UNIVERSITY OF CALIFORNIA SAN DIEGO

Effects of Cultural Orientation and Privacy Perspectives on Trust in Public Health Officials During COVID-19

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by

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ABSTRACT OF THE THESIS

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by

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Master's degree in Public Health

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Professor Cinnamon Bloss, Chair

Objective: The inaccurate portrayal of health information has contributed to distrust in public health throughout COVID-19 causing reduced compliance with recommended health behaviors putting the health and safety of individuals at risk. The purpose of this study is to assess the relationship between cultural orientation and privacy perspectives on trust in public health officials to better disseminate health information and mitigate the impact of COVID-19. Methods: A secondary qualitative analysis was conducted on survey data collected from 634 participants in a cross-sequential study titled "Thoughts and Feelings about COVID-19."

Horizontal Collectivism describes individuals who value equality over power. In Vertical Collectivism, people are willing to sacrifice personal gains for the common group goals. Vertical Individualism emphasizes personal status. Low Comfort privacy disposition describes one's willingness to share medical information.

Results: Horizontal Collectivism, Vertical Collectivism, Vertical Individual, and Low Comfort privacy disposition were significant predictors of trust in public health officials, regarding COVID-19. There was higher trust in public health officials among high Horizontal Collectivism and high Vertical Collectivism cultural orientation constructs. There was lower trust in public health officials among high Vertical Individualism and Low Comfort privacy disposition.

Conclusion: Findings from this study shed light on how cultural patterns and attitudes towards health-related privacy could obscure trust in public health officials within the United States. Moreover, understanding the association between these factors could inform effective communication of information regarding COVID-19 and support efforts to efficiently slow the spread of the Coronavirus and prevent future pandemics.

CHAPTER 1: INTRODUCTION

Many factors influence the way an individual perceives or understands a situation. Past experiences, one's upbringing, and one's culture all influence an individual's outlook on life. Cultural orientation is defined as "an inclination to think, feel or act in a way" that is determined by cultural values, and it often plays a role in the differences among self-identity, communication, relationships, and facing challenges[1]. Although there may be some similarities, differences in past experiences and culture shape how individuals think and respond to situations[1,2]. Therefore, cultural orientation plays a role in how an individual perceives healthcare, medical research, and public health. Throughout history, public health research has made life changing discoveries, but it has also created doubts and hesitations. Therefore, one's cultural orientation could influence an individual's acceptability of and willingness to comply with public health mandates, through impacting the trust people have in public health officials and the information they disseminate[2,3,4].

With an increase in technological advancements and society's dependence on technology over the years, privacy issues surrounding healthcare, research, and public health have increased. In light of the COVID-19 pandemic, public health surveillance tools have been used to monitor infections, trace infected individuals' contacts, and map the spread of the disease. Individuals have been required to share personal health information to institutions outside of the medical field to be able to travel and enter businesses[5]. Contact tracing apps, exposure notifications, and vaccination cards have been a crucial contributor to understanding and containing the spread of the Coronavirus[6]. However, the implementation of public health surveillance requires trust between the people and public health, as individuals are asked to bypass concerns to personal privacy to prioritize the greater good of the people[7,8,9]. Therefore, it is important to understand

how an individual's cultural orientation and confidence of privacy in public health may influence one's thoughts on trust in public health officials, effecting an individual's willingness to abide by health behavior recommendations and share information.

In addition to one's self-identity and perspectives of privacy, mistrust in public health officials also play a role in an individual's perception of public health. Positive experiences with healthcare professionals and medical treatments may influence an individual to be trusting of medical research and new discoveries[10]. However, there has been a history of maltreatment by physicians and injustices in research experiments that may make individuals and populations hesitant towards the medical field[10,11,12]. Mistrust in healthcare and medical research contributes to the mistrust people may have in public health. Throughout COVID-19, the concern individuals have towards the accuracy of scientific information regarding the Coronavirus has been well-documented in news media[11]. Individuals are hesitant towards COVID-19 vaccine uptake and reluctant to comply with other public health mandates[13]. The lack of trust in public health officials has been a barrier in achieving herd immunity and containing the spread of the Coronavirus[14]. Therefore, it is of public health importance to evaluate the relationship between cultural orientation and privacy perspectives on trust in public health officials to encourage effective communication to mitigate the impact of COVID-19 and protect the health of the people[15,16].

1.1 Cultural Orientation

Cultural orientation encompasses all the behaviors, attitudes, and beliefs that an individual draws from different social groups and experiences over their lifetime[1,18,19]. Cultural diversity creates differences in values and priorities that contribute to disparities within the medical field[18]. Geert Hofstede developed a model explaining cultural dimensions from a study

including over fifty countries that identifies five dimensions to describe the differences among national cultures: power distance, long-term versus short-term orientation, uncertainty avoidance, masculinity versus femininity, and individualism versus collectivism[2,18].

Hofstede uses individualism and collectivism to justify differing views within society and explain relationship dynamics[2]. Collectivism refers to the "power of the group", where individuals prioritize the interest of the group over the interest of an individual[1,2,18,19]. Collectivist cultures value the overall good and loyalty of a group, and make decisions with a "we" mindset, taking into consideration the effects on those around them[2,19]. Collectivism describes an individual's concern about their actions on others, their willingness to share, and their responsiveness to other people's opinions, causing people to sacrifice their own comfort for the greater good of everyone else[3,20]. On the other hand, individualism stresses the importance of independence and individual rights, where one often acts upon personal interest and seeks to gain recognition for personal achievements[19]. Those with individualistic mindsets show less concern for others and more concern for themselves, as they often make decisions looking out for themselves first[2].

