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Utilizing the Theory of Planned Behavior to determine the intentions to receive the influenza vaccine during COVID-19: A cross-sectional survey of US adults

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ABSTRACT

Vaccine hesitancy, especially in the setting of an ongoing COVID-19 pandemic and upcoming flu season, may pose a significant burden on US healthcare systems. The objective of this study was to evaluate the intentions of US adults to receive the influenza vaccine this flu season (2020–2021). A cross-sectional, population-based survey study of US adults age 18 years and older was distributed in early September 2020. The primary outcome was the intention to receive the flu vaccine assessed with a survey instrument based on the Theory of Planned Behavior. Three-hundred sixty-four adults (59.1% female, 66.5% white), completed the survey. Twenty percent of participants had already received the flu vaccine, 54.3% indicated high probability of getting the flu vaccine this flu season, and 49% would get it at a doctor's office. Concerns regarding adverse effects from the flu vaccine was a major barrier to vaccination and family (58.1%) was the primary influencer in participants' decision to get vaccinated. Participants who indicated that getting the vaccine was beneficial to them and that their doctor thinks they should get the flu vaccine were significantly more likely to have the intent of getting vaccinated. Approximately half of US adults believed that the flu vaccine was beneficial to them and indicated intent to receive the vaccine this flu season. Doctors can help educate patients regarding the limited adverse effects of flu vaccines, and include patients and their families in vaccination discussions – because families are influential in the decision-making process – to increase flu vaccination uptake.

1. Introduction

With the start of a new influenza (flu) season in the US, many healthcare providers and public health officials have raised concerns over the possibility of a concurrent flu epidemic in addition to the COVID-19 pandemic (Gostin and Salmon, 2020; Belongia and Osterholm, 2020; Solomon et al., 2020; Grech and Borg, 2020; Li et al., 2020). According to the Centers for Disease Control and Prevention (CDC), there were between 39 and 56 million reported flu illnesses leading to 410,000–740,000 hospitalizations, and 24,000–62,000 deaths during the 2019–20 flu season (2019-2020 US Flu Season, 2020). The CDC also reported that since tracking COVID-19 cases in late January 2020, the US has seen over 32 million reported COVID-19 cases leading to over 570,000 deaths as of May 1st, 2021 (CDC COVID Data Tracker, 2021). These statistics show that while COVID-19 may not be as virulent as the seasonal influenza virus, mortality is significantly higher. COVID-19 has already overwhelmed the healthcare system at its onset, and having a competing epidemic and pandemic in the fall and winter seasons may precipitate another healthcare system overwhelm (Shuster, 2020; Rosenthal et al., 2020). If this occurs, we may see repeat shortages of hospital beds, ventilators, personal protective equipment, and medications, increases in burnout among healthcare workers, and increases in patient mortality rates. Therefore, flu vaccinations must be a priority for the United States.

A recent article pointed out the urgency to increase the flu vaccination rate in the US because flu vaccine hesitancy is a well-documented public health issue (Schmid et al., 2017; Jaklevic, 2020). For the 2019–2020 flu season, only 48.4% of adults aged 18 years and older received the flu vaccine (Flu vaccination coverage, United States, 2020). In vaccinated patients, the risk of contracting the flu decreases by an

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estimated 40–60 percent (Vaccine Effectiveness, 2020). In unvaccinated adults, the risk of flu infection ranges from 3.5 to 10.7 percent (Jayasundara et al., 2014; Somes et al., 2018). Additionally, with COVID-19 stay-at-home orders, emphasis on minimizing going outside, and decline in patients seeing their healthcare providers unless urgent or emergent, the rate of flu vaccination is expected to decrease (Belongia and Osterholm, 2020). In order for healthcare providers and public health officials to determine effective public health interventions to improve flu vaccination rates, baseline understanding of the general population's beliefs and intentions to receive the flu vaccine must be assessed first to have a clear understanding of the severity of vaccine hesitancy during COVID-19.

For individuals to carry out a targeted health behavior – in this case, receiving the flu vaccine – the Theory of Planned Behavior (TPB) model posits that they must believe in the positive consequences of their behavior, perceive familial and societal pressure to participate in the behavior, and believe that carrying out the behavior is within their control (Ajzen, 1991). Positive correlation with individuals' attitudes (i.e. I believe that the flu vaccine is effective), social norms (i.e. My family thinks I should get the flu vaccine), and perceived behavioral control (i.e. I have the time to get the flu vaccine) are associated with greater intention to complete the health behavior. Therefore, this study seeks to evaluate the general public's intentions to receive the 2020–2021 flu vaccine using the TPB model.

