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Factors Associated with Student Adherence to Personal COVID-19 Mitigation Behaviors at Idaho State University

by

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List of Abbreviations

CDC	Centers for Disease Control and Prevention
ISU	Idaho state university
NPI	Non pharmaceutical intervention

List of Symbols

β	Greek small letter Beta

Factors Associated with Student Adherence to Personal COVID-19 Mitigation Behaviors at Idaho State University

Thesis Abstract- Idaho State University (2021)

Introduction: Universities presented high-risk environments for transmission of COVID-19 in Fall 2020 due in part to the high incidence of COVID-19 among younger adults, and the high-density settings on campus. Our objective was to determine factors associated with adherence to recommended COVID-19 mitigation behaviors at Idaho State University to further understand COVID-19 transmission, among students. Methods: 1,288 students were surveyed during 2020 regarding perceived susceptibility to COVID-19, and adherence to personal COVID-19 mitigation behaviors. Demographic information was also collected. Factors associated with adherence to personal COVID-19 mitigation behaviors were analyzed using multivariable linear regression. Results**:** Factors that were significantly associated with adherence to personal COVID-19 mitigation behaviors included gender, perceived susceptibility, and education. Conclusion: More directed public health messaging on COVID-19 mitigation for males, those that live off campus, those that do not perceive themselves susceptible to COVID-19, and Freshman students may help to lessen COVID-19 transmission in campus communities.

Key Words: COVID-19, mitigation, adherence

Chapter I: Introduction

During 2020 and 2021 the respiratory disease COVID-19 reached pandemic status and impacted the lives of individuals throughout the world, in particular colleges and universities were affected by closures and transmission on campuses. In the context of a pandemic respiratory disease, interventions have typically been categorized into two groups, pharmaceutical and non-pharmaceutical interventions (NPIs). NPIs have been found to be effective means of reducing the rate of disease transmission within communities and have been incorporated into institutional health and safety policies throughout the globe (Seale et al., 2020a). During the current COVID-19 pandemic, NPIs such as social distancing and face coverings became household terms. Although globally certain types of NPIs were widely utilized during the COVID-19 pandemic, NPIs have been used effectively in many other pandemics throughout history (Seale et al., 2020a). While NPIs are effective not all groups of individuals adopt or adhere to such interventions which has implications for the continuation of the COVID19 pandemic, and future pandemics. Therefore, it is necessary to understand the factors that are associated with adoption and adherence to NPIs.

Due to the lack of medical interventions, such as pharmaceutical treatments and vaccines, early in the COVID-19 pandemic of 2020, communities implemented mitigation strategies based around nonpharmaceutical interventions. These included physical distancing and the use of face coverings, in addition to the promotion of improved hygienic behaviors, such as increased handwashing and avoiding touching one's face (Seale et al., 2020a). To our knowledge, before the 2020 pandemic face covering acceptance had not been specifically studied among the university population.

Colleges and Universities present high-risk environments for the transmission of respiratory diseases such as COVID-19. High population dense areas are typically found on college and university campuses which have been found to significantly contribute to the transmission of the virus, such as classrooms and athletic programs (Yamey & Walensky, 2020). In particular, university housing has been found to be problematic. A study conducted at a North Carolina university showed that significant outbreaks occurred across their campus, largely attributed to shared university housing (Wilson et al., 2020).

Furthermore, there has been evidence showing that college age individuals (18 – 24 years of age) have facilitated the spread of COVID-19 to older adults who are potentially at risk for severe infection (Oster et al., 2020). These findings highlight the importance of reducing the rate of transmission of COVID-19 within the 18-24 age group. In the absence of a vaccine, aside from avoiding physical contact altogether, NPIs provide an effective way to continue gathering if NPIs are followed both on and off campus. During the Fall semester of 2020, mitigation policies were implemented using NPIs at Idaho State University (ISU) (Idaho State University [ISU], 2020). In order to understand and improve adherence to mitigation policies related to COVID19, and future pandemics involving respiratory droplets and/or airborne spread, it is critical to understand how students have responded to these policies on university campuses.

The response during the COVID-19 pandemic of 2020 set the precedent for the implementation of large-scale personal mitigation practice, with the use of NPIs, for a respiratory disease. Additionally, researchers have expressed that certain NPIs, in particular face coverings, may become fixtures of social life in certain settings moving forward (Mermel, 2021). If in the future such mitigation efforts are deemed worthwhile, as a result of this research, there will be an

increased understanding of the factors that are associated with the adherence to personal mitigation behaviors at the university level.

Problem Statement

Given the nature of COVID-19 transmission and the high-risk environment that universities present for infection, student adherence to personal mitigation practices to prevent COVID-19 infection is of the upmost importance, in order to protect the health of the campus and surrounding communities. However, due to the novelty of the personal mitigation practices that were initiated during the Fall semester of 2020 at ISU, there is little known about student adherence and attitudes towards the COVID-19 mitigation practices. Therefore, it is the intent of this research to describe adherence to and understand factors associated with COVID-19 mitigation practices that were established at ISU during the fall semester of 2020.

Specific Aims

In order to complete this objective, this study has the following specific aims:

1) Evaluate attitudes towards the use of face coverings among students at ISU in Fall 2020.

