Master of Public Health

Integrative Learning Experience Report

VACCINE HESITANCY IN COLLEGE STUDENTS

by

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submitted in partial fulfillment of the requirements for the degree

MASTER OF PUBLIC HEALTH

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Summary/Abstract

Vaccine hesitancy is a growing public health concern in the United States, especially in the wake of the COVID-19 pandemic. The World Health Organization (WHO) lists vaccine hesitancy on its “10 Threats to Global Health in 2019” and defines it as “a delay in acceptance of or refusal of vaccines despite the availability of vaccine services”. Studies have shown that young adults are less likely to get vaccinated against COVID-19. A portion of my public health practice consisted of investigating vaccine hesitancy in college students on Kansas State University campus during summer 2021 by administering an anonymous survey related to vaccination behaviors and opinions.

Another portion of my public health practice consisted of spending time at Lafene Health Center and visiting with staff members of various departments. My main objective was to learn Lafene’s COVID-19 procedures from the time a patient walks in the door up until they are released from quarantine/contact tracing. I created an infographic for student outreach about how to help keep yourself and others safe from COVID-19.

I also worked with Riley County Health Department (RCHD) to help provide COVID-19 testing and vaccine clinics to the residents of Riley County at no charge. I had several duties including helping individuals administer self-tests, filling out vaccine cards, and disseminating COVID-19 vaccine information/tips. I also created two infographics for RCHD outreach materials related to frequently asked vaccine questions and COVID-19 vaccine-specific facts.

Subject Keywords: vaccine hesitancy, COVID-19, public health, vaccines, college students, global health

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Chapter 1 - Literature Review

Vaccine hesitancy is a growing public health concern in the United States and around the world (17). The World Health Organization (WHO) lists vaccine hesitancy on its "10 Threats to Global Health in 2019" (15) and defines it as "a delay in acceptance of or refusal of vaccines despite the availability of vaccine services" (18). In a 2018 survey done by the WHO and United Nations Children's Fund Joint Reporting Form, 74% out of 194 countries surveyed listed vaccine hesitancy (in general) as a public health concern in their country (9). Vaccine hesitancy is an issue that spans the globe and is not limited to developing countries. In fact, countries with higher gross domestic product (GDP) have been found to have the lowest levels of confidence in vaccines (15). Vaccine hesitancy not only has public health consequences, but economic consequences as well, and can lead to the resurgence of infectious diseases. For example, a 5% reduction in the measles, mumps, and rubella (MMR) vaccination is predicted to result in up to a 3-fold increase in measles cases and cost more than $2.1 million (8).

Although anti-vaccine campaigns are increasing in occurrence, vaccine hesitancy is not a new concept and has been around for as long as vaccines. In the 1800's, the smallpox vaccine was made using lymph taken from cowpox blisters and injected under the skin of healthy patients (15). The clergy was wary of this practice and thus, were hesitant to accept vaccination (15). In today's society, individuals are showing hesitance towards childhood vaccines as well as other types of vaccines, including the COVID-19 vaccine (9).

In the wake of the COVID-19 pandemic, vaccine hesitancy is an important topic and creates major concerns. In March 2021, the United States had an estimated 500,000 deaths from COVID-19, and higher mortality and morbidity rates than most other developed countries (13). If these trends continue, COVID-19 will remain the leading cause of death in the United States (14). Rural areas still fall behind in COVID-19 vaccination numbers when compared to urban and suburban areas (5). Approximately 20% of the United States adult population live in rural areas (4), including 25.8% of Kansans. The percentages of adults in Kansas who are undecided about the COVID-19 vaccine has dropped from 38% in January 2021 to 15% in April 2021 (7). While the undecided group has shown improvement, the vaccine denial group has not. In Kansas, one in ten adults say they will definitely not get the COVID-19 vaccine and that number has remained constant from January 2021 to April 2021 (7).

Of COVID-19 cases in the United States, individuals on college campuses account for more than 397,000 (14), making college students an important part of the network of disease transmission. It has also been shown that young adults are less likely to get vaccinated, with 48% of college students surveyed reporting COVID-19 vaccine hesitancy (13). In April 2021, three in ten adults aged 18-49 years old said they would not get the COVID-19 vaccine (4). Due to the development of the Delta variant and increased hospitalizations and deaths reported associated with the Delta variant, there has been an increase in vaccine acceptance in some groups, including Hispanic adults and those aged 18-29 years old (5). While 72% of United States adults are currently at least partially vaccinated against COVID-19 in 2021, the lowest vaccinated group remains the non-elderly who lack health insurance (5).

College students are important to consider when it comes to transmission of disease for several reasons. Due to the nature of their activities, college students have the ability to become "superspreaders", where they pass on the virus to an unusually or unexpectedly large number of individuals (13). Many college students have close or crowded living arrangements, and they engage in social activities on and off campus where many people are present, leading to an increased risk of infecting others (12). College students are also employed in locations where they may come in contact with the general public, creating a potential transmission link between students and the rest of the community (12). For many college students, university breaks are a time to travel home to visit family and friends, whether that's local or international. Travel brings about increased concern about the transmission of pathogens due to bringing together vaccinated and unvaccinated people, as well as increasing the possibility of coming into contact with diseases (15).

In order to combat vaccine hesitancy, we have to discover how and why it occurs. It is a common belief that vaccine hesitant individuals are against science or do not understand it; however, that is not necessarily true. A study carried out on how and why mothers refuse vaccines for their children showed that participants interviewed were not anti-science, did have a basic level of scientific literacy, and overall believed in science (2). The women interviewed presented several reasons for vaccine hesitance, including believing some research is not credible or held to high enough standards to be conclusive. Changes in vaccine schedules and formulations as well as no long-term safety data were other reasons listed (2). Another interesting topic brought up is the concern with political or economic agendas associated with vaccines and pharmaceutical companies. Many people do not trust vaccines because they are funded by pharmaceutical companies and promoted by physicians that both make a profit or

gain financial incentives from the product, making individuals wary if patient safety is the top priority (2). The National Vaccine Injury Compensation Program (NVICP) was cited by study participants, and from 1989 to 2014, over $2.7 billion was awarded to over 3600 individuals for injuries related to vaccinations which contributes to overall mistrust of vaccines, pharmaceutical companies, and the government as a whole (2).

An interesting aspect of reasons for vaccine hesitancy is the idea that personal experience outweighs other evidence. In the above reference study, a majority of the women agreed that a mother's intuition is a major decision-making tool, and that people should use their experiences and knowledge to come to conclusions (2). Over 11% of United States parents have refused at least one vaccine for their child(ren), based on different kinds of expertise including intuition (2). Adverse events can have an impact on an individual's vaccine experience or beliefs. Although most adverse events are coincidental, since they happen so close to receiving vaccinations, people believe they're related (17). Lacking trust in the physician can occur for various reasons and can add to vaccine hesitancy. It has been shown that mistrust in conventional medicine is a strong indicator of vaccine hesitancy (15).

Racial/ethnic minority groups are at a disproportionately higher risk of COVID-19 than White individuals (10). In a survey done on 5440 healthcare workers about their COVID-19 vaccination intentions, 50% of individuals showed vaccine hesitancy (10). Of those hesitant individuals, 83% were Black, 63.5% were Hispanic or Latino, 47.1% were Asian, 54.3% were of other of mixed race, and 46.2% were White (10). One reason reported for higher vaccine hesitancy in the Black racial group was historical medical mistreatment that led to mistrust of the healthcare system (10). According to the Centers for Disease Control (CDC), Black and Hispanic individuals are more likely to be hesitant to the COVID-19 vaccine than White individuals (6). Of the 61% of people who have been vaccinated where race/ethnicity data is available, 60% are White, 11% are Black, 17% are Hispanic or Latino, 6% are Asian, 1% are American Indian or Alaskan Native, <1% are Native Hawaiian or Other Pacific Islander, and 5% are multiple races or listed as "other" (6). While there is still a gap between the different racial/ethnic groups, recent results show these gaps are getting smaller (6). Between late September and early October 2021, vaccination rates for Black and Hispanic individuals have increased by 1.2 percentage points and vaccination rates for Asian individuals have increased by 0.5 percentage points (6). In the same timeframe, vaccination rates for White individuals have increased 0.6 percentage points (6). These increases are helping to close the gap between the groups.

During the COVID-19 pandemic, many different reasons for vaccine hesitancy have been seen, including conspiracy theories about the origins of the virus, whether the disease is real, and actual objectives of the vaccine (15). In Kansas, 66% of people who refused the COVID-19 vaccine listed possible side effects as the reason, 60% wanted to wait to see if it is safe, and 47% said others need it more than them (7). Other reasons are mistrust of the government (42%) and mistrust of the vaccine itself (32%) (7). For college students, making vaccination decisions may be the first independent medical decision they have ever made. In a study done on a college campus regarding the influenza vaccine, 55% of undergrads were not vaccinated and 56% said their parents usually made their medical decisions (12). Graduate students had a higher percentage of vaccinations (72%) and only 23% relied on their parents for medical decisions (12). Other reasons students stated they did not get vaccinated were low accessibility to the vaccine and a lower perceived risk of contracting influenza (1).

The process of how people come to vaccination decisions is just as important as why. An important aspect to consider is where people gain the information that they use to make their decision. Both traditional media and social media can have an influence on individuals' vaccination decisions (11). While the internet and social media can be sources of health information, they can also jeopardize public health strategies (3). The WHO warns against the era of "infodemics" which refers to the spread of fake news, false scientific claims, and misinformation (16). Studies have shown that social media and online resources have contributed to increased vaccine hesitancy and has gotten worse since the introduction of the COVID-19 vaccine (11). Online platforms sometimes only present one side of an issue which can lead to bias (15). Many social media platforms use algorithms to filter search results based on previously searches, so people can quickly find themselves in a "bubble" of misinformation (15). For reasons such as this, social media is scrutinized more than traditional media in terms of spreading false information and contributing to increased vaccine hesitancy (11). Individuals that received their COVID-19 vaccination information from traditional media sources were more likely to accept the vaccine (46.9%) compared to individuals who received their information from social media (29.3%) or a mixture of the two (37.1%) (11). In the past year, 72% of adults in the United States report searching online for health information with three major purposes in mind: individual health care, medical treatment, or public health concerns (19). Not only do online platforms display information, but they also bring people together. Many people state the benefits of these platforms are receiving empathy and feedback from their peers and social and emotional support in group settings (19). With so many people looking online for health

information, a sense of health literacy is important for decision-making. Health literacy is defined as the ability to find, understand, and evaluate health information and apply it in daily decision-making and health behavior (3). College students routinely use online platforms and information technology to make decisions, especially during the COVID-19 pandemic (3). One study found that 60% of college students get their health information from social media (14). Another study has shown that individuals who receive their information only from social media are less likely to be vaccinated and individuals that receive their information from traditional media outlets are more likely to get vaccinated (11). This could be because traditional media outlets are more likely to use and share more reliable and higher quality information (11). It has been shown that low health literacy is correlated with confusion about the information found on the internet or in the news. High health literacy has actually been correlated with the use of more trustworthy, reputable web-based information and less fear of COVID-19 (3).

In order to decrease vaccine hesitancy worldwide, effective communication strategies need to be put in place. The WHO lists six determinants of trust that can be used to help combat this problem: competence, objectivity, fairness, consistency, sincerity, and faith (16). Using these, relevant and specific education can lead to increased trust in vaccines and this education needs to be tailored to specific audiences and include the pros and cons of vaccines (16). Through research, it has been shown that emotions and personal beliefs play a role in vaccine hesitancy (9) so focusing on informative and emotional delivery of education information is also important (15). A part of this tactic can include conveying information in story form instead of listing facts. These stories are often times more persuasive and bring a more human aspect to conversations (15). Community campaigns are not always successful (9) and a one-size-fits-all approach won't work (12). Health practitioners and leaders need to deliver tailored messages and remain empathetic to different viewpoints (9). It is also a good approach to educate and use community leaders to fight vaccine hesitancy as people look up to these individuals in their communities and are sometimes more open to listening to their opinions on certain topics. For instance, on college campuses, university administrators, campus housing leaders, athletic directors, and student organization leaders can be used to influence vaccine acceptance (13). Reinforcing the message of community protection through these leaders has been shown to have an impact (9). Vaccine information (or health information in general) should be clear and to the point (13), should be easy to access, user friendly, relevant, easy to understand, and culturally appropriate (3) in order to be most effective.

Overall, vaccine hesitancy is a complex issue that spans the globe. Individuals report many reasons for vaccine hesitance, from personal experience to mistrust of the government and some populations show more vaccine hesitancy than others. Therefore, a single, one-size-fits-all solution to the growing problem does not exist. Instead, public health leaders must consider the vaccine hesitant population and determine a strategy that will best work for their community. Increasing knowledge and awareness, clear communication that includes listening to concerns, and using vaccine advocates that the population will trust are crucial components to addressing vaccine hesitancy.

Chapter 2 - Learning Objectives and Project Description

My project began at Lafene Health Center where I visited different departments. I spent my time with the Lafene Health Center staff members learning about their COVID-19 protocols. My main objective for this part of my project was to understand the procedures from the time the patient enters the facility until the patient is released from quarantine/contact tracing. I also created a COVID-19 infographic that gave information on how to protect yourself and others from COVID-19.

Lafene Health Center is the student health center on the campus of Kansas State University. Their mission is to “offer an accessible, high quality, affordable, outpatient healthcare services on the Manhattan campus” and to “provide health and well-being education to the student body and larger Kanas State University community”. The five core values the health center embodies are compassion, mutual respect, adherence to standards, appreciation for timeliness, and collaboration. Lafene Health Center is accredited as an outpatient healthcare facility by the Accreditation Association for Ambulatory Health Care and has been accredited since 1968. My mentor at Lafene Health Center was Dr. Jennifer Miller. Dr. Miller holds a doctor of public health practice (DrPH) from the University of North Texas Health Science Center in Fort Worth. Dr. Miller also has a bachelor’s and master’s degrees in Sociology from Oklahoma State and Kansas State, respectively. Dr. Miller currently works as the Director of the Bachelor of Science in Public Health program within the Department of Kinesiology at Kansas State University. Prior to this role, she has worked for Lafene Health Center as their Assistant Director of Health Promotion, the Kansas Department of Health and Environment as a Health Planning Consultant for Maternal and Perinatal Initiatives, and Sedgwick County Health Department as their Fetal and Infant Mortality Coordinator. Dr. Miller participates in multiple professional organizations including the Society for the Study of Social Problems, Kansas Public Health Association, American Public Health Association, American College Health Association, and the American Sociological Association. Dr. Miller currently serves as a governing councilor for the sexual and reproductive health section of APHA. Additionally, Dr. Miller is on the board for the Flint Hills Wellness Coalition, Public Health Advisory Committee for Riley County, KS, and is the member-at-large for Kansas for the Central College Health Association.

My project then moved to Riley County Health Department (RCHD). I was able to work with many different members of the RCHD team to bring COVID-19 testing sites and vaccine clinics to Riley County residents. These services were provided at no charge thanks to RADx-

UP which is a National Institutes of Health (NIH) funded program for underserved populations. At the COVID-19 testing sites, I helped individuals take self-administered tests, registered their information for results reporting, and ensured the tests were packaged and sent properly. At the COVID-19 vaccine clinics, I assisted the healthcare team administering the vaccines by filling out individual's vaccine cards and disseminating vaccine information/care sheets. I created two infographics for RCHD that can be used as educational and outreach materials. The first infographic lists several general vaccine frequently asked questions and answers. The second infographic is specific to the COVID-19 vaccine and lists quick facts that may help decrease vaccine misinformation and increase trust.

