

Influences and Willingness to Receive Future COVID-19 Vaccination by Demographic Data and Proposed Interventions

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ABSTRACT

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a rapidly growing problem in the global health community and has affected millions of people worldwide. The resulting COVID-19 disease poses a significant threat as it can lead to both short and long-term health consequences in all demographics. In order to contain this infectious disease and reduce the amount of harm it inflicts; vaccination has been the best recommended course of action in association with mask wearing and appropriately enforced social distancing measures. The increased speed of development for the mRNA COVID-19 vaccines relative to other vaccines and politicization of being immunized against COVID-19 in the United States of America serve as two points of potential divergency for demographics’ willingness to be immunized. The connections between demographic identifiers and immunization attitudes were evaluated using an online survey distributed to adults living in the United States. Representative data on demographics including age, education level, and political affiliation was collected as was the associated willingness to be immunized against COVID-19 and the annual influenza vaccine. The survey collected data on the factors that influence the participants’ attitudes towards immunization for both influenza and COVID-19. Upon analysis of the data, the relationship between political affiliation and willingness to be immunized for COVID-19 reported a chi-squared statistic of 10.8282 which resulted in a p-value of $0.001 < 0.05$. The relationship between political affiliation and willingness to be immunized against COVID-19 proved to be statistically significant in the test population. Upon further analysis of the relationship, self-identified Republicans are less likely to receive the COVID-19 vaccine. Also concluded from the study in order of descending importance, people of all demographics decide to be immunized for both COVID-19 and influenza by reviewing primary scientific literature, considering physicians’ opinions, and reflecting on personal health status. However, in the groups with the lowest willingness to be immunized against COVID-19, the timeline of development was cited as the only deviating deciding factor from those listed above. Using this data, an intervention plan was proposed to increase vaccination participation in low-participating demographics in concurrence with the idea that increased vaccination rates offer a higher level of protection against the illness.

KEYWORDS: COVID-19 vaccine, vaccination, influenza, COVID-19 politics, immunization participation, coronavirus

INTRODUCTION

As of October 15th, 2020, the Centers for Disease Control and Prevention (CDC) reports the impact of SARS-CoV-2 in the United States has exceeded 215,000 deaths and 66% of excess deaths from January 2020 to October 2020 are a result of this virus (Rossen et al. 2020). The COVID-19 pandemic has had a catastrophic effect on the economic, mental, and physical health of the United States. The recent influx of cases offers little confidence that the pandemic will end without wide scale medical and public health intervention (Centers for Disease Control and Prevention [CDC], 2020). The current intervention that offers the most protection from COVID-19 is immunization via mRNA vaccines currently being produced. Due to the global nature of the virus and the development of a safe and effective vaccine being a top priority of the global medical research community, the current vaccines are being developed at an unprecedented pace. This is creating a feeling of ambivalence and anxiety towards being immunized for COVID-19 in the United States (Chou and Budenz, 2020). Previous studies found that 25% of a tested population of Americans were COVID-19 vaccine hesitant, while another study found that 31% were (Steven et. al. 2020; Reiter et al. 2020). In addition to individual willingness to participate in COVID-19 vaccination, previous research also found that people are more likely to get the vaccine if it is recommended by their doctors or if they identified as politically liberal (Reiter et al. 2020).

For maximum efficacy and efficiency in controlling the COVID-19 pandemic via immunization, it is of extreme importance that there is consensus within the population that the vaccine will be effective and safe. It is estimated that the current variation of the COVID-19 virus in October 2020 has a reproduction factor of four, which indicates on average, an infected individual will

infect four other individuals in proximity. This factor indicates that at least 50% of the population in the United States needs to be immunized in order to halt the spread of this virus (Peiris and Leung, 2020). Vaccines are created to provide protection against infectious diseases by introducing small amounts of an identifiable feature of the virus into the human body, such as its antigens or its mRNA. This allows the body’s immune system to preserve the virus’s profile and acts to protect the body from significant illness in case of future exposure. High rates of vaccination are effective at preventing the spread of viruses by increasing the speed at which herd immunity can be reached while limiting mortality associated with the illness. The mechanism by which herd immunity becomes an effective protective factor is that the reproduction factor is no longer significant, and it becomes harder for infected individuals to encounter a susceptible individual.