2) Determine rate of self-reported adherence with COVID-19 mitigation strategies and preventive health behaviors among students at ISU in Fall 2020.

3) Determine the factors associated with adherence to COVID- 19 mitigation strategies and preventive behaviors among students at ISU in Fall 2020.

    3b) Determine the association between perceived susceptibility and adherence to COVID-19 mitigation strategies among students at ISU in Fall 2020 adjusting for demographic factors.

Significance

The Fall 2020 semester at ISU is the first in which there has been large scale mitigation and surveillance associated with COVID-19. This research is significant in that it will contribute to a small but growing body of research on COVID-19 mitigation within the university setting. As a result of this research, policymakers at ISU and elsewhere may be better informed when developing and implementing health and safety policies at their respective universities relevant to COVID-19 or, if in the future, there is another respiratory disease that requires similar largescale mitigation. With this in mind, the better-informed policymakers are on disease mitigation at the university level, ultimately the healthier their universities, and the surrounding communities will be.

Chapter II: Evaluation of COVID-19 Mitigation Policies on University Campuses During the 2020 Pandemic

During the Spring semester of 2020, many colleges and universities were forced to close their campuses due to the COVID-19 pandemic. Subsequently, over the summer months university officials were challenged with developing safe and effective protocols for reopening in the Fall. In the absence of vaccines, universities primarily incorporated NPI's into their COVID19 health and safety mitigation policies, such as the use of face coverings, physical distancing, and the promotion of improved hygiene. ISU in particular implemented policies requiring the use of face coverings in all outdoor and indoor spaces, in addition to guidelines to facilitate physical distancing (Idaho State University, 2020).

COVID-19 Epidemiological Context

While this current study was taking place, the COVID-19 pandemic was still enfolding, therefore epidemiological metrics were continuously in flux. However, some epidemiological context can be provided. The Fall 2020 semester for ISU took place between August 17th and December 4th. In absolute terms, according to Southeastern Idaho Public Health, there were 78 active COVID-19 cases on August 17th 2020 in Bannock County, the county where the primary ISU campus is located. The number of active cases continued to rise exponentially and on December 4th there were 648 active reported cases in Bannock County (Southeastern Idaho Public Health, 2020). To date, the highest active cases per day in Bannock County occurred in December 2020. During the Fall 2020 Semester, the traditional university student age group of 18–24 years had the highest incidence rates in the country. The CDC reported that the COVID19 incidence rate during mid-November for this age group was approximately 340 per 100,000 people (Centers for Disease Control and Prevention [CDC], 2020a)

Estimations of transmissibility of COVID-19 were calculated based off a meta-analysis which showed the median R0, or reproductive number, to be approximately 2.85 for the general population, however researchers have acknowledged that the reproductive number varied significantly throughout the country (Billah et al., 2020). This reproductive number reflects the highly contagious nature of this disease. A contributing factor to this elevated reproductive number may be the high amount of asymptomatic spread that is associated with COVID-19, which is believed to be between 40%-50%. In addition to asymptomatic spread, pre-symptomatic spread has been a problematic characteristic of disease transmission (Byrne et al., 2020).

Byrne et al. (2020) have conducted a meta-analysis of data surrounding the infectious period of the coronavirus. The infectious period, the time when an individual is shedding virus and can infect others, for asymptomatic infections is estimated to be between 6.5-9.5 days, while the pre-symptomatic infectious period varies from 1-4 days. There is also variability for the infectious period once symptoms begin, however it is believed that it is no longer than 10 days (CDC, 2020b). Overall, the infectious period is dependent on the viral load and incubation period. The coronavirus has been shown to have a median incubation period of 5.1 days, with 97.5% of cases manifesting within 11 days after infection. These widely variable incubation and infectious periods and asymptomatic and pre-symptomatic spread, combined with the highdensity settings of university life, have likely contributed to the elevated risk of spread of COVID-19 on university campuses.

Face Coverings

The use of face coverings and physical distancing have received a great deal of attention during the COVID-19 pandemic, and in the absence of a vaccine, were believed to be among the most effective ways to prevent transmission and protect communities. COVID-19 has been found

to be transmitted through human-to-human contact, primarily from respiratory droplets from infected individuals (Morawska et al., 2020). Due to this route of transmission, mitigation strategies have largely focused on reducing contact with the infected respiratory droplets through the use of face coverings and physical distancing measures, which have shown to be effective at reducing the probability of transmission (Jarvis et. al, 2020; Cheng et al., 2020).

Facial coverings have been shown to protect the wearer through the reduction of inhalation of respiratory droplets and protect others by reducing the transmission of respiratory droplets by exhalation of an infected individual (Robinson et al., 2021). Furthermore, in a metaanalysis conducted by Abboah- Offei et al. (2021), examining the effectiveness of the use of face coverings for respiratory pathogens, there was significant evidence to support that those who wore face coverings were less likely to contract the disease. Specifically, those who did not wear face coverings were 36.9 times more likely to contract COVID-19 (Abboah-Offei et al., 2021). With all of the available evidence supporting face coverings for the reduction of virus transmission, the Centers for Disease Control and Prevention (CDC) formally implemented guidelines for universities which included the use of face coverings and physical distancing measures on campuses (Centers for Disease Control and Prevention, 2021).

