

# AGE, SEX, AND RACE DIFFERENCES IN COLLEGE STUDENTS'

## COVID-19 PERCEPTIONS, BEHAVIORS,

## POLICY ATTITUDES, AND VACCINATION DECISIONS

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*Abstract: Understanding college students' attitudes, beliefs, and behaviors related to the COVID-19 pandemic is important for public health and health promotion efforts on university campuses, as well as to inform decisions and practices of administrators. The purpose of this study was to extend existing research by investigating some COVID-related variables that have yet to be clearly studied, and by examining how student responses varied by age, sex, and race. University students (N=2764) attending five universities in Florida, Louisiana, Missouri, North Carolina, and Virginia completed an online anonymous survey between October and December, 2021. Survey items addressed personal COVID-19 history, perceptions of severity and susceptibility, engagement in COVID-19 preventing behaviors, COVID-19 vaccination status, and attitudes about COVID-related university policies. More than half of students (63.1%) had not contracted COVID-19 at the time of data collection, but most (96.4%) knew someone who had. Over two-thirds of the sample (67.9%) had been vaccinated at the time of survey completion. Survey responses varied significantly by gender, age, and race/ethnicity, with female, older, and African American students expressing greater concern, more often engaging in COVID-preventing behaviors, getting vaccinated against the virus, and supporting college policies regarding mandated face masks and COVID-19 vaccination. This study highlights significant variations in college students' attitudes and behaviors towards COVID-19, influenced by demographic factors such as age, sex, and race.*

**Keywords:** COVID-19, University Students, Attitudes, Health Behaviors, Vaccination

### INTRODUCTION

The worldwide COVID-19 pandemic of 2020-2023 resulted in catastrophic illness, negatively impacted educational and economic systems, and brought about significant changes to daily life. The response to this evolving public health emergency included government issued "stay-at-home" mandates, and recommendations to prevent further spread of the virus that included increasing hand washing, wearing masks in public, and engaging in physical distancing from others. During the Spring 2020 semester, universities abruptly cancelled on-campus activities, closed offices, sent residential students home, and moved all instruction online. By the Fall of 2020, universities had re-opened, at least in part, with COVID-mitigating policies in place that included mandates of social distancing and face

masking while indoors. COVID vaccines were approved for emergency use in the U.S. in December 2020, and by April 2021, all adults nationwide were eligible to receive a vaccine (AJMC Staff, 2021). Many universities encouraged or mandated students be vaccinated as they returned for the Fall 2021 semester (Acton et al., 2022; Ghaffarzadegan, 2022; Hodge et al., 2022).

The experiences, beliefs, behaviors, and health-related decisions of adults during the pandemic became significant research topics, and college students in the U.S. are one population subgroup of particular interest. During the time of high viral spread, university students were a high-risk group who lived with and attended classes in close proximity to others, experienced hardships affecting daily life and academic performance, as well as pandemic-

related changes to educational plans and career paths (Gravagna et al., 2022; Lederer et al., 2021; Sahu, 2020). COVID-19-related research on college students has evolved with the pandemic. Much of the early work focused on their mental health, stressors, and barriers to academic success during the school closure and emergency pivot to online learning (e.g., Aguila-Hermida, 2020; Browning et al., 2021; Charles et al., 2021; Garriss & Fleck, 2022; Hickey et al., 2021; Hoyt et al., 2021; Murphy et al., 2020; Rudenstine et al., 2021; Son et al., 2020; Tasso et al., 2021). Additional research examined students' level of concern about the pandemic and their compliance with COVID-preventing behavioral recommendations. The results of these studies indicated approximately two-thirds of students were concerned about the pandemic, concern was higher among female students, and worry was higher about loved ones contracting the virus than themselves. Additionally, the majority of college students (over 80%) reported engaging in frequent hand washing, wearing a face mask, and physically distancing when possible (e.g., Charles et al., 2021; Cohen et al., 2020; Hickey et al., 2021; Kecojevic et al., 2020; Li et al., 2022).

Much of the early research on college students during the pandemic was oriented toward answering initial questions of interest (e.g., their experiences during campus shutdown, perceptions of mental health, and engagement in preventive behaviors) and were not necessarily grounded in theoretical models. The Health Belief Model (HBM) and its constructs have been used in recent COVID-vaccine related research. The HBM was constructed in the 1950s to help better understand hesitations related to disease prevention behaviors (Alyafei & Easton-Carr, 2024; Janz & Becker, 1984; Kirscht, 1974; Maiman & Becker, 1974). It focuses on individual perceptions through six primary constructs said to influence behavior: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and cues to action. Perceived susceptibility refers to an individual's belief that they could contract an illness. Perceived severity refers to the person's belief that the illness should be taken seriously, should it be contracted. Perceived benefits reflects an individual's belief that taking actions to prevent the illness could be effective (i.e., wearing a face mask or social distancing). Perceived barriers pertain to the challenges an individual may face when engaging in the recommended health action (i.e., access, discomfort, perceived social implications). Self-efficacy refers to the individual's belief in their own ability to perform the recommended health action; cues to action refers to internal or external factors that initiate the decision-making process related to perform (or not perform) the recommended health actions. Several investigations have examined perceived susceptibility and severity as well as measures of one's level of worry or concern in relation to the COVID-19 pandemic (e.g., ACHA, 2022; Rentner & Alsulaiman, 2022; Terry et al., 2022; Zhou et al., 2023).

With the development of COVID-19 vaccines,

research began to examine vaccine acceptance vs. hesitancy among adults. Vaccine hesitancy is "the refusal or delay in being vaccinated despite safety assurance and availability of vaccination services" (MacDonald, 2015). With respect to COVID-19 vaccines, Peters (2022) suggested willingness/refusal to be vaccinated exists on a continuum ranging from acceptance to hesitancy (reluctance associated with a "wait-and-see" approach) to resistance/refusal. Evidence indicates COVID-19 vaccine hesitancy was higher among young adults (for reviews, see Aw et al., 2021; Dhanani & Franz, 2022); several reports have found vaccination rates were lowest among younger adults and increase with age (e.g., Anderson et al., 2022; Morales et al., 2022). In addition, vaccine acceptance was found to increase with higher levels of educational attainment (e.g., Acar-Burkay & Christian, 2022; Aw et al., 2021; Coe et al., 2021; Hennessy et al., 2023; Mondal et al., 2021). As a result of pro-vaccine policies and messages, and providing easy access to vaccinations, universities had the potential to be a catalyst for facilitating COVID-19 vaccination among college students (Thompson et al., 2021), and early data suggested vaccine uptake rates among college students exceeded those of young adults nationally (American College Health Association [ACHA], 2022; Kaighobadi et al., 2023). It has also become apparent that pandemic-related attitudes, beliefs, and behaviors are inter-related and vary with socio-demographic characteristics such as age, race, and gender (Acar-Burkay & Christian, 2022; Anderson-Carpenter & Neal, 2022; Aw et al., 2021; Coe et al., 2021; Ferrin, 2021; Hennessy et al., 2023; Hearne & Nino, 2021; Mondal et al., 2021; Morales et al., 2022; Pena et al., 2023; Peters, 2022).

