Radio referred to local radio stations, NPR, Podcasts, etc. Television referred to ABC, CBS, CNN, FOX, MSNBC, NBC, etc. Newspapers (print or online) referred to The NY Times, USA Today, Wall Street Journal, Economic Times, Washington Post, etc. Finally, education major variables represented 15 groups of majors of the entire sample. The referenced major of each variable can be found in Table 2.

Table 1: Grouped Dummy Variables	
What is your education status?	
Education Level	**Independent Variable**
High School Technical Certification Currently pursuing an Associate's Currently pursuing a Bachelor's	Educ1
Bachelor's Degree Currently pursuing a Master's/Doctorate	Educ2
Master's/Doctorate Degree	Educ3
What is your age range?	
Age	**Independent Variable**
<18-20	Age1
21-30	Age2
30+	Age3
What is your political affiliation?	
Political Affiliation	**Independent Variable**
Undecided Independent Green Party	Politics1
Libertarian Party Moderate Democratic Party	Politics2
Republican Party Conservative	Politics3

Statistical Analyses

Dummy Variables

We began our statistical analysis by coding responses in the Excel spreadsheet file where responses were aggregated to allow easy import into the IBM® SPSS® software platform. SPSS is a statistical software suite for data management, multivariate analysis, business intelligence, and criminal investigation (*IBM*, 2022). The responses were coded with numerical values to replace their string with a number to be able to read in SPSS properly. These coded responses were then transformed into dummy variables using

Stata Statistical Software 17 (*Stata Features*, 2022). Those dummy variables were then imported into SPSS along with the original data. We created dummy variables for age, education level, major, household income, political ideology, and for vaccination status. After running frequency descriptives for the demographics we found that there was not a normal distribution among some categories, so we decided to group dummy variables in SPSS.

Table 2: Degree Major Dummy Variables

What is your major(s) or degree(s)?	
Major	**Variable (major==)**
General Studies	0
Mass Communication/Film and Media Studies	1
Education	2
History/Library Science/English	3
Criminal Justice	4
Political Science/Law/Economics/Sociology/Public Administration	5
Business/Management/Finance/Accounting	6
Human Resource Development	7
Psychology	8
Exercise Science/Kinesiology	9
Nursing/Public Health	10
Pharmacy	11
Biology/Chemistry	12
Mathematics/Computer Science	13
Engineering/Construction Management	14

The grouped dummy variables used in the model were age1, age2, age3, educ1, educ2, educ3, politics1, politics2, and politics3. These grouped dummy variables were computed in SPSS by creating a new variable summing together corresponding dummy variables. Age1 includes age groups <18-20, age2 includes age groups 21-30, and age3 includes age groups 30+. Educ1 includes the education levels of high school, technical certification, and some college (either currently pursuing an Associate's or bachelor's degree. Educ2 includes the education levels of a bachelor's degree or currently pursuing a Master's/Doctorate degree. Educ3 includes those respondents who hold a master's or Doctorate. Politics1 includes the political affiliations of the

undecided party, the Independent Party, or the Green Party. Politics2 includes the political affiliations of Moderate ideologies, the Libertarian Party, or the Democratic Party. Politics3 includes the political affiliations of the Republican Party or Conservative ideologies. Table 1 provides a visual of the grouped dummy variable categories.

All other independent variables were transformed into dummy variables to simplify the model. The other dummy variables used in the model were based on gender, race, ethnicity, and news source. Figure 2 visualizes how the major dummy variables were computed. Participants were able to write in their major in the survey platform, so to reduce the variables in the model we combined like-majors into each of the 15 major categories as follows: General Studies (0), Mass Communication/Film and Media Studies (1), Education (2), History/Library Science/English (3), Criminal Justice (4), Political Science/Law/Economics/Sociology/Public Administration (5), Business/Management/Finance/Accounting (6), Human Resource Development (7), Psychology (8), Exercise Science/Kinesiology (9), Nursing/Public Health (10), Pharmacy (11), Biology/Chemistry (12), Mathematics/Computer Science (13), and Engineering/Construction Management (14).