Despite substantial evidence to support the effectiveness of face coverings in preventing COVID-19 transmission, their use has been highly polarized and not universally adhered to. Various factors have been identified that have been associated with affecting the likelihood of using a face covering. For instance, gender has been found to be one of the strongest predictors of compliance, with estimations showing that women may be 50% more likely to use face coverings, despite men being more likely to be at risk for severe infection (Haischer et al., 2020).

Additionally, Haischer et al. (2020) described that those who live in urban areas are more likely than those who live in rural areas to wear face coverings.

Physical Distancing

In addition to the use of face coverings, physical or social distancing has been highly promoted in order to reduce transmission of the virus. Research has shown that in high population dense areas there is an increased propensity for the transmission of respiratory droplets, and subsequently high population dense areas have been found to have higher COVID19 reproduction numbers (Rubin et al., 2020). During normal times certain university settings, such as classrooms and athletic events, may be considered high population dense areas. Mathematical models have provided evidence of the effectiveness of physical distancing for the reduction of the probability of COVID-19 transmission and validation of the widespread promotion of the practice and implementation of physical distancing policies (Elgazzar, 2020). Abouk and Heydari (2021), have provided further evidence on the effectiveness of stay-at-home orders during the COVID -19 pandemic for reducing the rates of COVID-19 transmission. The research that has been done providing evidence for the effectiveness of physical distancing measures and stay at home orders gives validation for the university policies implementing physical distancing guidelines and moving to an online of hybrid model during the pandemic.

Physical distancing and mental health

Although there is efficacy in the practice of physical distancing to reduce transmission of COVID-19, it has been recognized that the isolation that accompanies physical distancing may have consequences for individual's mental health. These consequences may be particularly severe for college age young adults, who are typically in the peak of their social lives. For

instance, researchers in Canada found evidence of declining mental health among university students that did not previously have a preexisting mental health condition (Hamza et al., 2020). The decline in mental health among these students was attributed to increased social isolation as a result of mitigation efforts during the pandemic. Therefore, physical distancing may be an effective strategy for reducing COVID-19 transmission, although there may be some deleterious consequences to mental health of university students that accompanies physical distancing mitigation efforts.

Factors Associated with Personal Adherence to NPI Mitigation Behaviors

Evidence suggests that people form certain demographic groups may be more likely to adhere to personal mitigation behaviors for COVID-19. For instance, Seale et. al (2020) has suggested that women, and the highly educated in particular, are more likely to adhere with preventative mitigation behaviors. Prior to the COVID-19 pandemic Moran and Del Valle (2016), conducted a meta-analysis with the intent of understanding the relationship between demographic characteristics and engaging in protective behaviors for respiratory diseases. Consistent with the research by Haischer et al. (2020), Moran and Del Valle concluded that women were 50% more likely to participate in non-pharmaceutical intervention behaviors to protect themselves from infection (Moran & Del Valle, 2016).

Education is also a common factor for the adoption of positive health behaviors. Researchers have discussed this topic as the education gradient and have identified possible explanations for its occurrence. Cutler and Lleras-Muney (2009), conducted data analysis that showed approximately one third of the gradient may be attributed to family background and health insurance, one third attributed to knowledge and cognitive ability, and a third attributed to social networks (Cutler & Lleras-Muney, 2010).

Perceived Susceptibility

Seale et al. (2020) has also suggested that those who perceive themselves to be susceptible to disease are more likely to adhere with preventive mitigation behaviors. The Health Belief Model purposes that individuals who perceive themselves more likely to develop a disease, or severe infection from a disease, such as COVID-19, would be more likely to adhere to personal mitigation behaviors in order to prevent infection. In a study evaluating perceived susceptibility in the context of COVID-19, participants were asked to complete a questionnaire in which they were asked about their likelihood of being infected with COVID-19, in addition to participating in health promoting behaviors to prevent the spread of COVID-19. Approximately 60% of participants who engaged in health promoting behaviors also perceived themselves likely to be susceptible to disease infection (Jose et al., 2021). There is currently limited data on the relationship between perceived susceptibility and adherence to personal mitigation behaviors among university students.

Throughout the COVID-19 pandemic there has been evidence provided on the effectiveness of various strategies to mitigate the spread of COVID-19. In particular, the use of face coverings and physical distancing have found substantial support. The CDC has also promoted various health behaviors, with the goal of reducing the rate of transmission, such as frequent handwashing and decontaminating surfaces. Furthermore, surveillance through testing and ultimately vaccinations, which were just beginning to become available to certain populations at the time this paper was written, have been seen as valuable tools in order to end the pandemic. However, there have been reservations by some individuals towards these mitigation strategies and health behaviors, in particular the use of face coverings and vaccines.

The attitudes towards and compliance with these mitigation strategies and health behaviors by the ISU campus community remains unknown.

