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A Survey to Determine the Relationship between Health Literacy and Vaccine Hesitancy in College Students at Butler University

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A Survey to Determine the Relationship between Health Literacy and Vaccine Hesitancy in College Students at Butler University.

Bio

Lindsey Schreiber is a senior at Butler graduating in May of 2022. She is a Healthcare and Business major in the College of Pharmacy and Health Sciences and is also a member of the Honors College. She is also on the Women's Lacrosse team at Butler University at the Division 1 level.

Introduction

The prolonged pandemic has proven the need for vaccines to protect the public against COVID-19. The first COVID-19 vaccine approved for emergency use in the United States was the Pfizer-BioNTech COVID-19 Vaccine approved back on December 11, 2020, yet hesitancy surrounding a Coronavirus vaccine still exists in early 2022. As of April 3, 2022, 77% of Americans received at least one dose and 65.60% are fully vaccinated. The rate of vaccination across states varies. Only 45% of vaccinated individuals have opted to receive a booster shot.¹ Currently, there are three vaccines that are authorized or approved for use to decrease the severity of symptoms of COVID-19.² Safety and efficacy were identified as the top two categories of concern in a study done in August 2020, more specifically concerns centered around possible side effects and the seemingly rushed process.³ Finding reasons for and addressing this hesitancy could be critical in improving the number of vaccinated individuals across the country, which is needed to alleviate the strain of this pandemic on the population and the healthcare system. Since these vaccines are relatively new, there is a need for additional studies focusing on what might predict whether an individual decides to become vaccinated. While there are many existing studies, due to how common this issue is, information surrounding this topic needs to be continually developed over time to remain current.

Indiana, where this study took place, currently has a fully vaccinated rate of 53%.¹ An existing study at a Southern US university which focused on hesitancy among 282 college students found that 47.50% of these participants were hesitant to receive a COVID-19 vaccine. This high percentage of hesitant participants validates that the need to convince the college student population to become vaccinated is real, and remains a large public health issue.⁴ Another study that took participants knowledge of vaccines into account found that medical students show a greater degree of acceptance toward COVID-19 vaccines, and that there was a significant correlation between hesitancy and school curriculum.⁵ This study showed the importance of health literacy when thinking about vaccine hesitancy, and how it can affect how an individual makes decisions about their health.⁶

The purpose of this study was to find if there is a significant relationship between health literacy and vaccine hesitancy. A second objective was to find what concerns and influences lead to an individual's hesitancy. The data collected through this study was focused on college students, which can help universities plan how they can campaign to reduce vaccine hesitancy. The results of this study can validate the need for specific methods of reducing hesitancy. We hypothesized that a limited level of health literacy would statistically correlate with an unvaccinated status.

Methods

A Qualtrics skip logic survey was created that collected demographic information, vaccine status, vaccine influences, vaccine concerns, as well as The Newest Vital Sign, a health literacy assessment. This survey can be found in the Appendix. This data was collected over Butler's 2021 fall semester, and included both undergraduate and graduate students. Each college at Butler was surveyed in order to gain a valid sampling of the university, and included different ages, years, and majors. The anonymous survey was approximated to take 3-5 minutes, and the link was provided for students to take during scheduled class periods.

Health literacy was determined for each participant by the The Newest Vital Sign (NVS), a health literacy assessment tool created by Pfizer. This test has been validated to provide an easy and quick way to assess health literacy. This tool has also been researched extensively by health literacy experts.⁷ In a recent systematic review, the NVS performed moderately well in identifying patients with limited literacy.⁷ The Newest Vital sign contains 6 questions based on an ice cream container, and the participants score is calculated based on the amount of correct answers. A score of 0-1 suggests high likelihood of limited literacy, a score of 2-4 indicates the possibility of limited literacy, and a score of 5-6 indicates adequate literacy.⁷ A patient's ability to read and analyze a nutrition label requires the same analytical and conceptual skills that are needed to understand and follow a provider's medical instructions.⁷

After the six questions from Pfizer, the survey then asks if the participant has received a Covid-19 vaccination. If the respondent answers yes, there are two Likert scales that collect their level of concern and influences before receiving the vaccine. If the respondent has not been vaccinated, their concerns and influences that prevented them from becoming immunized are recorded. The respondents are also asked if they received the vaccine only after Butler's vaccine mandate.

Logistic regression analysis and Student T Tests were chosen as statistical methods to interpret the data collected. First, a description table was created for the demographics that were collected in the beginning of the survey. The percentages of each characteristic are listed in the table (% n), along with data from the entire university (% N). To find the predictor of vaccination, a logistic regression was used to compare one's score with vaccination status. Score was used as the independent variable along with demographics including age, year, and college. The dependent variable was vaccination status. This was also run again with a dependent variable of vaccine hesitancy, with the hesitant including those who only received the vaccine after Butler's mandate. This hesitancy was assumed in this study because Butler's vaccine clinic was in April 2021, and the mandate was announced June 21st, 2021, giving the individual more than enough time to have gotten the vaccine otherwise.