Understanding college students' attitudes, beliefs, and behaviors related to the COVID-19 pandemic is important for public health, health promotion efforts on university campuses, as well as to inform decisions and practices of administrators. Many reports of college students during the pandemic included results for the entire sample and ignored or failed to examine how responses may vary with these demographic characteristics. Additionally, some COVID-related variables have yet to be clearly studied. Thus, this study sought to extend existing knowledge by examining several understudied variables including experiences with COVID-19 (e.g., personally contracting the virus and the severity of experienced symptoms); perceptions of the virus (perceived susceptibility and severity); COVID-19 vaccination decision/status; and attitudes about COVID-related university vaccination and face mask policies. In addition, we examined how student responses varied by age, sex, and race/ethnicity.

## METHODS

### Participants

Participants were 2764 students attending five universities in Florida, Louisiana, Missouri, North Carolina, and Virginia, which included one large

research intensive, two mid-sized regional, and two small historically black universities. As indicated in Table 1, the sample was 71.1% female, and the majority (75.9%) were in the age range of traditional college students (18-23 years old). They were relatively equally divided among academic year. Slightly over 70% reported their race/ethnicity as White; followed by Hispanic (12.7%), and Black/African American (10.2%). Respondents were pursuing a variety of degrees including those in business fields (n=472), education (n=394), biology/chemistry/physics (n=292), nursing (n=239), psychology (n=165), history/political science/sociology (n=164), computer science (n=141), kinesiology (n=116), and fine arts (n=97).

### Data Collection

After receiving approval from the Institutional Review Boards of each university, data were collected October 11 through December 31, 2021 using an online survey designed for the study. Participation was sought through a variety of methods including email messages, posting of flyers on campus, and visiting intact classes. Participants were informed that the research team was studying perceptions and experiences of students during the pandemic, their participation was voluntary, and they were ensured of anonymity. No incentives were offered for participation. In addition to seeking demographic information (age, gender, race/ethnicity, classification, and major), the survey included the sections below.

**COVID-19 history.** In this section, respondents indicated whether or not they had personally contracted COVID-19, and if so the extent of their symptoms/illness by selecting from the options: (a) mild symptoms (for example short-term flu or cold-like symptoms, and/or loss of taste or smell); (b) moderate symptoms (e.g., fever, fatigue, or other symptoms for a week or more that limited behavior), and (c) severe symptoms (for example fever, fatigue, difficulty breathing, etc. that resulted in hospitalization). In addition to these items addressing personal contraction, this section also included an item inquiring about COVID-19 among family, friends, and co-workers. Responses indicated whether participants knew at least one family, friend, or coworker who had contracted the virus, and if so whether this person “had severe symptoms,” or “died as a result of the virus.”

**Perceived susceptibility, severity, and level of concern.** Perceptions of susceptibility, severity, and level of concern about the pandemic were assessed through three separate items. Respondents indicated perceived susceptibility along a 5-option scale anchored by “I do not believe I will get COVID-19” and “I am certain I will contract COVID-19.” Perceptions of severity if you were to contract the virus were selected from: (a) Not severe/no worse than the common cold, (b) somewhat severe, and (c) very severe/potentially life threatening. The final question in this section sought participant’s “level of concern about the pandemic,” with response options indicating “not,” “slightly,” “moderately,” or “highly”

concerned.

**Engagement in COVID-19 preventive behaviors.** Three items asked about the extent to which participants engaged in three COVID-19 preventive behaviors over the past year: wearing a face mask in public areas, avoiding crowds, and maintaining physical distance from others. For each behavior, responses were selected from “Never,” “Sometimes,” “Often,” and “Always.”

**COVID vaccination.** The first question in this section focused on vaccination decision and status. Response options were created to indicate whether the student had been vaccinated, as well as to provide some indication about the timing of their decision. Choices included: (a) I received a COVID-19 vaccine immediately or soon after I was eligible to do so; (b) I was reluctant and did not initially receive a COVID-19 vaccine when it was available to me, but decided to on my own, and am now vaccinated; (c) I was reluctant and did not initially receive a COVID-19 vaccine when it was available to me, but have received it now due to work or school policies; (d) I have yet not received a COVID-19 vaccine, but plan to do so; and (e) I have not received a COVID-19 vaccine, and do not plan to be vaccinated. Students who had been vaccinated completed a follow-up question about the specific vaccine received (i.e., Pfizer-BioNTech, Moderna, Johnson & Johnson).

**Attitudes about COVID-related university policies.** The final survey section assessed attitudes about two COVID-19 related policies: requiring the wearing of face masks in university buildings, and university mandates that students be COVID-19 vaccinated. Statements were worded to indicate support for the policy, and responses were selected along a 4-option Likert scale anchored by “Strongly Disagree” and “Strongly Agree.”

### Data Analysis

Descriptive statistics indicating the frequency and percent of students providing each response are reported for items (see Table 1). Variation in responses by sex (male vs. female), race/ethnicity (African American, Hispanic, White), and age group were examined using Chi-Square analyses. Age groups were identified as “younger” (18-23 years, the age range typically associated with traditional college students) and “older” (24 years and higher). Odds-ratios (OR) were also calculated to represent the relative likelihood of contracting COVID-19, having a high level of concern about the pandemic, engaging in COVID-19 preventive behaviors, getting vaccinated, etc.

## RESULTS

### Rates of COVID Infection and Severity

Approximately one-third of students (36.7%) reported having contracted the COVID-19 virus at the time of data collection; 63.1% had not. Among those who contracted the virus, 57.4% reported mild symptoms, 40.4% moderate symptoms, and few (0.8%) severe symptoms that required hospitalization. Rates of infection and severity among male/

female, younger/older students, and according to race/ethnicity are depicted in Figure 1; Table 2 presents values for groups, odds ratios, and significant Chi-Square results. Contracting COVID-19 varied significantly with age and race/ethnicity, highest among younger and White students. Odds ratios indicated older students were 27% less likely to have contracted COVID-19, and Black students were 49% less likely than White students.

#### **Family/Friends/Co-Workers**

The vast majority of students (96.4%) reported knowing at least one family member, friend, or colleague who contracted COVID-19, and approximately half knew someone who had severe symptoms (21.8%) or died as a result of the virus (26.0%). Knowing someone who had severe symptoms or died from COVID-19 was significantly higher among female than male students, and among older than younger students (see Table 2). Responses were similar among race/ethnic groups.