The issue of obtaining herd immunity should be of concern to everyone in society. Electing to abstain from immunization for COVID-19 once available to the general public will affect not only the individual’s health and associated risk of health consequences due to COVID-19 but also other community members. Individuals who are unable to be vaccinated and who rely on the eligible masses to participate in vaccination will remain at highest risk for contracting the disease. This population is also among the highest risk for severe COVID-19 related short and long-term health consequences. Reaching herd immunity via high participant immunization stands to decrease that risk and this is among one of the top priorities for public health officials in the United States. The COVID-19 vaccination has been politicized in American culture, with political figures from all major political parties issuing warnings or endorsements. Individuals in the United States by and

large consider political party affiliation, especially for members of the two main Republican and Democrat political parties, a key identity factor and often hold opinions that exclusively are held by their respective parties. Due to the significant importance political affiliation has on forming individual opinions it was included as a main demographic identifier used to analyze the significance of the effect politicization of immunization has had on the United States population. In addition to analyzing responses to COVID-19 immunization, data regarding flu vaccinations was analyzed in order to investigate any difference in attitudes towards the two vaccines and to investigate and account for the potential for one demographic to be entirely vaccine advert. The flu vaccine was selected as it is a well-established vaccine, with over 48% of the population in the United States receiving it in the 2019-2020 flu season (CDC, 2020). The priority of this research was to identify which demographic of people in the United States is most likely to be hesitant to COVID-19 immunization as an isolated case of vaccine hesitancy. Understanding the correlations between demographic markers and planned immunization participation allows for public health measures to efficiently target vaccine hesitant demographic groups via the associated indicated influence channels.

METHODS

Using the Google Forms website, a single comprehensive survey was created to collect data on planned immunization participation for COVID-19 and Influenza and the societal factors that influence those individual decisions. In addition, demographic information about the test sample population was collected. The survey was distributed via Facebook, text link, and written links to the online survey. The survey was made available for two weeks beginning on the 2nd of November 2020. Respondents were first asked to evaluate their level of planned participation in the annual influenza immunization on a scale of 1 to 5, with 1 being the least likely to get an annual influenza vaccine and 5 being the most likely. After choosing an answer, they were presented with different reasons that might affect their decision (Appendix A). Respondents were then asked to rank their top five reasons in order of significance to them, with 1 being the most influential factor and 5 being the least influential factor. The second portion of the survey was conducted in an identical fashion but pertained to the COVID-19 vaccines once available to the general public. A sample survey has been provided in Appendix A.

After receiving 226 responses the results were categorized and analyzed. People who selected 1 or 2 on likelihood to receive a vaccine were grouped together as “unlikely to receive a vaccine.” People who selected 3 were grouped together as “undecided.” Individuals who selected a 4 or 5 were grouped together as “likely to receive a vaccine.” The top three factors that influence the attitudes towards a vaccine within each demographic group were analyzed as well. To do so, influences which were listed as an individual respondent first, second, or third choice were collected and recorded. Among all factors which were listed at these positions, the three which occurred the most often were documented. This data for the demographic groups with the lowest likelihood of vaccination served as the basis for deciding which factor to utilize when implementing an intervention plan.

This information was compiled in three tables according to the demographic categorizations. The reported data focuses on the percent of each set of respondents unlikely to get each vaccine due to the focus on identifying at risk populations. Table 1 focuses on age groups: ages 18-25, 26-44, 45-54, and 55+. Table 2 focuses on the level of education obtained by the respondents: non-degree (high school or equivalent and/or some college), or degree (Associate’s, Bachelor’s, Master’s, PhD, and other professional degrees). Table 3 focuses on political party affiliations of respondents: Democrat, Republican, or other political party affiliations (Independent, Libertarian, Green, Constitution, none, or other).

Once all data was collected, a chi-squared test for independence was conducted for each of the demographics and their willingness to participate in influenza and COVID-19 immunization. The culminated results of chi-squared test data were compiled in Tables 4-9.

RESULTS

The age range of 45-54 had the highest percentage of people who are unlikely to receive the COVID-19 vaccination, at 39.0% (Table 1). This group displayed concern about the timeline of development of the COVID-19 vaccine. While slightly more willing to get the COVID-19 vaccination, with only a 31.2% rejection rate, the 55+ age group was also weary of the timeline of development. Interestingly, the group of individuals between the age of 26 and 44 had the second largest discrepancy between the percent of rejection

Table 1. Breakdown of results by age. Red cells indicate a deviation between influences for Influenza and COVID-19 vaccines. Yellow cells indicate the two largest disparities in willingness to receive Influenza and COVID-19 vaccines.

