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RESEARCH

COVID-19 and influenza vaccine hesitancy among college students

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ABSTRACT

Background: Successful vaccination against coronavirus disease 2019 (COVID-19) is an essential component of achieving community immunity to bring the COVID-19 pandemic to an end. Vaccine hesitancy, identified as a top threat to global health by the World Health Organization, is a significant barrier to vaccine uptake. With COVID-19 vaccination programs in effect since December 2020, it is critical that vaccination barriers are proactively identified. With limited information surrounding college students' perspectives on COVID-19 vaccines, outreach measures will play a pivotal role in vaccine uptake in this population. Development of informative, cohort-driven vaccination campaigns requires proactive assessment of factors influencing vaccine hesitancy, access, and uptake.

Objectives: The primary objective of this study was to investigate the spectrum of vaccine hesitancy among college students at the University of Rhode Island (URI). The secondary objective was to identify differences in COVID-19 and influenza vaccine hesitancy rates in this population.

Methods: A 22-item, Institutional Review Board–approved, anonymous questionnaire was developed to survey URI students who voluntarily attended 2 joint University Health Services and College of Pharmacy influenza vaccination clinics in November 2020.

Results: A total of 237 vaccination clinic participants consented and responded to at least 1 question on the survey. Once available to their respective priority group, 92% are very/somewhat likely to receive a COVID-19 vaccine and 50% will receive a COVID-19 vaccine as soon as possible. Only 3% of the participants stated that they would never receive a COVID-19 vaccine. The top 3 reported COVID-19 vaccine–related concerns were safety (37%), effectiveness (24%), and limited information (16%). When asked if COVID-19 vaccines and influenza vaccines should be mandated, 85% and 83%, respectively, were in favor.

Conclusion: Understanding the spectrum of vaccine hesitancy is critical in achieving COVID-19 community immunity thresholds. URI students are willing to be vaccinated against COVID-19 provided that the vaccines are proven safe and efficacious.

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Background

Coronavirus disease 2019 (COVID-19) has accounted for millions of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infections in the United States and the deaths of more than half a million Americans since the pandemic's inception.¹ If current trends continue, COVID-19 will remain as

the leading cause of death in the United States.² With case numbers continuing to set daily records, public health officials and the new administration are advocating for strengthened transmission mitigation strategies nationwide, including accessible testing, physical distancing measures, mask requirements, and accelerated rates of COVID-19 vaccination.³ Pfizer BioNTech, Moderna, and Johnson & Johnson/Janssen COVID-19 vaccines are the first to receive Emergency Use Authorization (EUA) by the Food and Drug Administration (FDA), and several more vaccines have completed or are undergoing phase 3 randomized controlled studies. With statewide vaccination efforts underway, Americans are cautiously but increasingly optimistic about receiving the vaccine.^{4,5}

However, achieving the suggested COVID-19 community immunity threshold of 70%–85% poses a significant challenge given increased reports of vaccine hesitancy, particularly

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among health care workers, which, until recently, was compounded by the absence of an organized national immunization strategy.^{6–8} Vaccine hesitancy, identified as a top threat to global health by the World Health Organization (WHO) in 2019, is a significant barrier to vaccine uptake and community immunity.⁷ Vaccine hesitancy is described as “the delay in acceptance or refusal of vaccines despite availability of vaccination services,” by WHO. Pharmacists play an integral role in mitigating vaccine hesitancy and promoting vaccine uptake.⁹ The American Pharmacists Association released guidance referencing 2 important models, the 3Cs and the 5As, to understand and address prominent factors influencing vaccine hesitancy; factors including confidence, complacency, and convenience (3Cs) and access, affordability, awareness, acceptance, and activation (5As).¹⁰ Numerous national surveys have attempted to proactively assess vaccine uptake on the basis of such factors. One survey reported an overall decline in COVID-19 vaccination likelihood from 74% in April to 56% in December 2020, and cohort analyses (women vs. men, black vs. white individuals, 65 years and older vs. 18–49 years, and those with a bachelor’s degree vs. a high school education or less) showed a larger decline in COVID-19 vaccination likelihood among women, black individuals, individuals aged 18–49 years, and those with a high school education or less.¹¹ Such results further supported the need for systematic vaccine hesitancy assessments to improve COVID-19 vaccination rates.

