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The Prevalence of COVID-19 Misinformation among High School Students and its Influence on National Public Health Perception

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The Prevalence of COVID-19 Misinformation among High School Students and its Influence on National Public Health Perception

Cover Page Footnote

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Introduction

Ever since the first vaccine was created by English physician Edward Jenner to immunize the world against smallpox, the media has raised questionable concerns following the advent of every scientifically proven and safe vaccine (Muric et al., 2021). The recent diffusion of false health information has become increasingly concentrated on social media platforms, along with an increase in vaccine hesitancy. Dr. Noni E. Macdonald defines vaccine hesitancy as the delay in acceptance or refusal of a vaccine, even though vaccination services are available (Macdonald, 2015). COVID-19, caused by severe acute respiratory syndrome 2 (SARS-CoV-2) has resulted in a worldwide pandemic with over 16 million cases as of July 25th, 2020 (Patel et al., 2020). In this moment of global uncertainty, many people relied on what has turned out to be misinformation. Misinformation can be defined as a “claim of fact that is currently false due to lack of scientific evidence” (Chou et al., 2018). Regarding SARS-CoV-2, misinformation on media and the internet consists of theories on its origins, vaccination, social distancing, face masks, etc.

An immense amount of research has been done to address COVID-19 social media misinformation, inclusive of both the virus and vaccine; however, research regarding the further implications of misinforming society is minimal. COVID-19 has brought infectious disease and medicine back into the forefront of American consciousness, and there’s increased attention on public health agencies as they have the responsibility of protecting the health of Americans (Harvard T.H. Chan School of Public Health & Robert Wood Johnson Foundation, 2021). As the COVID-19 pandemic progressively increases infection rates globally, it is critical to address the threats caused by false beliefs, conspiracy theories, and disinformation. Misinformation gets in the way of trust for public health institutes to function effectively and deliver health recommendations to the public. Marie Plasime et al. found that 94.6% of teens utilize social media (Plasime et al., 2020). Spending a considerable amount of time on social media contributes to trusting claims made on their platforms, credible or not.

Trust in public health is crucial to maintain the proper implementation of health mandates. This occurs only when the public abides by information from public health sectors, and not unreliable sources such as media and the internet. This applies especially for teenagers because they contribute to the future health of our nation and are avid users of social media platforms. Hence, for the purposes of this research, students ages 14-18 were asked to state their viewpoints on COVID-19 misconceptions and their perception of national public health institutes. The resulting findings were used to draw thematic connections on how high school students perceive common false news they come across on social media, along with the likeliness of them agreeing to common false COVID-19 claims. Social media is incessantly advancing, and the internet-based tools that comprise it allow individuals and communities to accumulate and communicate content like health information (Ventola, 2014). However, online health information is difficult to regulate and can be used in an improper way that will result in determinants. The internet has the potential to promote unscientific health information, and factors that cause audiences to lack understanding of how knowledgeable and secure media reports are must be addressed.

Nevertheless, this paper analyzes the extent to which high school students accept common rumors on COVID-19 and examines the connection their opinions have to perceptions on national public health. The purpose of this research is to evaluate the implications of COVID-19 misinformation circulating through social media on high school students.

Literature Review

Historically, healthcare has enjoyed a high level of trust compared to other sectors in society. Research by Boland et al. studies the six central roles of public health, which include ensuring availability of critical strategic epidemiological information. Boland stated, “Scientific evidence should drive decisions regarding how to formulate appropriate health policy, how to design and implement safe and effective interventions, and where and how to invest human and financial resources” (2012). The purpose of public health institutions is to prevent disease and implement any strategies needed to improve health outcomes among the general population. However, miscommunications and false information among society render this goal difficult. Narayan et al. asserts that, during the COVID-19 pandemic, there have been escalating attacks on scientific and expert opinions, an interference of partisan policies into public agencies, especially the Centers for Disease Control and Prevention (CDC) and the US Food and Drug Administration (FDA), and lack of national coordination. Additionally, public trust in science and public health communication has been undermined due to the spread of misinformation through social media, and it is concerning how enormous sections of society have displayed vulnerability to erroneous information. Furthermore, this paper emphasizes that the US must enhance knowledge and understanding of science and the scientific method to repair public trust in science and relevant institutions (Narayan et al., 2021).