Demographic Identifier	Sample Size	% Not Likely to Get Influenza Vaccine	% Not Likely to Get COVID-19 Vaccine	Top Three Influences: Influenza Vaccine	Top Three Influences: COVID-19 Vaccine
18-25 years old	126	28.6	28.6	Personal Health, Review of Scientific Lit, Physician Opinion	Personal Health, Review of Scientific Lit, Physician Opinion
26-44 years old	26	30.8	38.5	Personal Health, Review of Scientific Lit, Physician Opinion	Personal Health, Review of Scientific Lit, Physician Opinion
45-54 years old	41	36.6	39.0	Personal Health, Review of Scientific Lit, Physician Opinion	Review of Scientific Lit, Physician Opinion, Timeline of Development
55+ years old	32	28.1	31.2	Personal Health, Review of Scientific Lit, Physician Opinion	Review of Scientific Lit, Physician Opinion, Timeline of Development

Table 2. Breakdown of results by amount of education received. Non-degree respondents have high-school or equivalent and/or some college education. A degree includes an Associate’s degree and any higher-level degrees. Red cells indicate a deviation between influences for Influenza versus COVID-19 vaccines.

Demographic Identifier	Sample Size	% Not Likely to Get Influenza Vaccine	% Not Likely to Get COVID-19 Vaccine	Top Three Influences: Influenza Vaccine	Top Three Influences: COVID-19 Vaccine
Non-Degree	114	33.3	30.7	Personal Health, Review of Scientific Lit, Physician Opinion	Personal Health, Review of Scientific Lit, Physician Opinion
Degree	111	27.0	33.3	Personal Health, Review of Scientific Lit, Physician Opinion	Review of Scientific Lit, Physician Opinion, Timeline of Development

Table 3. Breakdown of results by political party affiliation. Other political party affiliations include Independent, Libertarian, Green, Constitution, none, or any other party affiliations. Red cells indicate a deviation between influences for Influenza and COVID-19 vaccines. Yellow cells indicate the two largest disparities in willingness to receive Influenza and COVID-19 vaccines.

Demographic Identifier	Sample Size	% Not Likely to Get Influenza Vaccine	% Not Likely to Get COVID-19 Vaccine	Top Three Influences: Influenza Vaccine	Top Three Influences: COVID-19 Vaccine
Democratic	100	21.0	20.0	Personal Health, Review of Scientific Lit, Physician Opinion	Personal Health, Review of Scientific Lit, Physician Opinion
Republican	61	32.8	41.0	Personal Health, Review of Scientific Lit, Physician Opinion	Review of Scientific Lit, Physician Opinion, Timeline of Development
Other Political Party Affiliations	67	40.3	41.8	Personal Health, Review of Scientific Lit, Physician Opinion	Review of Scientific Lit, Physician Opinion, Timeline of Development

of the Influenza vaccine versus the percent of rejection of the COVID-19 vaccine. For this demographic group, the rejection rate for the COVID-19 vaccine is 7.7% higher than that of the Influenza vaccine.

Analysis of Table 2 showed that people with a degree were more likely to score COVID-19 immunization lower than those without a degree 33.3% rejection versus 30.7%, respectively. The timeline of development was in the top three concerns of the group with a degree as well. In Table 3, those who indicated a Republican political party affiliation or other political party affiliation (not including Democrat) were more likely to score willingness to participate in COVID-19 immunization lower, with 41.0% and 41.8% low score responses, respectively. Both of these demographics included a timeline of development to be a major influence on their decisions. Additionally, people who affiliate themselves with the Republican political party had the largest discrepancy in the rejection of a COVID-19 vaccine compared to an influenza vaccine, with a rejection rate of a COVID-19 vaccine that is 8.2% higher than that of the influenza vaccine. This demographic group had the most significant difference between willingness to take the influenza and COVID-19 vaccines. Overall, in all but two categories (people without degrees and people identifying as Democrats) individuals are more likely to not get the COVID-19 vaccination compared to the Influenza vaccination. The demographic of people identifying as Democrats had the lowest percentage of responses of “no” both to the Influenza vaccine and to the COVID-19 vaccine, indicating that of all those sampled,

this demographic is the most likely to get either of these vaccinations.