With limited information surrounding college students’ perspectives on COVID-19 vaccines, carefully crafted outreach measures will play a pivotal role in vaccine uptake in this population. A recent *New York Times* survey indicates that college campuses account for at least 397,000 SARS-CoV-2 cases in the United States; however, it is likely that a substantial number of untested students may have unknowingly contributed to asymptomatic viral transmission.¹² Although younger, healthier people, such as college students, were not an initial priority group for vaccination, counties with universities and colleges that returned to in-person instruction in the fall of 2020 experienced relatively higher incidence rates in COVID-19 cases than counties without these institutions owing to community spread.^{13,14} Therefore, in addition to emphasis on physical distancing, mask wearing, and gathering limits, development of informative, cohort-driven vaccination campaigns on college campuses will ensure that not only students are protected but also people at risk of severe disease, hospitalization, and death in their communities.

Objectives

The primary objective of this study was to investigate the spectrum of vaccine hesitancy among college students at the University of Rhode Island (URI). The secondary objective was to identify differences in COVID-19 and influenza vaccine hesitancy rates in this population.

Methods

Study design, population, and setting

This descriptive, cross-sectional survey study was approved by the URI Institutional Review Board (IRB) as exempt research. URI Health Services and the College of

Pharmacy organized 2, no-cost influenza vaccination clinics staffed by volunteers and students from both. To promote the clinics, URI Health Services sent university-wide e-mail messages with the location, dates, and times of the clinics on the morning of the first clinic (Monday, November 9, 2020, 4 PM–7 PM) and on November 12, 2020 before the Monday, November 16, 2020, 10 AM–1 PM clinic. These e-mails included links to the online Qualtrics (Qualtrics, Provo, UT) survey as a URL and QR code. At the clinics, identical QR code survey links were accessible to clinic participants on the back of the vaccine consent forms. Volunteers encouraged participants to complete the 5-minute survey while waiting in line to get vaccinated and while being observed after the vaccination. Any student, aged 18 years or older, enrolled at URI who voluntarily attended the Health Services and College of Pharmacy influenza vaccination clinic was eligible to complete the survey. Although certain cohorts of students (e.g., nursing, pharmacy) are required to receive the influenza vaccine for clinical experiences, influenza vaccination is not mandated by the university. There were no incentives for survey completion. Survey responses were anonymous and only accessible by the researchers.

Survey development

Participants reviewed a consent document and provided informed consent before proceeding with the questionnaire. Demographics collected included age, gender, ethnicity, area of residence, medical history, and current employment. The remaining 16 multiple-choice questions assessed the participants’ vaccination preferences, level of concern if they became sick with influenza or COVID-19, willingness to receive influenza and COVID-19 vaccines, perceived benefits and concerns with influenza and COVID-19 vaccines, and vaccine mandate preferences. Influenza vaccines were used as a comparator to assess if vaccine hesitancy rates differed among students when compared with the novel COVID-19 vaccine(s). Participants could only select 1 response, with the exception of 2 “select all that apply” demographic questions, and responded to likelihood questions using a 4-point Likert scale.

Survey completion took less than 5 minutes for the 22-item questionnaire. Participants could exit the survey at any time, and only completed responses were recorded on survey submission. Recorded responses securely stored within Qualtrics were accessed by the study researchers for data analysis. Demographic data were summarized using descriptive statistics and proportions. For Likert survey questions assessing concern surrounding influenza and COVID-19 illness, influenza and COVID-19 vaccine mandates, and benefits of receiving influenza and COVID-19 vaccines, Mann-Whitney U tests were performed among cohorts to identify if responses were affected by demographics such as age (18–19 vs. 20–29 years), gender (participants who identify as female vs. male), ethnicity (participants who identify as white vs. non-white), and occupation (health professional vs. non-health professional); $P < 0.05$ indicated significance. To compare survey question differences between influenza vaccinations and COVID-19 vaccinations, chi-square tests of independence were used. All statistical analyses were performed using IBM SPSS version 26 (Armonk, NY). To assist with ease of readability in tables, Likert-scale responses were consolidated into similar

groupings (e.g., very/somewhat likely and very/somewhat unlikely).

Results

A total of 534 students attended the university-wide influenza clinics. Of those participants, 300 accessed the Qualtrics survey (56%) and 237 consented and responded to at least 1 survey question, of whom greater than 94% responded to all survey questions. Demographic information (Appendix 1) collected at the end of the survey indicated that 97% ($n = 230$) of the participants were aged 18-29 years, 65% ($n = 155$) identified as female, and most identified as white, 84% ($n = 199$). Reported results are based on those that responded to at least 1 survey question.