The income dummy variable categorized five different income levels as follows: Less than $20,000 (0), $20,000 - $44,999 (1), $45,000 - $99,999 (2), $100,000 - $149,999 (3), and $150,000+ (4). The participants were able to select either male, female, or non-binary as their gender. The gender dummy variable (female) uses males/non-binary as the control group, so if the respondent identifies as female the model will return a 1 and a 0 for all other responses. The participants were able to identify with the following racial groups: White/Caucasian, Black/African American, American Indian or Alaskan Native, Asian, or Two or More Races. The race dummy variable uses White/Caucasian as the control group, so it will return a 0 if the participant identifies as White/Caucasian and will return a 1 for all other racial groups.

Respondents were asked about their ethnicity and were able to select either Hispanic/Latinx or Non-Hispanic/Latinx, the ethnicity dummy variable returns a 1 if the participant identifies as Hispanic/Latinx and a 0 if they identify as Non-Hispanic/Latinx.

Lastly, respondents were asked about their main source of information regarding COVID-19 and the vaccine with the following choices: Social media (Facebook, Twitter, Snapchat, TikTok, etc.), Radio (Local radio stations, NPR, Podcasts, etc.), Television (ABC, CBS, CNN, FOX, MSNBC, NBC, etc.), and Newspapers, print or

online, (The NY Times, USA Today, Wall Street Journal, Economic Times, Washington Post, etc.). News1 represents the respondents who receive their news from social media, news2 represents participants who receive their news through radio, news3 represents individuals who receive their news via television news broadcasts, and news4 represents those who receive their COVID-19 news from print or digital news articles.

Our dependent variable in the Booster Regression takes the responses of participants' vaccination status and will return a zero if the response is either No/Yes, 1 dose/Yes, 2 doses (or 1 Johnson and Johnson), and will return a 1 if the answer choice is Yes, 2 doses and a booster shot.

Excluded Variables

Both regression models excluded the following variables as the base group for each demographic: age3, educ1, politics1, major== 6, income== 2, and news1. SPSS automatically excluded these variables to prevent perfect collinearity. Each excluded variable serves as a reference group for the corresponding categories, so they are included in the betas of the included predictors. The excluded variables include ages 30+ (age3), education levels of high school, technical certification, and some college (educ1), political affiliations of undecided, Independent Party, and Green Party (politics1), Business related majors (major== 6), income level $45,000 - $99,999 (income== 2), and social media news source (news1).

Regression

The two multivariable linear regressions were executed in SPSS Statistical Software to test associations among sociodemographic characteristics, political ideologies, education specialization (majors), media sources, COVID-19 vaccine confidence, and COVID-19 vaccination status.

In our Vaccine Confidence Regression, we studied multivariable relationships among vaccine confidence (5-point Likert scale) and sociodemographic characteristics, political ideologies, education specialization, and media sources.

In our Booster Regression, we studied multivariable relationships among vaccination status (dummy variable, 1 = 2 shots + booster shot, 0 = all other vaccination statuses)

and sociodemographic characteristics, political ideologies, education specialization, and media sources.

Results

Sociodemographic Characteristics

We received responses from 103 participants from students, staff, and faculty at an east Texas college campus. We computed frequency tables for each predictor variable to show the representation of our sample. Table 3 shows all frequencies of demographic characteristics collected in our sample. Most respondents were female (67%) and/or White/Caucasian (85.4%). Most of the sample had educational specialization in Business-related fields (20.4%). Biology/Chemistry represented 11.7% of the sample, and both Nursing/Public Health and History/Library Science/English majors represented 7.8% of the sample, for a combined 15.6% representation. Income demographics were nicely distributed with 29.1% falling in the $45,000 - $99,999 income level, 25.2% falling in the $100,000 - $149,999 level, and 18.4% falling in the $150,000+ level. Many respondents identified with the Republican Party (45.6%), Independent affiliation (23.3%), and the Democratic Party (19.4%). 52.4% of participants had contracted COVID-19 and/or its variants, and participants mostly showed little concern about contracting COVID-19 (58.3%) or infecting their family and friends (39.8%). The main source of news for participants was close between newspapers (34%) and social media (32%).