For the secondary objective, the results from the Likert scales were used to analyze the scores of concern and influence. A student T-Test was used for each concern and influence to compare the results of those who were vaccinated and those who were not. Each concern/influence answer was given a score from 1-4, and this was used to test the null hypothesis; the level of concern/influence for those who are vaccinated are the same for those who have not received a vaccination. Each concern/influence that rejects this hypothesis has a statistically significant difference between the vaccinated and unvaccinated, labeled with an asterisk in the table.

To find which concerns/influences are predictors, another logistic regression was run for additional analysis. The independent variables for this test were the scores from each concern and influence. The dependent variable in this case was vaccination status.

The statistical analysis for logistic regressions were calculated using IBM Statistical Package for Social Science (SPSS) Version 27 software, provided by Butler University. The student T-Tests were calculated within Excel. For all statistical tests, those with a p-value $<.05$ are considered statistically significant. Butler University's Institutional Review Board reviewed and approved this study.

Results

A total of 361 students participated in this study, excluding those who did not fully complete the survey. This survey had a response rate of 80.09%. 285 students were indicated to have adequate literacy, 68 students were indicated to have the possibility of limited literacy, and 8 students were indicated to have high likelihood of limited literacy. These results can be seen in Table 1. Demographic Information can be found in Table 2.

There were not significant demographic predictors of vaccine status, as can be seen in Table 2. This model explained 4.10% of the variance of vaccine status (Nagelkerke R² value) and accurately classified 95.60% of cases. The p-values for each independent variable were larger than .05, deeming them statistically insignificant. Refer to Table 4 for these results.

There were also no significant demographic predictors of vaccine hesitancy, which can be seen in Table 2. This model explained 39% of the variance of vaccine hesitancy (Nagelkerke R² value) and accurately classified 81.70% of cases. The p-values for each independent variable in this case were also larger than .05, deeming them statistically insignificant.

The student-T tests showed a significant difference in the concerns safety, efficacy, and side effects for those who have received immunization and for those who have not. Refer to Table 3 for these results. The p-values for these categories were all smaller than .05. The t-tests also showed a significant difference in the influence of peers, public health, the Butler mandate, and work for those vaccinated and those unvaccinated. These p-values were also smaller than .05. All the categories listed rejected the null hypothesis that there was no difference in level of concern or influence for those who have received the vaccine and for those who have not.

Safety and understanding how the vaccine works were identified as predictors of vaccine status by using logistic regression. This model explained 32.60% (Nagelkerke R² value) of the variance of vaccination status and accurately classified 94.70% of cases. Values with a significance $<.05$ were deemed statistically significant, and an odds ratio was calculated for these values. Refer to Table 2 for these results. The table shows that those concerned about safety are 0.35 times less likely to be vaccinated, and the odds of being vaccinated is 2.40 times more for those concerned about how the vaccine works.

Peers, Public Health, social media and the government were identified as predictors of vaccine status by using logistic regression. This model explained 37.50% (Nagelkerke R² value) of the variance of vaccination status and accurately classified 96.60% of cases. Values with a significance $<.05$ were deemed statistically significant, and an odds ratio was calculated for these values. Refer to Table 2 for these results. The table shows that the odds of being vaccinated is

2.56 times more for those influenced by peers and 3.15 times more for those influenced by Public Health. The odds of being vaccinated are .40 times less for those influenced by social media and .39 times less for those influenced by the government.

Discussion

This study strengthens the existing literature on vaccine hesitancy in college students by having a strong sample size, a high response rate, and a variety of ages and majors from respondents. Professors at various colleges were asked permission to have their class surveyed. This high response rate was achieved by conducting the survey in person, and monitoring the participants so that they could ask questions if necessary. This recorded participation also excluded those who did not fully complete the survey.

This study also recorded a vaccination rate of 95.30%, which is close to Butler University's recorded rate of 95.20%. This further proves the validity of the sample that the responses were collected from.

The logistic regressions were unable to find a demographic predictor of vaccination or hesitancy, and this may have been due to the limitations of performing this study at a private college. The main motive in performing this regression was to find a relationship between health literacy, vaccination status, and vaccination hesitancy. The number of probable health illiterate participants was very low for this study. However, when the assumption was made that those who became vaccinated after the mandate were hesitant, the explained variance jumped from 4.10% to 39.00%. Although this result is not statistically significant, it can be interesting to consider when thinking about health literacy.