Survey questions assessed vaccination preferences as well as vaccine hesitancy factors related to influenza and COVID-19 vaccination. A comparison of survey question differences between influenza and COVID-19 vaccinations is found in Table 1. When asked if they were concerned about getting sick, statistically significant more participants were more concerned about COVID-19 illness than influenza. Females reported increased concern surrounding COVID-19 ($P = 0.025$);

however, participants who did not identify as white were more concerned about influenza ($P = 0.031$). More students were motivated to receive the influenza vaccine to prevent physician visits ($P = 0.03$) and to protect themselves ($P < 0.001$), whereas students were more motivated to receive the COVID-19 vaccine to reduce viral spread ($P = 0.004$). Consistent with previously published vaccine hesitancy survey data, the top 3 reported COVID-19 vaccine-related concerns were safety (37%), effectiveness (24%), and limited information (16%).^{2,15,16} Students were more concerned about limited access to and safety of COVID-19 vaccines, whereas most of the students indicated no concern to receiving the influenza vaccine. Survey takers were in favor of mandatory influenza and COVID-19 vaccinations by a margin of 6:1. Participants who identified as female ($P = 0.011$), non-white ($P = 0.039$), and a health care worker ($P = 0.032$) were more likely to support influenza vaccine mandates than their counterparts. COVID-19 vaccine mandate preferences were not statistically different among the analyzed cohorts.

The remaining questions (Table 2) assessed general vaccination preferences as well as vaccine specific behaviors. Of the participants, 53% ($n = 125$) were more likely to receive the influenza vaccine because of the COVID-19 pandemic. In the

Table 1
Influenza vs. COVID-19 vaccinations

Survey question	Survey response	Influenza % (n)	COVID-19 % (n)	P value
How concerned are you that you will get sick with influenza and COVID-19?	Very/somewhat concerned	40 (94)	79 (187)	$P < 0.001^a$
Do you think the influenza and COVID-19 vaccine(s) should be mandated?	Not too/not at all concerned	60 (142)	21 (49)	$P = 0.52$
	Definitely/probably yes	83 (197)	85 (202)	
What do you think is the biggest benefit of receiving the influenza and COVID-19 vaccine(s)?	Definitely/probably not	16 (38)	14 (33)	$P = 0.03^a$
	Prevent doctor's visit	4 (9)	1 (2)	
	Prevent hospital stay	4 (10)	3 (6)	$P = 0.31$
	Protect others	33 (78)	41 (96)	$P = 0.20$
	Reduce spread	27 (63)	38 (91)	$P = 0.004^a$
	Protect yourself	30 (71)	15 (35)	$P < 0.001^a$
What is your biggest concern with the influenza and COVID-19 vaccine(s)?	Other	2 (5)	3 (6)	$P = 0.76$
	Cost	6 (14)	4 (10)	$P = 0.40$
	Effectiveness	23 (55)	24 (58)	$P = 0.67$
	Limited access	3 (6)	14 (33)	$P < 0.001^a$
	Limited information		16 (38)	
	Multiple doses		1 (3)	
	Adverse effects/safety	19 (44)	37 (88)	$P < 0.001^a$
	Supply	3 (6)		
No concern		44 (104)		
	Other	3 (7)	3 (6)	

Abbreviation used: COVID-19, coronavirus disease 2019.

^a $P < 0.05$ denotes significance.

study population, the responses indicated a 23% increase in 2020–2021 influenza vaccine receipt as compared with the 2019–2020 season. In addition, students responded positively to receiving COVID-19 vaccinations. Once available, 92% ($n = 219$) are likely to receive a proven safe and effective COVID-19 vaccine, and 50% ($n = 118$) will receive a COVID-19 vaccine as soon as possible. Students trust health professional recommendations, with 99% ($n = 235$) and 91% ($n = 215$) likely to accept physician and pharmacist vaccine recommendations, respectively; however, only 14% ($n = 34$) use health professionals to stay up-to-date on COVID-19 information. Instead, nearly 60% ($n = 136$) use the Internet and social media for COVID-19 updates.

Discussion

At the time this survey was developed and released, COVID-19 vaccines were not available. To mitigate nationwide concerns regarding vaccine access, allocation plans were based on a phased or priority group approach. In accordance with evolving national guidelines, state regulators rapidly adjusted priority group assignments to ensure successful, equitable, and accessible COVID-19 vaccine programs. Priority group considerations involved maintaining a delicate balance of Centers for Disease Control and Prevention (CDC) COVID-19 vaccine program goals. These include ensuring the safety and effectiveness of COVID-19 vaccines, reducing disease transmission, mitigating morbidity and mortality of COVID-19 disease, helping minimize disruption to society and the economy while maintaining health care capacity, and ensuring equity in vaccine allocation and distribution.⁸ Vaccines are now available to all adults aged 18 years and older as the final step of states' phased allocation plans to improve vaccination distribution and administration rates.