#### **Perceived Susceptibility, Severity and Level of Concern**

When asked about the likelihood of contracting COVID-19, two thirds of respondents (65.3%) indicated their chances were low, 28.6% reported there was a moderate chance of contracting COVID, and few (6.0%) believed there was a high probability. Responses to perceptions of the severity of illness if one were to contract it indicated most students (71.1%) felt their symptoms would not be severe, one fourth (25.7%) anticipated their symptoms would be somewhat severe, and few (3.2%) indicated severe illness was a likely outcome. The level of concern about the pandemic was relatively equally divided across responses with 28.4% not concerned, 22.9% slightly concerned, 30.5% moderately concerned, and 18.3% highly concerned.

The percentage of students in demographic groups reporting “moderate-to-high” perceived susceptibility, “somewhat severe-to-severe” perceived severity, and “moderate-to-high” concern about the pandemic are presented in Table 2. Perceived susceptibility varied significantly by sex and age. Odds-ratios indicated female students were 72% more likely to have “moderate-to-high” perceived susceptibility than male students, and older students were 75% more likely than younger students. Perceived susceptibility did not vary with race/ethnicity.

Both perceived severity and concern about the pandemic were significantly related to sex, age, and race/ethnicity (see Table 2). Compared to male students, females were 34% more likely to have high severity perceptions and 87% more likely to have high concern about the pandemic. Older students were 47% more likely to have high perceptions of COVID-19 severity, and 75% more likely to have high concerns about the pandemic. Among race/ethnic groups, perceived severity and pandemic concern were highest among African American students, who were 1.81 and 4.41 times more likely to report these

responses than White students.

#### **Engagement in Preventive Behaviors**

Engagement in COVID-19 preventive behaviors was highest for wearing a face mask in public areas (71.9%). Slightly less than half of students reported often or always avoiding crowds (45.8%) and physical distancing (47.1%). Significant differences were found with respect to sex, age, and race (Table 2). As shown in Figure 2, there was a clear pattern of higher behavioral response among female, African American, and older students. Odds ratios indicated female students were 1.47 to 1.87 more likely to report frequent engagement in preventive behaviors than males, and older students from 1.45 to 1.89 more likely than younger students. By comparison, odds ratios comparing race/ethnic groups indicated greater differences, with Black students 4 to 7 times more likely than White students to report engaging in COVID-19 preventing behaviors.

#### **Vaccination Rate**

Of the entire sample, 67.9% (n=1877) of students had been vaccinated at the time of survey completion. Among vaccinated students, the most common vaccine was that of Pfizer BioNTech (66.5%, n=1255), followed by Moderna (26.0%, n=491), and Johnson & Johnson (5.8%, n=109). Vaccination was significantly related to sex, age, and race (see Table 2). Female students were 28% more likely to have been vaccinated than male students, and older students 50% more likely than younger students. The greatest demographic group variation was a function of race; 81.2% of African American students had been vaccinated compared to 65% of White students (OR = 2.33).

#### **Vaccine Decision**

Based on responses to the vaccination decision question, we created three categories: (a) Early Adopters - those who reported getting vaccinated immediately or soon after being able to do so; (b) Hesitant Adopters - who did not pursue vaccination initially, but subsequently chose to do so; and (c) Vaccine Refusers - students who reported not being currently vaccinated nor planning to be. Of the entire sample, 40.8% were Early Adopters, 31.7% were Hesitant Adopters, and 27.6% were Vaccine Refusers.

The percent of students in these 3 categories as a function of demographic groups is presented in Figure 3; Early Adoption was highest in older students, and Refusal highest in males and White students. Early adoption varied significantly by age group (with older students 2.12 times more likely) and race (African American 47% more likely than White students). Refusing the vaccine was significantly higher among males (8% more likely than females), younger students (28% more likely than older students), and White students (49% more likely than African American students) (see Table 2).

### Attitudes about Policies

Overall, approximately half of respondents supported COVID-19 related policies: 46.1% (n=1267) supporting requiring vaccination of college students, and 55.3% (n=1521) policies mandating face masks on campus. As shown in Table 2, support for these policies varied significantly by age, sex, and race/ethnicity. The greatest group differences were for race/

ethnicity. More African American students supported these policies than Hispanic and White students; odds-ratios indicating they were over 7 times more likely to support face mask requirements and 2.92 times more likely to support COVID-19 vaccination mandates. In addition, female students were 64% more likely to support face mask policies, and older students 49% more likely to support vaccination requirements of students.

**Table 1.** Descriptive Statistics of the Sample (N=2764) and Item Responses

| Variable /Response                              | n    | %     |
|-------------------------------------------------|------|-------|
| <b>University Attending</b>                     |      |       |
| Florida A&M University                          | 22   | 0.8%  |
| Johnson C. Smith University                     | 48   | 1.7%  |
| Northwest Missouri State University             | 601  | 21.7% |
| Southeastern Louisiana University               | 2010 | 72.7% |
| Virginia Commonwealth University                | 83   | 3.0%  |
| <b>Sex</b>                                      |      |       |
| Female                                          | 1966 | 71.1% |
| Male                                            | 753  | 27.2% |
| Other/No Response                               | 19   | 0.7%  |
| <b>Race/Ethnicity</b>                           |      |       |
| Black/African American                          | 282  | 10.2% |
| Latin/Hispanic                                  | 351  | 12.7% |
| White                                           | 1928 | 69.8% |
| Other                                           | 203  | 7.3%  |
| <b>Classification</b>                           |      |       |
| Freshman                                        | 606  | 21.9% |
| Sophomore                                       | 477  | 17.3% |
| Junior                                          | 631  | 22.8% |
| Senior                                          | 649  | 23.5% |
| Graduate Student                                | 395  | 14.3% |
| <b>Age</b>                                      |      |       |
| 18-23                                           | 2098 | 75.9% |
| 24 and older                                    | 572  | 20.7% |
| <b>Personal COVID-19 Infection History</b>      |      |       |
| Have not contracted COVID-19                    | 1743 | 63.1% |
| Contracted COVID-19 / mild symptoms             | 582  | 21.1% |
| Contracted COVID-19 / moderate symptoms         | 410  | 14.8% |
| Contracted COVID-19 / severe symptoms           | 22   | 0.8%  |
| <b>People I know</b>                            |      |       |
| No one I know has contracted COVID-19           | 101  | 3.7%  |
| Contracted COVID and had mild/moderate symptoms | 1341 | 48.5% |
| Contracted COVID and had severe symptoms        | 603  | 21.8% |
| Contracted COVID and died as a result           | 719  | 26.0% |