Table 3: Socio-demographic characteristics of sample	
Gender	
Male	33.0%
Female	67.0%
Ethnicity	
Non-Hispanic/Latinx	80.6%
Hispanic/Latinx	19.4%
Race	
White/Caucasian	85.4%
Black/African-American	5.8%
American Indian or Alaskan Native	1.0%
Asian	1.0%
Two or More Races	6.8%
Age	
<18	2.9%
18-20	22.3%
21-24	32.0%
25-30	7.8%
30-45	18.4%
45-65	11.7%
65+	4.9%
Education Level	
High School	1.9%
Technical Certification	1.0%
Currently pursuing an Associate's	1.9%
Currently pursuing a Bachelor's	45.6%
Bachelor's Degree	15.5%
Currently pursuing a Master's/Doctorate	8.7%
Master's/Doctorate Degree	25.2%
Approximate Household Income	
Less than $20,000	10.7%
$20,000 - $44,999	16.5%
$45,000 - $99,999	29.1%
$100,000 - $149,999	25.2%
$150,000+	18.4%

Table 3 (continued): Socio-demographic characteristics of sample	
Education Specialization (Major)	
General Studies	1.9%
Mass Communication/Film and Media Studies	2.9%
Education	4.9%
History/Library Science/English	7.8%
Criminal Justice	6.8%
Political Science/Law/Economics/Sociology/Public Administration	7.8%
Business/Management/Finance/Accounting	20.4%
Human Resource Development	2.9%
Psychology	4.9%
Exercise Science/Kinesiology	8.7%
Nursing/Public Health	7.8%
Pharmacy	1.9%
Biology/Chemistry	11.7%
Mathematics/Computer Science	2.9%
Engineering/Construction Management	6.8%
Political Affiliation	
Undecided	2.9%
Independent	23.3%
Green Party	1.0%
Libertarian Party	3.9%
Moderate	1.9%
Democratic Party	19.4%
Republican Party	45.6%
Conservative	1.9%
Have you ever contracted COVID-19 or any of its variants?	
Yes	47.6%
No	52.4%
Concern about contracting COVID-19	
Unconcerned	58.3%
Somewhat concerned	34.0%
Concerned	7.8%
Concern with infecting family and friends	
Unconcerned	39.8%
Somewhat concerned	32.0%
Concerned	28.2%
Main Source of News	
Social Media	32.0%
Radio	4.9%
Television	29.1%
Newspapers	34.0%

Regression Models

Booster Regression

The results of the Booster Regression are shown in Table 4. In this multivariable regression model, several predictor variables were significantly associated with vaccination status with a 90% confidence level.

- Female participants were 16.8% more likely to be boosted than male and non-binary participants.
- Age groups 1 and 2, ages <18-24, were less likely to be boosted than older participants.
- Those holding a Master's or Doctorate were 26% more likely to be boosted than other education levels.
- Those that were affiliated or identified with the Republican Party or conservative ideologies were 21.3% less likely to be boosted than other political ideologies.
- Individuals with education specialization in mass communication or media and film studies were 52.3% more likely to be boosted than other majors.
- Those specializing in Education, Human Resource Development, Psychology, and Pharmacy presented a negative association with vaccination status.
- Mathematics and computer science majors were 71.8% more likely to be boosted.
- The income variables show that the upper class ($150,000+) was more likely to be boosted than all other income levels.
- Participants who received their news updates on COVID-19 from radio and newspapers were less likely to be boosted than those who receive their updates from television broadcasts or social media.