Table 4. Chi-squared analysis of political party affiliation (two party) and willingness to take COVID-19 vaccine.

	Yes Covid	No Covid	Row totals
Republican	24 (32.67) [2.30]	25 (16.33) [4.60]	49
Democrat	66 (57.33) [1.31]	20 (28.67) [2.62]	86
Column totals	90	45	135

In Table 4, the chi-squared statistic of 10.8282 results in a p-value of 0.001. This test was run at a p<0.05 significance level, so the result is statistically significant, and there is evidence to reject the null hypothesis which states that there is no relationship between the categorical variables and indicates there is a relationship between political party affiliation and willingness to participated in COVID-19 immunization.

In Table 5, the chi-squared statistic of 2.1914 results in a p-value of 0.138784. This test was run at a p<0.05 significance level, so the result is not statistically significant, and fail to reject

the null hypothesis which states that there is no relationship between the categorical variables. This indicates that there is insignificant evidence to support a relationship between political party affiliation and willingness to participate in Influenza immunization.

Table 5. Chi-squared test for independence of political party affiliation (two party) and willingness to take Influenza vaccine.

	Yes Flu	No Flu	Row totals
Republican	35 (38.89) [0.39]	20 (16.11) [0.94]	55
Democrat	64 (60.11) [0.25]	21 (24.89) [0.61]	85
Column totals	99	41	140

In Table 6, the chi-squared statistic of 0.0001 results in a p-value of 0.993494. This test was run at a p<0.05 significance level, so the result is not statistically significant, and we fail to reject the null hypothesis which states that there is no relationship between the categorical variables. This indicates that there is insignificant evidence to support a relationship between being a non-degree holding individual and willingness to take the COVID-19 vaccine.

Table 6. Chi-squared test for independence of degree holding and willingness to take COVID-19 vaccine.

	Yes Covid	No Covid	Row totals
Degree	58 (58.03) [0.00]	37 (36.97) [0.00]	95
No Degree	55 (54.97) [0.00]	35 (35.03) [0.00]	90
Column totals	113	72	185

In Table 7, the chi-squared statistic of 1.9689 results in a p-value of 0.160568. This test was run at a p<0.05 significance level, so the result is not statistically significant, and we fail to reject the null hypothesis. This indicates that there is insignificant evidence to support a relationship between being a non-degree holding individual and willingness to take the flu vaccine.

Table 7. Chi-squared test for independence of degree holding and willingness to take Influenza vaccine.

	Yes Flu	No Flu	Row totals
Degree	71 (66.31) [0.33]	30 (34.69) [0.63]	101
No Degree	59 (63.69) [0.34]	38 (33.31) [0.66]	97
Column totals	130	68	198

In Table 8, the chi-squared statistic of 3.797 results in a p-value of 0.284238. This test was run at a p<0.05 significance level, so

the result is not statistically significant, and we fail to reject the null hypothesis. This indicates that there is insignificant evidence to support a relationship between age and willingness to take a COVID-19 vaccine.

Table 8. Chi-squared test for independence of age and willingness to take COVID-19 vaccine.

	Yes Covid	No Covid	Row totals
18-25	72 (65.97) [0.55]	36 (42.03) [0.87]	108
26-44	10 (12.22) [0.40]	10 (7.78) [0.63]	20
45-55	17 (20.16) [0.49]	16 (12.84) [0.78]	33
55+	14 (14.66) [0.03]	10 (9.34) [0.05]	24
Column totals	113	72	185

In Table 9, the chi-squared statistic of 0.8957 results in a p-value of 0.826476. This test was run at a p<0.05 significance level, so the result is not statistically significant, and we fail to reject the null hypothesis which states that there is no relationship between the categorical variables. This indicates that there is insignificant evidence to support a relationship between age and willingness to participate in Influenza vaccination.

Table 9. Chi-squared test for independence of age and willingness to take Influenza vaccine.