**Table 1.** Continued

| <b>Perceived Susceptibility to Contracting COVID-19</b>    | <b>n</b> | <b>%</b> |
|------------------------------------------------------------|----------|----------|
| Little to no chance I will get COVID-19                    | 1800     | 65.1%    |
| Moderate chance of getting COVID-19                        | 788      | 28.5%    |
| High chance of getting COVID-19                            | 165      | 6.0%     |
| <b>Perceived Severity if You Were to Contract COVID-19</b> |          |          |
| Not severe / no worse than common cold                     | 1922     | 71.1%    |
| Somewhat severe                                            | 695      | 25.7%    |
| Very severe / potentially life threatening                 | 87       | 3.2%     |
| <b>Concern About the Pandemic</b>                          |          |          |
| Not concerned                                              | 782      | 28.4%    |
| Slightly concerned                                         | 630      | 22.9%    |
| Moderately concerned                                       | 839      | 30.5%    |
| Highly concerned                                           | 503      | 18.3%    |
| <b>Preventive Behaviors (past year)</b>                    |          |          |
| Often/Always worn a face mask in public areas              | 1987     | 71.9%    |
| Often/Always avoided crowds                                | 1267     | 45.8%    |
| Often/Always maintained physical distance                  | 1301     | 47.1%    |
| Often/Always washed hands                                  | 2273     | 82.2%    |
| <b>Vaccination Decision/Status</b>                         |          |          |
| Received vaccine soon after being eligible                 | 1127     | 40.8%    |
| Reluctant, but vaccinated due to personal decision         | 490      | 17.7%    |
| Reluctant, but vaccinated due to work/school policies      | 260      | 9.4%     |
| Not vaccinated, but plan to be soon                        | 125      | 4.5%     |
| Not vaccinated, and do not plan to be                      | 762      | 27.6%    |
| <b>Support University COVID-19 Mandates</b>                |          |          |
| Support requiring face masks in campus buildings           | 1521     | 55.3%    |
| Support requiring vaccination of students                  | 1267     | 46.1%    |

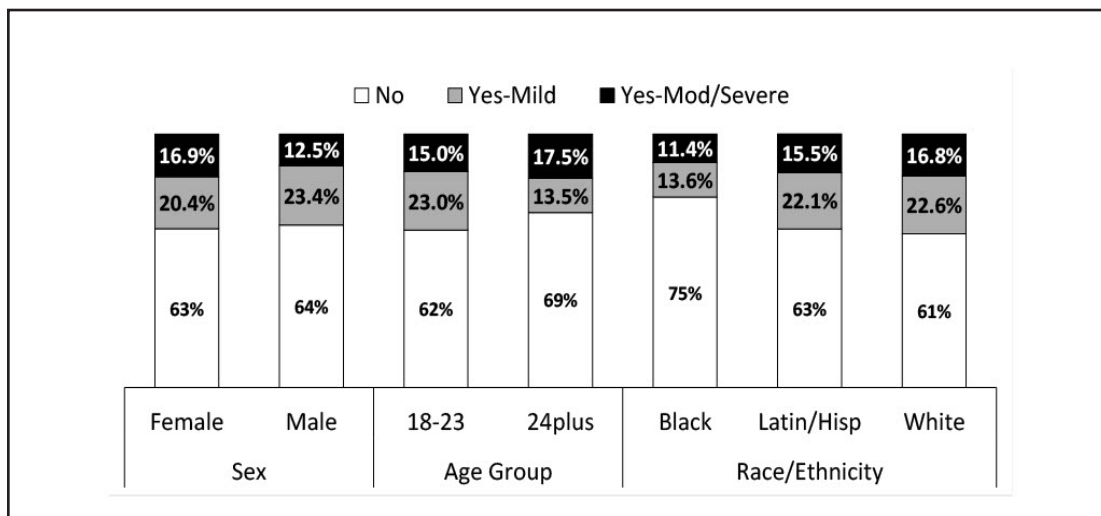


**Figure 1. Rates of COVID Infection and Severity Among Students**

NOTE: NO = Did not contract COVID-19. YES-MILD = Contracted COVID-19 and had mild symptoms. YES-MOD/SEVERE = Contracted COVID-19 and had moderate-to-severe symptoms.

**Table 2.** Sex, Age, and Race Comparisons of Responses

| Characteristic/Group                                                |                  | %     | OR       | Significant statistic            |                                  |
|---------------------------------------------------------------------|------------------|-------|----------|----------------------------------|----------------------------------|
| Contracted COVID-19                                                 |                  |       |          |                                  |                                  |
| Sex                                                                 | Female           | 37.4% | 1.06     | X <sup>2</sup> (1)=9.32, p<.001  |                                  |
|                                                                     | Male             | 36.0% | referent |                                  |                                  |
| Age Group                                                           | 18-23            | 38.0% | referent |                                  |                                  |
|                                                                     | 24 and older     | 31.1% | 0.73     |                                  |                                  |
| Race/Ethnicity                                                      | African American | 25.0% | 0.51     |                                  |                                  |
|                                                                     | Latin/Hispanic   | 37.5% | 0.93     |                                  |                                  |
|                                                                     | White            | 39.4% | referent |                                  |                                  |
| Friend/family member/co-worker had severe COVID-19 symptoms or died |                  |       |          |                                  |                                  |
| Sex                                                                 | Female           | 49.9% | 1.38     | X <sup>2</sup> (1)=14.08, p<.001 |                                  |
|                                                                     | Male             | 41.9% | referent |                                  |                                  |
| Age Group                                                           | 18-23            | 46.2% | referent | X <sup>2</sup> (1)=13.66, p<.001 |                                  |
|                                                                     | 24 and older     | 54.9% | 1.42     |                                  |                                  |
| Race/Ethnicity                                                      | African American | 49.3% | 1.04     |                                  |                                  |
|                                                                     | Latin/Hispanic   | 47.7% | 0.97     |                                  |                                  |
|                                                                     | White            | 48.3% | referent |                                  |                                  |
| Moderate-to-high perceived susceptibility                           |                  |       |          |                                  |                                  |
| Sex                                                                 | Female           | 37.8% | 1.72     |                                  | X <sup>2</sup> (1)=51.15, p<.001 |
|                                                                     | Male             | 26.1% | referent |                                  |                                  |
| Age Group                                                           | 18-23            | 31.9% | referent | X <sup>2</sup> (1)=34.55, p<.001 |                                  |
|                                                                     | 24 and older     | 45.1% | 1.75     |                                  |                                  |
| Race/Ethnicity                                                      | African American | 31.7% | 0.87     |                                  |                                  |
|                                                                     | Latin/Hispanic   | 36.6% | 1.08     |                                  |                                  |
|                                                                     | White            | 34.8% | referent |                                  |                                  |
| Somewhat severe-to-severe perceived severity                        |                  |       |          |                                  |                                  |
| Sex                                                                 | Female           | 30.5% | 1.34     |                                  | X <sup>2</sup> (1)=9.25, p<.01   |
|                                                                     | Male             | 26.1% | referent |                                  |                                  |
| Age Group                                                           | 18-23            | 26.8% | referent | X <sup>2</sup> (1)=14.33, p<.001 |                                  |
|                                                                     | 24 and older     | 34.9% | 1.47     |                                  |                                  |
| Race/Ethnicity                                                      | African American | 39.5% | 1.81     | X <sup>2</sup> (2)=20.99, p<.001 |                                  |
|                                                                     | Latin/Hispanic   | 31.1% | 1.25     |                                  |                                  |
|                                                                     | White            | 26.5% | referent |                                  |                                  |