Table 4: Booster Regression Results

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.720[a]	0.518	0.317	0.407

a. Predictors: (Constant), news4, major== 13.0000, female, major== 1.0000, income== 0.0000, major== 9.0000, major== 8.0000, major== 7.0000, major== 5.0000, politics3, major== 0.0000, major== 4.0000, major== 11.0000, major== 2.0000, income== 4.0000, major== 14.0000, major== 10.0000, news2, educ2, age2, Hispanic, major== 3.0000, race, income== 1.0000, income== 3.0000, major== 12.0000, educ3, politics2, news3, age1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.779	30	0.426	2.577	<.001[b]
	Residual	11.901	72	0.165		
	Total	24.680	102			

a. Dependent Variable: booster

b. Predictors: (Constant), news4, major== 13.0000, female, major== 1.0000, income== 0.0000, major== 9.0000, major== 8.0000, major== 7.0000, major== 5.0000, politics3, major== 0.0000, major== 4.0000, major== 11.0000, major== 2.0000, income== 4.0000, major== 14.0000, major== 10.0000, news2, educ2, age2, Hispanic, major== 3.0000, race, income== 1.0000, income== 3.0000, major== 12.0000, educ3, politics2, news3, age1

Table 4 (continued): Booster Regression Results

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.522	0.198		2.635	0.010
	Female	0.168	0.098	0.161	1.719	0.090
	Race	-0.059	0.153	-0.042	-0.382	0.703
	Hispanic	0.048	0.122	0.038	0.391	0.697
	Age1	-0.439	0.179	-0.389	-2.452	0.017
	Age2	-0.221	0.133	-0.221	-1.664	0.100
	Educ2	0.033	0.136	0.028	0.239	0.812
	Educ3	0.260	0.154	0.231	1.693	0.095
	Politics2	0.096	0.133	0.085	0.716	0.477
	Politics3	-0.213	0.114	-0.217	-1.862	0.067
	Major== 0.0000	0.007	0.352	0.002	0.020	0.984
	Major== 1.0000	0.523	0.271	0.180	1.927	0.058
	Major== 2.0000	-0.121	0.248	-0.053	-0.490	0.626
	Major== 3.0000	0.160	0.192	0.088	0.834	0.407
	Major== 4.0000	0.116	0.189	0.060	0.616	0.540
	Major== 5.0000	0.021	0.203	0.011	0.104	0.918
	Major== 7.0000	-0.123	0.282	-0.042	-0.437	0.664
	Major== 8.0000	-0.014	0.216	-0.006	-0.066	0.947
	Major== 9.0000	0.036	0.180	0.021	0.202	0.841
	Major== 10.0000	0.166	0.191	0.091	0.866	0.390
	Major== 11.0000	-0.056	0.357	-0.016	-0.158	0.875
	Major== 12.0000	0.209	0.170	0.137	1.227	0.224
	Major== 13.0000	0.718	0.265	0.247	2.710	0.008
	Major== 14.0000	0.097	0.206	0.050	0.473	0.638
	Income== 0.0000	-0.324	0.168	-0.205	-1.937	0.057
	Income== 1.0000	-0.275	0.149	-0.209	-1.842	0.070
	Income== 3.0000	-0.356	0.125	-0.316	-2.855	0.006
	Income== 4.0000	0.081	0.132	0.064	0.613	0.541
	News2	-0.305	0.220	-0.134	-1.385	0.170
	News3	0.162	0.142	0.150	1.137	0.259
	News4	-0.019	0.120	-0.019	-0.161	0.873

a. Dependent Variable: booster

Table 4 (continued): Booster Regression Results						
Excluded Variables[a]						
Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	Age3	.[b]				0.000
	Educ1	.[b]				0.000
	Politics1	.[b]				0.000
	Major== 6.0000	.[b]				0.000
	Income== 2.0000	.[b]				0.000
	News1	.[b]				0.000

a. Dependent Variable: booster

b. Predictors in the Model: (Constant), news4, major== 13.0000, female, major== 1.0000, income== 0.0000, major== 9.0000, major== 8.0000, major== 7.0000, major== 5.0000, politics3, major== 0.0000, major== 4.0000, major== 11.0000, major== 2.0000, income== 4.0000, major== 14.0000, major== 10.0000, news2, educ2, age2, Hispanic, major== 3.0000, race, income== 1.0000, income== 3.0000, major== 12.0000, educ3, politics2, news3, age1