2. Methods

2.1. Participants

The study utilized a cross-sectional survey design and was administered using SurveyMonkey Audience, via email and in-app notifications to eligible participants, in early September 2020. SurveyMonkey Audience maintains a national panel of survey participants and the sample used in this study included US adults aged 18 years and older. There were no exclusion criteria. The sample size was calculated based on Tabachnick's recommendation of a minimum of 10 participants per predictor variable for analyses that involve associations, such as regression analyses (Tabachnick and Fidell, 1996). Therefore, with 15 independent variables, the minimum required sample size was 150. A sample size of 250 was agreed upon based on literature. The cover page of the survey included a description of the study that stated, "The purpose of this research study is to evaluate the general public's beliefs and intentions on receiving the influenza vaccine during the COVID-19 pandemic." This statement, as well as the survey's administration in early September 2020 before the flu season started, provided the context of possible concurrent flu and COVID virus circulation. Participants were provided an informed consent with the description of the study. Those who consented to participate in the research proceeded to take the survey. The study was approved by the Institutional Review Board at Roseman University of Health Sciences.

2.2. Measures

The survey had 22 items, composed of Likert-scale, rank order, and select all that apply questions, developed by the authors based on TPB framework. The survey was tested for face validity by piloting it with eight non-medical individuals, based on the intended survey demographic, and adjusted for clarity. Nine of the questions were demographics, such as age, gender, race/ethnicity, education, income, possession of medical and prescription insurance, region of residence, and occupation as a healthcare provider. Gender (male, female, other) and race/ethnicity (White, Asian, Hispanic or Latino, Black or African American, multiracial or multiethnic, Native American or Alaska Native, Native Hawaiian or other Pacific Islander, Other) were defined by SurveyMonkey using their standard demographic questions and self-reported by participants. The demographic variable of race/ethnicity was collected as lower rates of influenza vaccination have been reported in Black, Hispanic, and American Indian/Alaskan Native participants (Grohskopf et al., 2020).

Six questions related to receipt of the flu vaccine this flu season (2020–2021), receipt of flu vaccine last flu season (2019–2020), intent to receive the flu vaccine this flu season, intent to receive a potential COVID-19 vaccine, diagnosis of influenza in the past five years, and diagnosis of COVID-19. One question each inquired the location where participants were most likely to get the influenza vaccine, barriers preventing participants from getting the vaccine, likelihood of various stakeholders and informational resources to influence participants' decision to get the vaccine, and likelihood of a pharmacist to influence the participants' decision to get the vaccine.

There were four questions based on the TPB framework, with one statement on intention (I plan on getting the flu vaccine this year), six statements assessing participants' attitudes about the flu vaccine, six statements on subjective norms, and four statements related to perceived behavioral control. For these TPB questions, a 7-point Likert-scale ranging from strongly disagree to strongly agree was used.

Attitude items, such as, "I believe the flu vaccine is effective", represented the participant's beliefs regarding the flu vaccine. Subjective norms statements were used to determine the participant's belief that significant people in their life think they should get the flu vaccine. One example was, "My family thinks I should get the flu vaccine". Perceived behavioral control items described whether the participant thought they had control of getting the flu vaccine. In example, "Getting the flu vaccine is completely up to me". The mean of the items was used to develop the construct scores: attitude, subjective norm, and perceived behavioral control. Cronbach's alpha was used to assess internal consistency of the construct items, and bivariate correlation coefficients assessed the relationships between the TPB constructs and behavioral intention to get the influenza vaccine.

2.3. Statistical analysis

Data were analyzed using SPSS Version 26 (IBM). Descriptive statistics were used to describe the data based on counts and frequencies for categorical data and mean and standard deviation for continuous data. A regression model was used with intention to receive the flu vaccine as the dependent variable and attitude, subjective norm, and perceived behavioral control as the independent variables. The model was controlled for age, gender, race, education, income, region of residence, medical insurance, prescription insurance, receipt of the flu vaccine last flu season, diagnosis of the flu in the last five years, and status as a healthcare provider.

3. Results

Data collection was completed in two days and the survey yielded a total of 364 completed responses. Almost 60% of the participants were female, 66.5% were white, and 30% of participants were between the ages of 30–44 years, and another 30% between 45 and 60 years. A little over half of the participants (51.4%) had received less than a bachelor's degree, and 37.1% had an annual household income of less than $50,000. More than 75% of participants had medical and prescription insurance. Table 1 provides a detailed description of participant demographics.