Individualism and collectivism can be broken down further into two constructs: horizontal and vertical, where horizontal emphasizes equality amongst all, and vertical emphasizes hierarchy[20]. In Horizontal Individualism, people often are not especially concerned with having high status, but they are highly self-reliant and value uniqueness, wanting to be distinct from groups[20]. Vertical Individualism describes individuals who value status and want to become distinguished through personal competitions with others[20]. In Horizontal Collectivism, individuals are not quick to yield to the power or authority of another but do see themselves as being similar to others and have an emphasis on common goals with others[20]. Vertical

Collectivism describes people who are willing to sacrifice their personal goals for the sake of the integrity and intentions of the group[20]. Individuals that identify with Vertical Collectivism are willing to abide by authority to act in ways that benefit the overall group even if their personal beliefs do not align with that of the majority[20].

One's cultural orientation plays a role in their thoughts and beliefs towards public health, influencing how an individual may think and behave[1]. Despite whether one is oriented towards individualism or collectivism, horizontal or vertical, both cultures influence trust. Understanding differences in cultural orientations allow for medical professionals to build a sense of trust between consumers and in patient-physician interactions, and between individuals and public health officials[2]. Public health officials would be able to combat disparities through understanding different points of views to be able to communicate effectively and cater to everyone's needs across all populations. The right to privacy is an important belief in individualistic societies[2]. Individual's may prioritize protecting their rights and information over the greater good of the people. Therefore, gaining trust in relationships in healthcare and public health allows for individuals to be more open and willing to accept new medical advancements and new discoveries in medical research to protect the health of the population, despite individualistic values[2].

1.2 Privacy

Despite the technological advancements and discoveries, privacy rights and thoughts on privacy remains a limitation of the medical field and public health. The concept of privacy varies among populations, as it is experienced at the individual level. Privacy within the medical field refers to the confidentiality and security of personal information[8]. The use of big data increases the potential for privacy violations since more individuals are involved. Violations of privacy

could cause distrust, as individuals are susceptible to identity theft, increased insurance rates, and emotional distress[9]. A study conducted in 2018 assessed the privacy of health data through examining the possibilities of reidentifying individuals from physical activity monitor data where protected information was removed using machine learning techniques[22]. Researchers were able to successfully re-identify 95 percent of the adults, indicating that sharing big data presents privacy risks despite protection efforts from federal law[23]. Furthermore, the development of precision medicine and innovations such as direct-to-consumer genetic testing has posed privacy concerns. A study analyzing genetic testing companies, 23 and Me and Ancestry, revealed that although these services can mitigate risks of diseases, increase autonomy, and contribute to generalizable knowledge in research, they also can exploit consumer information[24]. The transactions of these companies give consumers limited genetic information in exchange for money, DNA, and personal health information[24]. Although these companies disclose privacy information to their consumers about privacy practices and risks of their services, the study found that threats to privacy from genetic testing companies include general deception, deceitful data collection, improper use of data, and unfair data security practices[24].

Hesitations towards privacy in the medical field plays into the privacy concerns individuals have regarding public health. Public health surveillance has been a crucial factor in understanding and slowing the spread of the Coronavirus. Public health officials have used new surveillance tools in response to COVID-19 to monitor infections, trace infected individuals' contacts, and visualize the spread of the disease. Contact tracing is performed through using digital tracing tools, like Bluetooth and geolocation data, to track the movements of infected individuals[7]. Throughout the pandemic, individuals have also been asked to share health information to institutions outside of the medical field with proof of vaccination cards to be able

to travel freely within countries and enter local businesses[5]. Through the implementation of apps for contact tracing and exposure notification and documentation of vaccination status, public health officials have been able to mitigate the pandemic and prepare for future pandemics[6]. The effective use of public health surveillance to monitor the COVID-19 pandemic requires trust in technology, public health institutions, and public health officials[7]. With the implementation of public health surveillance techniques, citizens of the United States are asked to forgo their individual beliefs about the right to privacy for the long-term greater good of the public[6]. Therefore, the use of this technology has instilled privacy concerns and fear of mass surveillance among the people[6]. A study exploring the interplay between privacy concerns, data practices of surveillance capitalism, and trust in health care providers suggests that people have privacy concerns because health surveillance shows a tendency towards general surveillance causing them to be less trusting in public health[6]. If people lack trust in healthcare and public health, they may often forgo care or refuse to comply with recommended health behaviors, putting themselves and potentially those around them at risk[24]. These individuals may withhold information or avoid compliance due to their lack of trust. Therefore, it is important to protect privacy rights within public health because thoughts on health-related privacy are built upon the foundation of trust between individuals and science.

1.3 Trust in Public Health

Historically, mistrust in medical research advancements, medical approaches, and health professionals developed through the misuse and mistreatment of participants and participant information in research. Medical mistrust has been a persistent issue within public health that dates back further than the 18th century. Public health literature cites the Tuskegee Study of Untreated Syphilis in 1932 as a key contributor to medical mistrust among racial and ethnic

minority groups[10,12,17]. In this study, taking course over approximately 40 years, socially and economically marginalized Black men were subject to syphilis observation to assess and better understand the long-term effects of the disease in this population[12,17]. There was intentional deception and denial of treatment when knowledge about penicillin as a potential cure came about to record the natural history of the disease. Research associates were more concerned about providing findings to contribute to medical research than the well-being of their participants[11]. When recent research was conducted analyzing current thoughts on the Tuskegee study among African Americans and Whites, a substantial amount of both study populations voiced their opinions that the maltreatment of research subjects could still occur currently[11,12]. Whether or not these participants had previous knowledge about the case, these individuals believed unethical maltreatment of study participants would be possible in clinical research currently[11,12]. The Tuskegee Study has negatively impacted individuals' trust in the research field, contributing to lower rates of clinical research involvement[10,12,17]. This is of concern because it potentially limits public health knowledge, as research populations may be less diverse. Findings may be less generalizable to and representative of the overall public because individuals may choose to not participate in medical research, due to their lack of trust in the medical field.