**Table 2.** Continued

| Characteristic/Group                                 |                  | %     | OR       | Significant statistic             |
|------------------------------------------------------|------------------|-------|----------|-----------------------------------|
| Moderate-to-high level of concern about the pandemic |                  |       |          |                                   |
| Sex                                                  | Female           | 52.7% | 1.87     | X <sup>2</sup> (1)=51.15, p<.001  |
|                                                      | Male             | 37.3% | referent |                                   |
| Age Group                                            | 18-23            | 45.8% | referent | X <sup>2</sup> (1)=34.55, p<.001  |
|                                                      | 24 and older     | 59.6% | 1.75     |                                   |
| Race/Ethnicity                                       | African American | 77.1% | 4.41     | X <sup>2</sup> (2)=115.48, p<.001 |
|                                                      | Latin/Hispanic   | 53.1% | 1.49     |                                   |
|                                                      | White            | 43.3% | referent |                                   |
| Often-or-always wore a face mask in public buildings |                  |       |          |                                   |
| Sex                                                  | Female           | 75.6% | 1.83     | X <sup>2</sup> (1)=44.31, p<.001  |
|                                                      | Male             | 62.8% | referent |                                   |
| Age Group                                            | 18-23            | 70.9% | referent | X <sup>2</sup> (1)=11.14, p<.001  |
|                                                      | 24 and older     | 77.9% | 1.45     |                                   |
| Race/Ethnicity                                       | African American | 94.3% | 7.85     | X <sup>2</sup> (2)=88.48, p<.001  |
|                                                      | Latin/Hispanic   | 76.1% | 1.51     |                                   |
|                                                      | White            | 67.8% | referent |                                   |
| Often-or-always engaged in physical distancing       |                  |       |          |                                   |
| Sex                                                  | Female           | 49.7% | 1.47     | X <sup>2</sup> (1)=19.45, p<.001  |
|                                                      | Male             | 40.3% | referent |                                   |
| Age Group                                            | 18-23            | 44.1% | referent | X <sup>2</sup> (1)=44.37, p<.001  |
|                                                      | 24 and older     | 59.9% | 1.89     |                                   |
| Race/Ethnicity                                       | African American | 76.2% | 4.43     | X <sup>2</sup> (2)=115.90, p<.001 |
|                                                      | Latin/Hispanic   | 47.4% | 1.25     |                                   |
|                                                      | White            | 41.9% | referent |                                   |
| Often-or-always avoided crowded areas/events         |                  |       |          |                                   |
| Sex                                                  | Female           | 48.4% | 1.47     | X <sup>2</sup> (1)=19.22, p<.001  |
|                                                      | Male             | 39.0% | referent |                                   |
| Age Group                                            | 18-23            | 43.6% | referent | X <sup>2</sup> (1)=26.82, p<.001  |
|                                                      | 24 and older     | 55.8% | 1.63     |                                   |
| Race/Ethnicity                                       | African American | 74.8% | 4.46     | X <sup>2</sup> (2)=124.97, p<.001 |
|                                                      | Latin/Hispanic   | 50.4% | 1.53     |                                   |
|                                                      | White            | 40.0% | referent |                                   |

**Table 2.** Continued

| Characteristic/Group                                                   |                  | %     | OR       | Significant statistic             |
|------------------------------------------------------------------------|------------------|-------|----------|-----------------------------------|
| Was Vaccinated                                                         |                  |       |          |                                   |
| Sex                                                                    | Female           | 69.4% | 1.28     | X <sup>2</sup> (1)=7.56, p<.01    |
|                                                                        | Male             | 63.9% | referent |                                   |
| Age Group                                                              | 18-23            | 66.3% | referent | X <sup>2</sup> (1)=13.22, p<.001  |
|                                                                        | 24 and older     | 74.3% | 1.50     |                                   |
| Race/Ethnicity                                                         | African American | 81.2% | 2.33     | X <sup>2</sup> (2)=33.53, p<.001  |
|                                                                        | Latin/Hispanic   | 72.4% | 1.40     |                                   |
|                                                                        | White            | 65.0% | referent |                                   |
| Was an Early Vaccine Adopter: Was vaccinated soon after being eligible |                  |       |          |                                   |
| Sex                                                                    | Female           | 40.8% | 1.06     |                                   |
|                                                                        | Male             | 39.6% | referent |                                   |
| Age Group                                                              | 18-23            | 36.8% | referent | X <sup>2</sup> (1)=63.35, p<.001  |
|                                                                        | 24 and older     | 55.2% | 2.12     |                                   |
| Race/Ethnicity                                                         | African American | 47.5% | 1.47     | X <sup>2</sup> (2)=11.36, p=.003  |
|                                                                        | Latin/Hispanic   | 43.9% | 1.26     |                                   |
|                                                                        | White            | 38.2% | referent |                                   |
| Was a Vaccine Refuser: Not vaccinated and not planning to be           |                  |       |          |                                   |
| Sex                                                                    | Female           | 26.4% | 0.92     | X <sup>2</sup> (1)=4.70, p<.05    |
|                                                                        | Male             | 30.5% | referent |                                   |
| Age Group                                                              | 18-23            | 28.8% | referent | X <sup>2</sup> (1)=8.78, p=.003   |
|                                                                        | 24 and older     | 22.6% | 0.72     |                                   |
| Race/Ethnicity                                                         | African American | 15.6% | 0.41     | X <sup>2</sup> (2)=31.29, p<.001  |
|                                                                        | Latin/Hispanic   | 23.1% | 0.68     |                                   |
|                                                                        | White            | 30.4% | referent |                                   |
| Supports University Requirement for Face Masks in Buildings            |                  |       |          |                                   |
| Sex                                                                    | Female           | 58.5% | 1.64     | X <sup>2</sup> (1)=33.00, p<.001  |
|                                                                        | Male             | 46.3% | referent |                                   |
| Age Group                                                              | 18-23            | 53.5% | referent | X <sup>2</sup> (1)=12.74, p<.001  |
|                                                                        | 24 and older     | 61.9% | 1.41     |                                   |
| Race/Ethnicity                                                         | African American | 88.2% | 7.82     | X <sup>2</sup> (2)=155.02, p<.001 |
|                                                                        | Latin/Hispanic   | 58.6% | 1.48     |                                   |
|                                                                        | White            | 48.8% | referent |                                   |