The study found that those who are vaccinated and those who are not have different levels of concern for safety, efficacy, and side effects. These varying concerns and perceptions may be what holds certain individuals back from becoming vaccinated against Covid-19, and therefore could be focused on to reduce this hesitancy. Further education on the mechanics of the vaccine could help ease these concerns, and therefore validates the need for further health education on college campuses. Peers, the Butler mandate, public health, and work all have different levels of influence for these individuals. It is important to see how each of these possible influences impacts hesitancy and focus further efforts through the appropriate lens.

The logistic regressions further validated the path that further campaigning must take, as performing an odds ratio showed which of these concerns and influences were predictors of vaccination status. Safety was found to be a predictor of vaccination status, as this study found that the odds of being vaccinated is 0.35 times less for those concerned about safety. This further proves that these concerns about safety have not been diminished, and that further education to improve vaccine literacy could be beneficial. The model also showed that the odds of being vaccinated is 2.40 times greater for those concerned about how the vaccine works. This may highlight a different issue, as this shows that the unvaccinated are not as concerned about how the vaccine works, but are still worried about safety, efficacy, and side effects. Further effort to limit vaccine hesitancy may be affected by this mindset, as there is not a significant concern about the actual mechanics of this vaccine.

Four influences were also proven to be predictors of vaccination status. This can help pinpoint the ways that vaccination is promoted, as the odds of being vaccinated is 2.56 times greater for those influenced by peers. Efforts to achieve a higher vaccination rate may be most successful by targeting different peer groups, and allowing the influence of socialization to carry across individuals. Public Health is also a positive influence on vaccination. The odds of being vaccinated is 3.15 times greater for those influenced by public health, which proves that this type of channel is beneficial for raising vaccination rates. On the other hand, the odds of being vaccinated is .39 times less for those influenced by the government. The nation has always been divided politically, especially during this pandemic, and this political divide is evident in varying levels of intent to become vaccinated as well. A different approach would be beneficial, as efforts to promote vaccination coming from the government may come across as political, when they should only be an issue of personal health. The odds of being vaccinated are .40 times less for those influenced by social media. This may be due to the amount of misinformation that is spread on social sites, and shows that these individuals may not be getting their information from reputable sources. This shows that activity on social media may need to be monitored, and misinformation must be flagged, as this influence can have a detrimental effect on vaccination.

Existing literature further validates the results of this study. In a survey sent out to students at the University of Rhode Island, the top reported COVID-19 vaccine-related concerns were safety (37%), effectiveness (24%), and limited information (16%).⁸ This reinforces the results from our study, as safety and efficacy were shown to be of higher concern for the unvaccinated. The difference is that in this study, it was found that the unvaccinated were not as concerned about the mechanics of the vaccine, whereas the Rhode Island study participants wanted more information. Another study further validated the need for more education on vaccines, as one interview-based university report found that vaccine-hesitant students enrolled in health courses significantly increased their vaccine attitude scores by a statistically significant amount over the course of the study.⁶

There were several limitations to this study. First, Butler University is a private university that has a high academic standard. The health literacy results of surveying a private college do not represent those of the general public. Therefore, this study is not generalizable, as it mainly focuses on a certain population.

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Appendix

Table 1: Health Literacy Scores

n (%)	Score	Health Literacy
8(02.22)	0-1	Indicates high likelihood of limited literacy
68(18.84)	2-4	Indicates possibility of limited literacy

285(78.95)	5-6	Indicates adequate literacy
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Table 2: Demographic Table

Age	Sample n (%)	University (%)
18	38 (10.56)	N/A
19	77 (21.39)	N/A
20	46 (12.78)	N/A
21	129 (35.83)	N/A
22	52 (14.44)	N/A
23	5 (1.39)	N/A
>23	13 (3.61)	N/A
College	Sample n (%)	University (%)
Pharmacy and Health Sciences	181 (50.10)	16.44
Lacy School of Business	30 (8.33)	24.00
Jordan College of the Arts	18 (5)	3.07
College of Liberal Arts and Sciences	102 (28.33)	36.50
College of Communications	25 (6.94)	10.90
College of Education	4 (1.11)	4.60
Year	Sample n (%)	University (%)
First Year	59 (16.39)	24.10
Sophomore	67 (18.61)	21.00
Junior	45 (12.50)	24.90
Senior	170 (47.10)	25.00
5th Year	7 (1.90)	2.36
Graduate Student	12 (3.30)	2.53

Vaccination	Sample n (%)	University (%)
Vaccinated	344 (95.30)	95.20
Unvaccinated	16 (4.70)	4.80