However, medical mistrust encompasses a broad spectrum of mistrust, not limited to medical research, but also including the overall health care system and public health[13]. This mistrust could lead to reduced compliance with recommended health behaviors that could put the safety and health of the public at risk[13]. Through the current Coronavirus (COVID-19) pandemic, mistrust in public health officials, medical advancements, and health information has been well-documented in news media and press, as individuals express concern towards the accuracy of

scientific information regarding rapidly developed vaccinations and safety protocols[11]. A study analyzing the misrepresentation of COVID-19 expresses concern towards how news media have been misusing design affordances when creating visualizations about the pandemic that has displayed deceptive patterns and downplayed the severity of COVID-19[25]. Despite efforts to contain and control the spread of the virus, individuals are hesitant to comply with regulations to become vaccinated against COVID-19 and follow the mask mandates. Vaccinations are developed to keep individuals and those around them safe, but because of the lack of trust in medical technology, research, and public institutions combined with the active dissemination of misinformation, people are reluctant to receive the immunization[11]. A study analyzing COVID-19 vaccine hesitancy found that trust in public health figures, like Dr. Fauci, has been associated with higher likelihood of becoming vaccinated and encouraging vaccination among others[14]. However, lack of trust from individuals has been an immense barrier in gaining herd immunity and containing the spread of the coronavirus nationwide. A study assessing trust in health information sources identified that mistrust in public health professionals and healthcare creates a messaging barrier that limits effectively engaging with preventative efforts[15,16]. Therefore, there is a need to address the lack of trust in public health officials to mitigate the global impact of COVID-19 and protect the health and safety of the public.

1.4 Study Objectives

There are federal laws and public policy in place to protect an individual and their rights. However, people are still hesitant to trust and comply with recommended health behaviors by public health officials. Therefore, cultural orientation and perspectives of privacy should be taken into consideration when analyzing differing levels of trust in public health to ensure the safety of the people. Individualistic cultures that focus on protecting one's privacy and the

history of inaccurate information makes it difficult for some populations to trust and abide by public health regulations. People who practice individualism may be hesitant to put their health or information at risk for the greater good of the community. The inaccurate dissemination of information creates barriers to understanding the science behind public health mandates during a global pandemic. Individuals may be reluctant to use digital tracing tools, since they ask individuals to forgo personal concerns about privacy for the greater good of the people. Lack of trust in public health is highly concerning and relevant as public health officials and healthcare workers struggle to implement safety protocols and encourage vaccinations through the COVID-19 pandemic. Therefore, the purpose of this thesis was to explore the differences in attitudes and behaviors pertaining to trust in public health officials, examining how trust varies by cultural orientation, privacy perspectives, and demographic factors. The research question this project aims to address is what is the relationship between cultural orientation and perspectives of health-related privacy, and trust in public health officials during COVID-19? The data analysis of this study will assess if there is an association between cultural orientation and trust in public health officials, and between health-related privacy and trust in public health officials. Findings from this analysis will shed light on the impact individual beliefs and privacy concerns have on trust in public health to suggest potential steps to encourage effective communication in disseminating information relating to the Coronavirus and increase compliance with health behavior recommendations to mitigate the impact of the COVID-19 pandemic.

CHAPTER 2: METHODS

2.1 Study Design & Data Collection

This quantitative secondary analysis utilized data collected during the first six months of the COVID-19 pandemic from March 23 to July 13, 2020 from seven cohorts at two-week intervals in a cross-sequential study titled "Thoughts and Feelings about COVID-19." Participants were asked to complete baseline (T1) and one-month follow-up (T2) web-based surveys through REDCap or Qualtrics regarding impacts of COVID-19, privacy perspectives, public health attitudes, psychosocial functioning, and health outcomes, measured with standardized scales. The overall study included 8,132 participants with a quota set to recruit equal numbers of men and women, and one-third of the sample as Hispanic ethnicity, Black or African American race, and White race. However, for this secondary analysis, only data from cohort 7 were analyzed, as this was the most recent sample allowing for open recruitment to the entire United States. Participants were eligible if they were fluent in English, 18 years of age or older, and lived in the United States. Convenience sampling was used to recruit participants from Amazon Mechanical Turk (MTurk) and Qualtrics Online Panels (Qualtrics). MTurk is a crowdsourcing marketplace where business and individuals can moderate content and gather insights from a global workforce. Qualtrics is a web-based software that enables effective data collection through building surveys, administering questionnaires, and analyzing responses. MTurk respondents were eligible if they had a 95% approval rate. They were compensated $5 for the completion of the survey. Qualtrics recruited and compensated participants in compliance with various market research platforms.

2.2 Sample

Baseline and one-month follow-up participant surveys from 634 individuals from the United States in cohort 7 of the "Thought and Feelings about COVID-19" were included in this secondary analysis. Participants' demographics of interest were reported at baseline to include birth year, sex, income, education, race, and ethnicity (Table 2). Birth year was used to calculate age. Those reporting age older than 91 years of age were excluded from the analysis due to this likely being an indicator of inaccurate responding. Those who chose to not report income were also excluded from the data analysis. Race categories included White or Caucasian, African American or Black, or other, where other represented those who reported race as Asian, Native Hawaiian or Other Pacific Islander, American Indian or Alaskan Native, more than one race, or other. Participants also reported ethnicity as Hispanic or Non-Hispanic. At follow-up, participants completed a questionnaire regarding trust in public health officials[27], privacy perspectives[26], and cultural orientation[20] in relation to COVID-19.