**Table 2.** Continued

| Characteristic/Group                                                 |                  | %     | OR       | Significant statistic  |
|----------------------------------------------------------------------|------------------|-------|----------|------------------------|
| <b>Supports University Mandates for Student COVID-19 Vaccination</b> |                  |       |          |                        |
| Sex                                                                  | Female           | 47.0% | 1.19     | $X^2(1)=4.33, p<.05$   |
|                                                                      | Male             | 42.6% | referent |                        |
| Age Group                                                            | 18-23            | 44.2% | referent | $X^2(1)=17.65, p<.001$ |
|                                                                      | 24 and older     | 54.1% | 1.49     |                        |
| Race/Ethnicity                                                       | African American | 66.8% | 2.92     | $X^2(2)=76.75, p<.001$ |
|                                                                      | Latin/Hispanic   | 53.3% | 1.66     |                        |
|                                                                      | White            | 40.8% | referent |                        |

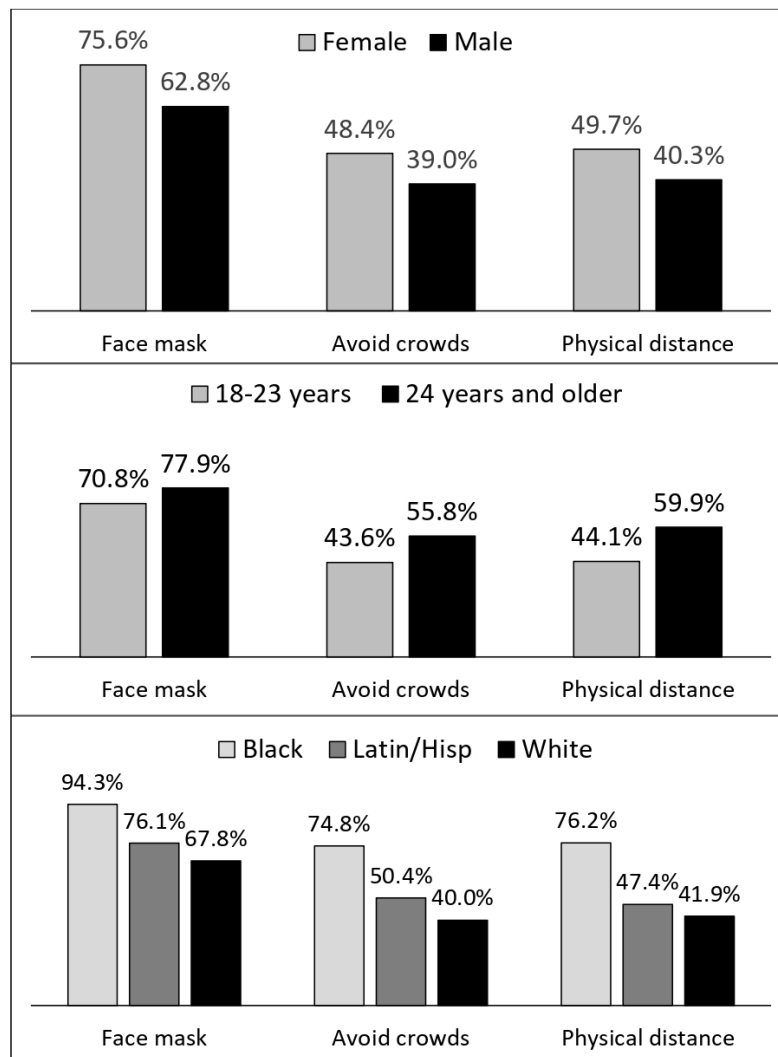


**Figure 2.** Percent of Students Who "Often-or-Always" Engaged in COVID-19 Preventive Behaviors

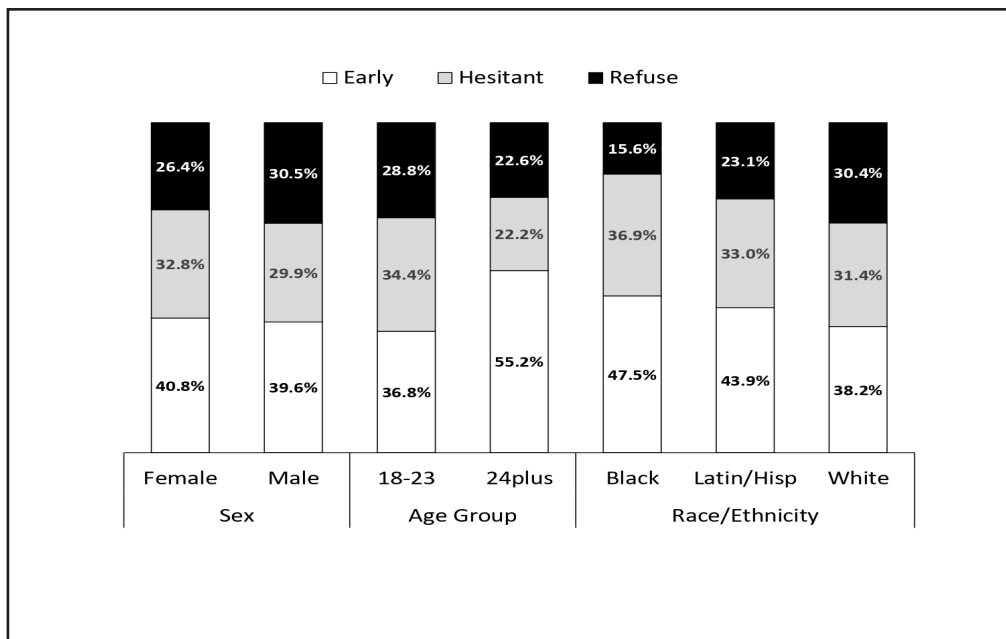


**Figure 3. Percent of Students Who Were Early Adopters, Hesitant Adopters, and Vaccine Refusers**

*Note:* EARLY = Early Adopters - Chose to be vaccinated soon after being eligible. HESITANT = Hesitant Adopters - Was not initially vaccinated but later chose to be. REFUSE = Vaccine Refusers - It not vaccinated and does not plan to be.