Vaccine Confidence Regression

The results for the Vaccine Confidence multivariable regression are shown in Table 5. In this model, several predictor variables were significantly associated with vaccination status with a 90% confidence level.

The Booster Regression model had similar significant variables, however, the Vaccine Confidence Regression model does not show statistically significant betas for the age dummies or the major== 13 dummy variable, unlike the Booster Regression model. On the contrary, the Vaccine Confidence Regression model shows statistically significant betas for the news2 variable and major== 0, 8, and 12 while the Booster Regression model does not.

Table 5: Vaccine Attitudes			
Concern of Contraction			
Answer Choice	**N**	**Total Number of Responses**	**%**
I've had the virus before	52	**103**	50.49%
I do not want to get sick	48		46.60%
It is only a matter of time before everyone contracts the virus	39		37.86%
I have seen loved ones hospitalized with the virus	31		30.10%
The symptoms are not that bad	25		24.27%
I do not want to lose income (missing work for quarantine)	19		18.45%
I have underlying conditions	12		11.65%
I don't believe COVID-19 is real	2		1.94%
Direct exposure but no positive test	2		1.94%

Table 5 (continued): Vaccine Attitudes			
Vaccination Reasons			
Answer Choice	**N**	**Total Number of Responses**	**%**
I do not want to infect my family/friends	52	**75**	69.33%
I want to take all necessary precautions to protect myself against COVID-19	50		66.67%
It is what's best for the health and safety of the community/country	47		62.67%
I do not want to miss out on work or school	40		53.33%
I trust the vaccine	37		49.33%
I am concerned with the long-term effects of COVID-19	35		46.67%
The number of deaths is alarming to me	34		45.33%
The number of hospitalizations is alarming to me	33		44.00%
I've seen loved ones hospitalized/die from COVID-19	30		40.00%
My friends/family encouraged me to get the vaccine	27		36.00%
My employer mandates that I be vaccinated	8		10.67%
Travel purposes	6		8.00%
My friends/family forced me to get the vaccine	3		4.00%
To stop having to take COVID-19 tests	3		4.00%
Everyone else is doing it	2		2.67%
Vaccine Hesitancy Reasons			
Answer Choice	**N**	**Total Number of Responses**	**%**
There is not enough research on the vaccine or long-term effects of the vaccine	25	**26**	96.15%
I do not trust the vaccine	20		76.92%
I feel like the vaccine is being forced on me	17		65.38%
I do not want the government to tell me what to put in my body	16		61.54%
I am not concerned about contracting COVID-19	16		61.54%
I have seen loved ones contract COVID-19 and they were okay	15		57.69%
Speed of vaccine rollout	14		53.85
I have contracted COVID-19 and it wasn't that bad	12		46.15
I do not believe the vaccine will protect me against COVID-19	12		46.15
I think there are ulterior motives behind the vaccine	8		30.77
Fear of fertility issues/complications	4		15.38
I have an allergy associated with the COVID-19 vaccine	2		7.69
If everyone else is getting vaccinated, there is no need for me to get vaccinated	2		7.69
I have underlying conditions that prevent me from contracting COVID-19	1		3.85
I do not believe COVID-19 is real	0		0

The betas can be interpreted as the marginal effect on the 5-point Likert scale of each variable. Females showed .631 more confidence than other genders, or 12.6% more confidence (calculated by dividing the beta by the 5-point scale).

The model also shows, like the Booster Regression model's likeliness to be boosted, a negative association with race and vaccine confidence.