2.3 Measures

2.3.1 Trust

The primary outcome of interest of trust in public health officials was measured at follow-up using an item from The Coronavirus Health Impact Survey ("How much do you trust public health officials when they say things about coronavirus (COVID-19)?")[27]. Participants reported answers on a 5-item Likert scale with 1 being "strongly distrust" and 5 being "strongly trust" to depict their trust in public health officials score.

2.3.2 Cultural Orientation

Cultural Orientation was measured at follow-up using the Cultural Orientation Scale, also known as the Individualism and Collectivism Scale, a 16-item measure that creates four

independent constructs: Horizontal Collectivism, Vertical Collectivism, Horizontal Individualism, and Vertical Individualism[20]. Table 1 describes each of the four items in the four constructs, and participants rated each statement on a 9-item Likert scale with 1 being "never or definitely no" and 5 being "always or definitely yes". Individual participant's scores for each independent subscale were summed with higher scores indicating more correlation with each construct description[20].

2.3.3 Privacy

Attitudes towards privacy was measured at follow-up using the Privacy Disposition measure, a 20-item self-report instrument analyzing individuals' openness and comfort with sharing personal health information or sharing personal data[26]. This instrument creates four independent, subscale scores: Institutional, Interpersonal, Low Comfort, and Discomfort[19]. This secondary analysis focuses only on the Low Comfort subscale, which has an overall theme of reasons to share medical information[26]. The subscale included five items where participants were able to best describe their level of agreement or disagreement on a 5-point Likert scale, with 1 being "strongly disagree" and 5 being "strongly agree." The items examined thoughts on health information use ("My health information should be freely used by doctors" and "My health information should be freely used by researchers"), willingness to share health information ("Sharing my health information now may help others in the future" and "Everyone has a duty to contribute information to medical research"), and access to personal medical records ("All doctors should automatically have access to my medical records")[26]. Individual's reported scores for each of the five questions were reversed, then summed, with a higher total score indicating the individual is more private and less likely to share information with doctors and researchers[26].

2.3.4 Covariates

The association between trust in public health officials, cultural orientation and privacy perspectives was examined after adjusting for demographics collected at baseline. Covariates of interest were self-identified age, sex, income, education, race, and ethnicity.

2.4 Statistical Analysis

Descriptive analysis (proportions and means) was used to summarize the sample. The primary aim of this study was to examine the effect of cultural orientation and attitudes towards privacy on trust in public health officials. Therefore, a multiple linear regression was performed on the data to create a model examining the association of each predictor on the outcome of interest, accounting for various covariates. The outcome of interest was trust in public health officials, quantified from the score of the single item from The Coronavirus Health Impact Survey. The primary predictors were the cultural orientation score from the Individualism and Collectivism Scale and the Low Comfort privacy score from the Privacy Disposition measure. 95% confidence intervals (CI) were estimated with a significance level of alpha = 0.05. The covariates of interest adjusted for in the model were age, sex, income, education, and race. Collinearity diagnostics of the multiple linear regression model were conducted to compute a tolerance statistic and Variance Inflation Factor (VIF) for each predictor and covariate. All analyses were conducted in R Version 1.2.5033.

CHAPTER 3: RESULTS

Proportions and counts of the demographic characteristics of the study population are presented in Table 2. Of the 634 participants who completed the surveys, there was a fairly even distribution of male and females with 50.63% being male (n=321) and 49.37% being female (n=313). The average age was 51.07 years (SD=16.14). 37.70% reported an income of $49,999 and below (n=239), 37.07% reported and income between $50,000 to $99,999 (n=239), 14.83% reported and income between $100,000 to $149,999 (n=35), 1.74% reported and income between $200,000 to $249,999 (n=11), 1.74% reported and income between $250,000 to $299,999 (n=11), and 0.79% of participants reported an income of $300,000 or above (n=5). 22.87% were high school graduates or lower (n=145), 49.21% attended college or graduated from college (n=312), and 27.92% had some post-college education or above (n=177). 70.66% of participants identified as Caucasian or White (n=448), 22.87% of participants identified as Black or African American (n=145), and 6.47% were categorized as other (n=41), which included those that reported race as Asian, Native Hawaiian or Other Pacific Islander, American Indian or Alaskan Native, more than one race, or other. 82.49% of the study population identified as non-Hispanic (n=532), and 17.51% self-reported ethnicity as Hispanic (n=111). Mean trust in public health officials score of income, education, race, and ethnicity are presented in Table 3.

For the multivariable analysis, all assumptions were tested and satisfied to create a linear regression model. Regression diagnostics run to examine the fit of the residuals of the final linear regression model confirmed that linearity was achieved, where errors had a mean of zero, errors had a constant standard deviation (sd), and the errors were normally distributed (Figure 1). An F-test for the covariates in the multiple linear regression model confirmed that Horizontal Collectivism (F=4.324, p=0.038), Vertical Collectivism (F=4.141, p=0.042), Vertical

Individualism (F=11.359, p<0.001), Low Comfort privacy disposition (F=42.264, p<0.001), education (F=4.084, p=0.017), race (F=5.531, p=0.004), and ethnicity (F=7.365, p=0.007) are significant predictors of trust in public health officials score.

To examine if cultural orientation was a significant predictor of trust in public health officials, a multiple linear regression was computed to model the mean of trust in public health officials score as a linear function of each independent cultural orientation construct score (Table 4). A higher score for each cultural orientation indicates a greater association with the respective construct. There was a statistically significant positive association between trust in public health officials and Horizontal Collectivism (p=0.0380), after accounting for other covariates. There is a 0.021(CI: 0.0011 to 0.0402) unit increase in trust in public health officials score per every 1 unit increase in Horizontal Collectivism score, when all covariates are held constant. The positive association between trust in public health officials and Vertical Collectivism (p=0.0423) was also statistically significant. There is a 0.020(CI: 0.0007 to 0.0395) unit increase in trust in public health officials score per every 1 unit increase in Vertical Collectivism score, when all covariates are held constant. There was also a statistically significant negative association between Vertical Individualism and trust in public health officials, after accounting for covariates (p=0.0008). There is a 0.026 (CI: -0414 to -0.0109) unit decrease in trust in public health officials score for every 1 unit increase in Vertical Individualism score, when all covariates are held constant.