Chapter III: Methods

Setting

The Idaho State University main campus can be found in the rural community of Pocatello, which according to the U.S. Census Bureau had a population of 56,637 in 2019. Pocatello is located in Bannock County, Idaho. The population of Bannock County was 87,808 in 2019. Bannock County is primarily white, with 8.9% Hispanic and 3.8% American Indian (U.S. Census Bureau, 2019).

As of November 24th, 2020 there were 622 self-reported cases of COVID-19 that occurred within the campus community at ISU. There was no systematic screening program for COVID-19 on campus during Fall 2020. This peak in cases corresponded with a peak in cases in the corresponding community. There were a high number of weekly cases from September 3rd to November 17th. Notably, there were no in-person classes held after the 25th of November, and at this time cases began to decline (ISU, 2020).

ISU is a public university that had a reported total of 12,402 students, with the majority of students located on the Pocatello campus during the Fall 2020 semester. Additionally, there were 17% students that were exclusively online, 26% exclusively in-person and 6,968 had hybrid in person/online classes. The student population consisted of 57% female and 43% male, with 72% white and 13% identifying as Hispanic or Latino. The majority of students are traditional age college students with 78% being 24 years of age or younger, and 22% being 25 or older. 58% of the population attended full time and 42% attended part time (ISU, 2021).

ISU established institutional policy prior to the start of the Fall 2020 semester that required the use of face coverings in all indoor and outdoor spaces when in the presence of

others, in addition to guidelines for maintaining physical distancing (ISU, 2020). The city of Pocatello also established a city-wide mask mandate that was put in place on November 21st, 2020, that required the use of face coverings in all indoor and outdoor spaces when in close proximity to others (City of Pocatello, 2020).

Sample

In order to gain data relevant to the scale of the impact of COVID-19 has had on the ISU campus, in collaboration with stakeholders at ISU, a survey was developed and distributed via email invitation to a list of fee-paying students (n=8,129). The survey received research approval from the ISU Institutional Review Board. Within the survey, questions measuring personal mitigation behaviors such as face coverings, social distancing, testing, and vaccines were included. The survey was administered using the Qualtrics online survey platform and received a 16% response rate with a total of 1,288 anonymized student respondents. Students were incentivized to participate in the survey with an option to enter into a raffle to win a $25 gift card upon completion of the survey. Respondents were excluded if they were not students, had not completed the survey, were under the age of 18, indicated their gender as other, or reported previously having COVID-19. After excluding those that did not meet the inclusion criteria, there was a total of 1,192 survey respondents included in this study.

Measures

The survey was distributed beginning mid-November of 2020 through mid-December 2020. The survey consisted of 36 items in total, however not all of these items were included in this study. The demographic questions that were used for this study included age, gender, residence location, year of study, and online class status. Also included in the questionnaire was a question evaluating students' perception of their likelihood to be infected with COVID-19

within the next year. This question was used to evaluate perceived susceptibility in the analysis. The question assess the likelihood of being infected was originally asked in a 5-point Likert scale format. This variable was dichotomized in the analysis with those that responded as strongly agree, somewhat agree, replaced with “yes”, and with those that responded as neither agree nor disagree, strongly disagree, and somewhat disagree replaced with “no”.

Attitudes toward facial coverings

Attitudes and intentional behaviors towards face coverings were assessed by survey questions that were derived from a national survey that was used to evaluate face covering use early in the pandemic (Fisher et al. 2020). The questions included are as follows; it is important for me to wear a cloth face covering when I am out in public, it is important for everyone to wear a cloth face covering when they are out in public, I could protect others if I wear a cloth face covering while out in public, I would protect myself from COVID-19 if I wear a face covering when out in public, everyone wearing face coverings while out in public would prevent the spread of COVID-19 in our community, I think it is a good idea for everyone to wear a cloth face covering when in public, and I intend to wear a face covering when I am in public and in the presence of others.

Adherence to personal mitigation behaviors

Additionally, survey respondents were asked to self-report which personal mitigation behaviors they adhered to over the course of the Fall 2020 semester. The questions that were included were as follows: wore a face covering; stayed away from individuals at risk for severe COVID-19 infection; stayed home when sick; cancelled, or postponed social events; stayed away from crowded places; consciously stayed 6ft away from others; and reduced the number of

physical encounters with social contacts. Respondents were directed to select all of the personal mitigation behaviors that applied to them over the Fall 2020 semester.

As adherence to personal mitigation behaviors was our outcome of interest for analysis of aim 3, we calculated a composite score. In order to calculate the composite score, the questions relating to student mitigation during the Fall 2020 semester, the respondents were given a 1 for each behavior they reported adhering to, and a zero if they reported not adhering to a behavior. The behaviors that were selected to be included in the composite were based on evidence from the literature. Given the limited evidence supporting the efficacy of increased hygienic behaviors in suppressing COVID-19, they were not included in the composite. Getting a flu shot was also not directly related to protection from COVID-19, therefore was excluded from the composite as well. Subsequently, each behavior that was included was added resulting in a composite score for each respondent, which had a minimum score of 0 and a maximum of 7.

Statistical Analysis

All analysis used for this study was conducted in Jamovi statistical software package. Statistical analysis included descriptive statistics in addition to bivariate and multivariable linear regression that was used to evaluate the relationship between the independent variables of age, gender, education, housing, online/in person classes, and perceived susceptibility, with the dependent variable of self-reported adherence to the personal mitigation behaviors. The composite score was used in order for the analysis of the dependent variable. The critical value for significant associations was set at 0.05 for the linear regression.

