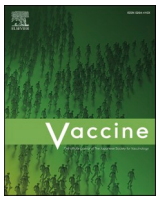
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Correlates of higher trust in public health officials: results from a representative cohort of private university undergraduates

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ABSTRACT

Background: University students' COVID-19 vaccination attitudes and decisions are shaped by their trust in health-related information and its sources. Few studies have identified factors associated with trust in public health officials among university students. We sought to identify these factors in a representative cohort of private university undergraduates in New York State.

Methods: We used two-stage sampling to recruit a representative sample of 233 private university undergraduates from January–May 2022. Students completed a cross-sectional online survey with questions on trust in public health officials, socio-demographics, and COVID-19 vaccine beliefs and attitudes. Logistic regression was used to identify factors associated with trust in public health officials.

Results: Of 233 participants, 162 were women (73 %) and 110 were White (47 %). Three-quarters of participants had high trust in public health officials (n = 170, 76 %). Women were five times as likely (adjusted odds ratio [aOR] = 4.5, 95 % confidence interval [CI]: 2.0–10.3) and White students had 60 % reduced odds (aOR = 0.4, 95 % CI: 0.2–0.9) of reporting high levels of trust in public health officials, compared to men and non-White students, respectively. Students who did not report religious concerns were three times as likely (aOR = 3.4; 95 % CI: 1.5–7.9) and students who were not concerned about long-term side-effects of COVID-19 vaccination were four times as likely (aOR = 3.5; 95 % CI: 1.4–8.8) to report high levels of trust in public health officials compared to students with concerns.

Conclusion: Our results differed from previous findings on the effects of race/ethnicity on vaccine hesitancy and medical mistrust, potentially reflecting high education and family income, heightened risk perception among racial minorities, and effective messaging in our sample and study setting. Further targeted messaging on vaccine safety and effectiveness would benefit students, with a particular focus on men, White students, students with religious concerns regarding vaccines, and students with low trust in institutions and leaders recommending vaccination.

1. Introduction

Over the last decade, vaccine hesitancy, defined as a reluctance or lack of confidence in vaccines leading to delayed or refusal to be vaccinated despite the availability of safe and effective vaccines, has become an increasingly urgent public health concern in the United States and globally [1–3]. Between January 2021 and April 2022, vaccine hesitancy contributed an estimated 318,981 to 338,961 excess COVID-19-related deaths in the United States [4]. COVID-19 vaccine coverage in the United States has varied by age, with young adults aged 18 to 29 years showing the lowest coverage from 2021 to 2025. During the 2024–25 season, only 11 % of 18–29 year olds received at least one COVID-19 vaccine compared with 45 % of adults aged 65 years of older [5].

University campuses pose a high risk of COVID-19 transmission due to shared housing and high mobility [6]. While university students face lower risks of severe COVID-19 infection and death, post-COVID conditions (or "long COVID") with a reported prevalence of 36 % in some university settings [7], can derail academic performance. Campus transmission can spill over to surrounding communities [8,9]. Student

Abbreviations: WHO, World Health Organization; aOR, adjusted odds ratio; CI, confidence intervals.

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vaccination attitudes and decisions, shaped by trust in health information and messengers, are key to COVID-19 outcomes.

Studies have shown that 29 % [10] to 48 % [11] of university students were unwilling to receive a COVID-19 vaccine. Vaccine hesitancy among university students varied by age, race, program of study, political identity, and social status [10,12,13]. For example, undergraduate students aged 27 years and older were more vaccine hesitant than younger peers [13]. Students who self-identified as Asian or Black, Conservative, or perceived higher social status were less vaccine hesitant than students who self-identified as White, Liberal, or perceived lower social status [12,13]. Social norms, including the COVID-19 vaccination status of acquaintances and perceived approval of the vaccine among university students, and fear of COVID-19 outcomes also influenced students' vaccine hesitancy [10,14].