A higher score for the Low Comfort privacy perspective indicates that an individual is more private and less willing to share medical information with doctors or researchers. Low Comfort privacy disposition is a significant predictor of trust in public health officials because there was a statistically significant negative association between Low Comfort privacy

disposition score and trust in public health officials score ($p<0.00001$), after accounting for other covariates (Table 4). There is a 0.063 (CI: -0.0826 to -0.0443) unit decrease in trust in public health officials score per every 1 unit increase in Low Comfort privacy disposition score, when all other covariates are accounted for.

The multiple linear regression model also determined the mean difference in trust in public health score between participants with a high school education or lower (reference), some college education, and those with some post-college education or higher, after adjusting for other covariates (Table 4). There was a positive association between some post-college education or above and trust in public health officials score, when compared to those with a high school education or lower ($p=0.0170$). When compared to those with a high school education or below, there was a 0.326 (CI: 0.0585 to 0.5930) unit increase in trust in public health score for participants that had some post-college education or above, for constant covariates.

Differences in mean trust in public health officials score was compared between those that identified their race as White or Caucasian (reference), Black or African American, or other, which included Asian, Native Hawaiian or other Pacific Islander, American Indian or Alaska Native, more than one race, and other (Table 4). There was a statistically significant positive association between Black or African American race ($\beta=0.2921$, CI: 0.0734 to 0.5108, $p=0.009$) and trust in public health officials, compared to White or Caucasian race. As seen in Table 3, the mean trust in public health score among African American or Black was 3.938 (sd=1.049) and among White or Caucasian was 3.545 (sd=1.259). The negative association between Hispanic ethnicity and trust in public health officials was also statistically significant, when compared to non-Hispanic individuals ($\beta=-0.345$, $p=0.007$, CI: -0.5944 to -0.0953). The overall multiple linear regression model had a residual standard error of 1.13 on 616 degrees of freedom, which

means that there is an error of 1.13% that is not accounted for by the predictors and covariates. The multiple r-squared value was 0.1545, which indicates that 15.45% of the variation in mean trust in public health officials score can be explained by the predictors and covariates in the model.

For the multiple linear regression model, a tolerance statistic and variance inflation factor (VIF) were computed for each predictor and covariate to examine multicollinearity. Tolerance determines the percent of variance that cannot be accounted for by other predictors[28]. Table 5 shows the tolerance statistic for each predictor and covariate. Higher tolerance indicates lower collinearity, meaning that the overall linear regression model is not being affected by collinearity[28]. VIF measures the inflation in the variance of the parameter estimates due to collinearities that may exist among the predictors and covariates of interest[28]. Table 5 shows that all predictors and covariates had a VIF close to 1, indicating that there is no correlation among the predictor of interest with each remaining predictor variables, as the smallest possible value for VIF is 1 meaning absence of multicollinearity[28]. The variance of the estimated regression coefficient for each predictor and covariate is not inflated.

CHAPTER 4: DISCUSSION

The study utilized data collected via web-based surveys from 634 participants during the height of the COVID-19 pandemic to assess an individual's trust in public health officials and the information they were disseminating concerning the safety of the public. The aim of this secondary analysis was to examine the association between trust in public health officials and cultural orientation, and between trust in public health officials and Low Comfort privacy disposition, considering age, sex, education, income, race, and ethnicity. To our knowledge, very few studies analyze the relationship between cultural orientation, perspectives of privacy, and trust in public health or medicine, and this is one of the few studies to examine the connection between the three.

From the analysis, it was found that there is a significant positive association between Horizontal Collectivism and trust in public health officials, and Vertical Collectivism and trust in public health officials. The linear regression model revealed that those with Horizontal Collectivism and Vertical Collectivism cultural patterns had an increase in trust in public health officials when they voice information regarding COVID-19. Horizontal Collectivism describes individuals who value the overall goals of the group and equality of everyone[20]. They believe that the self is a part of a larger group, all of which are similar to one another[20]. Horizontal Collectivist societies emphasize interdependence and sociability, valuing equality among all but not freedom[20]. Individuals that correspond with this cultural orientation would be more trusting of authority and abide by the COVID-19 protocols because they would value the health of those around them. It therefore stands to reason that they would be more trusting of health information and receive the COVID-19 vaccine to help achieve herd immunity and protect the overall public from the spread of the Coronavirus. Vertical Collectivism describes individuals who emphasize

the integrity of the group, and support competitions between out-groups[20]. Individuals that identify with this construct are often willing to sacrifice their personal goals for the sake of common group goals[20]. Fascism or communalism of traditional societies with strong leaders are examples of Vertical Collectivism societies, where neither equality or freedom are valued[20]. The assumption can be made that those who identify with this cultural orientation construct may be more trusting of public health officials and may be more willing to follow COVID-19 safety protocol, as they value authority and often abide by what is being told of them. If authorities ask them to act in a way that may be distasteful to them, they most likely will submit to the power[20].