Moreover, dedicated public institutions such as the World Health Organization (WHO), CDC, FDA, and National Institutes of Health (NIH) are accountable for health management and illness prevention. National public health institutions’ responsibilities include establishing clearly defined mandates for public health and clarity of objectives. Public health institutions respond to public health emergencies such as the COVID-19 pandemic. Infectious and non-infectious diseases are of great importance to public health, since these institutions build a strong infrastructure to respond to public health emergencies, which entails such a great trust in them (Harvard T.H. Chan School of Public Health & Robert Wood Johnson Foundation, 2021). However, recently there has been a rising concern over what scholars describe as a “trust crisis in the health care system” (Gille et al., 2015). Despite this concern, there is only limited research about the extent and nature of public trust in health care systems. Likewise, an increase in misinforming political development calls for more research and advocacy to recognize and restore public trust in health care systems (Gille et al., 2014).

The earliest example of widespread mistrust is the release of the measles-mumps-rubella vaccine during the late 1990s in the United Kingdom. Unproven correlations between the vaccine, bowel disease, and autism were shared by the media and caused low vaccination rates due to lack of trust, hence leading to disease outbreaks. The “vaccine confidence gap” is a product of low levels of public trust in vaccines, pursuant to Heidi Larson, founding director of the Vaccine Confidence Project (Larson et al, 2011). Research needs to focus not only on the safety and efficiency of a vaccine but also on social factors affecting the public’s trust in vaccines (Gille et al., 2014). Vaccines are one of the greatest public health interventions, yet they are losing public confidence (Larson et al., 2011). Larson et al. (2011) state the following in their paper addressing the vaccine confidence gap:

Public decision-making related to vaccine acceptance is neither driven by scientific nor economic evidence alone but is also driven by a mix of psychological, sociocultural, and

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political factors, all of which need to be understood and taken into account by policy and other decision-makers. (p.526)

This paper by Larson et al. (2011) forms an agreement with research communities such as Gille et al. (2014) that state the importance of demanding rigorous research on comprehensive psychological, social, and political factors that affect public trust in vaccines rather than just the scientific and technical feasibility of new vaccines, for example, unsubstantiated concerns regarding the COVID-19 vaccine. As a result of low to no focus on willingness to vaccinate, estimates of vaccine hesitancy remained high in March 2021 through a study published by Narayan et al.

Additionally, Gille et al. (2014) mentioned the conflicting role that the internet plays in influencing public health trust and the quality of information that is shared on the platform itself. In contrast to Gille's assertion, social media can be used by the public to communicate about health issues and potentially improve their outcomes due to the widespread network available on the Internet (Moorhead et al., 2013). The reality, however, is that the internet can also be used as a platform to promote unscientific and pseudoscientific health information, and this contributes towards real world consequences.

Social media is a common method used to spread health-related information during the COVID-19 pandemic. The most comprehensive review of social media uses for health purposes was conducted in 2013, and it included specified health purposes such as health interventions, health campaigns, disease outbreak surveillance, and medical education. A study published by Junhan Cheng and Yuan Wang covers new social media usages regarding health purposes and reveals research gaps that have emerged in recent years. The researchers searched for peer-reviewed journal articles published between 2006-2020 in 12 databases that cover medicine, public health, and social science. The study summarized 10 social media uses for various health purposes, which included advancing health research and practice, offline health-related services, social mobilization, etc. (Chen & Wang, 2021). This study is an ideal example of the benefits regarding using social media as a primary source of health information, specifically COVID-19 information. On the contrary, research portrays that social media messages with a lack of credibility and scientific backup gain more popularity than ones from public health institutions. In fact, during the pandemic, the tweets of top celebrities related to COVID-19 outperform messages coming from health and scientific institutions (Kamniski et al., 2021). Suarez-Lledo and Alvarez-Galvez conducted a study on the prevalence of health misinformation on social media published in the *Journal of Medical Internet Research (JMIR)*. Their systematic review concluded that health misinformation was most prevalent on Twitter and on issues such as smoking and drugs, however also high on major public health issues such as vaccines and diseases. This study also distinguished health information into 6 domains including (1) vaccines; (2) diets and eating disorders; (3) drugs and new tobacco products; (4) pandemic and communicable diseases; (5) NCDs; and (6) medical treatments and health interventions. Furthermore, they mentioned that there is little control over the quality and regulation over online health information and little evidence on the consequences this has for the future of public health (Suarez-Lledo & Alvarez-Galvez).