Trust in public health officials is a critical but vulnerable pillar of vaccine uptake amid a decline in trust in government [15], expansion of misinformation [16,17], shifting public health guidelines [18–20], and concerns about vaccine safety [21–23] since the COVID-19 pandemic. From 2020 to 2022, trust in health and public health institutions (e.g., Centers for Disease Control and Prevention) among the general population in the United States declined by up to 26 % [24], with variation by sociodemographic and political factors. Lower trust in public health officials was reported among men [25], adults with lower education/income [25,26], conservative political views [26,27], and rural residents [25]. In university settings, racial minorities reported lower levels of trust in science and scientists [28]. In general population studies, associations between race and trust were mixed, with studies reporting higher [29], similar [30], or lower [31] levels of trust among racial minorities compared to White individuals. Higher or similar levels of trust among racial minorities may reflect heightened risk perception in the context of the COVID-19 pandemic [29,30], while lower trust may reflect historical racism and discrimination in healthcare settings, including unethical and illegal experimentation such as the Tuskegee Syphilis Study [32–34].

While trust in public health officials was found to be associated with vaccine hesitancy and uptake among university students during the COVID-19 pandemic, few studies have identified factors associated with this trust and none have examined specific beliefs underlying its variation [14,35–37]. Existing studies surveyed convenience samples of students or recruited university staff, faculty, and students without distinguishing among these subsets [28,37]. Our work aimed to address these gaps by investigating the factors associated with trust in public health officials in a representative cohort of private university undergraduates in New York State.

2. Materials and methods

2.1. Study design and setting

We conducted a cross-sectional study at a private university serving a diverse student body studying on two campuses serving urban and suburban students in New York State and including Schools delivering undergraduate education in arts and sciences, computer science, health professions, business, and education. During the COVID-19 pandemic, students were actively studying per the modality offered for their courses, which included in-person, online, and hybrid formats.

2.2. Recruitment

We recruited students using a two-stage sampling method from January to May 2022. During this period, the population of Pace University undergraduate students was 8260 (7483 full-time and 777 part-time). At a 95 % confidence level, we needed between 192 and 259 participants to achieve a 6–7 % margin of error. Schools were the primary sampling unit, course sections were the secondary sampling unit, and students were the tertiary unit. Course sections were randomly selected with probability proportional to size of enrollment from all course sections offered within each School. Each student within a selected course section was assigned a sequential number, per the course roster as it appeared in the Learning Management System, and 10 students were then selected using a random number generator from each section. Selected students were contacted by their course instructor via an email delivered from the Learning Management System interface. If a course instructor did not respond or did not agree to participate in the study, we randomly selected another course section within the same School. Instructors were sent reminders after 48 hours and 72 hours to contact their section's sampled students.

2.3. Data collection and follow-up procedures

Students who accepted the study invitation via email were directed to a Qualtrics survey (Provo, UT; Appendix A) where they were invited to participate in the study. The online survey was available in English and took 20–25 min to complete. To be eligible, students had to be 18 years old or older, enrolled as an undergraduate student, and provide informed consent. Participants were provided with a $10 gift card for their participation. Students who were invited to participate but did not complete the online survey were followed up by email up to three times by a research team comprised of trained Health Science senior students who were supporting the study as part of their Capstone course internship.

2.4. Measures

The primary outcome of interest was trust in public health officials. Participants were asked how much they trusted public health officials (e.g., Centers for Disease Control) to deliver credible vaccine-related information on a 5-point scale (range: 1–5; 1= 'Not at all' and 5 = 'Completely'). This outcome was dichotomized into low trust (i.e., not at all, very little, or somewhat) in public health officials and high trust (i.e., quite a bit or completely) in public health officials.

The online survey collected data on socio-demographics and vaccine beliefs and attitudes. Key sociodemographic covariates of interest included university year, gender, and race/ethnicity. Participants self-identified their race/ethnicity using an open-ended question with the following categories: White, Hispanic/Latinx, Black/African American, Middle Eastern, Biracial/Multiracial, Asian/Asian American, Hawaiian/Pacific Islander, and Other. Multiple selections were allowed. For analyses, we dichotomized the race/ethnicity variable into two categories: White, including any endorsement whether single or multiracial, and other, including all other single races and multiracial students who did not identify as White.