In addition, Vertical Individualism was also a significant predictor of trust in public health officials. Those that identified with Vertical Individualism were less trusting of public health officials when they spoke about the COVID-19 pandemic. In Vertical Individualism, people strive to become superior to their peers[20]. They aim to achieve status and be distinguished often through individual competitions with others[20]. Societies that correspond with Vertical Individualism tend to value freedom but not equality[20]. They emphasize competitive capitalism and market economics, depicting the political system of the United States[20]. Therefore, these findings suggest that due to the political system of the United States, many individuals from this country may be less trusting of public health officials in nature. Understanding that the United States' political system is consistent with Vertical Individualism could help public health officials to tailor messages in a way that prioritizes the individual and would be receptive of the public. Emphasizing the importance of and educating citizens about how vaccinations are protective of the individual may encourage more people to follow COVID-19 safety protocols moving forward through the pandemic. Individualism and Collectivism each play a role in comprehending the various communication styles and content across cultures[29]. Therefore, our

findings coincide with those of previous studies concluding that it is important within public health to understand people's cultural orientation in order to effectively communicate and increase their trust in public health officials[18,19,20].

There was a significant association between trust in public health officials and the Low Comfort privacy disposition. Low Comfort privacy disposition categorizes the willingness of an individual to share medical information in research and healthcare[26]. A higher Low Comfort privacy disposition score indicates that the individual tends to be more private and less willing to share their personal information with doctors and researchers[26]. It therefore stands to reason that those with higher Low Comfort privacy disposition may be less trusting of public health officials when they would disseminate information regarding the coronavirus[26]. An individual's trust in physicians, researchers, and public health officials can facilitate disclosure, the understanding of medical information, and the use of health discoveries[30,31,32,33]. Reassuring individuals, informing them of the protective measures in place for their health information, may encourage individuals to be more comfortable with the public health surveillance in place to protect the safety of the people from COVID-19 and partake in the public health mandates, like wearing masks and presenting vaccine passports. Findings from this study are similar to previous studies stating that through understanding the concept that those with more individualistic cultures may avoid privacy risks, effective communication could be facilitated to gain trust in public health officials and the medical information they disseminate from individuals in the United States[31,32].

Furthermore, this study concluded that there was an association between education and trust in public health officials. Compared to those with a high school education or below, participants with some post-college education or above had an increase in trust in public health officials score. Although not statistically significant, those with some college education also had

an increase in trust in public health officials score, compared to those with a high school education or below. Those with a higher education value the importance of knowledge and gaining information and may in turn be more health literate[34]. Therefore, these individuals may be more willing to explore and accept information regarding COVID-19 from public health organizations and institutions. Furthermore, previous studies have found that a key barrier for low-income individuals and minority groups is lack of education[35]. Lack of education contributes to the distrust of medical advancements and health information because assumptions are often made, and individuals are less willing to take risks[36]. Therefore, these findings are consistent with previous literature acknowledging the barriers that prevent acceptance of public health information and medical advancements, contributing to vaccine hesitancy surrounding the COVID-19 vaccination[35]. As technology advances, medical education is crucial to address the knowledge gaps that can contribute to preventable illness[34].

Findings from this study suggest that there is a positive association between trust in public health officials and race among the study population. When compared to White or Caucasian race, those that identified as African American or Black had an increase in trust in public health officials score. This is contradictory of previous literature, as African Americans are a marginalized group that has experienced maltreatment and injustice in healthcare and research[10,11,12,37]. A study analyzing COVID-19 vaccine hesitancy in African Americans revealed that nearly all (97%) participants expressed at least one general mistrust belief regarding the Coronavirus, and more than half expressed at least one hesitancy belief for the COVID-19 treatment or vaccine[11]. The results of this current analysis suggest that African American or Black individuals in this study population are more trusting of public health officials when they say things about COVID-19, compared to Whites or Caucasians. This could be because

participants were recruited from Qualtrics and MTurk, online crowdsourcing platforms for social science survey completion, so these individuals may already express interest in medical research or may be knowledgeable about the information presented by public health officials regarding the Coronavirus. This study also utilizes data that was collected at the start of the pandemic. News media and press highlighted hesitations towards the rapid development of the COVID-19 vaccine, lack of information, and misinformation at the time surrounding the Coronavirus that may have influenced those that identified as White or Caucasian to have decreased trust in public health officials compared to those that identified as African American or Black[11].

Lastly, this secondary analysis concluded that there was a negative association between Hispanic ethnicity and trust in public health officials. Those who self-reported ethnicity as Hispanic were less trusting of public health officials in regards to COVID-19. This may be because ethnic minorities have been disproportionately affected by COVID-19 in both mortality rates and severity of infection[13]. These findings are supported in previous literature indicating that minority groups have a history of medical mistrust, encompassing lack of trust in healthcare, medical research and researchers, and public health officials due to perceived discrimination or system health disparities that may lead to reduced compliance with recommended health behaaviors[13]. According to the Center for Disease Control and Prevention, as of 2021, only 15% of Hispanics were vaccinated against COVID-19 compared to the 61% of White individuals in the United States[13]. Therefore, there is a need to address the lack of trust in public health officials from Hispanics and other minority groups in order to mitigate the impact of COVID-19 and protect the health and safety of Americans.

4.1 Strengths

Some strengths of the study are that the large study sample increases statistical power. There were quotas set for the recruitment process of study participants to have equal parts male and female to increase generalizability of results and representation of the overall population. Due to the nature of the web-based surveys, the participants may have been more comfortable and honest in providing their responses. In addition, because the data was collected during the first six months of the pandemic, news surrounding COVID-19 was well-documented in press and media, making thoughts and attitudes towards the Coronavirus highly relevant and predominant in people's lives.