Detrimental consequences include the fact that the COVID-19 pandemic has brought alongside it an "infodemic"—a global spread of misinformation that causes serious issues regarding public health (Bridgman, 2020). A study done by Kouzy et al., published in the *Cureus Journal of Medical Science*, concluded that medical misinformation and unverifiable content pertaining to the COVID-19 pandemic is increasingly becoming diffused on social media platforms at an alarming rate. Previous research has indicated that belief in misinformation and conspiracy theories

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pertaining to health is associated with sociodemographic groups and political affiliations (Agle & Xiao, 2021). Chronologically, the earlier sources from 2020 discuss COVID-19 preventive and treatment misinformation, and towards the end of 2021 studies were done on the reactions of misinformation to the COVID-19 vaccine and common COVID-19 misconceptions. One study from Harvard University concluded that beliefs in COVID-19 conspiracy theories and misinformation are primarily a reflection of viewpoints towards the government, scientists, and particular leaders, and less so an inability to recognize discrepancies in quality information regarding health and medicine (Enders et al., 2020). Regarding COVID-19, a study such as the one done in New Zealand by Jagadish Thaker and Arun Subramanian indicated that there was no significant difference in gender, age, education, and ethnicity between the three conditions measuring intent to vaccinate against COVID-19. The three conditions in this study were images shown before a questionnaire, being prime examples of misleading and incorrect online information about a COVID-19 vaccine. This study included equal proportions of gender, ethnicity, education, and income, and demonstrated the fact that demographics do not result in a significant difference in intentions to vaccinate against COVID-19 (Thaker & Subramanian, 2021).

For the most part, researchers conducted survey analyses to determine the attitudes that the public has on COVID-19 misinformation. A study done by Harvard Kennedy School intended to investigate the relationship between media consumption, misinformation, and important attributes and behaviors during the coronavirus disease 2019 pandemic (Bridgman et al., 2020). Additionally, the second section of the survey is derived from an article by Johns Hopkins Medicine and reviews common myths circulating about the vaccine. This article intends to serve as clarification for readers who are doubtful of the COVID-19 vaccine and provides credible, scientific evidence to back up vaccine-supportive claims (Kelen & Maragakis, 2021). Another crucial source for this study was the Harvard T.H. Chan School of Public Health and Robert Wood Johnson Foundation study on perception towards the U.S. Public Health System. This study intended to inform leaders about public views on public health systems in the United States during the COVID-19 era. This study utilized a survey method and focused on public views about the nation's public health systems at federal, state, and local levels. The study had four sections to interpret survey results and generate a collective conclusion. For the interest of my research, I removed sections that did not contribute to my study and utilized section II, which required participants to share their views on the nation's system for protecting the public and the quality of the job that public health agencies are doing in the federal government. Therefore, the primary goal of this research is to determine the prevalence of COVID-19 misinformation among high school students and its impact on their perception of national public health.

Method

Purpose: The purpose of this correlational mixed-method study is to measure the extent to which high school students are influenced by COVID-19 social media misinformation and how this impacts their perception of the nation's public health system. During the uncertain period of the COVID-19 global pandemic, social media use has been destructive; furthermore, there's an increased spread of health-threatening information that threatens public safety (Sahni & Sharma, 2020). COVID-19 misinformation has escalated the rates of anti-vaccination sentiments and created greater vaccine hesitancy among the general population (Pullan & Dey, 2020). This gets in the way of NPHI's attempts to improve communities regarding health, particularly health communication that provides accurate information to the public, whereas electronic media bring news risks and a lack of credibility (Frieden & Kaplan, 2010). Thus, the correlation between COVID-19 misinformation and public health will be analyzed through the study's approach. The type of data

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necessary to conduct this research is primary data because there is no current research on the impacts and volume of COVID-19 misinformation on high school students and how it correlates to national public health viewpoints.

Participants: To understand levels of trust in COVID-19 misinformation and public health, a questionnaire given to voluntary participants at a single high school determined the survey data. The objectives required a random sample of students ranging between the ages of 14 and 18. Parental consent was necessary for the participants prior to distributing surveys. To select participants, I gained approval from multiple high school teachers who agreed to request and encourage student participation in the study.