Riley County Health Department (RCHD) was started as a city-county health department in 1952 and later became a county health department in 2011. The health department vision is "Healthy people in a healthy community" and their mission is to "promote and protect the health and safety of our community through evidence-based practices, prevention, and education". There are a variety of programs and services available to the residents of Riley County ranging from immunizations to child-care licensing to infectious disease control. Some of these services have eligibility guidelines including income limits and geographic area limits. My mentor at RCHD was Ms. Shanika Rose. Ms. Rose is a Health Educator and Accreditation Coordinator for RCHD.

For the last part of my project, I had three goals: understand what vaccine hesitancy is, determine if it exists on the K-State campus amongst students, and if so, try to figure out why. I decided the best and most efficient way to do this was to create a Qualtrics survey and disseminate it to students across campus. The 14-question survey was available to students for a month and was sent via an anonymous email link as well as posted in K-State Today.

Chapter 3- Methods

Study Participants

The study population included undergraduate and graduate students on the Kansas State University campus. Prospective participants were contacted via email with an anonymous survey link. The survey link was also posted in K-State Today for students to access. The study protocol was approved by the institutional review board (IRB #10719) of Kansas State University and informed consent was obtained for all participants.

Survey

An online survey was developed and distributed via Qualtrics to assess vaccine hesitancy. Fourteen questions were asked with both quantitative and qualitative answers including:

1. What is your age range?
2. What is your race/ethnicity? (choose all that apply)
3. What is your monthly household income?
4. What is your student status?
5. Will you receive a COVID-19 vaccine?

6a. If you will not get a COVID-19 vaccine, why?

6b. If you will wait to get a COVID-19 vaccine, why?

6c. If you will or have already received a COVID-19 vaccine, why did you choose to get it? (choose all that apply)

7. Where did you receive information from and/or what did you base your vaccination decision on? (choose all that apply)
8. Have you ever tested positive for COVID-19?
9. Have you had any negative health effects due to COVID-19? Has anyone close to you had negative health effects or died of COVID-19? (choose all that apply)
10. How confident are you that the COVID-19 vaccine is safe?
11. How confident are you that the COVID-19 vaccine is effective?
12. Should universities require the COVID-19 vaccine in order to attend in future semesters?
13. Do you receive the Influenza vaccine every year?
14. If you receive the Influenza vaccine every year, why? (choose all that apply)

Questions 8, 13, and 4 had two possible answer choices, questions 10, 11, and 12, had three possible answer choices, questions 1, 5, 6a, 6b, 6c, 9, and 14 had four possible answer choices, questions 3 and 7 had six possible answer choices, and question 2 had seven possible answer choices. Participants were able to choose more than one answer for questions 2, 6c, 7, 9, and 14. Questions 6a, 6b, 6c, and 14 had the option of qualitative answers.

Data Analysis

Quantitative Analysis

Vaccine hesitancy status was determined using the question “Will you receive a COVID-19 vaccine?” with four response levels: 1(“No”), 2(“Will wait”), 3(“Will receive”), 4(“Have received”). This ordinal response was analyzed using cumulative logistic regression models. The explanatory variable was assumed to have a constant multiplicative effect on the odds of cumulative vaccine hesitancy, including level=1, level=2 and level=3. Model goodness of fit was verified by assuring the ratio of deviance to degrees of freedom was no greater than two.

Explanatory variables age and student status were associated (Pearson Chi-square P-value<0.001; Phi coefficient=0.51). To avoid Simpson's paradox, these two variables and their interaction were modeled together. The simple regression model with the annual flu-shot vaccination had poor fit (deviation-over-degree-of-freedom ratio was 6.45). In the meantime, association of the annual flu-shot vaccination was noticed with age (Pearson Chi-square P-value=0.020; Phi coefficient=0.13) and student status (Pearson Chi-square P-value=<0.001; Phi coefficient=0.21). To overcome overdispersion, the present work performed the multiple regression analysis where the three variables and all their two-ways interactions were in the model. Three-way interaction was not estimable because of a missing combination. Effect of interactions was evaluated via the type 3 likelihood-ratio (LR) Chi-square test.

For the rest of the demographic characteristics, their association with COVID-19 vaccine hesitancy was examined separately. Family income and history of COVID-19 test were collected via single-choice questions. They were analyzed using the simple regression model. Race/ethnicity, source of information for COVID-19 vaccine and experience of negative health effects due to COVID-19 were multiple-choice questions. Each of the choice corresponds to a binary explanatory variable. They were analyzed using the multiple logistic regression model. Their overall effect was evaluated via the global test using the LR Chi-square statistics.

The estimated cumulative probabilities of COVID-19 vaccine hesitancy and their standard errors (SEs) were reported for every level of a demographic characteristics. Pairwise comparisons among levels of demographic characteristics were performed based on the two-sided LR Chi-square test for non-zero difference in log-cumulative odds. Statistical tests were performed at the 0.05 level. No multiplicity adjustment was applied.

Attitude toward vaccine safety and efficacy were collected using questions “How confident are you that the COVID-19 vaccine is safe?” and “How confident are you that the COVID-19 vaccine is effective” with three response levels: 1(“Not confident”), 2(“Undecided”), 3(“Confident”). Attitude toward vaccine mandate was collected using the question “Should universities require the COVID-19 vaccine in order to attend in future semesters?” with three response levels: 1(“No”), 2(“Undecided”), 3(“Yes”). Association of these ordinal variables with vaccine hesitancy was measured using Kendall’s Tau-b and Stuart’s Tau-c. Both measurements are on the -1 to 1 scale with values close to 1 being highly concordant (strongly positively associated), and values close to -1 being highly discordant (strongly negatively associated).

SAS Statistical analysis was executed via Statistical Analysis Software (SAS version 9.4; Cary, NC) LOGISTIC and GENMOD procedures.

Qualitative Analysis

The written qualitative answers from questions 6a, 6b, 6c, and 14 were reviewed immediately after the survey closed. Questions 6a and 6b were examined for themes of vaccine hesitancy. In total, 18 separate written answers were evaluated and two were removed, leaving a total of 16 to be examined. Question 6c was examined for themes related to COVID-19 vaccine non-hesitancy. In total, 22 separate written answers were evaluated and none were removed. Question 14 was examined for themes of Influenza vaccine non-hesitancy. In total, seven separate written answers were evaluated and none were removed. The answers were read again independently, and codes were assigned for qualitative analysis of thematic content, with themes related to vaccine hesitancy and non-hesitancy. To assure accurate coding of the data, we discussed and confirmed agreement for the identified recurring patterns and emerging themes. The corrected, typed transcripts and notes were entered into NVivo12 Plus software (QRS International LTD, 2018) to classify, sort and analyze the data. From questions 6a and 6b, five major themes were developed: concern of health risks, perception of not being at risk, mistrust in the vaccine, prior infection, and concern of vaccine long-term effects. For question

6c, four major themes were developed: work or school related, a wish to return to normal, moral obligation, and protecting myself and others. For question 14, four major themes were developed: to protect myself and others, trust in the vaccine, work or school related, and trust in the research process.

Chapter 4- Results

In the fall 2021 semester, Kansas State University has a total reported number of 20,229 students. Of those, 4,134 are reported as graduate students and 15,619 are reported as undergraduate students. Table 3.0 shows the total reported number and percentages of race/ethnicity in the student population, compared to the population of this study. Our study includes a lower percentage of undergraduate students and a higher percentage of graduate students as compared to the total K-State student population. Each racial/ethnic group is reported at a higher percentage in our study compared to the total K-State student population except for the White and Hawaiian or Other Pacific Islander students, which are reported at a lower percentage in our study than the total K-State student population.

Table 3.0 Kansas State University Student Demographics

Student Status	**K-State**		**Study**	
	n	*%*	*n*	*%*
Undergraduate	15619	77.2	132	42.4
Graduate	4134	20.4	179	57.6
Other	476	2.4	n/a	n/a
Total	20229	100	311	100
Race/Ethnicity	**K-State**		**Study**	
	n	*%*	*n*	*%*
White	15473	76.5	210	66.5
Hispanic or Latino	1532	7.6	29	9.2
Black or African American	630	3.1	15	4.7
Asian	388	1.9	57	18
American Indian or Alaska Native	77	0.4	5	1.6
Hawaiian or Other Pacific Islander	21	0.1	0	0
Other	2108	10.4	n/a	n/a
Total	20229	100	316	100

A total of 345 responses were received for the survey. Of those, seven did not complete the survey, one had unknown student status, and twenty-six were not students so they were removed. This left a remainder of 311 completed responses. The study population was made up of undergraduate and graduate students from K-State. Of this total of 311 participants, 132 were undergraduate students and 179 were graduate students.

As seen in table 3.1 and figure 3.1, when COVID-19 vaccination was examined by age and student status, undergraduates in the 27 and older age group were more likely to be vaccine hesitant than undergraduates in the 18-26 age group (OR>1, p<0.05). No student in this group selected “have received”. Graduate students in the 18-26 age group were more likely to be vaccine hesitant than graduates in the 27 and older age group (OR>1) but the difference is not statistically significant (p>0.05).

Table 3.1 COVID-19 Vaccination by Student Status and Age

		COVID-19 Vaccination Status									
		n					%				
		No	Will wait	Will receive	Have received	Total	No	Will wait	Will receive	Have received	Total
Undergraduate	**18-26**	36	16	9	63	124	29	13	7	51	100
	27 and older	6	1	1	.	8	75	13	13	.	100
	Total	42	17	10	63	132	32	13	8	48	100
Graduate	**18-26**	8	2	9	61	80	10	3	11	76	100
	27 and older	4	2	7	86	99	4	2	7	87	100
	Total	12	4	16	147	179	7	2	9	82	100
Total	**18-26**	44	18	18	124	204	22	9	9	61	100
	27 and older	10	3	8	86	107	9	3	7	80	100
	Total	54	21	26	210	311	17	7	8	68	100

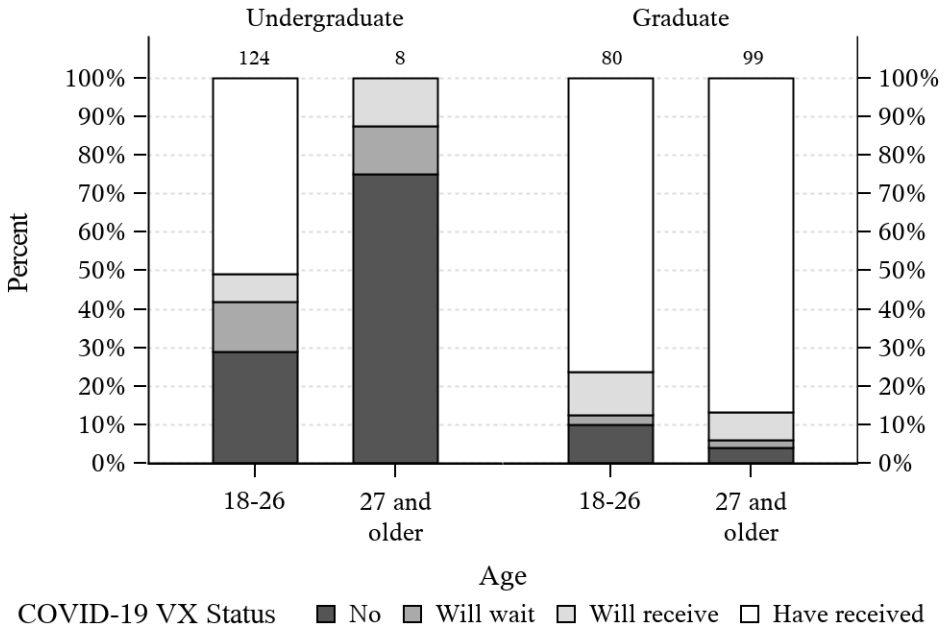


Figure 3.1 COVID-19 Vaccination Status by Student Status and Age

Table 3.2 and figure 3.2 show results of COVID-19 vaccination when examined by race/ethnicity. American Indian or Alaska Native students are more likely to be hesitant Asian students and the Black or African American students (OR>1, $p<0.05$). There is a difference between American Indian or Alaska Native students compared to Hispanic or Latino students and White students but it is not statistically significant (OR>1, $p>0.05$). Asian students are less likely to be hesitant than White students (OR<1, $p<0.05$). Asian students are less likely to be hesitant compared to Hispanic or Latino students but it is not statistically significant (OR<1, $p>0.05$). Asian students are more likely to be hesitant than Black or African American students but it is not statistically different OR>1, $p>0.05$). Black or African American students are less likely to be hesitant than Hispanic or Latino students (OR<1, $p<0.05$) and White students (OR<1, $p<0.05$). No difference was seen in hesitancy between Hispanic or Latino students and White students. No students self-identified as Native Hawaiian or Other Pacific Islander.

Table 3.2 COVID-19 Vaccination Status by Race/Ethnicity

	COVID-19 Vaccination Status									
	n					%				
	No	Will wait	Will receive	Have received	Total	No	Will wait	Will receive	Have received	Total
American Indian or Alaska Native	2	0	0	3	5	40	0	0	60	100
Asian	0	3	9	45	57	0	5	16	79	100
Black or African American	1	0	0	14	15	7	0	0	93	100
Hispanic or Latino	1	4	5	19	29	3	14	17	66	100
Native Hawaiian or Other Pacific Islander	0	0	0	0	0	.	.	.	.	.
White	48	14	13	135	210	23	7	6	64	100
Total	52	21	27	216	316	16	7	9	68	100

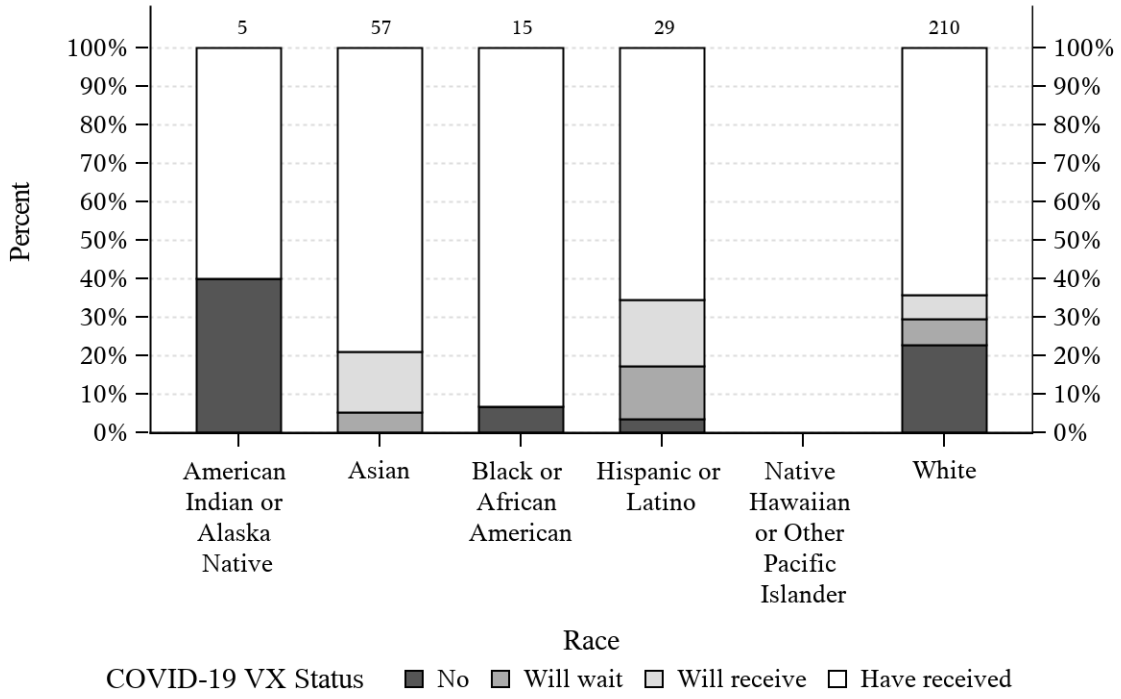


Figure 3.2 COVID-19 Vaccination Status by Race/Ethnicity

As seen in table 3.3 and figure 3.3, when COVID-19 vaccination was examined by income, no difference was seen between the income levels (OR=1, p>0.05). There were several pieces of data not collected, as no student selected these choices: “will wait” and “will receive” in the $140,000-$149,999 income level as well as “will wait” in the $150,000 and above income level.