Table 3: Predictors of Vaccination

Demographic (Refusal)	Sig	Exp (B)
Score	.68	N/A
Age	.54	N/A
Year	.85	N/A
College	.07	N/A
Demographic (Hesitant)	Sig	Exp (B)
Score	.38	N/A
Age	.40	N/A
Year	.06	N/A
College	.22	N/A
Concerns	Sig	Exp (B)
Safety*	.01	0.35
Efficacy	.09	N/A
Side Effects	.12	N/A
Understanding How the Vaccine Works*	.03	2.40
Availability	.52	N/A
Cost	.79	N/A
Influences	Sig	Exp (B)
Family	1.49	N/A
Peers*	0.03	2.56
Government*	0.01	.392
Public Health*	0.00	3.148
Butler (Mandate)	0.08	N/A
Work	1.98	N/A
Social Media*	0.02	.400

Table 3: Significant Difference in Level of Concern or Influence between Vaccinated and Unvaccinated Individuals

Concerns	P Value
Safety*	<.00
Efficacy*	<.00
Side Effects*	<.00
Understanding How the Vaccine Works	0.09
Availability	0.51
Cost	0.49
Influences	P Value
Family	0.57
Peers*	0.04
Government	0.05
Public Health*	0.00
Butler (Mandate)*	0.04
Work*	0.02
Social Media	0.13

Survey

Overview of Survey

Please answer the following questions as honestly as possible. Your participation is completely anonymous and voluntary and you may opt out at any time without penalty. There are no consequences for completing this survey and you are not required to answer all of the questions. All information collected will be used solely for research. By taking this survey, you are agreeing to participate. The survey should take approximately 5 minutes to complete. Thank you for your participation! If you have any questions please contact: Lindsey Schreiber (lmshrei@butler.edu) or Trish Devine (tdevine@butler.edu)

The Newest Vital Sign

The Newest Vital Sign is based on a nutrition label from an ice cream container. You are given the label and then asked questions about it. You can and should refer to the label while answering questions. This will assess how you interpret health information. A calculator is not necessary, but you may use one if you wish.

Questions	Results
If you eat the entire container, how many calories will you eat?	1000* - 96.1%
If you are allowed to eat 60 grams of carbohydrates as a snack, how much ice cream could you have?	1 Cup* - 90.58%
Your doctor advises you to reduce the amount of saturated fat in your diet. You usually have 42 g of saturated fat each day, which includes	33 grams* - 91.36%

one serving of ice cream. If you stop eating ice cream, how many grams of saturated fat would you be consuming each day?	
If you usually eat 2,500 calories in a day, what percentage of your daily value of calories will you be eating if you eat one serving?	33%* -91.36%
Pretend that you are allergic to the following substances: penicillin, peanuts, latex gloves, and bee stings. Is it safe for you to eat this ice cream?	No*- 84.39%
Why not?	<i>It has peanut oil*</i> - 97.95%

Likert Scales

Concerns	Scale
Not at all Concerned	1
Slightly Concerned	2
Concerned	3
Very Concerned	4
Influences	Scale
Did not Influence	1
Slightly Influenced	2
Influenced	3
Greatly Influenced	4

References

1. U.S. COVID-19 vaccine tracker: See your state's progress. Mayo Clinic. <https://www.mayoclinic.org/coronavirus-covid-19/vaccine-tracker>. Accessed March 30, 2022.
2. Stay Up to Date with Your Covid-19 Vaccines. Centers for Disease Control and Prevention. https://www.cdc.gov/coronavirus/2019-ncov/vaccines/stay-up-to-date.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fvaccines%2Fdifferent-vaccines.html. Accessed March 30, 2022.
3. Dror AA, Eisenbach N, Taiber S, et al. Vaccine hesitancy: the next challenge in the fight against COVID-19. *Eur J Epidemiol*. 2020;35(8):775-779. doi:10.1007/s10654-020-00671-y
4. Sharma M, Davis RE, Wilkerson AH. COVID-19 Vaccine Acceptance among College Students: A Theory-Based Analysis. *Int J Environ Res Public Health*. 2021;18(9):4617. Published 2021 Apr 27. doi:10.3390/ijerph18094617

5. Sadaqat W, Habib S, Tauseef A, et al. Determination of COVID-19 Vaccine Hesitancy Among University Students. *Cureus*. 2021;13(8):e17283. Published 2021 Aug 18. doi:10.7759/cureus.17283
6. Johnson DK, Mello EJ, Walker TD, Hood SJ, Jensen JL, Poole BD. Combating Vaccine Hesitancy with Vaccine-Preventable Disease Familiarization: An Interview and Curriculum Intervention for College Students. *Vaccines (Basel)*. 2019;7(2):39. Published 2019 May 12. doi:10.3390/vaccines7020039
7. The Newest Vital Sign. Pfizer. <https://www.pfizer.com/products/medicine-safety/health-literacy/nvs-toolkit>. Accessed March 30, 2022.
8. Silva J, Bratberg J, Lemay V. COVID-19 and influenza vaccine hesitancy among college students. *J Am Pharm Assoc (2003)*. 2021;61(6):709-714.e1. doi:10.1016/j.japh.2021.05.009