	Yes Flu	No Flu	Row totals
18-25	68 (68.28) [0.00]	36 (35.72) [0.00]	104
26-44	17 (16.41) [0.02]	8 (8.59) [0.04]	25
45-55	23 (24.95) [0.15]	15 (13.05) [0.29]	38
55+	22 (20.35) [0.13]	9 (10.65) [0.25]	31
Column totals	130	68	198

DISCUSSION

Overall, using the annual Influenza vaccination as a baseline for gauging attitudes towards vaccinations indicated that all people across all demographics were most influenced by reviewing primary scientific literature, physicians’ opinions, and personal health in that order. As with any research, there is potential for biases in this project. Due to the nature of the survey being conducted online and mostly shared via Facebook,

there is a potential lack of response from those without access to the internet or those without a Facebook account. In addition, small descriptions of each of the potential influences were provided within the survey; however, there could have been room for varying interpretation with some of the factors. The most notable concern was people indicating the use of primary scientific literature. The general public's definition of primary research may not be as restrictive (i.e., Facebook science, word of mouth science, etc.) as the scientific community's definition (i.e., peer reviewed articles, published research, development studies directly from vaccine producers, etc.). The definition of scientific literature as understood by the scientific community was the definition intended to be used. This may have led to some differing results, depending on each respondent's interpretations. Regardless, the influences over people's willingness to take the COVID-19 vaccine were rather consistent, except for a single variation which stood out. The only variation which influenced people's decision about the COVID-19 vaccination compared to that of the Influenza vaccine, was the timeline of production of the COVID-19 vaccine. Supporting information also shows that there is an overwhelming concern on a national level over the rapid timeline of development of the COVID-19 vaccine. This significant influencing factor led to the decision that the potentials for bias discussed earlier were not detrimental to the overall conclusions drawn.

When looking at groups who are willing to take the COVID-19 vaccination, their reasonings for taking the COVID-19 and flu vaccine were in concordance. On the other hand, when looking at groups unwilling to receive the potential COVID-19 vaccine, there was more variation in their rationale between receiving a COVID-19 vaccine and a flu vaccine. Overwhelmingly the demographics with the highest percentage of people unwilling to receive vaccination for the coronavirus all included the timeline of development as the only deviant reasoning from the common set of reasons. This shows that for the people who are unwilling to get the COVID-19 vaccine, there is significant concern over the speed at which the vaccine is being developed. This is associated with the hesitancy to participate in COVID-19 immunization that is not observed in identical demographics for the influenza vaccine. This observation is in accordance with other research as vaccinations currently in trials are being produced at record speeds.

While the world is eager to return to pre-COVID-19 ways of life, which can only happen with successful implementation of a vaccine, many are concerned by the potential dangers of a vaccine that is produced too quickly (Hoffman, 2020). The project to produce and deliver COVID-19 vaccines beginning in May 2020 was named Operation Warp Speed (Assistant Secretary for Public Affairs (ASPA), 2020). The nomenclature of the initiative proports a faster than normal production time. Tables 1-3 provide support for the hypothesis that the most influential reason for rejection of a COVID-19 vaccine in low acceptance demographics is in fact the timeline of development. Addressing this concern with unwilling demographics has the potential to increase the overall willingness of people to receive the vaccine and increase the successful implementation of the vaccine within the United States.

It is necessary the COVID-19 vaccine be accepted and received widely when it becomes available, in order to significantly reduce community spread within the United States. Some reports say that a proportion as high as 70% of the U.S. population, or 200 million people, will need to have immunity in order to have the desired effect on control of the pandemic (Mayo Foundation for Medical Education and Research [MFMER],

2020). Reiter et al. estimate that 69-70% of people are willing to receive the COVID-19 vaccine. Conversely, only 50% of our entire sample population said that they would be willing to be vaccinated against the coronavirus. There are several reasons why our results might differ from those of Reiter et al. First, the difference may be due to the sample size. While our sample size was at 226, Reiter et al. had a sample size of 2,006 individuals. A larger sample size provides more representation of the general population. Also, Reiter et al. conducted their survey in May 2020 while our survey was conducted in November 2020. Restrictions and fear surrounding contracting COVID-19 around the country in May 2020 were more severe and had lessened dramatically by November 2020. This could have resulted in the decreased sense of urgency to participate in immunization as coronavirus was not as sensational or individuals had reevaluated their opinions based on their lived experience in the months since the Reiter et al. survey was conducted.