Table 3.3 COVID-19 Vaccination Status by Income

	COVID-19 Vaccination Status									
	n					%				
	No	Will wait	Will receive	Have received	Total	No	Will wait	Will receive	Have received	Total
Less than $20,000	14	4	10	67	95	15	4	11	71	100
$20,000-$44,999	6	7	7	51	71	8	10	10	72	100
$45,000-$139,999	15	4	4	51	74	20	5	5	69	100
$140,000-$149,999	3	.	.	9	12	25	.	.	75	100
$150,000 and above	7	.	1	17	25	28	.	4	68	100
Total	45	15	22	195	277	16	5	8	70	100

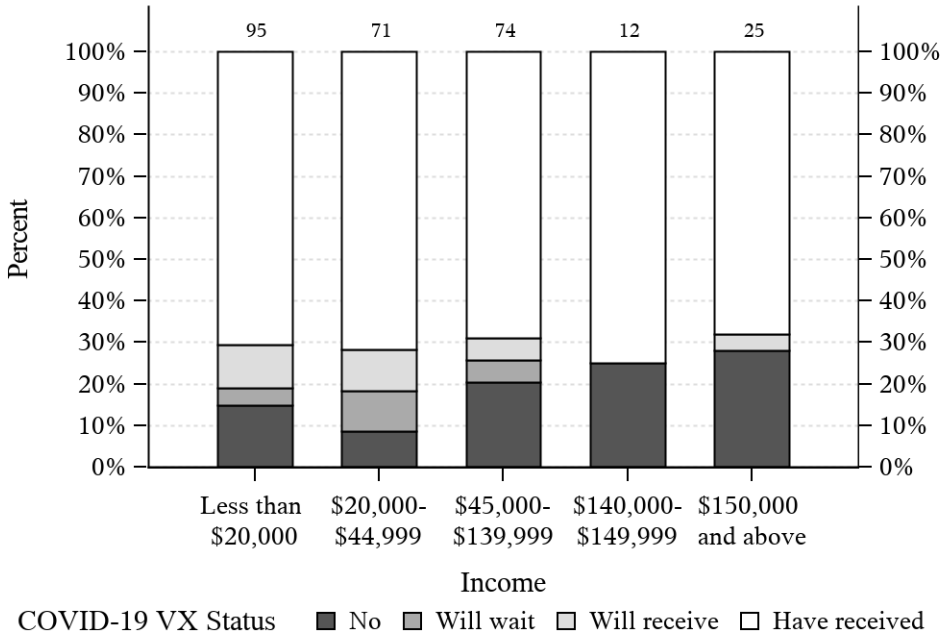


Figure 3.3 COVID-19 Vaccination Status by Income

We were interested in looking at the impact of Influenza vaccination on COVID-19 vaccine hesitancy. As seen in table 3.4 and figure 3.4, when hesitance of COVID-19 vaccination is examined by yearly Influenza vaccination status, students who received a yearly Influenza vaccine are less likely to be hesitant to the COVID-19 vaccine ($p<0.05$)

Table 3.4 COVID-19 Vaccination Status by Influenza Vaccination Status

	COVID-19 Vaccination Status									
	n					%				
	No	**Will wait**	**Will receive**	**Have received**	**Total**	**No**	**Will wait**	**Will receive**	**Have received**	**Total**
No	47	16	10	105	178	26	9	6	59	100
Yes	7	5	15	99	126	6	4	12	79	100
Total	54	21	25	204	304	18	7	8	67	100

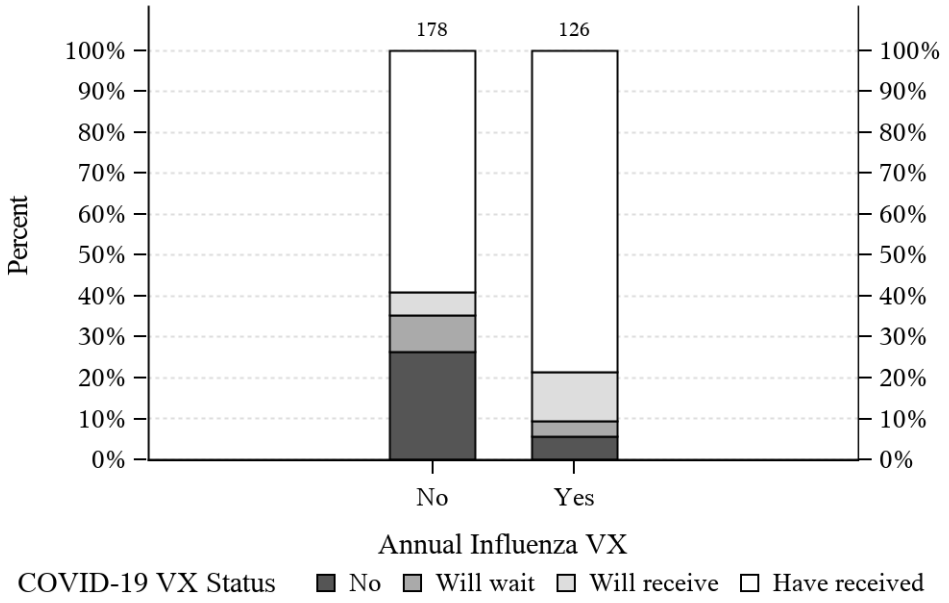


Figure 3.4 COVID-19 Vaccination Status by Influenza Vaccination Status

As seen in table 3.5 and figure 3.5, when COVID-19 vaccination is examined by Influenza vaccination status, student status, and age, undergraduates in the 18-26 age group that receive an Influenza vaccine every year are less likely to be hesitant to the COVID-19 vaccine than those who do not receive an Influenza vaccine every year (OR<1, p<0.05). Undergraduates in the 27 and older age group that do not receive an Influenza vaccine every year are likely to be hesitant to the COVID-19 vaccine. No undergraduates in the 27 and older age group responded "yes" to getting an Influenza vaccine every year. No difference was found in vaccine hesitancy in the graduate students in either age group whether they get an Influenza vaccine or not (OR=1, p>0.05).

Table 3.5 COVID-19 Vaccination Status by Influenza Vaccination Status, Student Status, and Age

			COVID-19 Vaccination Status									
			n					%				
			No	Will wait	Will receive	Have received	Total	No	Will wait	Will receive	Have received	Total
Undergraduate	**18-26**	**No**	34	12	4	34	84	40	14	5	40	100
		Yes	2	4	4	29	39	5	10	10	74	100
		Total	36	16	8	63	123	29	13	7	51	100
	27 and older	**No**	6	1	1	.	8	75	13	13	.	100
		Total	6	1	1	.	8	75	13	13	.	100
	Total	**No**	40	13	5	34	92	43	14	5	37	100
		Yes	2	4	4	29	39	5	10	10	74	100
		Total	42	17	9	63	131	32	13	7	48	100
Graduate	**18-26**	**No**	6	1	3	32	42	14	2	7	76	100
		Yes	2	1	6	25	34	6	3	18	74	100
		Total	8	2	9	57	76	11	3	12	75	100
	27 and older	**No**	1	2	2	39	44	2	5	5	89	100
		Yes	3	.	5	45	53	6	.	9	85	100
		Total	4	2	7	84	97	4	2	7	87	100
	Total	**No**	7	3	5	71	86	8	3	6	83	100
		Yes	5	1	11	70	87	6	1	13	80	100
		Total	12	4	16	141	173	7	2	9	82	100

			COVID-19 Vaccination Status									
			n					%				
			No	Will wait	Will receive	Have received	Total	No	Will wait	Will receive	Have received	Total
Total	**18-26**	**No**	40	13	7	66	126	32	10	6	52	100
		Yes	4	5	10	54	73	5	7	14	74	100
		Total	44	18	17	120	199	22	9	9	60	100
	27 and older	**No**	7	3	3	39	52	13	6	6	75	100
		Yes	3	.	5	45	53	6	.	9	85	100
		Total	10	3	8	84	105	10	3	8	80	100
	Total	**No**	47	16	10	105	178	26	9	6	59	100
		Yes	7	5	15	99	126	6	4	12	79	100
		Total	54	21	25	204	304	18	7	8	67	100

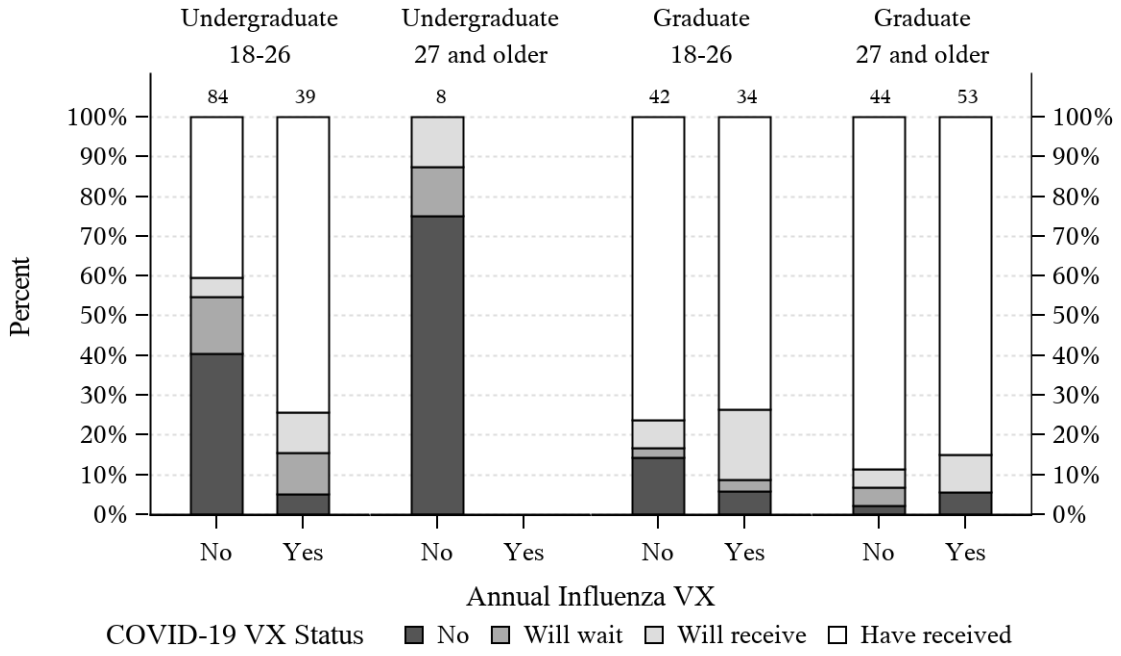


Figure 3.5 COVID-19 Vaccination Status by Influenza Vaccination Status, Student Status, and Age

We were interested in looking at the impact of previous COVID-19 infection on COVID-19 vaccine hesitancy. Table 3.6 and figure 3.6 show that students who had a previous COVID-19 infection are more likely to be vaccine hesitant than those who have not had a previous COVID-19 infection (OR>1, p<0.05).

Table 3.6 COVID-19 Vaccination Status by Previous COVID-19 Infection Status

	COVID-19 Vaccination Status									
	n					%				
	No	**Will wait**	**Will receive**	**Have received**	**Total**	**No**	**Will wait**	**Will receive**	**Have received**	**Total**
No	41	18	21	180	260	16	7	8	69	100
Yes	13	3	4	24	44	30	7	9	55	100
Total	54	21	25	204	304	18	7	8	67	100

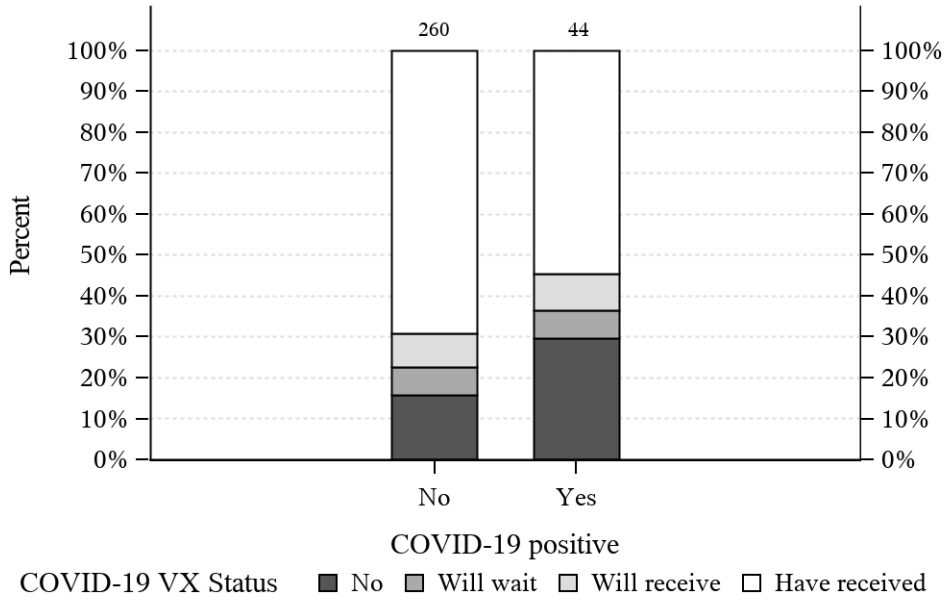


Figure 3.6 COVID-19 Vaccination Status by Previous COVID-19 Infection Status

We were interested in looking at the sources of information students used on COVID-19 vaccine hesitancy. Table 3.7 and figure 3.7 show that sources of information had no effect on COVID-19 vaccine hesitancy (OR=1, p>0.05).

Table 3.7 COVID-19 Vaccination Status by Sources of Information

	COVID-19 Vaccination Status									
	n					%				
	No	Will wait	Will receive	Have received	Total	No	Will wait	Will receive	Have received	Total
News	26	13	10	104	153	17	8	7	68	100
Peer-reviewed articles	27	8	16	96	147	18	5	11	65	100
Social media	10	7	3	43	63	16	11	5	68	100
Family and/or friends	25	7	9	98	139	18	5	6	71	100
Healthcare provider	26	6	8	81	121	21	5	7	67	100
Other	4	1	2	17	24	17	4	8	71	100
Total	118	42	48	439	647	18	6	7	68	100

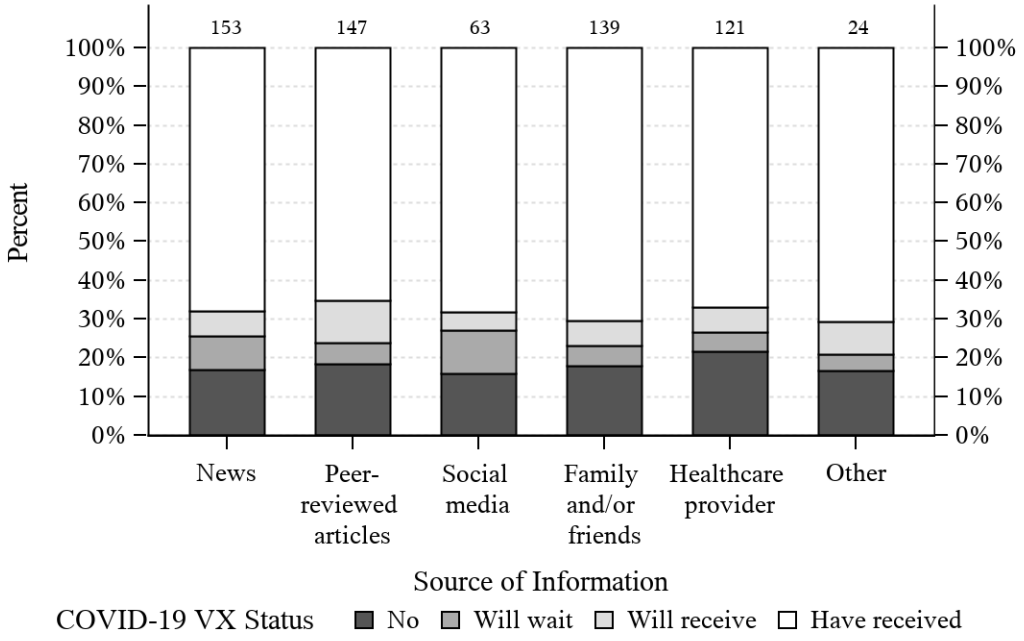


Figure 3.7 COVID-19 Vaccination Status by Sources of Information

As seen in table 3.8 and figure 3.8, when COVID-19 vaccination is examined by whether there have been negative health effects due to COVID-19, students are less likely to be vaccine hesitant when someone close to them has died as compared to having no negative health effects (OR<1), but it is not statistically different (p>0.05). No difference was seen in the other negative health effect groups.