Participants also self-reported their agreement with the following statements: "The COVID-19 vaccine has not been around long enough to know about long-term side effects," "I am worried about short-term side-effects [of the COVID-19 vaccine]," "I have religious concerns about vaccines," and "I don't trust the institutions or leaders that are recommending vaccination." Agreement was assessed on a 5-point scale (range: 1–5; 1 = 'Strongly agree' and 5 = 'Strongly disagree'). Agreement was dichotomized into low concern (i.e., strongly disagree, disagree, or neutral) versus high concern (i.e., strongly agree or agree).

2.5. Analyses

We described participants' sociodemographic characteristics and vaccine beliefs using frequencies and proportions. Bivariable and multivariable modelling of associations between covariates and trust in public health officials was conducted using logistic regression to obtain crude and adjusted odds ratios (aOR) and confidence intervals (CI). We started with the full multivariable model and used backward elimination, removing one covariate at a time until further removals no longer improved model fit (i.e., lower Akaike Information Criterion). Given the

modest sample size, backward elimination helped reduce the number of covariates included in the final model. All *p*-values were two-sided with $p < 0.05$ considered to be of statistical significance. Analyses were conducted in SPSS version 27 and R version 4.2.0.

2.6. Ethics

This study was approved by Pace University's Institutional Review Board (#1826753).

3. Results

3.1. Participant characteristics

Across five Schools, we sampled 41 course sections. Among course instructors sampled to participate, 74 % (42/57) enrolled and followed through on the protocol to contact students within their sampled section. Among the 416 students who were contacted, 233 completed the questionnaire (56 % response rate). Participant characteristics are described in Table 1. The 233 student participants included 45 freshmen (20 %), 54 sophomores (24 %), 79 juniors (35 %) and 51 seniors (22 %); four participants did not report their year of study. Most participants (66 %) were attending class via a mixed format of some online and some onsite (28 % fully in person, 6 % fully online). Most participants identified as women ($n = 162$, 73 %) or White ($n = 110$, 47 %). Most participants ($n = 224$, 97 %) had received at least one dose of any COVID-19 vaccine and approximately half had a suspected or confirmed case of COVID-19 infection ($n = 122$; 54 %). Three-quarters of participants had high trust in public health officials ($n = 170$, 76 %). Less than a quarter of participants reported low trust in public health officials ($n = 53$, 24 %). Most participants trusted institutions or leaders who were recommending vaccination ($n = 185$, 80 %) and did not have religious concerns about vaccines ($n = 215$, 93 %). However, approximately half of the participants agreed that COVID-19 vaccines have not been around long enough to uncover long-term side effects ($n = 102$, 44 %) and a third of the participants were worried about short-term side-effects of COVID-19 vaccines ($n = 84$, 36 %).

3.2. Correlates of trust in public health officials

Gender, race/ethnicity, religious concerns about vaccines, trust in institutions or leaders recommending vaccination, and concerns about long-term side-effects of COVID-19 vaccines were retained in the final multivariable model (Table 2). In unadjusted analyses, women were four times more likely (OR = 4.4, 95 % CI: 2.2–8.6) to report high levels of trust in public health officials compared to men. Compared to non-White students, White students had approximately 60 % reduced odds (OR = 0.4, 95 % CI: 0.2–0.8) of reporting high levels of trust in public health officials in unadjusted analyses. These associations were preserved after adjusting for religious concerns about vaccines, trust in institutions or leaders recommending vaccination, and concerns about long-term side-effects of COVID-19 vaccines. In adjusted analyses, women were five times as likely (aOR = 4.5, 95 % CI: 2.0–10.3) and White students had approximately 60 % reduced odds (aOR = 0.4, 95 % CI: 0.2–0.9) of reporting high levels of trust in public health officials, compared to men and White students, respectively.