The time at which the two surveys were conducted could provide another reason behind the differing results of Reiter et al. and our research. While a six-month difference may not seem long enough to cause a change in attitude of the general public, the coronavirus pandemic has been a rapidly evolving public health crisis with many unprecedented developments. A vaccine for coronavirus has had more time to become increasingly political throughout the year. On October 2, 2020 President Donald Trump announced that he tested positive for COVID-19. After he recovered, President Trump instructed people to not be afraid of coronavirus and not allow it to "dominate" them (Sprunt and Gringlas, 2020). This statement might have led many individuals, especially of the Republican party, to no longer feel the need to receive a COVID-19 vaccine. This may have played a role in why the Republican demographic in our study was the most unwilling to receive a COVID-19 vaccine.

We analyzed our results using a chi-squared of independence test to confirm that there is a statistically significant relationship between the different demographics and willingness to be vaccinated. The test that was statistically significant was the test for independence for political affiliation and willingness to take the COVID-19 vaccine (Table 4). This confirmed that there is a statistically significant relationship between belonging to the Republican party and being less willing to receive a COVID-19 vaccine. This information means that knowing an individual's political affiliation can help predict their willingness to get the COVID-19 vaccination. This result was expected due to the politicization of the COVID-19 vaccine through both President Trump's speeches and some Republican politicians' disapproval of the vaccine (Sprunt and Gringlas, 2020). Knowing that political affiliation affects the willingness to get the COVID-19 vaccination is essential for intervention as the intervention strategy could be more heavily implemented in areas that tend to be Republican by majority.

Another potential differentiation is accounted for by the understanding that in May of 2020, most people thought that a vaccine will only be available in another year or two, at the earliest (AJMC Staff, 2020). However, when companies announced in November of 2020 that they have come up with an effective vaccine, people were shocked at how quick the development was. This could have led to a major shift in the general public's attitudes towards a COVID-19 vaccine and their willingness to receive it. In early November 2020, Pfizer announced that their vaccine is reaching the end of stage 3 human trials, and that they have seen promising results at 90% efficacy. In late November 2020, Pfizer applied for authorization to distribute the vaccine

in both the United States and in Europe and was first approved by the U.K. on December 2, 2020 (Pfizer, 2020). This rapid timeline of development has made many weary and even fearful of the vaccine. However, it is vital that an intervention happens sooner rather than later.

In order to create an efficient and effective proposed intervention the top three influences that people who are unwilling to receive a COVID-19 vaccine listed in their survey will be used in order to reach those with similar concerns. Those top three influences were scientific literature, physician's opinion, and timeline of development. The most reported out of the three top influences was scientific literature. Much scientific literature is not available in an open access manner and requires payment for accessibility. Even scientific literature that is not behind paywalls is difficult to access, as it usually requires a deeper, more thorough search and a specialized group of comprehension skills. Unless using certain, professional websites, most searches will result in popular articles, biased news sources, and opinion pieces. A way to combat this issue is by advertising scientific literature more readily and making it much more easily accessible. This will allow the general public to have equitable access of literature surrounding major public health crises. If the information is easier to find, people may be more inclined to read it. This will also help bring more awareness to the quality of other sources they are receiving their information from. Scientific literature also uses a very advanced, academic language which is not accessible to a large portion of the general population. This results in inequity because even when the literature is available, it is usually difficult for the average person to comprehend the academic language and scientific jargon.

Another influential factor was physicians' opinions. Respondents indicated that they value the opinion of their physicians. This channel can be used to provide correct scientific information to the general public through their trusted physicians. Physicians are highly educated people who have extended knowledge regarding vaccinations and have the potential to serve as a liaison between the scientific community and the general public with whom they care for. One proposed action is to provide comprehensive literature, such as pamphlets, to primary care physicians that can be given to patients who may be vaccine hesitant. This will allow physicians to distribute the pamphlet throughout their visits with vaccine hesitant patients, providing the opportunity for people to make an informed decision. The pamphlet will include important and scientifically accurate information regarding the COVID-19 vaccine. Moreover, the pamphlet will be written in such a way that people with no scientific background will be able to understand the information easily. This will also help to remedy misinformation that is present due to the often-inaccessible language used in primary scientific literature. By making peer reviewed science easier to consume by individuals without a background in scientific education, more informed decisions can be made by all. A sample pamphlet has been provided in Appendix B.