Table 3.8 COVID-19 Vaccination Status by Negative Health Effect

	COVID-19 Vaccination Status									
	n					%				
	No	Will wait	Will receive	Have received	Total	No	Will wait	Will receive	Have received	Total
Self	4	2	3	17	26	15	8	12	65	100
Someone close	15	7	8	74	104	14	7	8	71	100
Someone close died	2	2	1	23	28	7	7	4	82	100
No negative health effect	33	13	15	114	175	19	7	9	65	100
Total	54	24	27	228	333	16	7	8	68	100

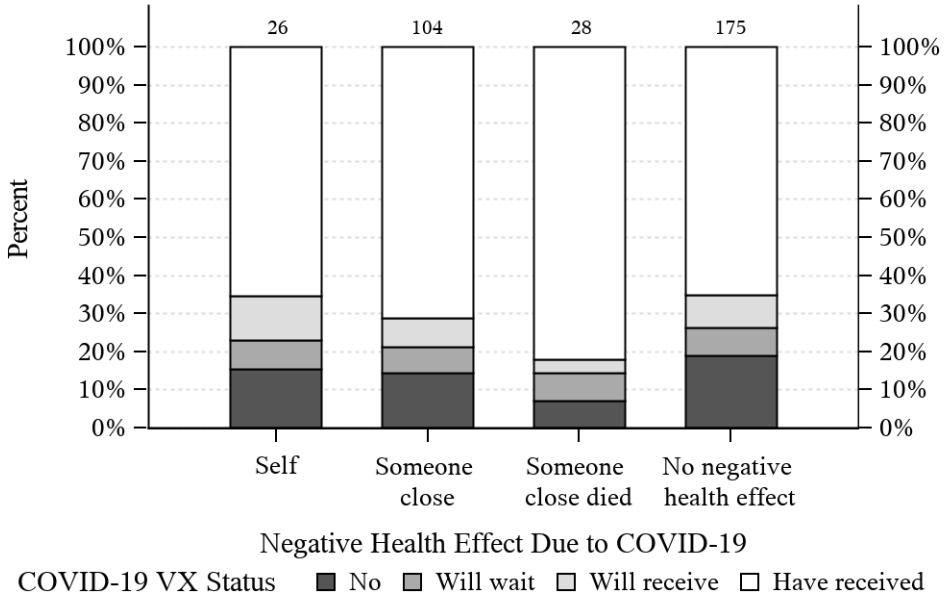


Figure 3.8 COVID-19 Vaccination Status by Negative Health Effect

We were interested in examining confidence in vaccine safety. As seen in table 3.9 and figure 3.9, when COVID-19 vaccination is examined by vaccine safety confidence, hesitant students are more likely to be not confident in the vaccine, while non-hesitant students are more likely to be confident or undecided about the vaccine. Vaccination status and level of confidence in safety are moderately associated (Kendall's Tau-b=0.53 and Stuart's Tau-c=0.41).

Table 3.9 COVID-19 Vaccination Status by Confidence in Vaccine Safety

	COVID-19 VX Status									
	n					%				
	No	Will wait	Will receive	Have received	Total	No	Will wait	Will receive	Have received	Total
Not Confident	41	5	1	9	56	73	9	2	16	100
Undecided	9	8	2	35	54	17	15	4	65	100
Confident	4	8	22	160	194	2	4	11	82	100
Total	54	21	25	204	304	18	7	8	67	100

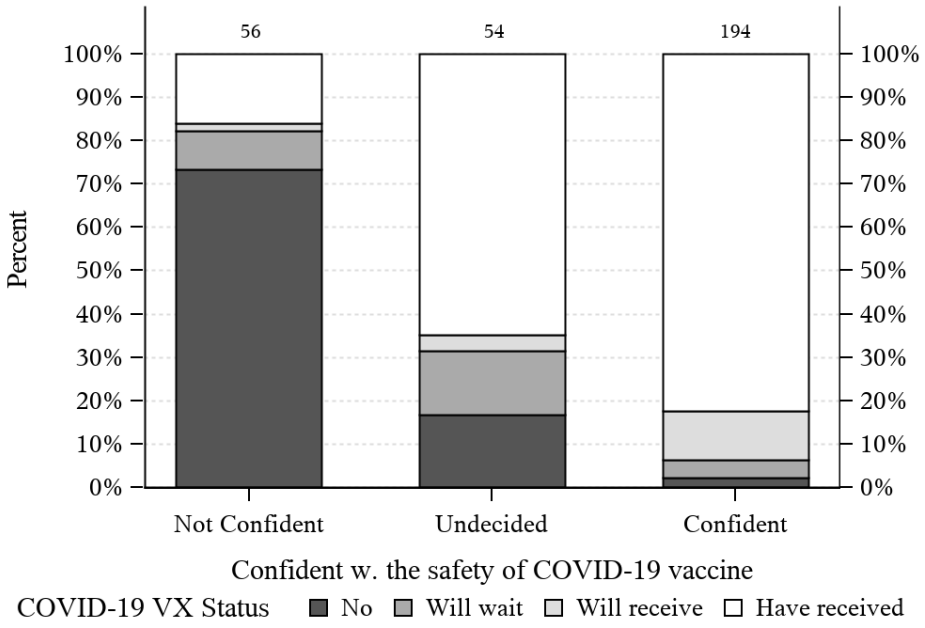


Figure 3.9 COVID-19 Vaccination Status by Confidence in Vaccine Safety

We were also interested in examining confidence in vaccine efficacy. As seen in table 3.10 and figure 3.10, when COVID-19 vaccination was examined by vaccine efficacy confidence, hesitant students are more likely to be not confident, while non-hesitant students are more likely to be confident or undecided about the vaccine. Vaccination status and level of confidence in efficacy are moderately associated (Kendall's Tau-b=0.52, Stuart's Tau-c=0.39).

Table 3.10 COVID-19 Vaccination Status by Confidence in Vaccine Efficacy

	COVID-19 VX Status									
	n					%				
	No	Will wait	Will receive	Have received	Total	No	Will wait	Will receive	Have received	Total
Not Confident	33	5	1	9	48	69	10	2	19	100
Undecided	16	7	2	28	53	30	13	4	53	100
Confident	5	9	22	167	203	2	4	11	82	100
Total	54	21	25	204	304	18	7	8	67	100

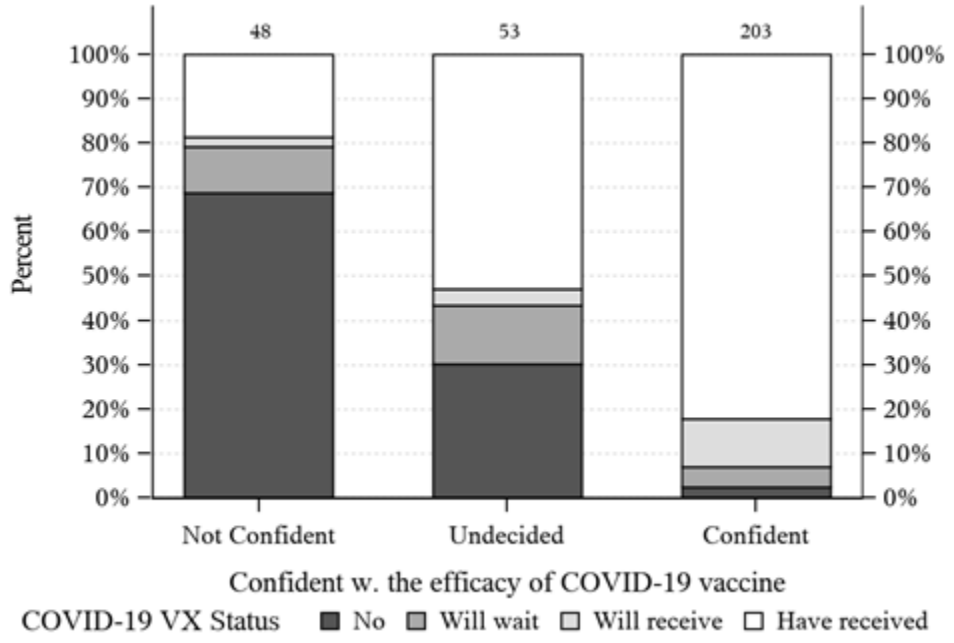


Figure 3.10 COVID-19 Vaccination Status by Confidence in Vaccine Efficacy

We were interested in examining students' opinions on if universities should require the vaccine in order to attend in future semesters. As seen in table 3.11 and figure 3.11, when COVID-19 vaccination status is examined by university requirement opinion, hesitant students are more likely to say no, while non-hesitant students are more likely to say yes or are undecided. Vaccination status and opinion are moderately associated (Kendall's Tau-b=0.45, Stuart's Tau-c=0.38).

Table 3.11 COVID-19 Vaccination Status by University Requirement Opinion

	COVID-19 VX Status									
	n					%				
	No	Will wait	Will receive	Have received	Total	No	Will wait	Will receive	Have received	Total
No	54	16	4	53	127	43	13	3	42	100
Undecided	.	3	5	40	48	.	6	10	83	100
Yes	.	2	16	111	129	.	2	12	86	100
Total	54	21	25	204	304	18	7	8	67	100

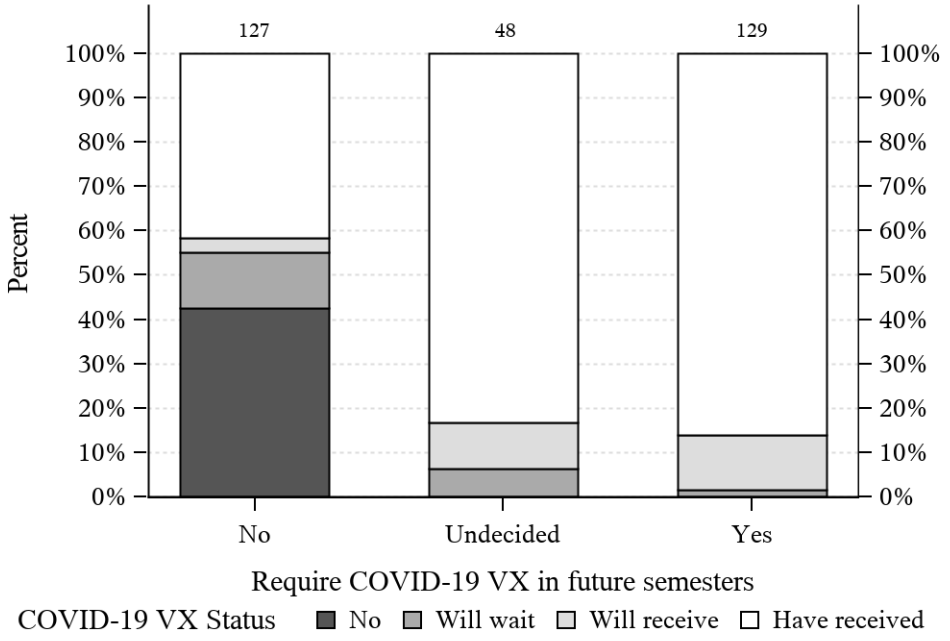


Figure 3.11 COVID-19 Vaccination Status by University Requirement Opinion

We were interested in finding out why students were hesitant. Figure 3.12 shows the COVID-19 vaccine hesitancy themes that were identified by qualitative analysis of two questions from the survey. The most frequently recurring themes in these answers were: concern of health risks, perception of not being at risk, mistrust in the vaccine, prior COVID-19 infection, and concern of vaccine long-term effects. The remaining themes of no time availability (3), a non-effective vaccine (2), considered themselves healthy (2), were each identified less than three times.

Table 3.12. COVID-19 Vaccine Hesitancy Themes

Vaccine Hesitancy Theme	Frequency (# of times theme was identified)
Perception of not being at risk	8
Mistrust	7
Concern of vaccine long-term effects	7
Prior COVID-19 infection	5
Concern of health risks	5

We also were interested why students have received the vaccine. Figure 3.13 shows the COVID-19 vaccine non-hesitancy themes that were identified by qualitative analysis of one question from the survey. The most frequently recurring themes were: work or school related, a wish to return to normal, moral obligation, and protecting myself and others. The remaining themes of disease prevention (3), to avoid quarantine (2) were each identified less than three times.

Table 3.13. COVID-19 Vaccine Non-Hesitancy Themes

Vaccine Non-Hesitancy Theme	Frequency (# of times theme was identified)
Protecting myself and others	7
Moral obligation	6
Work or school related	5
A wish to return to normal	5

We were interested in why students receive their Influenza vaccine every year. Table 3.14 shows the Influenza vaccine non-hesitancy themes that were identified by qualitative analysis of one question from the survey. Four recurring themes, identified only less than three times each included were: to protect myself and others, trust in the vaccine, trust in the research process, and work or school related.

Table 3.14. COVID-19 Vaccine Non-Hesitancy Themes related to Influenza vaccination

Vaccine Non-Hesitancy Theme	Frequency (# of times theme was identified)
Work or school related	3
Protecting myself and others	2
Trust in Influenza Vaccine	2
Trust in research process	2

Chapter 5- Discussion

Through this survey, we set out to investigate if COVID-19 vaccine hesitancy exists on K-State campus. If so, we were also interested in examining why students were hesitant. Our data shows that undergraduates in the 27 and older age group were more likely to be vaccine hesitant than undergraduates in the 18-26 age group. In fact, no undergraduates in the 27 and older age group selected “have received” for COVID-19 vaccination status. Examining the potential profiles of undergraduates in the 27 and older age group population consists of may give us clues as to why. Older undergraduates are non-traditional students and may have families of their own and they are most likely not under the medical direction of their parents. With families of their own, students may find it difficult to find time in their schedule to get vaccinated. As can be seen in previous studies, these students may have personal experiences of themselves or their children with vaccines, physicians, or any part of the healthcare system that may affect their vaccination decisions (2). These students are likely transitioning from the workforce back to school, so they may not have health coverage or the means to pay for out-of-pocket vaccinations. While we don’t have a definitive answer for this, one or multiple of these reasons may play a factor in this age group not getting vaccinated. We also saw that graduate students in the 18-26 age group were more likely to be hesitant than graduate students in the 27 and older age group but it was not statistically significant. Overall, the graduate students were less likely to be vaccine hesitant than the undergraduate students. This falls in line with previously reported data that graduate students reported a higher percentage of vaccinations (12). Reasons for this could include educational level, making independent medical decisions, and even holding positions where vaccinations are required.