Chapter IV: Results

Demographic characteristics of student survey respondents are presented in Table 1. Survey respondents were 70% female and 30% male. Regarding education level, 11% were first year Freshman, 15% Sophomores, 21% Juniors, 27% Seniors, 24% Graduate students, and 1.2% non-degree seeking continuing education students. The majority of respondents lived off-campus in a residence within driving distance (61%), 17% lived in a residence within walking distance, and 8% had other living arrangements. About one-third (31%) of respondents had all online classes, 36% of respondents indicated having most of their classes online, 27% having some online classes, and 6% indicating only in person classes. Less than half (43%) of survey respondents perceived themselves as susceptible to being infected with COVID-19 in the next year, while 56% believed that they were not susceptible.

Table 1: Demographics of Idaho State University Student Health and Safety Survey Respondents, Fall 2020.

Demographic Variable	***N (% of total)***
Gender	
Female	836 (70.1)
Male	356 (29.9)
Age	
18-21	464 (38.9)
22-24	265 (22.2)
25-44	415 (34.8)
45-59	48 (4.0)
Year of Study	
Freshman, First Year	136 (11.0)
Sophomore	180 (15.1)
Junior	246 (20.7)
Senior	316 (26.6)
Graduate Student	297 (25.0)
Non- Degree Seeking	15 (1.3)
Housing	

Dormitory or Apartment on Campus	163 (13.7)
Residence Driving Distance from Campus	730 (61.3)
Residence Walking Distance from Campus	198 (16.6)
Other	99 (8.3)
Online Class Status	
All	369 (31.0)
Most	432 (36.2)
Some	317 (26.6)
None	74 (6.2)
Perceived Susceptibility to COVID-19 Infection within the next year	
Yes	520 (44.0)
No	672 (56.0)

Student self-reported adherence to the personal COVID-19 mitigation behaviors can be found in Table 2. Each of the personal mitigation behaviors that were included in the questionnaire had at least 50% adherence by respondents, except getting a flu shot (43%). Use of face coverings had the most adherence at 93%. All behaviors relating to social distancing were in the 60%-70% range, although staying away from individuals at risk for severe infection was found to have 71% adherence. As for the hygienic behaviors, 70% indicated wiping potentially contaminated surfaces, 60% indicated increased handwashing, and 56% indicated avoiding touching eyes, nose, or mouth.

Table 2: Self-reported Adherence to COVID-19 Personal Mitigation Behaviors Among Students at Idaho State University, Fall 2020

Mitigation Behaviors	***N (% of total)***
Wore a face covering	1108 (93.0)
Stayed away from individuals at risk for severe infection	849 (71.2)
Wiped potentially contaminated surfaces	828 (69.5)
Washed hands frequently	1024 (59.9)
Consciously stayed 6 ft away from others	820 (68.8)
Stayed home when sick	803 (67.4)
Reduced the number of physical encounters with social interactions	783 (65.7)

Cancelled or postponed a social event	736 (61.7)
Washed hands frequently	1024 (59.9)
Avoided touching eyes nose and mouth	670 (56.2)
Got a flu shot	513 (43.0)

Results showing the bivariate relationship between COVID-19 personal mitigation behavior adherence and factors including age, gender, education, housing, online status, and perceived susceptibility are presented in Table 3. For age, when compared to the 18-21 age group, the 22-24 (β=0.49, $p<0.001$) and 25–44 (β=0.47, $p<0.001$) year-old age groups were found to be significantly associated with higher adherence, however the 45-59 (β=0.47, $p=0.102$) age group was not found to be statistically significant. When compared to females, males had significantly lower adherence to personal mitigation behaviors (β= -.063, $p<.001$). For education level, compared to Freshman/First Year students, all other grade levels had higher adherence to COVID-19 personal mitigation behaviors with the most being used by graduate students, first year freshman- Sophomore (β=0.58; $p=0.006$); Juniors (β=0.60, $p=.002$); Senior (β=0.78, $p<0.001$); Graduate (β=1.34; $p<0.001$); Non-degree seeking or continuing education (β=1.06, $p=0.035$). Online class status was also found to be significantly associated with higher adherence. Compared to those that had all in person classes, mostly online classes (β=-0.42, $p=0.02$), no in person classes (β=-0.77, $p=0.001$), and some in person classes (β=-0.43, $p=0.003$) where all significant. Perceived susceptibility was found to be statistically significant, with those who did not perceive themselves likely to be susceptible to COVID-19 less likely to self- report adherence to personal mitigation behaviors (β= -.52, $p<.001$). Lastly, housing status was not found to be statistically significant, dormitories-other housing (β=-0.12, $p=0.61$), Residence within driving distance (β=.04, $p=0.826$), Residence within walking distance (β=-0.06, $p=0.773$).

Table 3: Bivariate and Multivariable Associations between Demographic factors and Adherence to COVID-19 19 Student Personal Mitigation Behaviors at Idaho State University during Fall Semester 2020.