More than half of the participants (56.0%) stated that they received the flu vaccine last flu season. Seventy-one participants (19.5%) indicated that they had already received the flu vaccine by the time the survey was administered on September 4th, 2020. Of the remaining 293 participants, 54.3% said that they were likely or very likely to get the flu vaccine this flu season. However, a third of participants indicated that they were unlikely or very unlikely to get the flu vaccine this flu season. When asked about the participants' beliefs about the flu vaccine, 46.6% said they agreed or strongly agreed that it was beneficial to them, and

Table 1
Demographic characteristics of participants.

	No. (%)
No. of participants	364
Female	215 (59.1)
Age* **(years)**	
18–29	95 (26.3)
30–44	108 (29.9)
45–60	106 (29.4)
>60	52 (14.4)
Race/Ethnicity	
White	242 (66.5)
Asian	37 (10.2)
Hispanic or Latino	35 (9.6)
Black or African American	31 (8.5)
Other (Multiracial, Native American, Alaska Native, Native Hawaiian, Pacific Islander, American, Arabic)	19 (5.2)
Highest level of education or degree	
High school degree or equivalent (e.g. GED)	57 (15.7)
Some college but no degree	72 (19.8)
Trade/technical/vocational training	16 (4.4)
Associate's degree	42 (11.5)
Bachelor's degree	100 (27.5)
Master's degree	56 (15.4)
Doctorate degree	9 (2.5)
Professional degree	7 (1.9)
Household Income*	
<$25,000	59 (16.3)
$25,000-$49,999	76 (21.1)
$50,000-$74,999	62 (17.2)
$75,000-$99,999	60 (16.6)
$100,000-$149,999	50 (13.9)
More than $150,000	18 (5.0)
Prefer not to answer	36 (10.0)
Region†	
Pacific	65 (18.2)
South Atlantic	58 (16.3)
Middle Atlantic	53 (14.9)
East North Central	47 (13.2)
West South Central	37 (10.4)
Mountain	27 (7.6)
New England	24 (6.7)
East South Central	24 (6.7)
West North Central	22 (6.2)
Medical Insurance	
Yes	321 (88.2)
No	37 (10.2)
Don't Know	6 (1.7)
Prescription Insurance	
Yes	275 (75.6)
No	64 (17.6)
Don't Know	25 (6.9)
Healthcare Provider (No)	290 (79.7%)

* n = 361,

† n = 357.

51.8% said they agreed or strongly agreed that it protected the people around them or their social circle.

Even though close to 90% of the participants said that they had not been diagnosed with COVID-19, almost 40% of them reported that they were likely or very likely to get the COVID-19 vaccine, if available. A quarter of respondents (25.3%) reported that they were unlikely to very unlikely to get the COVID-19 vaccine. The remaining respondents were either non-committal or reported somewhat likely or unlikely.

Almost half of the participants (48.9%) indicated that they would most likely get the flu vaccine at a doctor's office, followed by 30.0% at a community pharmacy. Concerns about adverse effects from the flu vaccine was ranked as the number one barrier to receiving the vaccine (41% of respondents). Additional barriers included fear of needles (22.3%), and inconvenience (17.2%). Participants were most likely to be influenced regarding their decision to get the flu vaccine by family, followed by their doctor, with 58.1% and 42.7% ranking it as their number one influencer, respectively. Only 22.6% of participants indicated that their decision would be influenced by a pharmacist, with 23.3% stating that a pharmacist providing education or contacting the participant would influence their decision to get the flu vaccine.

The mean of the intention to get the flu vaccine was 4.69 with a standard deviation of 2.47, on a range from 1 (very unlikely) to 7 (very likely). Table 2 provides details for the mean of the constructs, and the reliability statistics. The Cronbach's alpha was above 0.7 and acceptable for all the three constructs. Intention to receive the flu vaccine had a strong correlation with attitude and subjective norm. However, the strength of the correlation was moderate between intention and perceived behavioral control.

Among the attitude statements, most people believed that the flu vaccine was effective, beneficial to them, and helped protect the people around them. However, the agreement was less for the statements that they were at high risk for the flu, they were at high risk for the flu due to COVID-19, or that there were serious health risks associated with the flu vaccine. For the subjective norm statements, the agreement was high when the recommendation came from health officials, followed by their doctor, pharmacist, and family. The perceived behavioral control item with the strongest agreement was, "Getting the flu vaccine was completely up to me".

In the regression analysis (R squared = 78.9%), the significant predictors of intention to receive flu vaccine were attitude, subjective norm, having received the flu vaccine last flu season, race, and healthcare provider status (Table 3). The correlation between intent to receive the flu vaccine and the intent to receive the COVID-19 vaccine was statistically significant at 0.621 (p-value = 0.000).