Individuals who hold a Master's or Doctorate were 20% more confident in the vaccine.

Those affiliated with the Republican Party or conservative ideologies showed 15.92% less confidence in the vaccine than other political ideologies.

Those specializing in mass communication or media and film studies were 35.18% more confident in the vaccine, and those undeclared or focusing on general studies were 59.02% more confident in the vaccine. Psychology majors were 25.56% more confident and biology/chemistry majors were 27.88% more confident in the vaccine.

The lower income levels <$20,000 and $20,000 - $44,999 had 25.96% and 19.52% less confidence, respectively. Lastly, the participants who received their news and updates on COVID-19 through radio, be it local radio stations, NPR, or other podcasts, were 34.38% less confident in the vaccine.

Discussion

Study Strengths

The strength of this study is having two multivariable regression models that assess vaccine confidence from two different perspectives. The Vaccine Confidence Regression model evaluates the association between the predictor variables and the level of vaccine confidence, measured on a 5-point Likert scale. This allows the individual to self-assess their confidence in the vaccine and then respondents were asked to explain their reasoning for their confidence or hesitancy in the survey, see section Vaccine Attitudes. The Booster Regression model evaluates the association between the predictor variables and vaccination status, measured by the number of doses of a COVID-19 vaccine the respondent has received. Since the model uses the booster dummy variable as the dependent variable, it only returns a 1 if the individual has received 3 doses of a COVID-19 vaccine, that is 2 regular doses and a booster shot. This shows vaccine confidence because the booster shot was rolled out well after the first impact of the pandemic and the surges of the Delta variant. Therefore, individuals that were willing to receive the booster shot showed absolute confidence in the vaccine,

because it was expected to protect against the surging Omicron variant and was not mandated heavily like the two initial doses of the vaccine.

Study Limitations

This study does have its limitations. Due to the nature of a cross-sectional study design, the timing of the survey must be considered for interpretation. The survey was distributed from March 18, 2022, to March 25, 2022, during the winding down of the COVID-19 pandemic. Many people have been mandated to take the vaccine for travel or work purposes, so this most likely influences the vaccination status rate. This will also be discussed in the Vaccine Attitudes section. This study was also conducted on an east Texas college campus where 78.29% of residents voted Republican in the general 2020 presidential election (General Election, 2020), and 45.6% of respondents identified as Republican in this study, so we do acknowledge that this sample is not representative of the U.S. population and as such the study results are not generalizable outside the study population. The sample also was 85.4% White/Caucasian which could explain the lack of significance in the race variable, the study was initially aimed at assessing racial disparities in the COVID-19 vaccine, but due to the limited number of responses from racial groups such as African Americans, American Indian/Alaskan Native, Native Hawaiian/Pacific Islanders, and Asians did not allow us to effectively assess disparities between racialized groups. The sample was also over-representative of women, non-Hispanic/Latinx individuals, and college-educated individuals.

Vaccine Attitudes

Participants were able to write in their vaccine opinions, comments, and concerns on a few questions throughout the survey. We asked participants to rate their level of concern with contracting COVID-19 with a follow-up "check all that apply" question about their reasoning behind their concern or lack of concern in contracting COVID-19.

There was also an "Other" option at the end of the checklist of generalized reasonings that allowed participants to include any reasonings that were not listed in the answer choices. The same format was applied to the questions on the reasoning behind receiving the vaccine or not receiving the vaccine. The final question of the survey was for participants to add any additional thoughts, comments, or concerns about the pandemic and the vaccine. Table 5 shows the frequencies of responses. Earlier research shows that Black Americans were more fearful of infection from COVID-19 and

present more underlying conditions that lead to higher comorbidity from COVID-19 (Bunch, 2021), which sparks the curiosity of why minorities are hesitant to receive vaccinations that could prevent them from getting infected. We believe these questions will help in understanding individuals' decisions to get vaccinated or not, which could explain the disparities that we see in healthcare.