Variable	***β***	***95% CI***	***P value***	**β**	**95% CI**	**P value**
Intercept (multivariable only)				4.85		**<0.001**
Age						
18-21	(ref)			(ref)		
22-24	0.49	(0.11, 0.41)	**<0.001**	0.24	(-0.04, 0.30)	0.136
25-44	0.47	(0.12, 0.38)	**<0.001**	0.16	(-0.08, 0.24)	0.318
45-59	0.47	(-0.05, 0.54)	0.102	0.19	(-0.20, 0.40)	0.512
Gender						
Female	(ref)			(ref)		
Male	-0.06	(-.0.46, -0.21)	**<0.001**	-0.64	(-0.46, 0.22)	**<0.001**
Education						
Freshman/ First year				(ref)		
Sophomore	0.58	(0.09, 0.53)	**0.006**	0.61	(0.20, 1.02)	**0.004**
Junior	0.60	(0.11, 0.52)	**0.002**	0.59	(0.20, 0.97)	**0.003**
Senior	0.78	(0.21 0.61)	**<0.001**	0.76	(0.36, 1.15)	**<0.001**
Graduate Student	1.34	(0.51 0.91)	**<0.001**	1.21	(0.78, 1.64)	**<0.001**
Non-Degree Seeking	1.06	(0.04, 1.01)	**0.035**	0.96	(-0.04, 1.95)	0.061
Housing						
Dormitory	(ref)			(ref)		
Residence Within Driving Distance	0.04	(-0.15, 0.19)	0.826	-0.70	(-1.20, -0.21)	**0.006**
Residence Within Walking Distance	-0.06	(-0.24, 0.18)	0.773	-0.36	(-0.69, -0.02)	**0.040**
Other	-0.12	(-0.32, 0.19)	0.610	-0.43	(-0.82, -0.04)	**0.032**
Online Class Status						
All	(ref)			(ref)		
Most	-0.42	(-0.36, -0.08)	**0.002**	-0.25	(-0.52, 0.02)	0.073
None	-0.77	(-0.65, -0.16)	**0.001**	-0.44	(-0.91, 0.03)	0.064
Some	-0.43	(-0.37, -0.08)	**0.003**	-0.29	(-0.58, 0.01)	0.055
Perceived Susceptibility						
Yes	(ref)			(ref)		
No	-0.52	(-0.39, -0.16)	**<0.001**	-0.46	(-0.67, -0.25)	**<0.001**

Bolding Indicates Statistical Significance.

The results for the multivariable linear model determining factors independently associated with adherence to COVID-19 personal mitigation behaviors among students are presented in Table 3. Gender, education, housing, and perceived susceptibility were all found to be significantly associated with adherence to COVID-19 personal mitigation behaviors after controlling for demographics and perceived susceptibility. When compared to females', males had lower adherence to personal mitigation behaviors (β=-0.64, $p<0.001$). When looking at education level, compared to Freshman/ First Year students all other grade levels other than Non-degree seeking Continuing Education had higher adherence to COVID-19 personal mitigation behaviors and safety behaviors with the most being used by graduate students, first year freshman- Sophomore (β=0.611; p=0.004); Juniors (β=0.585; p=0.003); Senior(β=0.755, $p<0.001$); Graduate (β=1.212; $p<0.001$); Non-degree seeking or continuing education (β=0.956, p=0.061). Additionally, student housing was also shown to be a significant predictor of adherence to COVID-19 personal mitigation behaviors, When compared to those who live in the dormitories those that live within walking or driving distance have been shown to adhere to have had significantly less adherence to COVID-19 personal mitigation behaviors, dormitories- Other housing (β-0.702, p=0.006), Residence within driving distance (β=-0.355, p=0.040), Residence within walking distance (β=-0.429, p=0.032). Lastly, those who indicated that they believe themselves not likely to be infected with COVID-19 had lower adherence to COVID-19 personal mitigation behaviors were shown to adhere to significantly less behaviors than those who perceived themselves likely to be infected (β=-0.426 $p<0.001$).

There was no significant association between the personal mitigation behaviors and age or online status for classes. For age, with the 18-21 age group as the reference group ,22-24 (β=0.242, p=0.136), 25-44 (β=0.156, p=0.318), 45-49 (β=0.192, p=0.512). As for online class

status, when compared to all in person classes mostly online classes (β=-0.25, p=0.073), No in person classes (β=-0.444, p=0.064), Some in person classes (β=-0.288, p=0.055).

ISU Student attitudes towards face coverings can be found in Table 4. When evaluating attitudes towards face coverings by the student survey respondent s, overall, the attitudes towards face coverings by the respondent s were positive. Approximately 63% of respondents reported that they strongly agreed that it was important for them to wear face coverings when in public, as opposed to only 6% that reported that they strongly disagreed. These sentiments were reflected when asked on their intention to wear a face covering in public, with 63% reporting that they strongly agreed and 6% reporting that they strongly disagreed. When looking at respondents' beliefs in the effectiveness of face coverings 63% strongly agreed that they could protect others from infection by wearing a face covering if they wore a face covering and 47% strongly agreed that they could protect themselves from COVID-19 infection. Conversely, 6% indicated that they strongly disagreed that could protect others with the use of face coverings and 10% strongly disagreed that they could protect themselves. Lastly, 53% strongly agreed that if everyone in the community wore a face covering, they could prevent the spread of COVID-19 within the community, while 8% strongly disagreed.