Better attitude towards the flu vaccine and influence of significant others can positively affect the intention to receive the flu vaccine. When a sub-analysis was conducted to determine which items among the attitude and subjective norm contributed towards the significance, the statements, "I believe getting the flu vaccine was beneficial for me", and "my doctor thinks I should get the flu vaccine" were identified. Having received the flu vaccine last flu season was a significant predictor for intention to receive it this flu season. Compared to white participants, Hispanics were less likely to have the intention of getting the flu vaccine. Healthcare providers (HCPs) were also less likely to have the intention to receive the flu vaccine.

4. Discussion

The aim of the study was to use the Theory of Planned Behavior to determine the general public's intention to receive the flu vaccine this flu season during a pandemic of another respiratory virus, COVID-19. The intention to receive the vaccine was expressed by more than half (54.3%) of the respondents, with an additional 19.5% of respondents already vaccinated. This percentage is slightly higher than CDC reported flu vaccination rates from the 2019–20 flu season (48.4%), which is promising (Flu vaccination coverage, United States, 2020). It is also higher than reported intentions to receive the flu vaccine according to a similar study conducted by the CDC between September 10th and October 1st; 2020 (Lindley et al., 2020). In that study, 46.7% reported being absolutely certain or very likely to receive the vaccine, and 12.3% of respondents had already been vaccinated. Results from this study also are higher than another similar study by Mercadante and colleagues conducted between October 23rd and October 29th, 2020 (Mercadanate and Law, 2020). In that study, 53% of respondents reported either having received or intending to receive the 2020–2021 flu vaccine. Despite higher reported flu vaccination intent this flu season (2020–2021) than the previous flu season (2019–2020), a third of the participants in our study indicated high likelihood of not getting

Table 2
Characteristics of the TPB model constructs.

	# of items	Range	Mean	Standard Deviation	Cronbach's alpha	Pearson's Correlation Coefficient with Intention
Attitude Score	6	1–7	4.38	1.36	0.833	0.800
Subjective Norm Score	6	1–7	4.96	1.38	0.899	0.705
Perceived Behavioral Control Score	4	1–7	5.59	1.22	0.785	0.486
Intention	1	1–7	4.69	2.47		

Table 3
Parameter estimates for the regression model predicting intention to get the flu vaccine.

	Regression Coefficient	p-value	Confidence Intervals
Attitude	0.891	0.000	0.714–1.068
Subjective Norm	0.266	0.005	0.080–0.451
Received flu vaccine last flu season compared to no flu vaccine last flu season	1.445	0.000	1.050–1.839
Hispanic compared to whites	−0.726	0.03	−1.397–−0.054
Being a healthcare provider compared to not being one	−0.542	0.03	−1.042–−0.041

vaccinated. Therefore, increased public health campaigns, targeting both the general public and healthcare providers who administer flu vaccines, should be implemented to promote flu vaccination during COVID-19. The study was also able to identify potential influencers who can sway individuals' decision.

Attitude and subjective norms were significant predictors of the intention to receive the flu vaccine. Among the subjective norm items, the doctor's influence was the strongest. This observation aligns with the fact that more than half of the respondents stated that information received from the doctor's office would influence their decision to get the influenza vaccine, and almost half the respondents would likely get the flu vaccine at their doctor's office. Intentions were higher to get the flu vaccine when individuals believed that it was beneficial for them and protected others, which are similar to results found in other studies assessing flu vaccine hesitancy during COVID-19 (Mercadanate and Law, 2020; Jung and Albarracin, 2021). A doctor's role in educating patients about the benefits of flu vaccination, and encouraging them to get the flu vaccine as part of routine patient care is essential during flu season. Though pharmacies are highly accessible for flu vaccines, only a third of participants indicated that they most likely would get the flu vaccine at the pharmacy, with only one in five participants indicating that a pharmacist could influence their decision to get the vaccine.

A significant barrier to getting the influenza vaccine cited by study participants was concern regarding vaccine adverse effects. This is similar to findings assessing the likelihood of flu vaccination in asthma patients, where 43% cited fear of adverse effects (Asciak et al., 2013). Based on our study results, when educating patients on the flu vaccine, patient-specific concerns and negative public perceptions about vaccine adverse effects should be addressed by healthcare providers. This also points to the attitude statement that belief in vaccines was a strong predictor of intention to receiving it. Additionally, getting the vaccine in the previous flu season was a significant predictor of getting the vaccine this flu season. This shows that once educated and vaccinated, the concerns about adverse effects from flu vaccines decrease and individuals have a more positive attitude towards flu vaccines, making it more likely that they continue receiving the vaccine annually.