To assist with vaccination efforts and prioritize transmission control, college students should be considered a targeted population moving forward in vaccination efforts. To identify increasing COVID-19 transmission areas and support state and local health departments, CDC assessed COVID-19 transmission dynamics by age group from April to September 2020 within hotspot counties. Trends indicate that early increases in percent positivity among persons up to 24 years were followed by several weeks of increasing positivity rates in persons at least 25 years; at hotspot detection, percent positivity peaked at 15% in persons aged 18–24 years, whereas rates continued to increase 21–33 days later in other age groups.⁸ In addition, young adults, aged 18–24 years, account for 57.4% of 2,871,828 confirmed cases in persons up to 24 years through December 2020. Given increased COVID-19 incidence and community transmission rates among college-aged young adults, CDC urges schools to fully implement multiple mitigation strategies to slow community spread.¹⁷ Historically, college students have been the focus of numerous studies to identify barriers to vaccine uptake and vaccine hesitancy factors, especially with the annual influenza vaccine. Influenza vaccination rates on college campuses consistently fall below national vaccination goals despite high transmission rates and vaccine availability.¹⁸ For this reason, this study, among others, used the influenza vaccine as a comparator when assessing COVID-19 vaccine intentions. The United States, among other countries, focused on reserving

limited vaccine supplies for high-risk individuals based on age and comorbidities, so it remains to be seen if reducing cases among the transmitting population is as effective a strategy. Our survey results indicated that college students are aware of the critical importance of COVID-19 vaccination, with nearly 80% motivated to receive vaccination to protect others and reduce viral transmission as shown in Table 1. With more than 90% of our surveyed college students likely to receive the COVID-19 vaccine once available to them, in any location, campus-wide vaccination programs are well poised to lead to a reduction in transmission rates.

Successful campus-wide vaccination programs require a multifaceted approach in collaboration with local health professionals and institutional health care programs, such as College of Pharmacy faculty and students. A major barrier to address, particularly in this population, is prevalent misinformation on Internet and social media platforms. Our survey data revealed that college students are much more likely to receive a vaccination when recommended by a physician or a pharmacist; however, access to vaccine positive messages and reliable resources may be challenging. Research on social media disproportionately promoting vaccine hesitancy indicates that antivaccine content incites more user engagement with antivaccine tweets more likely to be retweeted by 4.13 fold.¹⁹ With nearly 60% of our college students receiving COVID-19–related information from such platforms, it is critical that experts at higher education institutions and public health departments are used to share accurate, reliable vaccine information by platforms preferred by students. Furthermore, most of our college students indicated increased concern regarding vaccine adverse effects and safety, effectiveness, and limited information, thus programs should tailor educational messages to these specific concerns. Health information can be difficult to navigate, especially in young adults who have had their health care organized and directed by parents and caregivers for most of their lives. Overcoming vaccine hesitancy is not a one size fits all; however, knowing the audience and their needs is a critical step. Targeting education on vaccine-preventable diseases, immunology, and critical thinking based on student's level of education, delivered through multiple communication channels has been shown to reduce vaccine hesitancy and mitigate vaccine misinformation.^{20,21} Given that one-third of our students have no preference on where they receive their COVID-19 vaccine, institutional personnel should take this opportunity to increase accessibility through on-campus vaccination clinics.

This study had various strengths and limitations. The large sample size allowed researchers to effectively collect and report new information on college student perspectives on influenza and COVID-19 vaccines. In addition, survey distribution coincided with a surge in COVID-19 cases and imminent EUA of 2 vaccine candidates, making findings pertinent to the primary objective. However, owing to a limited time frame to submit for and receive IRB approval before the first influenza clinic, survey questions were not piloted or validated, which may have led to redundant or misguided questions. The questionnaire was only provided to URI students and other URI community members who attended influenza clinics with the intention of receiving a vaccination, introducing bias toward vaccine uptake. As discussed, influenza vaccine hesitancy on college campuses negatively affected past vaccination rates. To