According to our data, there are differences in COVID-19 vaccination status between different racial/ethnic groups. American Indian or Alaska Native students are more likely to be hesitant than Asian and Black or African American students, but not more likely to be hesitant than Hispanic or Latino or White students. In prior studies, American Indian or Alaska Native individuals have the lowest vaccination rate (1%) of racial/ethnic groups reported (6). Our data partially contradicts this since no statistically significant difference is seen between this group and Hispanic or Latino or White students.

In our study, Asian students are less likely to be vaccine hesitant than White students. Asian students are also less likely to be hesitant compared to Hispanic or Latino students, although it is not statistically different. Our data shows Asian students are more likely to be

hesitant than Black or African American students but there is not a statistical difference. In previous studies, Asian individuals (47.1%) were more likely to be hesitant than White individuals (46.2%) and less likely to be hesitant when compared with Black individuals (83%) which contradicts our data (10). Studies show that Asian individuals are less likely to be hesitant than Hispanic or Latino individuals (63.5%) which corresponds to our data (10).

Our study shows that Black or African American students are less likely to be hesitant than Hispanic or Latino students or White students, which contradicts previous studies that show Black individuals as having the highest rate of hesitancy (83%) (10). No difference was seen in hesitancy between Hispanic or Latino and White students which is also contradictory to previous studies. Previous data shows Hispanic or Latino individuals as more hesitant (63.5%) than White individuals (46.2%). No students identified as Native Hawaiian or Other Pacific Islander so no comparisons were made with that group.

Our data may contradict previous data due to several factors. Our survey was administered to students on K-State campus which is located in a partially rural county. There are less people in rural areas compared to urban or suburban areas which can be a limitation. Our survey had 311 respondents which is a smaller sample size compared to previous studies. Our sample is less racially/ethnically diverse with a majority of our respondents identifying as White (n=210). The other racial/ethnic groups had relatively low numbers compared to the White group, including American Indian or Alaska Native having only 5 responses and no responses recorded for Native Hawaiian or Other Pacific Islander. Also, some students identified as more than one race/ethnicity so they may be counted more than once. There were a total of 316 responses for this question.

In our survey, annual household income did not play a factor in vaccine hesitancy. No difference was seen among the income groups and vaccine hesitance. Income is a more difficult category to consider in this context because not every participant answered this question (277 answers) and it is not known whether students are reporting their own income or their family (parents) income. Posing this question in a different way or adding constraints may have an effect on the data and could have given a more accurate representation of vaccine hesitancy in terms of income.

When COVID-19 vaccination was examined by yearly Influenza vaccination status, our data showed that students who receive a yearly Influenza vaccine are less likely to be hesitant to the COVID-19 vaccine. This data draws on a likely conclusion that if students are not hesitant towards the Influenza vaccine, they would likely not be hesitant to the COVID-19 vaccination

either. Not all participants answered this question; there were a total of 304 out of 311 responses to this question.

Influenza vaccination status was shown to be associated with student status and age. We examined undergraduate and graduate students in the 18-26 age group and the 27 and older age group and whether they receive a yearly Influenza vaccine in terms of COVID-19 vaccine hesitancy status. For undergraduate students, those in the 18-26 age group who receive an Influenza vaccine every year are less likely to be hesitant to the COVID-19 vaccine than those who do not receive an Influenza vaccine every year. In the undergraduates in the 27 and older age group, students who did not receive an Influenza vaccine every year were more likely to be hesitant to the COVID-19 vaccine. We need to consider that this group who answered “no” was only comprised of 8 participants. While this is not a large sample number for our study, if we used this model in a larger population size, we would expect to see these results. In this same group, no students responded “yes” to receiving the Influenza vaccine every year so were not able to compare those responses. We did not find a difference in vaccine hesitancy in the graduate students in either age group whether they get an Influenza vaccine every year or not.

Our data shows that students who had a previous COVID-19 infection are more likely to be vaccine hesitant than those who have had a previous COVID-19 infection. One reason for this may be the thought that because they have been infected with COVID-19, they do not need the vaccine. Previous studies show that 47% of Kansans that decline the COVID-19 vaccine reported others needing it more than them as the reason (7). Prior COVID-19 infection may contribute to this altruistic thought that others need the vaccine more than them, since they already have some natural protection. Adding to that, a study on Influenza showed that many college students decline the Influenza vaccine due to a low perceived risk of contracting the disease (1). This could be of importance in terms of COVID-19 as well. Those individuals who have had a COVID-19 infection may think they are less likely to contract the virus again or that their natural immunity from the prior infection will keep them protected so they don’t need the vaccine.

When examining COVID-19 vaccination status by sources of information, our data shows that sources of information had no effect on COVID-19 vaccine hesitancy. The six categories to choose from were: news, peer-reviewed articles, social media, family and/or friends, healthcare provider, and other. Participants were able to choose any and all choices that apply so we ended up with a total of 647 responses for this question. This is important

because it shows that students used a variety of sources and got their vaccine decision information from more than one source. Our data contradicts previously reported data that social media and the internet jeopardize public health strategies and information (3). Our data shows that information gathered online was no different than information obtained from a healthcare provider or peer-reviewed articles when it comes to vaccine hesitancy. While one study found that 60% of college students get their health information from social media (14), our study shows that other sources of information were also researched and considered when making vaccine decisions.

Our data shows that while students are less likely to be hesitant to the COVID-19 vaccine when someone close to them has died from COVID-19 as compared to having no negative health effects, the difference is not statistically different. No difference was seen in the other negative health effect groups. Participants had the following answer choices: they had negative health effects themselves, someone close to them had negative health effects, someone close to them died from COVID-19, or no negative health effects to themselves or someone close to them. Participants were requested to choose any and all that apply so we had a total of 333 responses. With a total response number of 333, it is evident that some participants chose more than one answer. Even with possibly more than one negative health effect, vaccine hesitancy was not affected. From the literature, we have seen that personal experience may outweigh other evidence and that intuition or experience is a powerful decision-making tool (2). So, we expected to see less hesitance in groups with negative health effects or death since the negative experience(s) with COVID-19 might have shaped their decision to get vaccinated. However, our data did not support this.

Qualitative analysis allowed us to view vaccine hesitancy and non-hesitancy themes that were in our open-ended questions of our survey. The top COVID-19 vaccine hesitancy themes identified were: perception of not being at risk (n=8), mistrust in the vaccine (n=7), and vaccine long-term effects (n=7) followed by concern of health risks(n=5), and prior COVID-19 infection (n=5). Overall, these themes match themes and sentiments that have been seen in other studies (1, 2, 7, 15). There is an overarching idea of mistrust in the vaccine but also in the government that we have seen previously and has showed up in our responses as well. Many people are concerned about the long-term side effects of the vaccine. There are other people who don’t believe they are at risk for the disease so don’t need to get the vaccine, for various reasons. All of these are ideas that have been freely conveyed in research articles, on the news, and even in personal conversations with people around us. The top COVID-19 vaccine non-

hesitancy themes identified were: work or school related (n=5), a wish to return to normal (n=5), moral obligation (n=6), and to protect myself and others (n=7). The top Influenza vaccine non-hesitancy themes identified were: to protect myself and others (n=2), trust in the vaccine (n=2), trust in the research process (n=2), and work or school related (n=3).

Vaccine hesitancy is an important topic, especially as the COVID-19 pandemic continues. There are many factors that play into vaccine hesitancy and individual's vaccine decision-making process and our survey sought to address some of these factors. We saw that age and student status, Influenza vaccination status, previous COVID-19 infection, and race/ethnicity may affect vaccine hesitancy while income, sources of vaccine information, and whether or not the student or someone close to them had negative health effects or died from COVID-19 did not have an effect on vaccine hesitancy.

References

1. Benjamin, S.M. & Bahr, K.O. (2016) Barriers associated with seasonal influenza vaccination among college students. Influenza Research and Treatment. http://dx.doi.org/10.1155/2016/4248071.

2. Carrion, M. (2018). “You need to do your research”: Vaccines, contestable science, and maternal epistemology. Public Understanding of Science, 27(3), 310-324.

3. Dadaczynski, K., Okan, O., Messer, M., Leung, A.Y.M., Rosário, R., Darlington, E. & Rathmann, K. (2021) Digital health literacy and web-based information seeking behaviors of university students in Germany during the COVID-19 pandemic: cross-sectional survey study. Journal of Medical Internet Research, 23(1), e24097.

4. Kaiser Family Foundation. (2021). KFF COVID-19 Vaccine Monitor-Rural America: April 2021. https://www.kff.org.

5. Kaiser Family Foundation. (2021). KFF COVID-19 Vaccine Monitor: September 2021. https://www.kff.org.

6. Kaiser Family Foundation. (2021). Latest Data on COVID-19 Vaccinations by Race/Ethnicity. https://www.kff.org.

7. Kansas Health Institute (2021). COVID-19 Vaccine Intent Among Kansas Adults. Pulse on Kansas, 7.

8. Lo, N.C. & Hotez, P.J. (2017). Public health and economic consequences of vaccine hesitancy for measles in the United States. JAMA Pediatr, 171(9), 887-892.

9. MacDonald, N.E., Butler, R., & Dubé, E. (2018) Addressing barriers to vaccine acceptance: an overview. Human Vaccines & Immunotherapeutics, 14(1), 218-224.

10. Momplaisir, F.M, Kuter, B.J., Ghadimi, F., Browne, S., Nkwihoreze, H., Feemster, K.A., Frank, I., Faig, W., Shen, A.K., Offit, P.A., & Green-McKenzie, J. (2021). Racial/Ethnic Differences in COVID-19 vaccine hesitancy among health care workers in 2 large academic hospitals. JAMA Open Network, Infectious Diseases, 4(8). Doi:10.1001/jamanetworkopen.2021.21931.

11. Piltch-Loeb, R., Savoia, E., Goldberg, B., Hughes, B., Verhey, T., Kayyem, J., Miller-Idriss, C., & Testa, M. (2021). Examining the effect of information channel on COVID-19

vaccine acceptance. PLOS One 16(5): e0251095. https://doi.org/10.1371/journal.pone.0251095.

12. Ryan, K.A., Filipp, S.L., Gurka, M.J., Zirulnik, A. & Thompson, L.A. (2019) Understanding influenza vaccine perspectives and hesitancy in university students to promote increased vaccine uptake. Heliyon, 5, e02604. https://doi.org/10.1016/j.heliyon.2019.e02604.

13. Sharma, M., Davis, R.E. & Wilkerson, A.H. (2021) COVID-19 vaccine acceptance among college students: a theory-based analysis. International Journal of Environmental Research and Public Health 18, 4617.

14. Silva, J., Bratberg, J. & Lemay, V. (2021) COVID-19 and influenza vaccine hesitancy among college students. Journal of the American Pharmacists Association, 1-6. https://doi.org/10.1016/j.japh.2021.05.009.

15. Stolle, L.B., Nalamasu, R., Pergolizzi Jr, J.V., Varrassi, G., Magnusson, P., LeQuang, J., & Breve, F. (2020). Fact vs Fallacy: The anti-vaccine discussion reloaded. Advances in Therapy, 37, 4481-4490.

16. Vergara, R.J.D., Sarmiento, P.J.D., & Lagman, J.D.N. (2021). Building public trust: a response to COVID-19 vaccine hesitancy predicament. Journal of Public Health, 1-2. Doi:10.1093/pubmed/fdaa282.

17. Weitz, L., Bellach, L., Faltum, A., Berger, A. & Maurer, W. (2020) Vaccine hesitancy report of a student study group. Wiender klinische Wochenschrift The Central European Journal of Medicine, 132, 243-252.

18. World Health Organization. Ten threats to global health in 2019. WHO. https://www.who.int/news-room/spotlight/ten-threats-to-global-health-in-2019.

19. Zhao, Y. & Zhang, J. (2017). Consumer health information seeking in social media: a literature review. Health and Information Libraries Journal, 34, 268-283.

Appendix

Help Protect Yourself and Others From COVID-19 infographic

Help Protect Yourself and Others From Covid-19

At Home:

- Don't share dishes or utensils
- Routinely clean and disinfect your space
- Avoid close contact with people who are sick
- Monitor your health and symptoms

Outside Your Home:

- Wear a properly-fitted face covering
- Continue social distancing of 6 feet
- Avoid crowds
- Avoid poorly ventilated areas

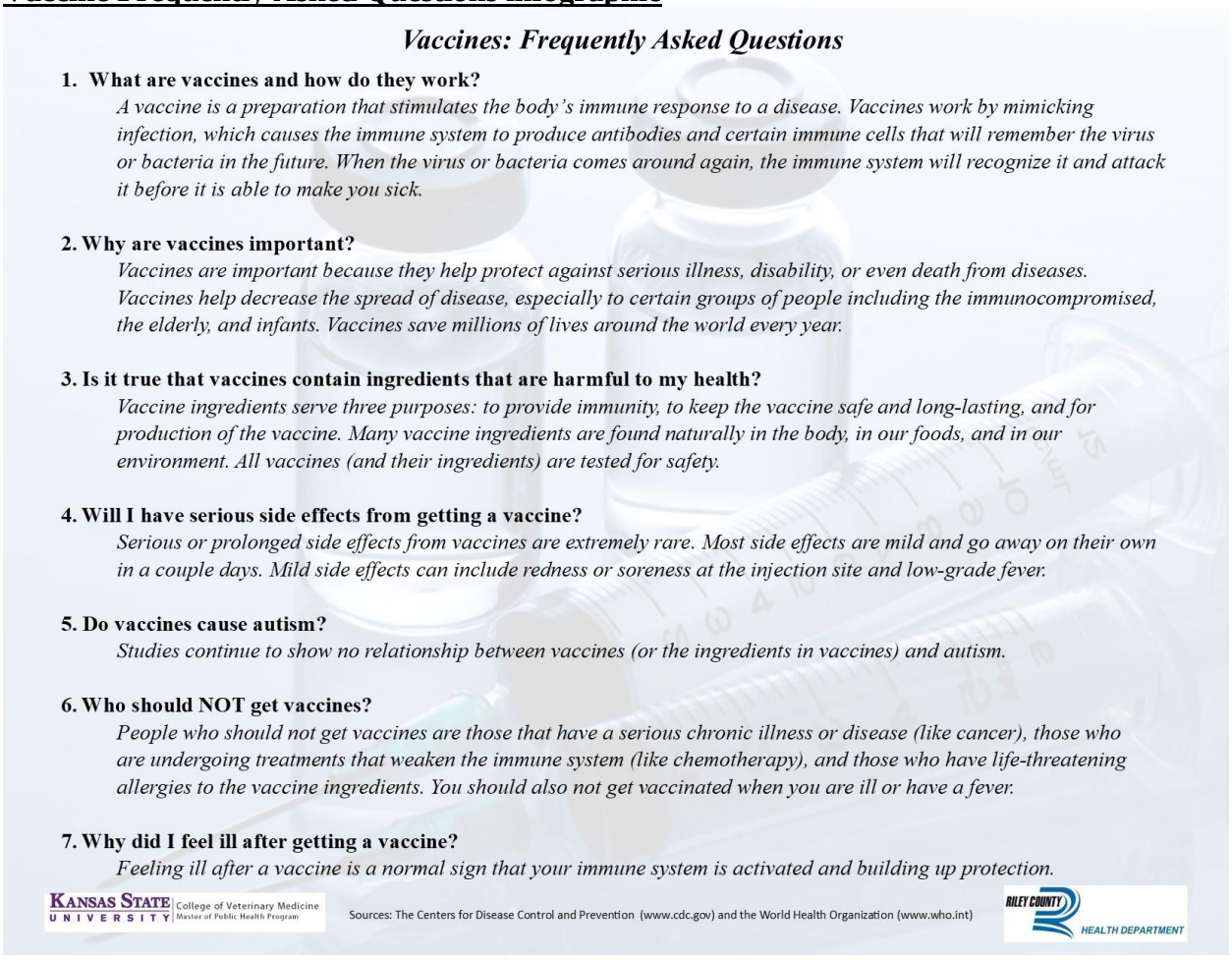
Always:

- Wash your hands frequently or use an alcohol-based hand sanitizer
- Cover coughs or sneezes
- Follow instructions from your healthcare provider
- Seek emergency medical care immediately if you're showing emergency warning signs

We will care for ourselves.
We will care for our fellow Wildcats.
We will care for the K-state Community.
TOGETHER, WE CAN MAKE EVERY WILDCAT A WELLCAT.