Table 4: Attitudes Towards Face Coverings Among Students at Idaho State University Fall 2020.

Variable	***N (% of total)***
It is important for me to wear face coverings when in public.	
Strongly agree	750 (63.0)
Somewhat agree	205 (17.2)
Neither agree nor disagree	90 (7.6)
Somewhat disagree	67 (5.6)
Strongly disagree	78 (6.6)
I intend to wear a face covering when I am in public and in the presence of others	
Strongly agree	754 (63.3)

Somewhat agree	194 (16.3)
Neither agree nor disagree	100 (8.4)
Somewhat disagree	76 (6.4)
Strongly disagree	68 (5.7)
I could protect others from COVID-19 if I wear a face covering when out in public.	
Strongly agree	754 (63.3)
Somewhat agree	194 (16.3)
Neither agree nor disagree	100 (8.4)
Somewhat disagree	76 (6.4)
Strongly disagree	68 (5.7)
I would protect myself from COVID-19 if I wear a face covering when out in public	
Strongly agree	560 (47.0)
Somewhat agree	278 (23.3)
Neither agree nor disagree	122 (10.2)
Somewhat disagree	117 (9.8)
Strongly disagree	115 (9.6)
Everyone wearing face coverings while out in public would prevent the spread of COVID-19 in our community	
Strongly agree	630 (52.9)
Somewhat agree	257 (21.6)
Neither agree nor disagree	121 (10.2
Somewhat disagree	86 (7.2)
Strongly disagree	97 (8.1)

Chapter V: Discussion

The present study examined attitudes towards, and factors associated with adherence to personal mitigation behaviors relevant to COVID-19 among students at ISU.

Attitudes Toward Facial Coverings

Overall, there were high rates of self-reported face covering adherence by the campus community. The high rates are likely influenced by the ISU mask mandate that was put in place prior to the beginning of the Fall 2020 semester. Coupled with the fact that the survey was administered by the university enforcing the mandate it is important to note that the survey did not differentiate between attitudes toward the use of face coverings on campus specifically. This evidence provides supporting data to the acceptability of masks in a rural university setting. When looking at the questions evaluating attitudes towards face covering use at ISU, overall, they indicated a high degree of positivity towards their use. This was reflected by the high rate of self-reported adherence to face coverings by the campus community. However, the institutional policy of mandatory use of face coverings on ISU property may have influenced the high rates of adherence.

When compared to a national survey looking at the same constructs evaluating attitudes and intentions towards face coverings, there were many similarities between the ISU and national populations that were observed. For instance, both samples indicated high percentages of agreement to the constructs. Although the national survey was conducted earlier in the pandemic, April and May 2020, the data obtained from the study provides a point of comparison.

For the construct of “I think it is important for me to wear a face covering when out in public”, 81.8% from the national sample agreed with this statement while 80.2% from the ISU sample either strongly agreed or agreed. When looking at the “intention to wear a face covering when in public and in the presence of others”, 84.2% agreed from the national population and 79.6% from the ISU population agreed. For “I could protect other from COVID- 19 if I wear a face covering when out in public”, 76.8% agreed from the national population and 79.6% from the ISU population agreed. For “I could protect myself from COVID-19 if a wear a face covering when in public” 77.6% agreed from the national population and 70.3% agreed from the ISU population. Lastly, for “Everyone wearing a face covering in public would prevent the spread of COVID-19 in our community”, 76.3% agreed from the national population while 74.5% from the ISU population agreed (Fisher et al. 2020).

Adherence to COVID-19 Personal Mitigation Behaviors

The linear regression analysis revealed that there were several factors that were statistically significant in showing associations with adherence to personal mitigation behaviors, with the intention of reducing the rate of COVID-19 transmission. There were some differences between the bivariate and multivariate regression analysis. Initially both age and online status were found to be statistically significant with bivariate associations, however when adjusting for other variables were no longer found to be significant. Additionally, housing was found to not be significant when looking at the bivariate association and was found to be significant when accounting for the other variables.

Our findings regarding differences in adherence to COVID-19 mitigation behaviors is consistent with other research indicating that females and those with higher education are more

likely to adhere to COVID-19 personal mitigation behaviors (Seale et al., 2020). Galasso et. al (2020) provides some explanation as to why women may be more likely to adhere to personal mitigation behaviors in the context of COVID-19. For instance, women may be more likely to perceive COVID-19 as a serious health problem, therefore more likely to take precautions (Galasso et al., 2020).

Compared to women, men have consistently been shown to be less likely to adhere with preventive behaviors, highlighting a need for improved mitigation, and increased public health messaging and intervention specifically for men. Men have also been shown to have higher rates of infection, severity of disease, and mortality from COVID-19 when compared to women (Scully et al., 2020). In June 2020, the CDC reported that 57% of deaths attributed to COVID-19 were men (Griffith et al., 2020). Additionally, in order to improve mitigation behavior adherence in men, Griffith et al. (2020) purposes incorporating several distinct approaches, including health education, community engagement, public health outreach, and sex disaggregated data in clinical practice and policy. Future research should seek to explore these approaches with the intention of improving mitigation behaviors in men at the university level specifically.