4.2 Limitations

Several limitations must be considered when interpreting the findings of this study. Although there were quotas set for the recruitment process of study participants to include one third African American or Black, Hispanic, and White or Caucasian individuals, there was still an overrepresentation of White or Caucasian individuals, as this study focus solely on cohort 7 but the quotas were set for recruitment of the overall study. Small sample sizes of race were also collasped into the category "other," limiting representation of the findings. Trust in medical research was measured using the single question "How much do you trust public health officials when they say things about coronavirus (COVID-19)?" Therefore, participants' opinion regarding trust in public health officials is limited to their sole answer choice on a Likert scale from 1 to 5[27]. Moreover, qualitative research with open-ended responses would allow for a more in-depth understanding of how different dimensions of cultural orientation and attitudes towards health-related privacy may influence one's trust in public health officials. Furthermore, attitudes and perceptions of trust may have changed after living through the pandemic for almost two

years. Data was collected using convenience sampling from Qualtrics and MTurk, which could introduce volunteer bias that may skew the sample away from and limit the generalizability of findings. People who may be more trusting of the medical field or have strong opinions regarding COVID-19 may be more likely to volunteer.

4.3 Future Research

The current study was conducted in March 2020 during the start of the COVID-19 pandemic, so trust in public health officials was measured regarding the dissemination of information related to the Coronavirus. New data using the same web-based surveys could be gathered to gain insight on thoughts and feelings about COVID-19 after almost two years of living through the COVID-19 pandemic to assess if there are changes in attitudes towards trust in public health officials when they say things about COVID-19. Future research could also expand upon individualistic and collectivist cultural patterns analyzed in this study to examine other cultural dimensions presented by Hofstede, such as power distance, long-term versus short-term orientation, uncertainty avoidance, and masculinity versus femininity[2,18]. In this study, we assess trust in public health officials. Future studies could examine the effects of cultural orientation and privacy perspectives on trust in healthcare delivery and doctor-patient relationships. Further research could also examine the association between cultural orientation and attitudes towards health-related privacy on trust medical research practice, referring to the previous maltreatment of participants in public health research.

4.34 Conclusions

Throughout the pandemic, individuals have expressed concern towards the accuracy of the scientific information surrounding the Coronavirus and its vaccinations. The distrust in medical advancements and health information has been well-documented in news media and

press, as individuals are hesitant to receive the vaccine due to its rapid development, and are non-compliant with the safety protocols, like lockdowns and mask mandates, to protect individuals from the spread of the Coronavirus[9]. Findings from this study shed light on how cultural patterns and attitudes towards health-related privacy could obscure trust in public health officials within the United States. Therefore, understanding the association between these three factors could promote effective communication in relaying information regarding the COVID-19 pandemic to efficiently slow the spread of the Coronavirus and prevent other pandemics in the future. Securing the trust of individuals in public health officials and the medical information they disseminate may also increase education of and interest in medical research in the future. Increasing diversity within medical research would help to address the racial disparities present and further the understanding of and advancements in medicine, allowing for increased compliance with public health mandates, like vaccine uptake. Inclusion within medical research and understanding differences in cultural orientations could also potentially increase the trust of individuals to help combat existing systemic health disparities overall.

APPENDIX

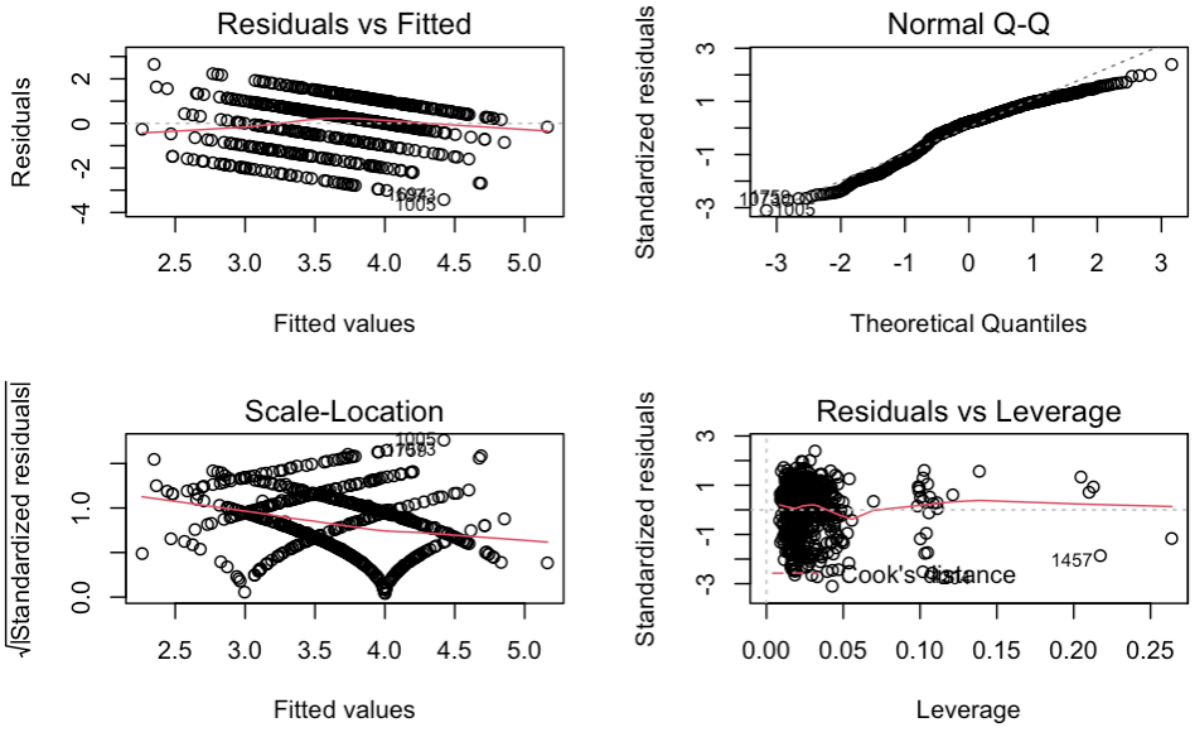

Figure 1. Residual plots to check the assumptions of the multiple linear regression model

Table 1. Items of the Individualism and Collectivism Scale

Construct	Item
Horizontal Individualism	1. I'd rather depend on myself than others. 2. I rely on myself most of the time; I rarely rely on others. 3. I often do "my own thing." 4. My personal identity, independent of others, is very important to me.
Vertical Individualism	1. It is important that I do my job better than others. 2. Winning is everything. 3. Competition is the law of nature. 4. When another person does better than I do, I get tense and aroused.
Horizontal Collectivism	1. If a coworker gets a prize, I would feel proud. 2. The well-being of my coworkers is important to me. 3. To me, pleasure is spending time with others. 4. I feel good when I cooperate with others.
Vertical Collectivism	1. Parents and children must stay together as much as possible. 2. It is my duty to take care of my family, even when I have to sacrifice what I want. 3. Family members should stick together, no matter what sacrifices are required. 4. It is important to me that I respect the decisions made by my groups.