The last of the top three influences was the timeline of production of the vaccine. Surveyed individuals communicated a concern that the vaccine will not be safe due to the unusually rapid production. Providing more information and a break down of the research and development processes used in the creation of the COVID-19 vaccine may offer reassurance to vaccine hesitant individuals. It is important to convey that in the production of a COVID-19 vaccine, a two-month period is required after each trial to ensure that there are no negative outcomes to the participants (Krause and Gruber, 2020). This time period is

equal to any other vaccine undergoing clinical trials (Vaccine Development, Testing, and Regulation). Steps are not being skipped over but are rather being done simultaneously to save time (Lurie et. al. 2020). Additionally, it is not the scientific process that is being sped up, but the bureaucratic processes involved in the production of a vaccination. A large amount of funding was provided immediately, whereas under normal circumstances it takes months to get approval for funding (ASPA, 2020). Also, a function of the Food and Drug Administration (FDA), called the Emergency Use Authorization (EUA), allows for medical products to be given out in the case of dire public health situations which have unique criteria as opposed to normal circumstances (Krause and Gruber, 2020). Worldwide collaboration and quick sharing of data among scientists were also contributors to a quicker production (Solis-Moreira, 2020). Additionally, the global intensity and destruction of the pandemic sped up the process thanks to a large public interest in enrolling for trials which gave access to the needed number of participants quickly (Cassata, 2021). Another concerned voiced by individuals who are not planning on participating in COVID-19 immunization is the risk of contracting the virus from the vaccination. Currently, the vaccines in progress do not utilize an active virus but use mRNA from the virus instead. This means that it is not possible to contract COVID-19 from the vaccine (Krause and Gruber, 2020).

CONCLUSION

In conclusion, skepticism exists in the United States regarding a COVID-19 vaccination. There are individuals who are not willing to receive a vaccine for the virus when it is released, and their unwillingness stems from several places. Reasoning for non-compliance with the vaccine comes from mainly three factors: review of scientific literature, physicians' opinions, and the timeline of development of the brand new COVID-19 vaccine. Knowing these factors is helpful in proposing interventions to alleviate distrust in the vaccine. Some ways in which intervention can occur include increasing the accessibility of scientific literature, providing access to scientifically accurate data in more conversational language, and passing informative pamphlets during doctor visits. In order for the distribution of the vaccine to have a meaningful effect, we need the cooperation of a very large portion of the population. While many people might not change their opinions regarding this issue, it is important we try to reach as many individuals as possible in order to obtain herd immunity and reduce the overall amount of morbidity and mortality caused by the novel coronavirus.

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APPENDIX A - SAMPLE SURVEY

All answers confidential and entirely anonymous.

How likely are you to get the flu vaccine annually?

Not likely *Very likely*

1 2 3 4 5

How likely are you to get a COVID-19 vaccine once it is released?

Not likely *Very likely*

1 2 3 4 5

Which age group do you belong to?

18-25 26-34 35-44 45-54

55-64 65+

What is the highest level of education obtained?

High school or equivalent

Some college

Associates degree

Bachelors degree

Masters degree

PhD.

Professional degree (JD, MD, DO, etc.)

Which political party do you most closely affiliate with?

Republican

Democratic

Independent

Libertarian

Green

Constitution

None

Other: _____

Which factors impact your decision on whether or not to get the annual flu vaccination? (Rank in order of 1st being most influential and 5th being least influential.)

	Review of primary scientific literature	Major news outlets (CNN, FOX, NBC, etc.)	Peer opinions (family/friends)	Physician opinion	Formal classroom education	Politician opinion	Timeline of development (too fast/too slow)	Personal health (health insurance accessibility, preexisting conditions, age group)	Religion	Other
1st										
2nd										
3rd										
4th										
5th										

Which factors impact your decision on whether or not to get the COVID vaccination? (Rank in order of 1st being most influential and 5th being least influential.)

	Review of primary scientific literature	Major news outlets (CNN, FOX, NBC, etc.)	Peer opinions (family/friends)	Physician opinion	Formal classroom education	Politician opinion	Timeline of development (too fast/too slow)	Personal health (health insurance accessibility, preexisting conditions, age group)	Religion	Other
1st										
2nd										
3rd										
4th										
5th										



**Olivia Englebright, Elissa Hachem,
Lexi Danielle**

**What you need to know
to make an informed
decision!**

COVID-19 Vaccine

COVID-19

Most common symptoms:

- Fever or chills
- Cough
- Shortness of breath or difficulty breathing
- Fatigue
- Muscle or body aches
- Headache
- New loss of taste or smell
- Sore throat
- Congestion or runny nose
- Nausea or vomiting
- Diarrhea

You can have COVID-19 and have no symptoms, (asymptomatic). This means that it is still important to wear a mask and socially distance. You might not know you are sick.