KANSAS STATE UNIVERSITY | College of Veterinary Medicine
Master of Public Health Program

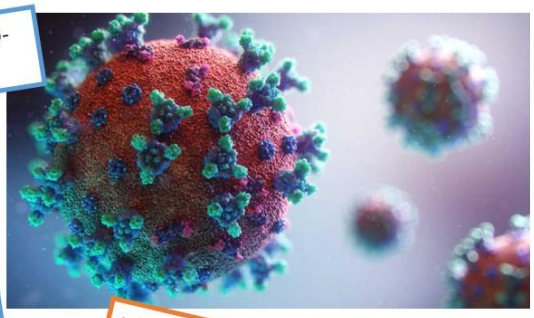
Vaccine Frequently Asked Questions infographic



Quick Facts: COVID-19 Vaccine infographic

Quick Facts: COVID-19 Vaccine

The COVID-19 vaccine protects against the COVID-19 disease, caused by the SARS-CoV-2 virus.



The Pfizer and Moderna vaccines require two doses. The Johnson and Johnson vaccine requires one dose. You are not fully protected until two weeks after your last dose.

Adults and children 12 years of age and older can get the COVID-19 vaccine.

Possible vaccine side effects include redness/pain at the injection site, low-grade fever, chills, body aches, nausea, and fatigue.

You should still get vaccinated even if you have had COVID-19 because it is not known how long you will be protected after recovering. Studies show that being fully vaccinated provides better protection than natural infection alone.

A messenger RNA (mRNA) vaccine teaches your cells to make a piece of spike protein and display it on their cell surface. The immune system will respond and make antibodies that will be used to fight off future SARS-CoV-2 infections.

Research is still being done to learn how long protection from the COVID-19 vaccine lasts.

RILEY COUNTY HEALTH DEPARTMENT

KANSAS STATE UNIVERSITY | College of Veterinary Medicine Master of Public Health Program

Source: The Centers for Disease Control and Prevention (www.cdc.gov)

Vaccine Hesitancy Survey Questions

1. What is your age range?
    a. 18-26 years old
    b. 27-49 years old
    c. 50-64 years old
    d. 65 and older
2. What is your race/ethnicity? (Choose all that apply)
    a. American Indian or Alaska Native
    b. Asian
    c. Black or African American
    d. Hispanic or Latino
    e. Native Hawaiian or Other Pacific Islander
    f. White
3. What is your monthly household income?
    a. Less than $20,000
    b. $20,000-$44,999
    c. $45,000-$139,999
    d. $140,000-$149,999
    e. $150,000 and above
4. What is your student status?
    a. Undergraduate
    b. Graduate
    c. Not a student
5. Will you receive a COVID-19 vaccine?
    a. Yes
    b. Yes, but I will wait
    c. I already received it
    d. No

6a. If you will not get a COVID-19 vaccine, why?
    a. I haven't gotten around to it
    b. I'm not confident in the vaccine
    c. Location/times of vaccine clinics are not convenient for me
    d. Other (Please list)

6b. If you will wait to get a COVID-19 vaccine, why?

a. I'm not confident in the vaccine

b. I'm letting more vulnerable people get it first

c. Location/times of vaccine clinics are not convenient for me

d. Other (Please list)

6c. If you will or have already received a COVID-19 vaccine, why did you choose to get it? (Choose all that apply)

a. To protect myself

b. To protect compromised individuals around me

c. It's mandated by my school/employer

d. Other (please state)

7. Where did you receive information from and/or what did you base your vaccination decision on? (Choose all that apply)

a. News- television, newspapers, online formats

b. Peer-reviewed scientific articles/journals

c. Social media

d. Family and/or friends

e. My healthcare provider

f. Other (please state)

8. Have you ever tested positive for COVID-19?

a. Yes

b. No

9. Have you had any negative health effects due to COVID-19? Has anyone close to you had negative health effects or died of COVID-19? (Choose all that apply)

a. Yes, I have

b. Yes, someone close to me has been negatively impacted

c. Yes, someone close to me has died

d. No

10. How confident are you that the COVID-19 vaccine is safe?

a. Confident

b. Not confident

c. Undecided

11. How confident are you that the COVID-19 vaccine is effective?

a. Confident

b. Not Confident

c. Undecided

12. Should universities require the COVID-19 vaccine in order to attend in future semesters?

a. Yes

b. No

c. Undecided

13. Do you receive the Influenza vaccine every year?

a. Yes

b. No

14. If you receive the Influenza vaccine every year, why? (Choose all that apply)

a. To protect myself

b. To protect compromised individuals around me

c. It's mandated by my school/employer

d. Other (please state)

Thank you for participating in this project. As mentioned in the consent portion of this document, the purpose of this research is investigating the opinions of K-State students regarding their vaccine hesitancy. If at any time you decide to withdraw from the process or do not want your anonymous survey responses used in the research, please contact Emily Gilbert-Esparza. If there are any questions regarding the interview process, purpose/procedure of the research, or if you have any research-related problems, please contact Emily Gilbert-Esparza via email at egilbert@vet.k-state.edu. Thank you again for participating in this project.

Quantitative Data Analysis

The FREQ Procedure

Table of Student by Age			
Student (Student Status)	**Age**		
Frequency	**18-26**	**27 and older**	**Total**
Undergraduate	124	8	132
Graduate	80	99	179
Total	204	107	311

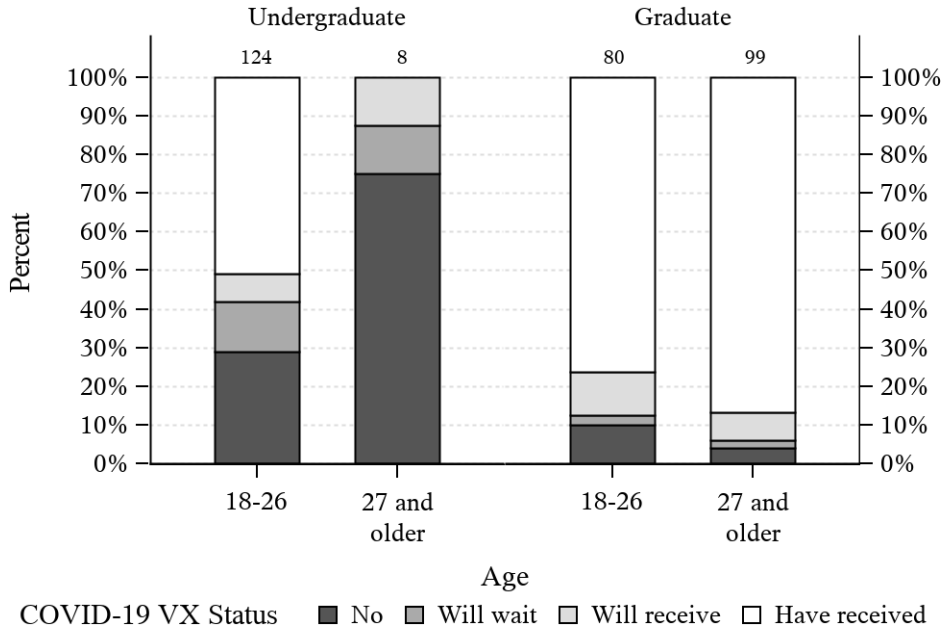
Statistics for Table of Student Age

Statistic	DF	Value	Prob
Chi-Square	1	81.6445	<.0001
Likelihood Ratio Chi-Square	1	93.8879	<.0001
Continuity Adj. Chi-Square	1	79.4769	<.0001
Mantel-Haenszel Chi-Square	1	81.3820	<.0001
Phi Coefficient		0.5124	
Contingency Coefficient		0.4560	
Cramer's V		0.5124	

Sample Size = 311

Summary Statistics

		COVID-19 VX Status									
		n					%				
		No	Will wait	Will receive	Have received	Total	No	Will wait	Will receive	Have received	Total
Undergraduate	**18-26**	36	16	9	63	124	29	13	7	51	100
	27 and older	6	1	1	.	8	75	13	13	.	100
	Total	42	17	10	63	132	32	13	8	48	100
Graduate	**18-26**	8	2	9	61	80	10	3	11	76	100
	27 and older	4	2	7	86	99	4	2	7	87	100
	Total	12	4	16	147	179	7	2	9	82	100
Total	**18-26**	44	18	18	124	204	22	9	9	61	100
	27 and older	10	3	8	86	107	9	3	7	80	100
	Total	54	21	26	210	311	17	7	8	68	100



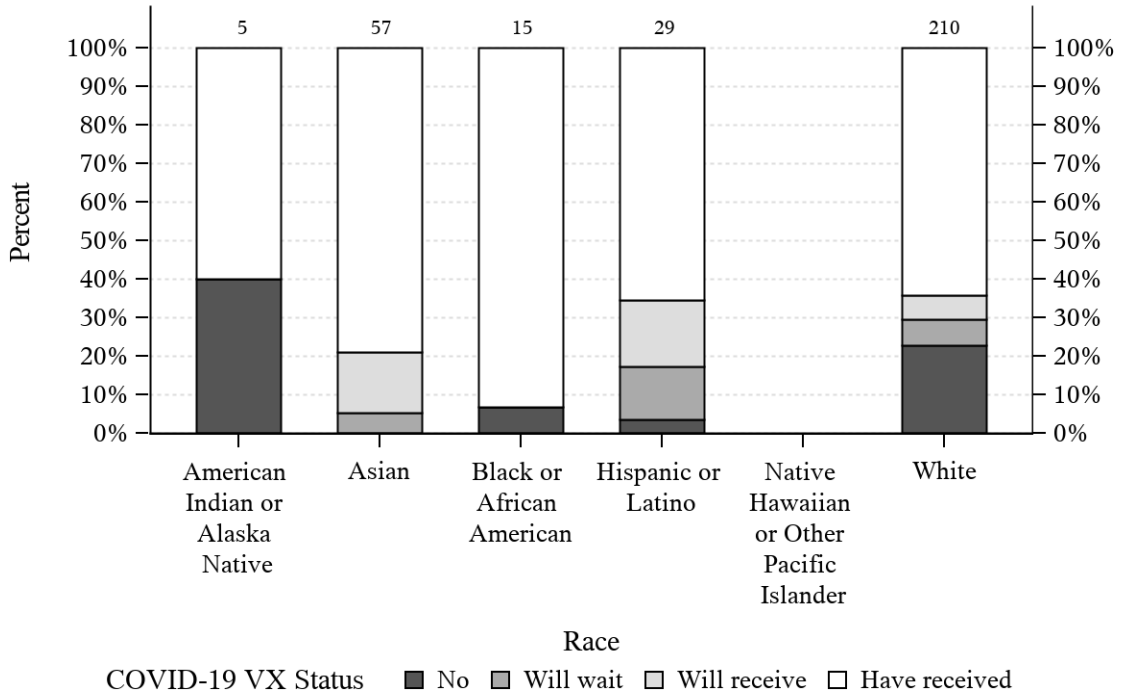
Analysis Results

Criterion	Value/DF	Global Test	Pr > Chi-Square	Type 3 Test	Pr > ChiSq
Deviance	1.7308	Likelihood Ratio	<.0001	Age	0.0875
	.		.	Student	<.0001
	.		.	Age*Student	0.0004

		Cumulative Odds Ratio (P-value) Comp. to	Cumulative Rate of VX Hesitancy +/- SE		
Student Status	**Age**	**27 and older**	**No**	**No, or will wait**	**No, will wait, or will recieve**
Undergraduate	18-26	0.11(0.002)	27.9%+/-3.8%	38.8%+/-4.3%	51.1%+/-4.5%
	27 and older		77.2%+/-14%	84.7%+/-10%	90.2%+/-7.1%
Graduate	18-26	2.06(0.065)	10.1%+/-2.6%	15.5%+/-3.6%	23.3%+/-4.6%
	27 and older		5.2%+/-1.6%	8.2%+/-2.3%	12.9%+/-3.3%

Summary Statistics

	COVID-19 VX Status									
	n					%				
	No	Will wait	Will receive	Have received	Total	No	Will wait	Will receive	Have received	Total
American Indian or Alaska Native	2	0	0	3	5	40	0	0	60	100
Asian	0	3	9	45	57	0	5	16	79	100
Black or African American	1	0	0	14	15	7	0	0	93	100
Hispanic or Latino	1	4	5	19	29	3	14	17	66	100
Native Hawaiian or Other Pacific Islander	0	0	0	0	0	.	.	.	.	.
White	48	14	13	135	210	23	7	6	64	100
Total	52	21	27	216	316	16	7	9	68	100



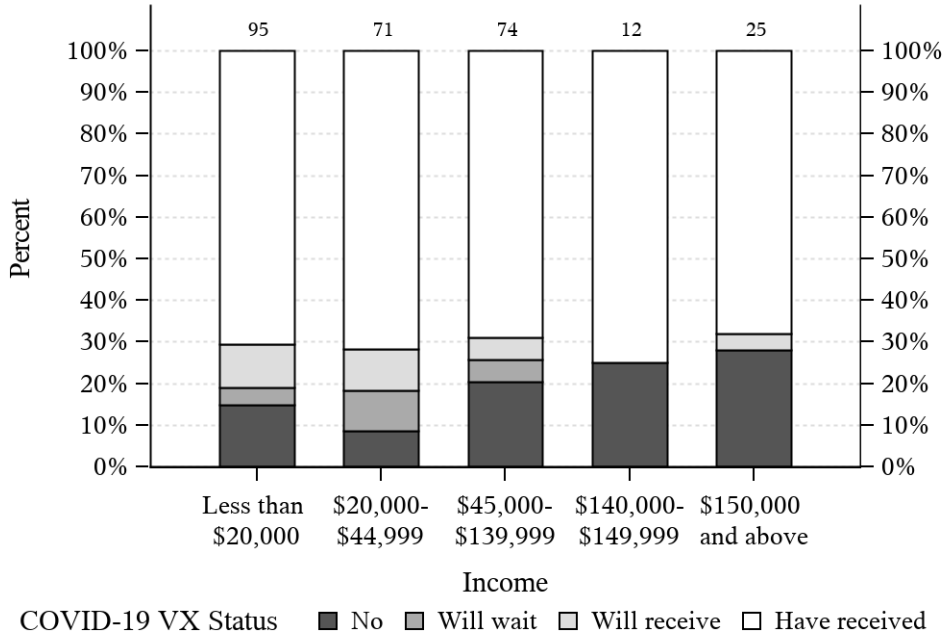
Analysis Results

Criterion	Value/DF	Global Test	Pr > Chi-Square	Type 3 Test	Pr > ChiSq
Deviance	1.8682	Likelihood Ratio	0.0025	q2_1	0.8744
	.		.	q2_2	0.0078
	.		.	q2_3	0.0024
	.		.	q2_4	0.0761
	.		.	q2_6	0.1219