## DISCUSSION

Early research on college students related to the COVID-19 pandemic primarily focused on their mental health, concerns, academic performance, and behaviors during the lockdown period. As the pandemic evolved, students returned to campus where COVID-19 preventing policies were in place (e.g., requiring face masks in buildings and social distancing). Vaccinations were soon developed. By April 2021, all U.S. adults were eligible to receive a vaccine, and many universities encouraged or mandated student vaccination. Research has shown that various aspects of pandemic-related effects, perceptions, and behaviors vary with race, age, and sex, yet examination of COVID-19 responses of university student with respect to these demographic variables is limited. The purpose of this study was to describe college students' COVID-19 infection rates and experiences with family/friends who contracted the virus; perceived susceptibility and severity; pandemic-related concern; engagement in COVID-preventing behaviors; rates of vaccination and the decision to be or not to be vaccinated; and attitudes toward COVID-19 related university policies. In addition, we compared responses of sex, age, and race/ethnicity demographic groups. Data were collected via an online survey distributed at five universities during the Fall 2021 semester. It yielded 2764 responses with most attending two public universities in Louisiana and Missouri.

### COVID-19 Infection Rate

A little over one third (36.7%) of college students in our sample reported contracting the virus.

These values generally align with previous survey-based research. For example, 32.5% of Nevada college students surveyed in early 2021 (Elliot & Yang, 2022), and 38% from two national surveys in March 2022 (Kecojevic et al., 2021; Soulakova et al., 2023) reported testing positive or believing they had contracted COVID-19. However, these self-report percentages are slightly lower than the 41% infection rate predicted by the results of antibody testing conducted in 2021 at the University of Georgia (Ebell et al., 2022). Most of our respondents (93.4%) knew someone who had contracted COVID-19, and 47.8% had a family member or friend who had severe symptoms or died as a result of the virus.

### Concern, Perceived Susceptibility, and Perceived Severity

Perceived susceptibility and severity are cognitive belief constructs in the Health Belief Model that are theoretically linked to preventive health behaviors, and their importance has been supported by decades of research (Skinner et al., 2015). Data collected during the Spring 2020 lockdown semester indicated 40-90% of U.S. college students had high levels of concern about the pandemic (Hickey et al., 2021; Kecojevic et al., 2020; Son et al., 2020), but concern has tended to decline over time (Charles et al., 2021). Our data suggests concern among college students has continued to decline; only 18.3% of the sample was highly concerned, while over 50% were slightly or not concerned about the pandemic.

Regarding perceived susceptibility, 45% of college students from a large U.S. midwestern university reported low COVID-19 perceived susceptibility.

ity in mid-2020 (Rentner & Alsulaiman, 2022). By comparison, two thirds of our respondents indicated their perceived susceptibility to the virus was low (65.1%), and one-third moderate (28.6%). Few believed they had a high chance of contracting COVID-19 (6.0%). These data suggest that perceived susceptibility among college students may have similarly lowered as the rate of COVID-19 infection has declined over time.

Over 70% of our respondents believed the perceived severity of their illness if they were to contract COVID-19 would be minimal, and few (3.2%) indicated severe illness was likely. Similarly, in previous research, only 9% of 200 nursing students had high perceived severity (Manning et al., 2021) and few college students believe their COVID-19 problems would last a long time (Rentner & Alsulaiman, 2022). This finding is also consistent with college students having greater concern about the dangers of COVID-19 for the health of others than themselves, which has been frequently reported (Charles et al., 2021; Cohen et al., 2020; Hickey et al., 2021; Son et al., 2020; Tasso et al., 2021).

### **Preventive Behaviors**

At the outset of, and throughout the pandemic, public health agencies and officials advocated for people to engage in behaviors to prevent the spread of the virus. Key behaviors included wearing a face mask when near others, washing hands frequently, and engaging in physical distancing behaviors (Centers for Disease Control and Prevention [CDC], 2021a; World Health Organization, 2023). Data on U.S. college students collected early in the pandemic indicated most reported complying with recommendations with over 75% avoiding crowds/social distancing and washing hands often (Cohen et al., 2020; Hickey et al., 2021; Kecojevic et al., 2020; Rentner & Alsulaiman, 2022). Mask wearing tended to be slightly lower during early 2020 when universities delivered instruction online (Cohen et al., 2020; Rentner & Alsulaiman, 2022), but increased to 80% or higher when universities re-opened and mandated students and faculty wear them in buildings (Clark et al., 2023; Hickey et al., 2021; Li et al., 2022). At the time of this study (Fall 2021), campus mask mandates had ended, but were still encouraged by health agencies, and 71.9% of students in our sample reported regularly wearing a face mask when near others. By comparison, slightly less than half were avoiding crowds (45.8%) or physical distancing from others (47.1%), these values suggesting a reduction in practice.

### **Attitudes about COVID-19 Campus Policies**

A reduction in infection rates was accompanied by a desire to re-open campuses, and policies were put into place to reduce the spread of COVID-19 when students returned to live and attend classes on campus, such as mandating face masks in buildings, reducing the size of gatherings, and practices to facilitate physical distancing (Lederer et al., 2021). The development of COVID-19 vaccines was soon

followed by deliberation for/against requiring vaccination for students and faculty/staff (Burke, 2021), with over 700 colleges and universities in the U.S. opting to required vaccination (Acton et al., 2022), this requirement higher among private than public universities (Trujillo et al., 2021). Seldom have researchers reported data on student attitudes toward these pandemic-related policies. In their national survey, Trujillo et al. (2021) found that the rate of student approval/disapproval of the way their university handled COVID-19 vaccination on campus was 33% higher on campuses that required students to be vaccinated compared to those without such a requirement. We focused on two specific policies: mandating face masks in campus buildings, and requiring students receive a COVID-19 vaccine. Among our sample, approximately half of students supported these policies, 46.1% supported the requirement of student vaccination, and 55.3% supported mandating face masks on campus. We found no other published data on college students' attitudes on university COVID-19 policies to compare our results, but they do generally align with the finding that slightly over 40% of U.S. adults support COVID-19 vaccination on college campuses (Haeder, 2021).

### **Vaccination Rate and Decision**

We found that 67.9% of students had been vaccinated at the time of survey completion. These rates were higher than national data for all eligible adults at the midpoint of data collection, as well as among young adults in each state where universities were located (36.3% in Louisiana, 17.8% in Florida, 50.6% in Missouri, 44.4% in North Carolina, 57.6% in Virginia) (CDC, 2021b). These results suggest college students were being vaccinated at a higher rate than young adults not in college. This conclusion parallels that from other studies, which includes a 2021 national survey finding 74% of college students reported at least one dose of a COVID-19 vaccine compared to 67% of young adults nationally (Trujillo et al., 2021), and subsequent surveys that reported 85-95% of college students reporting being vaccinated (ACHA, 2022; Kaighobadi et al., 2023). While COVID-19 vaccination rates are lowest among young adults (and increase with age), multiple sources indicate that those with a college education are more likely to get vaccinated (Anderson et al., 2022). It is likely that the higher COVID-19 vaccination rates among college students may be attributed to their educational attainment/goals, access to the vaccine (which was provided on many campuses), and university policies that encouraged the vaccine.