In unadjusted analyses, students who did not report religious concerns about vaccines (OR = 14.9; 95 % CI: 4.4–67.9) and students who were not concerned about long-term side effects (OR = 4.3; 95 % CI: 2.2–8.6) were more likely to report high trust in public health officials. Additionally, students who trusted any institutions or leaders who recommended vaccination (OR = 7.8; 95 % CI: 3.8–16.4), were eight times as likely to report high trust in public health officials. These associations held in adjusted analyses, where students who did not report religious concerns were three times more likely to report high levels of trust in public health officials (aOR = 3.4; 95 % CI: 1.5–7.9) compared to students with concerns. Students who were not concerned about long-term side-effects of COVID-19 vaccination were four times more likely to report high trust in public health officials (aOR = 3.5; 95 % CI: 1.4–8.8) compared to students with concerns. Students who reported trusting the institutions or leaders who were recommending vaccination

Table 1
Participant characteristics ($N = 233$).

Variable	N (%)
Student year	
Freshman	45 (20)
Sophomore	54 (24)
Junior	79 (35)
Senior	51 (22)
Missing	4
Mode of class	
All in person	65 (28)
All remote	14 (6)
Combination of in person and remote	153 (66)
Missing/Other	1
Gender	
Men	61 (27)
Women	162 (73)
NA/Missing/Other	10
Race/ethnicity	
White	110 (47)
Hispanic/Latinx	40 (17)
Asian	24 (10)
Black/African American	21 (9)
Middle Eastern	10 (4)
Native/Hawaiian	2 (1)
Biracial/multiracial	22 (9)
Other	4 (2)
Current level of agreement with: The COVID-19 vaccine has not been around long enough to know about long-term side effects	
Strongly agree/Agree	102 (44)
Strongly disagree/Disagree/Neutral	129 (56)
Missing	2
Current level of agreement with: I am worried about short-term side-effects [of the COVID-19 vaccine]	
Strongly agree/Agree	84 (36)
Strongly disagree/Disagree/Neutral	146 (63)
Missing	3
Current level of agreement with: I have religious concerns about vaccines	
Strongly agree/Agree	16 (7)
Strongly disagree/Disagree/Neutral	215 (93)
Missing	2
Current level of agreement with: I don't trust the institutions or leaders that are recommending vaccination	
Strongly agree/Agree	46 (20)
Strongly disagree/Disagree/Neutral	185 (80)
Missing	2
History of COVID-19 infection	
Yes, confirmed by a positive COVID-19 test	99 (44)
Yes, based on strong personal suspicion	19 (8)
Yes, based on medical advice	4 (2)
Unsure	22 (10)
No	83 (37)
Missing	6
Received at least one dose of any COVID-19 vaccine	
Yes	224 (97)
No	8 (3)
Missing	1
Trust in public health officials	
Not at all/Very little/Somewhat (Low trust)	53 (24)
Quite a bit/Completely (High trust)	170 (76)
Missing	10

Table 2
Logistic regression results for the association between key predictors and high trust in public health officials.

Variable	Crude OR (95 % CI)	p-value	Adjusted OR (95 % CI), $n = 210$	p-value
Student year, for each 1 year increase, $n = 219$	0.8 (0.6–1.0)	0.074	–	–
Gender, $n = 213$		**<0.001**		**<0.001**
Men	1.0		1.0	
Women	4.4 (2.2–8.6)		4.5 (2.0–10.3)	
Race/Ethnicity, $n = 223$		**0.006**		**0.029**
Non-white[1]	1.0		1.0	
White[2]	0.4 (0.2–0.8)		0.4 (0.2–0.9)	
Current level of agreement with: I have religious concerns about vaccines, $n = 221$		**<0.001**		**0.004**
Strongly agree/Agree	1.0		1.0	
Strongly disagree/ Disagree/Neutral	14.9 (4.4–67.9)		3.4 (1.5–7.9)	
Current level of agreement with: I don't trust the institutions or leaders that are recommending vaccination		**<0.001**		**0.030**
Strongly agree/Agree	1.0		1.0	
Strongly disagree/ Disagree/Neutral	7.8 (3.8–16.4)		6.0 (1.3–34.1)	
Current level of agreement with: The COVID-19 vaccine has not been around long enough to know about long-term side effects, n = 221		**<0.001**		**0.006**
Strongly agree/Agree	1.0		1.0	
Strongly disagree/ Disagree/Neutral	4.3 (2.2–8.6)		3.5 (1.4–8.8)	
Current level of agreement with: I am worried about short-term side-effects [of the COVID-19 vaccine], $n = 220$		**<0.001**	–	–
Strongly agree/Agree	1.0		–	–
Strongly disagree/ Disagree/Neutral	3.5 (1.8–6.7)		–	–