	Cumulative Odds Ratio (P-value) Comp. to				Cumulative Rate of VX Hesitancy +/- SE		
Race	Asian	Black or African American	Hispanic or Latino	White	No	No, or will wait	No, will wait, or will recieve
American Indian or Alaska Native	11.49(0.045)	36.98(0.016)	4.58(0.191)	4.33(0.204)	52.5%+/-28%	63.5%+/-26%	73.1%+/-22%
Asian		3.22(0.220)	0.40(0.079)	0.38(0.003)	8.8%+/-2.7%	13.2%+/-3.7%	19.1%+/-4.9%
Black or African American			0.12(0.023)	0.12(0.007)	2.9%+/-2.9%	4.5%+/-4.5%	6.8%+/-6.6%
Hispanic or Latino				0.94(0.895)	19.4%+/-6.5%	27.5%+/-8.2%	37.2%+/-9.5%
White					20.3%+/-2.8%	28.7%+/-3.2%	38.6%+/-3.5%

Summary Statistics

	COVID-19 VX Status									
	n					%				
	No	Will wait	Will receive	Have received	Total	No	Will wait	Will receive	Have received	Total
Less than $20,000	14	4	10	67	95	15	4	11	71	100
$20,000-$44,999	6	7	7	51	71	8	10	10	72	100
$45,000-$139,999	15	4	4	51	74	20	5	5	69	100
$140,000-$149,999	3	.	.	9	12	25	.	.	75	100
$150,000 and above	7	.	1	17	25	28	.	4	68	100
Total	45	15	22	195	277	16	5	8	70	100



Analysis Results

Criterion	Value/DF	Global Test	Pr > Chi-Square	Type 3 Test	Pr > ChiSq
Deviance	2.0000	Likelihood Ratio	0.9176	Income	0.9176

	Cumulative Odds Ratio (P-value) Comp. to				Cumulative Rate of VX Hesitancy +/- SE		
Income	**$20,000-$44,999**	**$45,000-$139,999**	**$140,000-$149,999**	**$150,000 and above**	**No**	**No, or will wait**	**No, will wait, or will recieve**
Less than $20,000	1.12(0.742)	0.86(0.638)	1.03(0.965)	0.75(0.550)	15.7%+/-3.2%	21.1%+/-3.8%	28.9%+/-4.6%
$20,000-$44,999		0.77(0.453)	0.92(0.912)	0.67(0.426)	14.3%+/-3.4%	19.3%+/-4.1%	26.6%+/-5.0%
$45,000-$139,999			1.21(0.791)	0.87(0.785)	17.9%+/-3.9%	23.8%+/-4.7%	32.2%+/-5.4%
$140,000-$149,999				0.72(0.682)	15.3%+/-8.8%	20.5%+/-11%	28.2%+/-14%
$150,000 and above					20.0%+/-7.0%	26.3%+/-8.4%	35.2%+/-9.8%

The FREQ Procedure

Table of Student by Flu_vx			
Student(Student Status)	**Flu_vx(Annual Influenza VX)**		
Frequency	**No**	**Yes**	**Total**
Undergraduate	92	39	131
Graduate	86	87	173
Total	178	126	304
Frequency Missing = 7			

Statistics for Table of Student by Flu_vx

Statistic	DF	Value	Prob
Chi-Square	1	12.9322	0.0003
Likelihood Ratio Chi-Square	1	13.1369	0.0003
Continuity Adj. Chi-Square	1	12.1005	0.0005
Mantel-Haenszel Chi-Square	1	12.8896	0.0003
Phi Coefficient		0.2063	
Contingency Coefficient		0.2020	
Cramer's V		0.2063	

Sample size= 304

Frequency Missing= 7

The FREQ Procedure

Table of Age by Flu_vx			
Age	**Flu_vx(Annual Influenza VX)**		
Frequency	**No**	**Yes**	**Total**
18-26	126	73	199
27 and older	52	53	105
Total	178	126	304
Frequency Missing = 7			

Statistics for Table of Age by Flu_vx

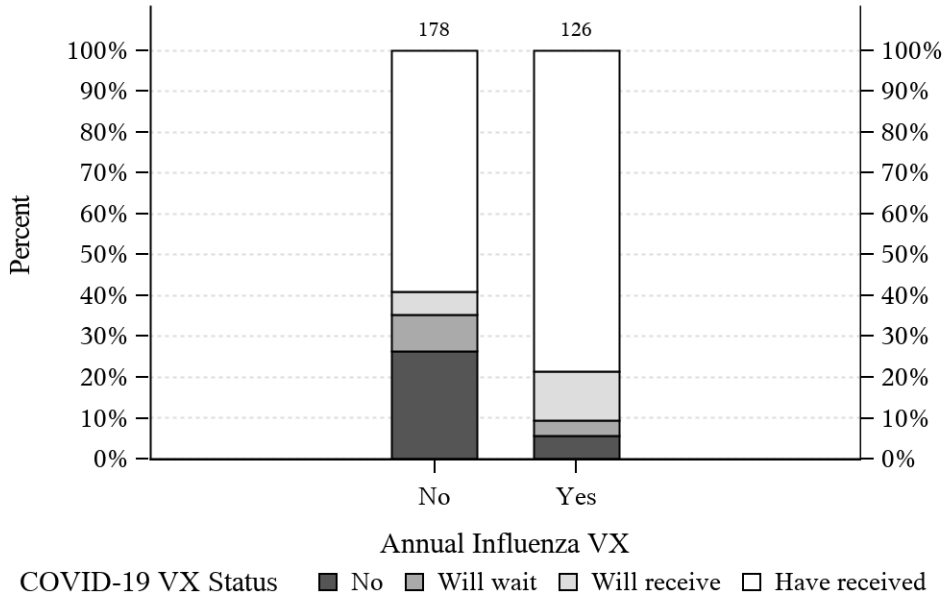
Statistic	DF	Value	Prob
Chi-Square	1	5.3880	0.0203
Likelihood Ratio Chi-Square	1	5.3583	0.0206
Continuity Adj. Chi-Square	1	4.8347	0.0279
Mantel-Haenszel Chi-Square	1	5.3703	0.0205
Phi Coefficient		0.1331	
Contingency Coefficient		0.1320	
Cramer's V		0.1331	

Sample Size= 304

Frequency Missing= 7

Summary Statistics

	COVID-19 VX Status									
	n					%				
	No	Will wait	Will receive	Have received	Total	No	Will wait	Will receive	Have received	Total
No	47	16	10	105	178	26	9	6	59	100
Yes	7	5	15	99	126	6	4	12	79	100
Total	54	21	25	204	304	18	7	8	67	100



The LOGISTIC Procedure

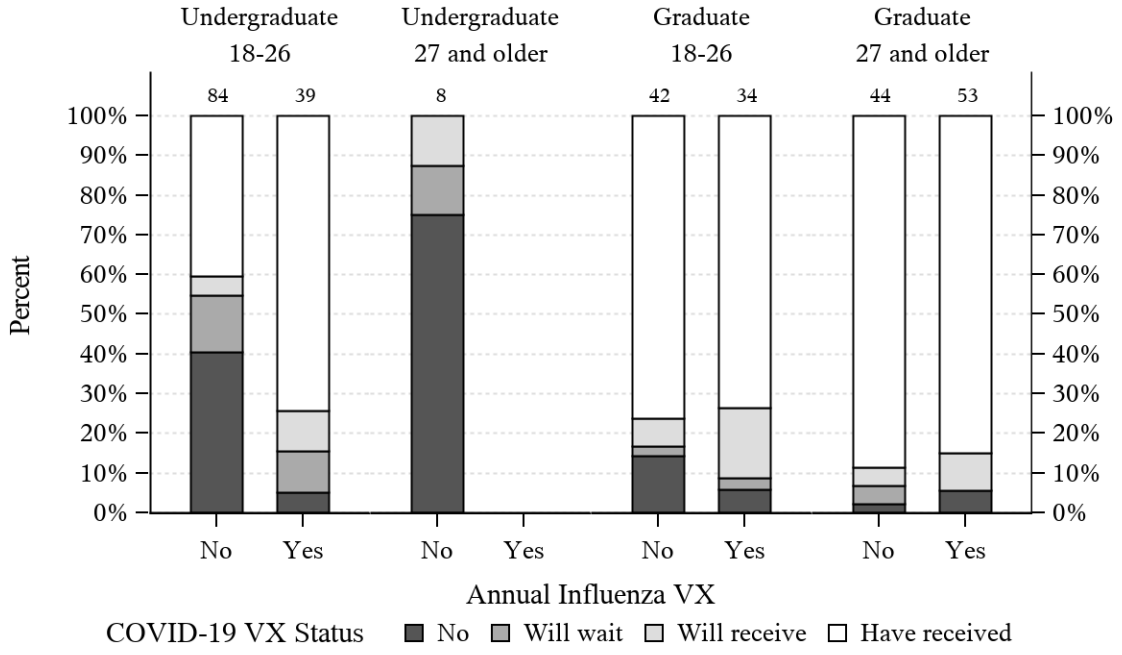
Deviance and Pearson Goodness-of-Fit Statistics				
Criterion	**Value**	**DF**	**Value/DF**	**Pr > ChiSq**
Deviance	12.8902	2	6.4451	0.0016
Pearson	13.5442	2	6.7721	0.0011

Number of unique profiles: 2

Summary Statistics

			COVID-19 VX Status									
			n					%				
			No	**Will wait**	**Will receive**	**Have received**	**Total**	**No**	**Will wait**	**Will receive**	**Have received**	**Total**
Undergraduate	**18-26**	**No**	34	12	4	34	84	40	14	5	40	100
		Yes	2	4	4	29	39	5	10	10	74	100
		Total	36	16	8	63	123	29	13	7	51	100
	27 and older	**No**	6	1	1	.	8	75	13	13	.	100
		Total	6	1	1	.	8	75	13	13	.	100
	Total	**No**	40	13	5	34	92	43	14	5	37	100
		Yes	2	4	4	29	39	5	10	10	74	100
		Total	42	17	9	63	131	32	13	7	48	100
Graduate	**18-26**	**No**	6	1	3	32	42	14	2	7	76	100
		Yes	2	1	6	25	34	6	3	18	74	100
		Total	8	2	9	57	76	11	3	12	75	100
	27 and older	**No**	1	2	2	39	44	2	5	5	89	100
		Yes	3	.	5	45	53	6	.	9	85	100
		Total	4	2	7	84	97	4	2	7	87	100
	Total	**No**	7	3	5	71	86	8	3	6	83	100
		Yes	5	1	11	70	87	6	1	13	80	100
		Total	12	4	16	141	173	7	2	9	82	100

			COVID-19 VX Status									
			n					%				
			No	Will wait	Will receive	Have received	Total	No	Will wait	Will receive	Have received	Total
Total	**18-26**	**No**	40	13	7	66	126	32	10	6	52	100
		Yes	4	5	10	54	73	5	7	14	74	100
		Total	44	18	17	120	199	22	9	9	60	100
	27 and older	**No**	7	3	3	39	52	13	6	6	75	100
		Yes	3	.	5	45	53	6	.	9	85	100
		Total	10	3	8	84	105	10	3	8	80	100
	Total	**No**	47	16	10	105	178	26	9	6	59	100
		Yes	7	5	15	99	126	6	4	12	79	100
		Total	54	21	25	204	304	18	7	8	67	100



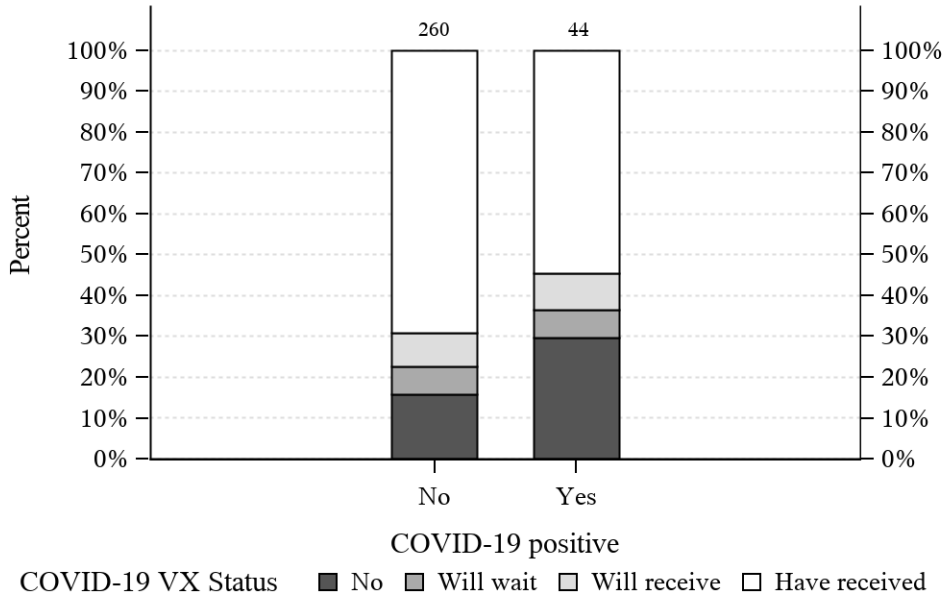
Analysis Results

Criterion	Value/DF	Global Test	Pr > Chi-Square	Type 3 Test	Pr > ChiSq
Deviance	1.8816	Likelihood Ratio	<.0001	Student	<.0001
	.		.	Age	0.2587
	.		.	Flu_vx	0.0669
	.		.	Age*Student	0.0048
	.		.	Student*Flu_vx	0.0119
	.		.	Age*Flu_vx	0.6824

			Cumulative Odds Ratio (P-value) Comp. to	Cumulative Rate of VX Hesitancy +/- SE		
Student Status	**Age**	**Annual Influenza VX**	**No**	**No**	**No, or will wait**	**No, will wait, or will recieve**
Undergraduate	18-26	Yes	0.18(<.001)	10.1%+/-3.5%	16.2%+/-5.0%	24.5%+/-6.7%
		No		38.0%+/-5.1%	51.3%+/-5.4%	64.0%+/-5.1%
	27 and older	No		77.0%+/-14%	85.2%+/-10%	90.6%+/-6.8%
Graduate	18-26	Yes	0.99(0.979)	10.0%+/-3.6%	16.1%+/-5.2%	24.4%+/-7.0%
		No		10.2%+/-3.5%	16.3%+/-5.1%	24.7%+/-6.7%
	27 and older	Yes	1.37(0.603)	5.6%+/-2.2%	9.3%+/-3.3%	14.7%+/-4.8%
		No		4.2%+/-2.0%	7.0%+/-3.1%	11.2%+/-4.7%

Summary Statistics

	COVID-19 VX Status									
	n					%				
	No	**Will wait**	**Will receive**	**Have received**	**Total**	**No**	**Will wait**	**Will receive**	**Have received**	**Total**
No	41	18	21	180	260	16	7	8	69	100
Yes	13	3	4	24	44	30	7	9	55	100
Total	54	21	25	204	304	18	7	8	67	100