Table 2
Vaccination behaviors and preferences

Survey question	Survey response	% (n)
Where do you typically get your vaccinations?	Doctor's office	63 (150)
	Pharmacy	16 (37)
	School/College	19 (46)
	Workplace	1 (2)
How likely are you to get a vaccine if recommended by your:		
	Doctor	Very/somewhat likely 99 (235) Not that/not at all likely 0 (1)
Pharmacist	Very/somewhat likely	91 (215)
	Not that/not at all likely	8 (19)
Partner/spouse	Very/somewhat likely	88 (208)
	Not that/not at all likely	11 (25)
Family member	Very/somewhat likely	89 (212)
	Not that/not at all likely	9 (22)
Friend	Very/somewhat likely	80 (189)
	Not that/not at all likely	19 (45)
Did you get the influenza vaccine last year for the 2019–2020 influenza season?	Yes	70 (166)
	No	28 (67)
Did you get or are you planning on getting the influenza vaccine this year for the 2020–2021 influenza season?	Yes	93 (220)
	No	2 (5)
	Undecided	5 (11)
How has the current COVID-19 global pandemic affected your decision to receive the 2020–2021 influenza vaccine?	Much more/more likely	53 (125)
	No change	46 (110)
	Much less/less likely	0 (1)
If proven safe and effective, how likely are you to get a COVID-19 vaccine once one is available for you?	Very/somewhat likely	92 (219)
	Not too/not at all likely	7 (16)
Once available for you, when are you likely to get a COVID-19 vaccine?	As soon as possible	50 (118)
	Within days	13 (30)
	Within weeks	19 (46)
	Within months	15 (35)
	Never	3 (7)

(continued on next page)

Table 2 (continued)

Survey question	Survey response	% (n)
If you had the choice, where would you prefer to get a COVID-19 vaccine administered?	Doctor's office	36 (85)
	Drive-thru vaccination clinic	11 (25)
	In-person vaccination clinic	6 (14)
	Pharmacy	8 (19)
	Workplace	3 (6)
How do you mainly stay up-to-date on COVID-19 related information?	No preference	35 (82)
	Other	2 (5)
	Family/Friends	9 (20)
	Health professionals	14 (34)
	Internet/Social media	57 (136)
	Newspaper	3 (7)
	Radio	1 (2)
	TV – News	16 (37)

Abbreviation used: COVID-19, coronavirus disease 2019.

counteract this, surveys addressed the need to understand vaccination barriers or hesitancy to enhance educational opportunities.¹⁸ Although vaccine uptake bias may have skewed the results, influenza vaccine and COVID-19 vaccine hesitancy factors differed as shown in [Tables 1 and 2](#), which supports the need for institutions to consider such factors when creating educational programs to increase vaccination uptake campus-wide. Study findings are representative of this population and may not be generalizable to a larger sample of college students. Participants were not asked about university affiliation (e.g., student or faculty/staff member) in the demographics, thus it is possible that faculty/staff completed the survey. In addition, since survey demographics did not ask about previous vaccine knowledge nor field of study, this may have potentially confounded the results. As COVID-19 data change daily, this research was conducted before the release of phase two-third efficacy data on currently available COVID-19 vaccines through FDA's EUA, which may influence current vaccine hesitancy rates.

Conclusion

Understanding the spectrum of vaccine hesitancy on college campuses is a critical step in slowing community spread and achieving COVID-19 immunity thresholds. Published data demonstrate increased COVID-19 incidence and community-wide transmission rates among college populations.^{8,17} When vaccine is plentiful, efforts should be made to target this group for vaccination to mitigate transmission. Surveyed college students are willing to receive the COVID-19 vaccine, at any location, and campuses are well positioned to develop successful, cohort-driven vaccination campaigns.

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Appendix

Appendix 1

Demographic data of study population

Demographics	% (n)
Age, y	
18–19	43 (103)
20–29	54 (127)
30–39	2 (4)
40–49	0 (1)
50–59	0 (1)
Gender identity	
Female	65 (155)
Male	30 (70)
Nonbinary	3 (7)
Transgender male	1 (2)
Prefer not to answer	1 (3)
Race/Ethnicity	
American Indian or Alaska Native	0 (1)
Asian	4 (9)
Black or African American	3 (6)
Hispanic	5 (11)
Multiracial	2 (5)
Native Hawaiian or Pacific Islander	1 (3)
White	84 (199)
Other	1 (2)
Medical conditions	
Diabetes	0 (1)
Kidney disease	0 (1)
Lung disease	0 (1)
Obese	3 (7)
Pregnant	0 (1)
Smoking/Vaping	7 (17)
Working group	
Essential worker	11 (27)
Health care worker	17 (39)
Public health worker	1 (2)