[1] Included all non-White races and multiracial students who did not identify as White.
[2] Included participants who identified as White, comprised of any endorsement whether single or multiracial.

were six times more likely to report high trust in public health officials (aOR = 6.0; 95 % CI: 1.3–34.1) compared to students who did not trust these institutions or leaders. These analyses were adjusted for religious concerns about vaccines, trust in institutions or leaders recommending vaccination, and concerns about long-term side-effects of COVID-19 vaccines.

4. Discussion

Vaccine hesitancy has been a long-standing public health concern [1,2], particularly among university-aged adults [5,10]. Understanding the reasons for distrust in public health officials is of critical importance for improving vaccine acceptance and reducing hesitancy. In our sample, three-quarters of undergraduate students reported high trust in public health officials. Women, non-White students, and students who lacked religious concerns or concerns about long-term COVID-19 vaccine-related side effects, and trust in institutions/leaders recommending vaccination were more likely to report high levels of trust in public health officials. The high levels of trust reported by participants were similar to a previous study which found that 71 % of American adult participants reported moderate, high, or very high trust in the information provided by the government and public authorities about the COVID-19 pandemic [25]. Similarly, another study found that 76 % to 81 % of adults surveyed in 15 states in the United States trusted institutions like the Centers for Disease Control and Prevention, the state health department, and Johns Hopkins University [26].

While we identified high trust in public health officials among our study participants overall, we found lower trust in public health officials among students who identified as men or White. Men have previously been identified as having lower trust in COVID-19-related information provided by the government or public health authorities in the United States [25]. Studies reporting on associations between race/ethnicity and trust in public health officials were mixed [29–31]. In line with a previous study [29], we found higher trust among non-White students compared to White students. Since COVID-19 disproportionately affected racial minorities in the United States [38], perceptions of the seriousness of COVID-19 among racial minorities may have led to higher trust in public health officials [30,39]. Notably, our results contrasted with prior findings of lower levels of trust in public health officials among racial minorities [28,31,37]. These inconsistencies may have been due to differences in the effectiveness of COVID-19 vaccine messages and framing [40,41], or differences in the identities of officials disseminating information between campus settings [42]. For example, one study found that Italian university students were more willing to get vaccinated when messaging emphasized the vaccine's impact on reducing COVID-19-related hospitalizations, compared to messaging focused on reducing infection risk [40]. A study conducted among university students in the United States found that students' COVID-19 knowledge and safety behaviors were most likely to be influenced by family, health organization websites, television, radio, or printed sources, followed by friends and a pandemic-related course within the university [42]. Other sources of information that influenced students' COVID-19 knowledge and safety behaviors included social media, official campus communications (e.g., emails, website, dashboard), government press briefings, and COVID dashboards (e.g., Johns Hopkins COVID Dashboard), among others [42]. Our study sample may have also impacted our findings as students were recruited from a private university in New York State. In the United Kingdom, universities in areas with higher local COVID-19 infection rates communicated COVID-19 information via websites earlier than universities in lower infection rate areas [41]. Given that New York State was the first epicenter of the COVID-19 pandemic in the United States [43,44], the private university we recruited from may have also initiated early COVID-19 communications with their students. Early crisis communication has been shown to elicit greater public trust [45]. Residents in urban areas have also reported higher trust in public health officials compared to people residing in rural or remote areas [25]. Further, private universities were found to be disproportionately attended by children of high-income families [46], and therefore, higher education and income levels may explain some inconsistencies between our study findings and previous studies.

Consistent with a previous study [47], students who had religious concerns in our study reported lower trust in public health officials compared with those who did not report such concerns. A previous study found that half of their adult participants who did not trust the Centers for Disease Control and Prevention and state and local public health authorities also reported the view that these agencies did not adequately respect religious beliefs [47].