Another commonly cited barrier to getting the flu vaccine was fear of needles. For the 2020–2021 flu season, non-pregnant patients aged 2–49 years may be candidates for the live attenuated influenza vaccine (LAIV), which is administered intranasally. Additionally, one formulation of the inactivated flu vaccine is available for administration via needle-free injection. Patients who cite fear of needles as a barrier for vaccine administration should be screened for eligibility for one of these alternative administration methods (Grohskopf et al., 2020). Those individuals who listed inconvenience as a barrier can be made aware of pharmacies that provide flu vaccinations without an appointment using a public health campaign. Furthermore, healthcare providers should consider offering vaccinations to family members who may be accompanying a patient to their doctor's appointment. Additionally, because family was a significant subjective norm in increasing the likelihood to receive the vaccine, a public health campaign about the benefits of vaccinating everyone in a household can be a conversation starter in families. Among the demographic variables, the only significant variable that influenced the intention to obtain the flu vaccine was Hispanic race. Hispanics were less likely to receive the flu vaccine compared to the whites. According to CDC data from the 2018–2019 influenza season, only 37.1% of Hispanic adults compared to 48.7% of white adults received the flu vaccine (Flu vaccination coverage, United States, 2020). While it is unknown from this survey the rationale for lower intent to obtain the vaccine, this highlights a need for identification of potential barriers and improved education in this patient population (Grohskopf et al., 2020).

Another interesting finding from this study is that HCPs were less likely to obtain the flu vaccine compared to the general population. Per the 2018–2019 *Influenza Coverage Among Healthcare Workers* data, approximately 80% of healthcare workers received the vaccine (Influenza vaccination coverage among health care personnel - United States, 2019). Vaccine coverage was highest among physicians, nurses, pharmacists, physician's assistants, and nurse practitioners and lowest among non-clinical health care workers. However, from our study, it is unclear which type of HCPs were included and only 20% of the participants identified themselves as HCPs. Nevertheless, measures such as providing free vaccinations on-site and workplace encouragement of vaccination can improve vaccination rates among healthcare workers.

The study has several strengths. Though there have been editorials and opinion articles about vaccine hesitancy during COVID-19, this is the earliest study conducted to our knowledge that measured the public's intention to receive the flu vaccine during the pandemic. Since the conclusion of our study, other studies have explored similar questions but were conducted after this study. The study was conducted using a national sample during the ongoing COVID-19 pandemic, in addition to the flu season that was approaching. The study also used the validated Theory of Planned Behavior in examining this intention.

However, the study was not without limitations. First, the study used SurveyMonkey Audience. Though this was a national panel and had demographics similar to the US population, there is still a risk of selection and sample bias. A second limitation was that the study is based on a self-reported questionnaire, which can include issues associated with recall and non-response bias. A third issue can be the desirability bias, where respondents may have answered positively to the intention question. Additionally, the questionnaire used the words doctor and doctor's office. Expansion in scope of practice of physician assistants and nurse practitioners allows them to serve as primary care providers who are able to educate patients and encourage receipt of the flu vaccine. Because the terminology, "doctor" and "doctor's office" were utilized in the survey, it is unclear whether the respondents made the delineation that all primary care providers could be included in these options. SurveyMonkey does not provide the baseline survey population size which was contacted to attain the requested 250 responses in order to determine the response rate. Finally, though the reliability statistics

were acceptable, the questionnaire was not a validated instrument.

5. Conclusion

Study results showed that the majority of participants had either received or intended to receive the influenza vaccine for the 2020–2021 flu season during the ongoing COVID-19 pandemic. For those who indicated that they are unlikely to get the influenza vaccine, doctors and families can play a significant role in educating patients about the benefits of the vaccine and addressing concerns related to vaccine adverse effects.

CRediT authorship contribution statement

Angela Chu: Methodology, Investigation, Resources, Data curation, Writing - original draft, Writing - review & editing, Visualization, Supervision, Project administration. **Vasudha Gupta:** Conceptualization, Methodology, Investigation, Resources, Writing - original draft, Writing - review & editing, Visualization, Supervision, Funding acquisition. **Elizabeth J. Unni:** Methodology, Validation, Formal analysis, Investigation, Resources, Writing - original draft, Writing - review & editing, Visualization, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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The funder did not have input on the study concept, design, data collection, management, or analysis; the funder was not involved in preparation of the manuscript.

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