Much of the reasoning behind individuals' concern or lack of concern with contracting COVID-19 stems from having contracted the virus before (n = 52, 50.49%), not wanting to get sick (n = 48, 46.60%), and believing that it is only a matter of time before everyone catches the virus (n = 39, 37.86%). Most of the responses in those three concern categories were from vaccinated individuals however, considering the scale of vaccinated to unvaccinated participants in the study, it is important to look at the relative percentages of unvaccinated participants who identified with these concerns. 66.67% of unvaccinated individuals reasoned their lack of concern with contraction with having had the virus before, possibly because the symptoms were not bad in their opinion. 11.11% of unvaccinated individuals identified with the concern of not wanting to get sick and 48.15% of unvaccinated participants related to the ideology that it is only a matter of time before everyone contracts the virus, which could explain hesitancy to receive the vaccine, because if everyone contracts the virus it increases immunity of the virus among the community and eliminates the need for a vaccine.

Vaccinated participants mostly resonated with not wanting to infect family and friends (n = 52, 69.33%), wanting to take all the necessary precautions to protect themselves against COVID-19 (n = 50, 66.67%), and believing that the vaccine is what is best for the health and safety of their community (n = 47, 62.67%) as their motivations behind getting vaccinated.

Unvaccinated participants mostly resonated with there not being enough research on the vaccine or the long-term effects of the vaccine (n = 25, 96.15%), not trusting the vaccine (n = 20, 76.92%), feeling like the vaccine was forced on them (n = 17, 65.38%), not wanting the government to tell them what to put in their body (n = 16, 61.54%), and not being concerned with contracting COVID-19 (n = 16, 61.54%).

The final question of the survey allowed participants to showcase their additional thoughts, comments, and concerns surrounding the pandemic and the COVID-19 vaccine. A lot of participants mentioned that while they believe in the vaccine, they do not agree with vaccine mandates that have been forced upon individuals. The stigma

around choosing to not vaccinate has caused stress on many individuals and created an even bigger divide in our country. Many believe that decisions that impact personal health should be left up to the individual and should not impact one's ability to make a living (employer mandates) or social acceptance, because some individuals are stuck between the recognition that it took years to develop a polio vaccine and the realization that medicine and technology have come a long way in the past decade, let alone 60 years. A common trend among participants is the belief that fear instilled by the media and government is overdone. The issue with this unprecedented virus is that everyone was adapting to the virus and information was scarce at the beginning of the pandemic, this led to a lot of "misinformation" which could also be construed as misunderstandings of the virus and vaccine. However, the politicization of the pandemic—due to the timeliness of the pandemic before the 2020 presidential election—led to demonizing of opposing viewpoints and left individuals not knowing what to believe. Participants also believe that vaccine "misinformation" is a term often used to shut down conversation points made by right-wing individuals, citing other public figures who have pushed narratives that could be labeled "misinformation" but were never critiqued in the same fashion as right-wing individuals. The consensus was that the vaccine mandates were a gross use of power, with one individual even mentioning that if laws were changed slightly, they would be more open to receiving the vaccine.

Conclusion

Understanding the attitudes behind the COVID-19 vaccine and the pandemic is crucial in understanding vaccine hesitancy and in reducing health disparities. The politicization of the pandemic has strayed many individuals away from receiving the vaccine and could be a determinant in the economic recession caused by the prolonging of the pandemic due to variants and surges. If individuals were convinced to vaccinate earlier on in the pandemic, then the immunity among the country would have increased and the effects of the variants would have been significantly smaller.

Political ideology and news sources are important factors in determining COVID-19 vaccine hesitancy. While both factors have no relation to health status or socioeconomic demographics, it shows that the pandemic was more focused on public policy rather than public health.

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This study was approved by the University of Texas at Tyler Institutional Review Board (Protocol number: 2022-016); the board determined the research protocol met the criteria for exemption per the regulations found at 45 CFR 46 and 21 CFR 56.

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