Building trust among those with religious concerns, those who do not trust institutions and leaders recommending vaccination, and those who are concerned about long-term side-effects of the COVID-19 vaccine, are a substantial challenge that will require long-term, collaborative effort and focused and innovative messaging. The WHO identified six key determinants of trust including competence, objectivity, fairness, consistency, sincerity, and faith [48]. These six determinants of trust can be used to develop messages that are clear and concise, easy to access and

understand, and culturally appropriate, for improving trust in public health authorities. To support development of more effective and locally acceptable messaging strategies, future studies should identify key sources of trusted information for students who do not trust public health authorities, institutions, and leaders. For example, religious leaders have been viewed as caring and community-driven and could serve as credible partners to amplify public health messages for those with religious leanings [49]. In a university setting, student leaders such as student organization leaders and campus housing leaders may also serve as effective messengers who can help to mitigate vaccine hesitancy [11].

Our study had several strengths and limitations. We used two-stage sampling to ensure our sample was representative of the student body. Despite our best efforts, we slightly oversampled students who self-identified as women (73 % in our study versus 66 % at the university) or White (47 % in our study versus 45 % at the university). Moreover, our study was restricted to a single institution and excluded law school and graduate students, which may have limited the generalizability of our findings to other institutions and graduate students. Despite follow-up invitations to participate, some professors and/or students may have been more likely to decline participation or not respond to invitations to participate based on factors related to the associations under study (i.e., selection bias). While students could select all the races/ethnicities they identified with in our survey, our dichotomization of race/ethnicity did not allow us to disaggregate our findings by individual races/ethnicities. Another limitation was the exclusion of some covariates of interest due to the need to limit time to survey completion to 20–25 min to prevent survey fatigue and its associated impact on data validity. In particular, although we found no associations of between the trust outcome variable and first generation status of the student, household income loss in the past year, or three food insecurity items, it is possible that more extensive analysis of income, education, religion, type of insurance, other factors related to students' family backgrounds, university campus, and/or students' previous experiences with public health officials may have accounted for some of the effects of the correlates identified here. We did not include political affiliation in our survey, which has been consistently shown to be associated with trust in public health officials and recommendations [26,27]. Uncontrolled confounding can lead to spurious associations or mis-estimation of effect sizes reported in our study. These unmeasured covariates should be examined in future research. Finally, our study was cross-sectional in nature which precluded assessments of causation.

Reasons for trust and distrust in public health officials among university students may change over time. Future studies should examine longitudinal changes in reasons for trust and distrust in public health officials among a larger, representative population of university students including suburban, exurban, and rural areas across different regions of the United States. Strong efforts should be made to recruit students who do not usually participate in research studies. Improved understanding in this area will help to improve public health messaging aimed at countering misinformation and encouraging evidence-based choices on vaccine uptake for student populations.

5. Conclusions

Our study explored factors associated with trust in public health authorities among a sample of private university students in New York State. Like previous studies, we found that gender and students' beliefs surrounding vaccines influenced their trust in public health authorities. Our study added novel student-based evidence to previous mixed findings on the effects of race/ethnicity on vaccine hesitancy and medical mistrust in the general population. Our findings may have reflected higher levels of education and family income among our sample compared with studies conducted among the general American population. Our findings may have also reflected heightened COVID-19 risk perception among racial minorities, and effective messaging due to source and framing of COVID-19 information, in our urban study setting. Further targeted messaging on vaccine safety and effectiveness would benefit students, with a particular focus on men, White students, students with religious concerns regarding vaccines, and students with low trust in institutions and leaders who recommend vaccination. Further research is warranted to validate, elaborate and capitalize on these findings.

CRediT authorship contribution statement

Erica L. Gollub: Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Nils Myszkowski:** Visualization, Validation, Formal analysis. **Min Xi:** Writing – review & editing, Writing – original draft, Visualization, Validation, Formal analysis. **Guler Boyraz:** Writing – review & editing, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Conceptualization. **Joshua B. Mendelsohn:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Conceptualization.

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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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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.vaccine.2025.127610.

Data availability

Data that support the findings of this study are available from the corresponding author upon reasonable request.

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