Compared to the use of facial coverings, there was less overall adherence to the mitigation behaviors relating to physical distancing. This may be due to a variety of factors including the lower perceived susceptibility of contracting COVID-19, and the perceived severity if individuals in this age group were to be infected. Additionally, young adults may have a more difficult time coping with the distancing guidelines due to negative effects on mental health (Hamza et al., 2020).

When evaluating the relationship between education and protective behaviors in the student population there was a statistically significant association. Freshman First Year students were the least likely to adhere to COVID-19 mitigation behaviors. The highest predictive factor for adherence to COVID-19 mitigation behaviors in the regression model was being a graduate student. Therefore, this research confirms previous evidence that higher education is associated with increased adherence to health-related behaviors. Research done by Cutler and Lleras-Muney (2009), identify knowledge and cognitive ability as an explanation for the education gradient for health behaviors. It may be beneficial to incorporate enhanced education on the importance of protective health behaviors relevant to COVID-19 during incoming student orientation and other ways to message health education towards those in lower grade levels. Education on respiratory disease mitigation during orientation may be effective at preventing disease if the information is retained and utilized by the students throughout the duration of their time at university. Future research in this area may be warranted.

As with gender and education, perceived susceptibility is a significant predictor of adherence to COVID-19 mitigation behaviors. The survey respondents who were less likely to believe themselves susceptible to COVID-19 were also less likely to adhere to personal mitigation behaviors. If a student does not perceive themselves to be at risk for COVID-19 infection there is no incentive for them to take the necessary precautions against COVID-19 infection. According to Lu and Schuldt (2018), in the context of the zika virus, metaphorical framing of messaging has been associated with an increase in public perceived susceptibility to the disease (Lu & Schuldt, 2018). Increasing public perceived susceptibility for COVID-19 through the use of metaphorical framing of public health messaging may be effective at increasing adherence to personal mitigation behaviors.

The model showed that when compared to other housing situations, those that lived on campus were significantly more likely to adhere to COVID-19 mitigation behaviors. With the evidence that Wilson et al. (2020) provides, that reported significant COVID-19 outbreaks occurring in university housing settings early in the Fall 2020 semester, increased mitigation was needed in these environments. It is possible that the exposure to frequent public health messaging and displays of mitigation policies and guidelines in addition to compliance requirements throughout the campus may have contributed to the higher level of personal mitigation behavior adherence by those who live on the university campus. This finding may be an important point for universities to consider with regards to health and safety of those living in on-campus housing, compared to off campus housing. This information could reassure students and their families when deciding whether or not to reside in on-campus housing.

Strengths and Limitations

When evaluating the limitations for this study there are some considerations for external validity that apply. For instance, the sample population for this study was a convenience sample obtained through email with a 16% response rate. To this end, females are overrepresented in the ISU demographics. Moreover, it must be acknowledged that the students that are most likely to participate in a survey on personal mitigation behaviors relating to COVID-19 are students who may be more likely to feel passionately for or against adherence to personal mitigation behaviors that the survey was inquiring about. Therefore there may be concern for a selection bias.. This may be particularly true given the extent to which certain mitigation strategies were politicized by local, state, and national leaders.

Additionally, the data was derived from self-reported survey responses, therefore the accuracy of the responses may be skewed due to those that took the survey wanting to respond with more socially desirable answers. Future studies may seek to utilize other means of evaluating rates of adherence by incorporating other objective observation methods to assess adherence. Additionally, due to the rapid progression of the pandemic, recommendations by the CDC and other government entities were often changing adding confusion to what measures were the most important and could have influenced public adoption of the measures. To this point, administering the survey more times would have allowed for assessment of trends in adherence, which we were unable to measure. Additionally, this cross-sectional study could only look at associations and could not prove causation. Furthermore, not having groups or additional campuses where the survey was administered makes generalizability and assessment of the effectiveness of ISU policies compared to other university policies unfeasible.

This study also has important strengths that should be noted. The large sample size allowed statistical power to determine small but significant differences between groups and increases the generalizability of this study. Additionally, we were able to assess attitudes of face coverings using pre-existing scales that had been used nationally. The timing of administration of the survey caught attitudes and behaviors at what may prove the highest point of COVID-19 disease activity in Southeast Idaho and nationally. Thus, the survey represents an important look at COVID-19 mitigation behaviors when the threat was greatest.

Conclusion

The positive attitudes towards face coverings by the ISU student population, supported by the overall high rates of self-reported adherence to the mitigation behaviors, may highlight the

effectiveness of the public health messaging that has taken place on campus throughout the pandemic, particularly in on-campus housing. However, this analysis indicates several groups that may need more directed public health messaging or training on the importance of personal mitigation behaviors in the context of a respiratory disease pandemic. In particular, males, those with lower levels of educational attainment, those that do not perceive themselves as susceptible to COVID-19, and those that do not live on the university campus may benefit from additional interventions to improve personal mitigation behaviors.

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