### **Age, Sex, and Race Differences**

Extensive research has documented socio-demographic underpinnings of COVID-19 experiences, attitudes, beliefs, and behaviors that include gender, age, and ethnicity (e.g., Acur-Burkay & Christian, 2022; Anderson-Carpenter & Neal, 2022; Dhanani & Franz, 2022; Ferrin, 2021; Hearne & Nino, 2021;

Lewis & Duch, 2021; Mondal et al., 2021; Peters, 2022). However, many reports of college students during the pandemic provided results for the entire sample and ignored or failed to examine how responses vary with these demographic characteristics.

Gender differences have been reported in numerous COVID-19 related investigations of U.S. adults. Women have consistently been found to have higher pandemic-related concern and perceived risk (Ferrin, 2021; Lewis & Duch, 2021; Metin et al., 2022; Scarinci et al., 2021; Wachira et al., 2022), greater agreement with social distancing policies (Matthews et al., 2021), and report greater compliance with preventive behavioral practices such as mask wearing and social distancing (Ferrin, 2021; Hearne & Nino, 2021; (Matthews et al., 2021; Wachira et al., 2022). In addition, at the time of data collection, the rate of COVID-19 vaccination was higher among women than men in all age groups and in the states where universities were located (e.g., Louisiana females 48.8%, males 43.0%; Missouri females 36.2%, males 29.3%) (CDC, n.d.b). Previous research on college students has reported males are less likely to believe COVID-19 poses a risk to them (Kaighobadi et al., 2023), but Soula-kova et al. (2023) found no difference in vaccine uptake among male vs. female college students in an early 2022 survey.

We found several gender differences. Consistent with data on U.S. adults, female students in our study were 72% more likely to have high perceived susceptibility and 87% more likely to have high pandemic-related concern. Additionally, they reported being more likely to engage in preventive behaviors (83% more likely to wear a mask, 2.63 times more likely to wash hands frequently) and agree with mask mandates on campus (64% more likely) than males. Consistent with Soula-kova et al. (2023), we found no difference in vaccine rate among male vs. female students.

Our data also revealed age-related differences in attitudes and behaviors. We compared students divided into two age groups typically associated with traditional (18-23 years) and non-traditional students (24+ years). Reflective of the university setting, the majority of our sample fell into the traditional student category, but we had over 500 students in the 24+ group. Older students reported higher perceived COVID-19 susceptibility and severity and were 45-89% more likely to engage in virus-preventing behaviors than younger students. They were also 41-49% more likely to support COVID-19 related university policies, and 2.12 times more likely to have been vaccinated early. Perhaps as a function of these concerns and behaviors, older students were significantly less likely to have contracted COVID-19 than younger students. Previous research on COVID-19 vaccination rates among college students has similarly reported higher rates of vaccine uptake among older students (ACHA, 2022; Elliott & Yang, 2022; Kecojevic et al., 2021), and among adults, preven-

tive behavioral compliance tends to increase across age groups (e.g., Hearne & Nino, 2021; Wachira et al., 2022).

The pattern of variance in survey responses as a function of socio-demographics were most pronounced for race/ethnicity, with the greatest differences between Black/African American and White students. Black students were 81% more likely to perceive the virus as severe, and over 4 times more likely to be concerned about the pandemic. They were 4 times more likely than White students to report physical distancing and avoiding crowds, and over 7 times more likely to wear a face mask indoors to prevent COVID-19. African American students were more also likely to support university COVID-19 policies, get vaccinated to prevent COVID-19 and be an early vaccine adopter. Given these attitudinal and behavioral characteristics, it may not be surprising that Black students were least likely to have contracted COVID-19.

These findings are similar to the results of previous research on U.S. college campuses, and on race-related differences in preventive behaviors. For example, the ACHA (2022) reported that worry about contracting the COVID-19 virus was higher among Black and Hispanic than White students. In their survey of over 4500 adults, Hearne and Nino (2021) found African Americans were 2.24 times more likely to wear a face mask than Whites, and Anderson-Carpenter and Neal (2022) concluded Black adults viewed the COVID-19 health threat more severely, more often wore a mask, and were more willing to comply with stay-at-home orders. However, multiple investigations have found that African American adults had higher vaccine hesitancy and the lowest COVID-19 vaccination rate relative to other race/ethnic groups (Agle et al., 2021, Anderson et al., 2022; Coe et al., 202; Daly et al., 2021; Hennessy et al., 2023; Mondal et al., 2021; Moniz et al., 2021; Ndugga et al., 2022; Pena et al., 2023; Preis et al., 2022; Purnell et al., 2021; Taylor et al., 2023). At the time of data collection, vaccine rates reported by the CDC were higher among White (39.7%) than Black adults (33.0%) nationally, and in every state where our data were collected. This inverse pattern in vaccine uptake differences among Black/White college students relative to the adult population is an important finding and is worthy of further investigation.

## CONCLUSIONS

Noteworthy findings of this large-scale survey-based study include those on seldom-reported variables among college students including COVID-19 infection rate, attitudes about COVID-related policies, and COVID-19 vaccination rates and decisions. Much of the previous research related to the vaccine reported vaccine perceptions and intent, rather than actual vaccination rates. It is important to highlight vaccine rates among college students in this multi-state sample were higher than rates of college aged adults nationwide. Finally, aligning with the findings of previous research on U.S. adults, COVID-

related attitudes, behaviors, and perceptions among college students were found to vary with age, race, and gender. The higher rate of COVID vaccination among Black/African American than White students is in opposition to the racial-comparison data on adults, which indicates lower rates among African Americans. This finding is clearly worthy of additional research, both replicating these trends in other samples, and exploring underlying reasons for racial differences in attitudes and behaviors that may reflect culture, experience, and institutional characteristics. Important limitations of the study, particularly relevant to external validity, are those related to sampling. While students attending multiple universities were surveyed, not all regions of the U.S. were represented, and students attending one public regional university in Louisiana make up a large portion of the sample. Future research that provides data on students from other regions would serve to corroborate these findings and/or identify regional differences.

Data from this study can serve to inform health promotion efforts on college campuses. Public health practitioners ideally tailor interventions and strategies (i.e., messaging, education) for their audience characteristics, which may lead to better outcomes (Alyafei & Easton-Carr, 2024). For example, our study found that, despite knowing someone who had contracted COVID-19, few college students believed they were at risk for contracting it or for serious illness if they did so. Future health promotion campaigns might strongly seek to increase knowledge of the severity of illnesses and risk factors associated, with messages specifically tailored to college students. Similarly, the race and gender disparities clearly suggest that messaging and other efforts target those least likely to engage in self-protecting behaviors.

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