Table 2. Descriptive statistics of the demographics of participants

Demographics	Count (n= 634)	Percentage (%)
Age		
- Mean (years), sd	51.07	16.14
Sex		
- Male	321	50.63%
- Female	313	49.37%
Income		
- Under $25,000- $49,999	239	37.70%
- $50,000 - $99,999	239	37.70%
- $100,000 - $149,999	94	14.83%
- $150,000 - $199,999	35	5.52%
- $200,000 - $249,999	11	1.74%
- $250,000 - $299,999	11	1.74%
- $300,000 or more	5	0.79%
Education		
- Some or graduated high school or lower	145	22.87%
- Some college or graduated from college	312	49.21%
- Some post-college education or above	177	27.92%
Race		
- Caucasian/White	448	70.66%
- Black or African American	145	22.87%
- Other	41	6.47%
Ethnicity		
- Non-Hispanic	523	82.49%
- Hispanic	111	17.51%

Table 3. Mean trust in public health officials score of income, education, race, and ethnicity

Predictor	Mean Trust in Public Health Score	Standard deviation (sd)
Income		
- Under $25,000 - $49,999	3.611	1.214
- $50,000 - $99,999	3.640	1.179
- $100,000 - $149,999	3.681	1.229
- $150,000 - $199,999	4.000	1.138
- $200,000 - $249,999	3.455	1.508
- $250,000 - $299,999	4.091	1.375
- $300,000 or more	3.000	1.414
Education		
- High school graduate or lower	3.517	1.259
- Some college or graduated from college	3.580	1.198
- Some post-college education or above	3.898	1.158
Race		
- Caucasian/White	3.545	1.265
- Black or African American	3.938	1.049
- Other	3.854	0.910
Ethnicity		
- Non-Hispanic	3.692	1.213
- Hispanic	3.477	1.182

Table 4. Multivariable linear regression model of the association of the effect of cultural orientation, privacy disposition, and other predictors on trust in public health officials

Predictor	Difference in trust in public health officials score between groups Mean (95% CI)	P-value
Cultural Orientation[1]		
- Horizontal Collectivism	0.0207 (0.0011, 0.0402)	0.0380*
- Vertical Collectivism	0.0201 (0.0007, 0.0395)	0.0423*
- Vertical Individualism	-0.0262 (-0.0414, -0.0109)	0.0008*
- Horizontal Individualism	-0.0008 (-0.0181, 0.0166)	0.9295
Privacy Disposition		
- Low Comfort	-0.0634 (-0.0826, -0.0443)	<0.00001*
Age		
- per year	-0.0004 (-0.0063, 0.0054)	0.8889
Income		
- Under $25,000 - $49,999	(Reference)	
- $50,000 - $99,999	-0.0410 (-0.2503, 0.1683)	0.7008
- $100,000 - $149,999	-0.0530 (-0.3324, 0.2264)	0.7097
- $150,000 - $199,999	0.1392 (-0.2794, 0.5578)	0.5140
- $200,000 - $249,999	-0.2050 (-0.9108, 0.5008)	0.5686
- $250,000 - $299,999	0.0224 (-0.6814, 0.7261)	0.9502
- $300,000 or more	-0.5325 (-1.5467, 0.4817)	0.3029
Education		
- Some or graduated high school or lower	(Reference)	
- Some college or graduated from college	0.0296 (-1.993, 0.2584)	0.7998
- Some post-college education or above	0.3258 (0.0585, 0.5930)	0.0170*
Race		
- Caucasian/White	(Reference)	
- Black or African American	0.2921 (0.0734, 0.5108)	0.0089*
- Other	0.4427 (0.0659, 0.8194)	0.0214*
Ethnicity		
- Non-Hispanic	(Reference)	
- Hispanic	-0.3449 (-0.5944, -0.0953)	0.0068*

1. Independent predictors

* Indicates statistical significance

Table 5. Collinearity diagnostics of the multiple linear regression model

Predictor	Tolerance	VIF
Cultural Orientation[1]		
- Horizontal Collectivism	0.579	1.727
- Vertical Collectivism	0.556	1.798
- Vertical Individualism	0.809	1.236
- Horizontal Individualism	0.866	1.155
Privacy Disposition		
- Low Comfort	0.925	1.081
Age		
- per year	0.866	1.155
Income		
- Under $25,000 - $49,999	(Reference)	
- $50,000 - $99,999	0.751	1.332
- $100,000 - $149,999	0.784	1.276
- $150,000 - $199,999	0.845	1.183
- $200,000 - $249,999	0.910	1.099
- $250,000 - $299,999	0.915	1.093
- $300,000 or more	0.960	1.042
Education		
- Some or graduated high school or lower	(Reference)	
- Some college or graduated from college	0.590	1.694
- Some post-college education or above	0.537	1.860
Race		
- Caucasian/White	(Reference)	
- Black or African American	0.915	1.092
- Other	0.900	1.111
Ethnicity		
- Non-Hispanic	(Reference)	
- Hispanic	0.859	1.164

1. Independent predictors

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