How COVID-19 is spread:

COVID-19 is spread through respiratory droplets, meaning it can be passed when someone sneezes, coughs, talks, breathes, and more. Close contact greatly increases the risk of spreading. This is why social distancing and staying 6 feet apart is so important. Rarely it can be spread through contact with an object that has particles of the virus, and it can be airborne if it's a tight, poorly ventilated area.

COVID-19 Vaccine

<https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html>

<https://www.cdc.gov/coronavirus/2019-ncov/vaccines/vaccine-benefits/facts.html>

<https://onlinepubs.health.wvu.edu/resources/producing-prevention-the-complete-development-of-vaccines/text/accordingtothecdc32020th ed,approval32020manufacturing320and320quality320control.html>

<https://investor.moderata.com/news-releases/news-release-details/moderna-announces-primary-efficacy-analysis-phase-3-covid-study>

<https://www.hhs.gov/coronavirus/explaining-operation-war-speed/index.html>

<https://www.pfizer.com/news/press-release/press-release-detail/pfizer-and-biontech-achieve-first-authorization-world>

<https://www.astrazeneca.com/media-centre/press-releases/2020/azd1222hfr.html>

**Phone: CDC COVID-19 hotline
1-800-CDC-INFO (1-800-232-4636)**

E-mail: insert physician's email

Process of Making a Vaccine

1. **Exploratory:** This stage is used for identifying antigens on the virus or bacteria that could be recognized by our immune systems.
2. **Pre-Clinical:** This next step is for testing if the antigen can be used to get immunity in cells in the lab or animal test subjects. When immunity can't be achieved or it causes harm to the subjects, the vaccine does not move on to the next step.
3. **Clinical Trials in humans**
 - a. **Phase 1:** This stage is tested in a small test group, around 100 people. Researchers can see responses and test effectiveness.
 - b. **Phase 2:** Similar to Phase 1 but with a much larger test group. This stage allows for more information regarding dosage and safety.
 - c. **Phase 3:** This stage tests thousands of people. Data is gathered to ensure safety.
4. **Review and Approval:** If a vaccine proves to be safe and passes all of the stages, the company that made it applies for a license from the FDA.
5. **Manufacturing:** Drug companies will mass produce the vaccine for the public.
6. **Quality Control:** Even after the vaccine is distributed, tests are being run to make sure that it is still safe and effective.

CURRENT VACCINES IN PROGRESS

Major companies began their vaccine production journey in March. Pfizer/BioNTech have produced a vaccine with 95% efficacy which was already approved in the U.K. Astra-Oxford vaccine shows prevention of 70% of COVID-19 cases. Moderna is in its phase 3 stage of the vaccine process. They have included 30,000 participants in this stage. For mild cases, the vaccine was 94, 1% effective and for the worst cases, it was 100% effective. There are currently no safety concerns.

Why is the vaccine ready so quickly?

Many people are concerned that the vaccine is being developed too quickly, implying that steps were skipped and safety was compromised. The vaccine process has progressed rapidly because the COVID-19 pandemic has been very detrimental to our public health and other aspects of society. However, no steps have been skipped. Part of the reason why vaccines take so long is due to policies, government agencies, and funding requests. For the COVID-19 vaccine, the time between steps was decreased and adequate funding was provided immediately. The safety has been maintained and scientific procedure was not changed.

WHY YOU SHOULD NOT BE WORRIED ABOUT A COVID-19 VACCINE

- All COVID-19 vaccines in progress do not use an active/live version of the vaccine, but rather another part of the virus called mRNA. This means that there is no way to get COVID-19 from the vaccine and test positive.
- Receiving the vaccine will not change your DNA or have any effect on your DNA. The vaccine will not even enter the nucleus, which is where your DNA is.
- Getting the COVID-19 vaccine will most likely prevent you from getting sick with COVID-19.
- The effects of COVID-19 are far more harmful than any small side effects a vaccine might have.
- Getting vaccinated can even be beneficial for those who have already contracted COVID-19 in the past.