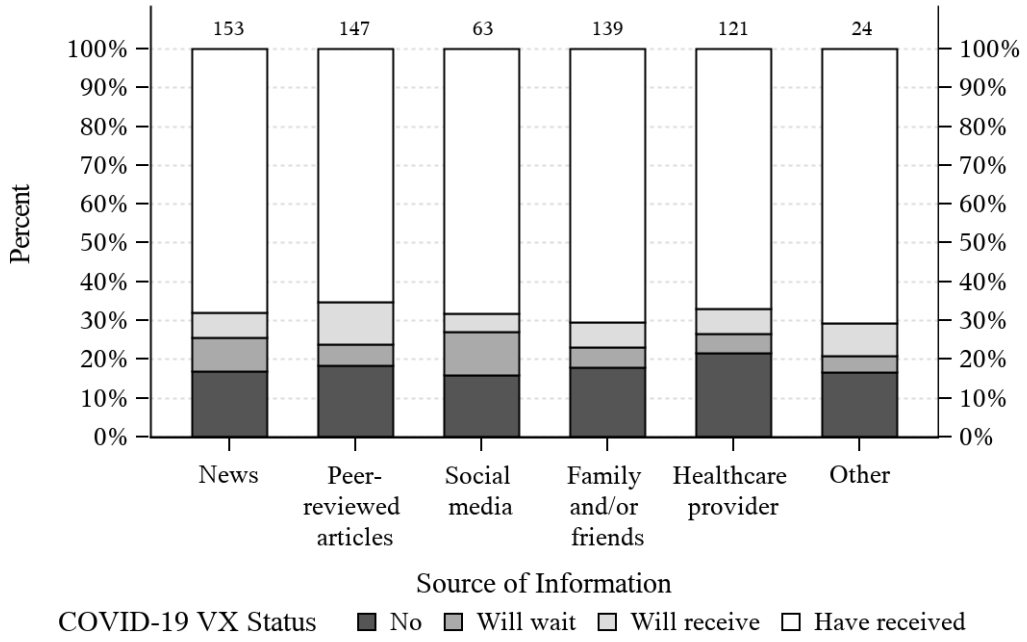
Analysis Results

Criterion	Value/DF	Global Test	Pr > Chi-Square	Type 3 Test	Pr > ChiSq
Deviance	0.2364	Likelihood Ratio	0.0377	test	0.0377

	Cumulative Odds Ratio (P-value) Comp. to	Cumulative Rate of VX Hesitancy +/- SE		
COVID-19 Positive	**No**	**No**	**No, or will wait**	**No, will wait, or will recieve**
Yes	1.97(0.038)	27.5%+/-6.0%	36.7%+/-6.9%	46.5%+/-7.3%
No		16.2%+/-2.2%	22.7%+/-2.5%	30.6%+/-2.8%

Summary Statistics

	COVID-19 VX Status									
	n					%				
	No	Will wait	Will receive	Have received	Total	No	Will wait	Will receive	Have received	Total
News	26	13	10	104	153	17	8	7	68	100
Peer-reviewed articles	27	8	16	96	147	18	5	11	65	100
Social media	10	7	3	43	63	16	11	5	68	100
Family and/or friends	25	7	9	98	139	18	5	6	71	100
Healthcare provider	26	6	8	81	121	21	5	7	67	100
Other	4	1	2	17	24	17	4	8	71	100
Total	118	42	48	439	647	18	6	7	68	100



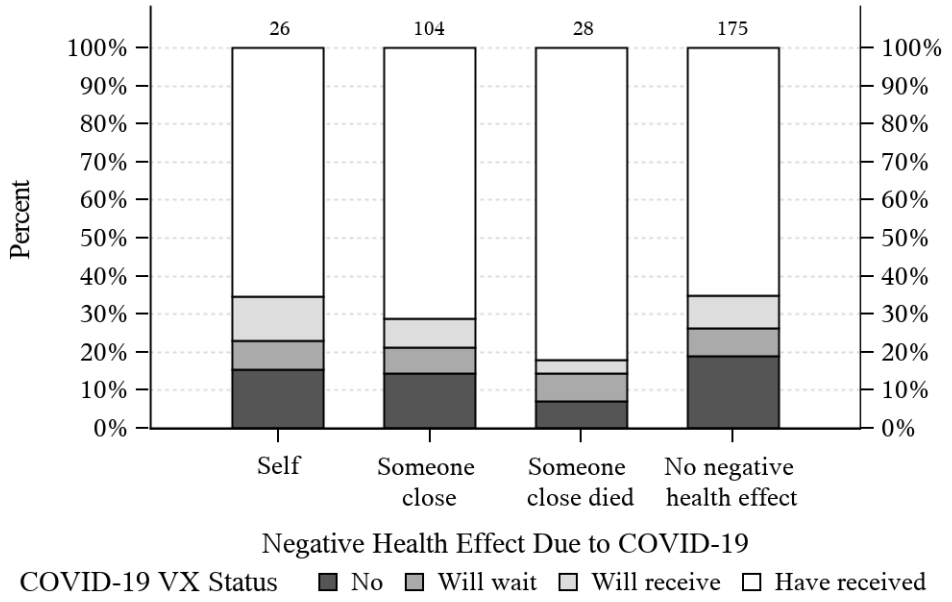
Analysis Results

Criterion	Value/DF	Global Test	Pr > Chi-Square	Type 3 Test	Pr > ChiSq
Deviance	0.8866	Likelihood Ratio	0.9557	q7_1	0.7372
	.		.	q7_2	0.8278
	.		.	q7_3	0.9796
	.		.	q7_4	0.3329
	.		.	q7_5	0.7519
	.		.	q7_6	0.5487

	Cumulative Odds Ratio (P-value) Comp. to					Cumulative Rate of VX Hesitancy +/- SE		
Source of Information	**Peer-reviewed articles**	**Social media**	**Family and/or friends**	**Healthcare provider**	**Other**	**No**	**No, or will wait**	**No, will wait, or will recieve**
News	0.87(0.684)	0.91(0.838)	1.18(0.650)	0.85(0.644)	1.22(0.688)	18.2%+/-4.2%	25.3%+/-5.2%	33.6%+/-6.1%
Peer-reviewed articles		1.05(0.915)	1.35(0.353)	0.98(0.945)	1.40(0.507)	20.4%+/-4.3%	28.0%+/-5.2%	36.8%+/-5.9%
Social media			1.29(0.575)	0.93(0.867)	1.34(0.604)	19.6%+/-6.8%	27.1%+/-8.5%	35.8%+/-9.8%
Family and/or friends				0.72(0.359)	1.04(0.942)	15.9%+/-3.9%	22.3%+/-4.9%	30.1%+/-5.8%
Healthcare provider					1.44(0.487)	20.8%+/-5.1%	28.5%+/-6.2%	37.4%+/-7.0%
Other						15.4%+/-6.1%	21.7%+/-7.9%	29.4%+/-9.5%

Summary Statistics

	COVID-19 VX Status									
	n					%				
	No	Will wait	Will receive	Have received	Total	No	Will wait	Will receive	Have received	Total
Self	4	2	3	17	26	15	8	12	65	100
Someone close	15	7	8	74	104	14	7	8	71	100
Someone close died	2	2	1	23	28	7	7	4	82	100
No negative health effect	33	13	15	114	175	19	7	9	65	100
Total	54	24	27	228	333	16	7	8	68	100



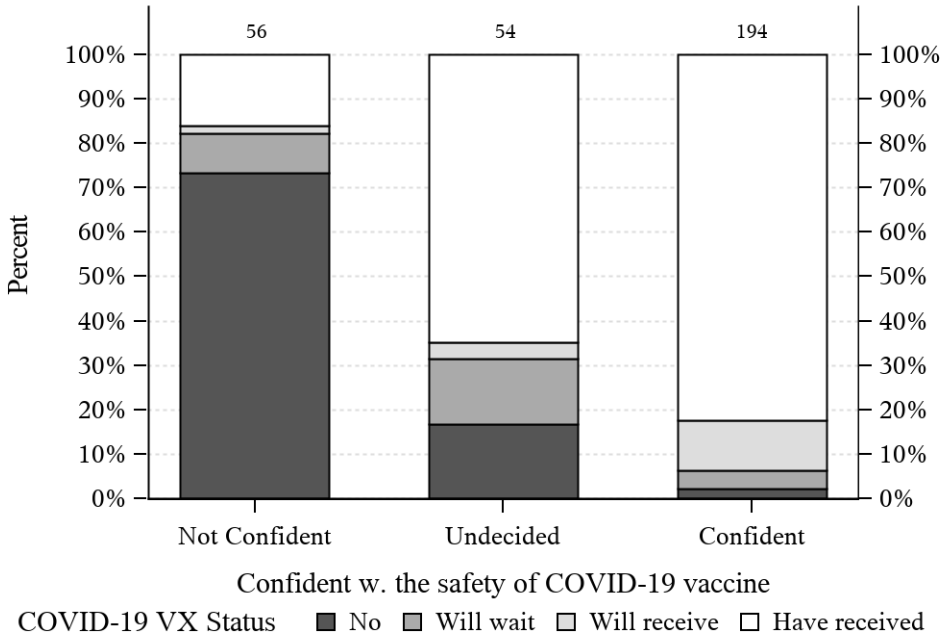
Analysis Results

Criterion	Value/DF	Global Test	Pr > Chi-Square	Type 3 Test	Pr > ChiSq
Deviance	1.3697	Likelihood Ratio	0.2380	q9_1	0.8769
	.		.	q9_2	0.4295
	.		.	q9_3	0.0907

	Cumulative Odds Ratio (P-value) Comp. to			Cumulative Rate of VX Hesitancy +/- SE		
Negative health impact	**Someone close**	**Someone close died**	**No negative health effect**	**No**	**No, or will wait**	**No, will wait, or will recieve**
Self	1.31(0.596)	2.41(0.182)	1.07(0.877)	20.6%+/-7.0%	28.3%+/-8.5%	37.3%+/-9.8%
Someone close		1.83(0.316)	0.81(0.429)	16.5%+/-3.4%	23.1%+/-4.2%	31.1%+/-4.9%
Someone close died			0.44(0.091)	9.7%+/-4.7%	14.1%+/-6.4%	19.8%+/-8.3%
No negative health effect				19.6%+/-2.7%	27.0%+/-3.2%	35.7%+/-3.5%

Summary Statistics

	COVID-19 VX Status									
	n					%				
	No	Will wait	Will receive	Have received	Total	No	Will wait	Will receive	Have received	Total
Not Confident	41	5	1	9	56	73	9	2	16	100
Undecided	9	8	2	35	54	17	15	4	65	100
Confident	4	8	22	160	194	2	4	11	82	100
Total	54	21	25	204	304	18	7	8	67	100

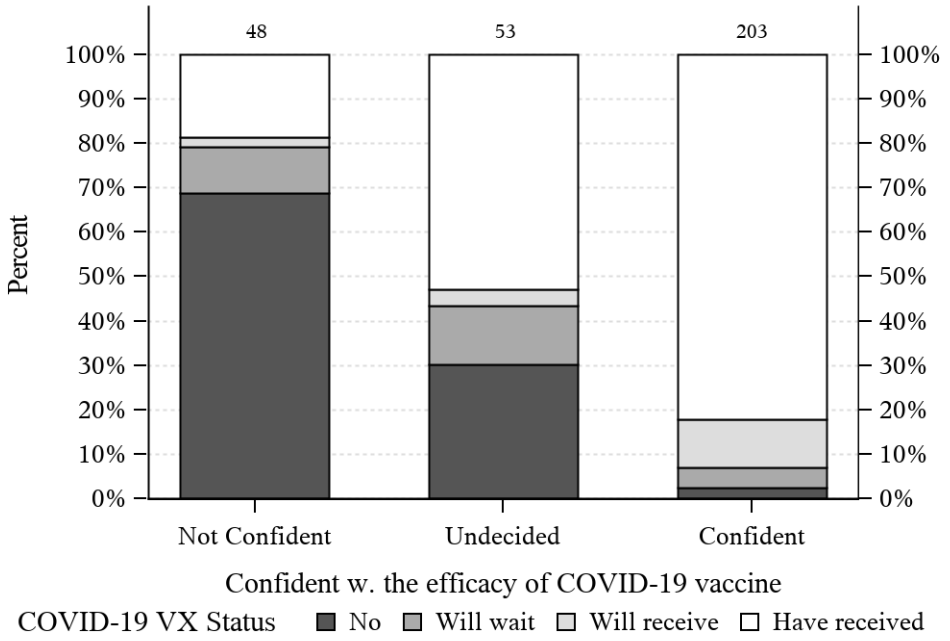


Analysis Results

Statistic	Value	SE
Kendall's Tau-b	0.5273	0.0473
Stuart's Tau-c	0.4088	0.0443

Summary Statistics

	COVID-19 VX Status									
	n					%				
	No	Will wait	Will receive	Have received	Total	No	Will wait	Will receive	Have received	Total
Not Confident	33	5	1	9	48	69	10	2	19	100
Undecided	16	7	2	28	53	30	13	4	53	100
Confident	5	9	22	167	203	2	4	11	82	100
Total	54	21	25	204	304	18	7	8	67	100

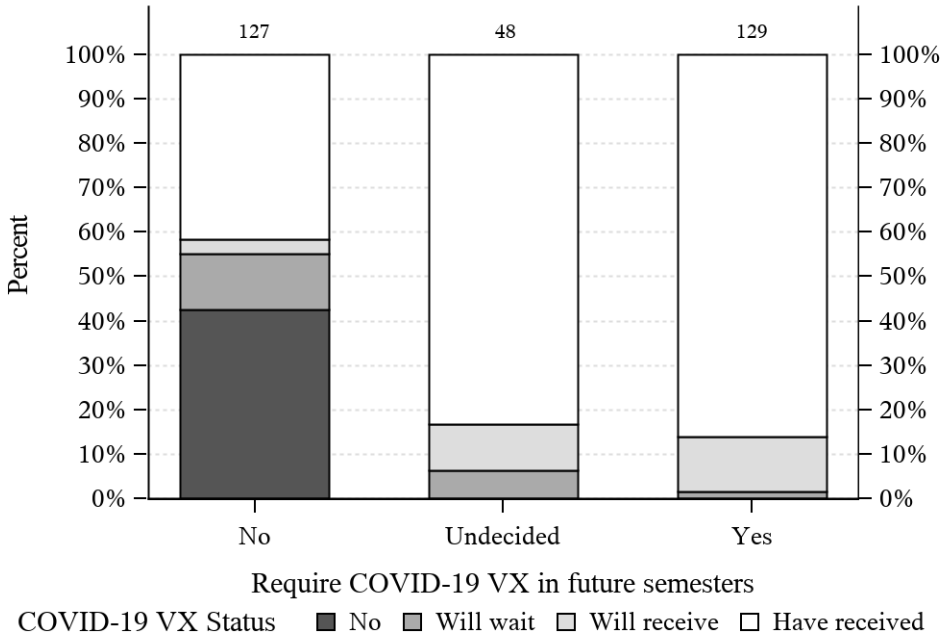


Analysis Results

Statistic	Value	SE
Kendall's Tau-b	0.5213	0.0472
Stuart's Tau-c	0.3930	0.0431

Summary Statistics

	COVID-19 VX Status									
	n					%				
	No	Will wait	Will receive	Have received	Total	No	Will wait	Will receive	Have received	Total
No	54	16	4	53	127	43	13	3	42	100
Undecided	.	3	5	40	48	.	6	10	83	100
Yes	.	2	16	111	129	.	2	12	86	100
Total	54	21	25	204	304	18	7	8	67	100



Analysis Results

Statistic	Value	SE
Kendall's Tau-b	0.4525	0.0419
Stuart's Tau-c	0.3805	0.0396

Qualitative Data Analysis

Questions 6a and 6b

Name	References
Emergency vaccine	1
Experimental vaccine	1
Not FDA approved	1
Health risks	5
Healthy	2
Age group not at-risk	1
Not at risk	8
High survival rate	1
Lessens symptoms	1
Mistrust	7
Not effective	2
No time availability	3
Prior infection	5
Antibodies	1
Resistant variant	1
Vaccine long-term effects	7

Question 6c

Name	References
Avoid frequent testing	1
Avoid quarantine	2
Back to normal	5
Ease anxiety	1
Easy access, convenient	1
Freedom	1
Get rid of masks	1
Government mandated	1
Incentives	1
Morals	6
Preventing disease	3
Protect myself and others	7
Respect for healthcare workers	1
To be vaccinated	1
Travel	1
Work or school-related	5

Question 14

Name	References
Dr. recommended	1
Have always gotten it	1
Health issues	1
Immunity	1
Immunocompromised family	1
Prevent virus drift	1
Protect myself and others	2
Trust in vaccine	2
Work or school-related	3
Worth it	1
Trust in research process	2