Procedure: To avoid a lack of participation, a community service hour was given for each participant in the study. Community service engages students with opportunities to be active members of their community and is appealing on college applications. To collect data, an 18-item questionnaire was created through Google Forms using a 5-point Likert scale and a question regarding rating the national public health system. Likert scales are commonly implemented into correlational studies to further determine attitudes, knowledge, and perceptions towards the variables being measured. In this study, those variables include COVID-19 misinformation and viewpoints on public health. Likert scales utilize 5 response alternatives: strongly disagree (1), disagree (2), neutral/unsure (3), agree (4), and strongly agree (5). This scale was used to measure respondents' attitudes to 18 common COVID-19 misconceptions. The most appropriate measure quantitatively is the mode, hence the most frequent responses, and the percent that agrees, disagrees, etc. Frequencies were evaluated and were qualitatively analyzed and displayed through a table. The data was derived through credible sources that quantitatively chose the most prevalent pieces of misinformation.

For example, as a source for misinforming statements about the COVID-19 virus, this study utilized misperceptions circulating on social media, notably Twitter. The percentages of participants answering a certain level of disagreement/agreement were analyzed along with those that answered that they are unsure. The most frequent responses to certain questions were considered. The main objective is to indicate the consensus high school students have on COVID-19 theories and national public health. Hence, the results indicated the trust and acceptance a general population of 14-18-year-olds have on 18 COVID-19 misinforming statements. A survey is one of the best methods to use when attempting to determine opinions and correlations between variables; therefore, it is the one my research involves. Participants were asked to answer truthfully the extent to which they agree or disagree with the presented misinformation on the COVID-19 virus and vaccine.

Data: The data was recorded through Google Sheets and was further analyzed through patterns and themes with the use of graphical analysis. Additionally, a Spearman's Rank Correlation Coefficient value was calculated by comparing the average value of each surveyor's response to the 18 COVID-19 misconceptions, separating the averages of each respondent's 10 vaccine and 8 virus misconceptions, to their rating of the nation's public health system. This was done to quantify the correlation between belief to COVID-19 theories and whether that correlates to our nation's public health rating for surveyors.

To minimize confounding variables, there were certain measures that had to be considered regarding this study. Different high school teachers were chosen, each of whom instructed different levels of classes, to have the best possible sample of the general population in high school. It was requested that surveys be done under the supervision of myself and an instructor, in about 10 minutes during school hours to avoid participants answering the questions dishonestly and prevent

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them from using outside sources to answer the questionnaire. The questionnaire is meant to be based on preconceptions of the COVID-19 vaccine that high school students give credence to, so using outside sources to gain questionnaire insight would misrepresent the data.

The first 8 items of the questionnaire were based on common COVID-19 virus misperceptions (Bridgman et al., 2020). A misinformation review done by the Harvard Kennedy school includes misperceptions on preventive measures, development, popularity, etc. The following questions were derived with the objective of reviewing misinformation and understanding the role of news and social media through a study done by Brigman et al. The second 10 items of the survey test the belief in common misinformation regarding the COVID-19 vaccine. These common COVID-19 rumors were derived through a Myths vs Facts analysis done by Dr. Gabor David Kelen and Dr. Lisa Maragakis from Johns Hopkins University. Both writers have expertise in their respective fields: Dr. Maragakis is the senior director of infection prevention, and Dr. Kelen is a director in the department of emergency medicine and a professor of emergency medicine at Johns Hopkins University. This analysis includes common myths circulating regarding the COVID-19 vaccine. A limitation of implementing this analysis is that the authors vaguely reported how the common beliefs were derived; however, they did report the myths circulating on social media platforms.

As a follow-up to the survey, a question about perception on the functioning of national public health was asked. The Robert Wood Johnson Foundation and Harvard T.H. Chan School of Public Health conducted a poll to derive public health viewpoints on the public health system in the United States during the COVID-19 pandemic circumstances. The questionnaire in this study varied from areas of effectiveness in every minor and major health concern, and federal funding for public health sectors. I implemented part II of the survey, which included questions to determine the views on the nation's public health system. I did not include the remaining parts I-VIII from this study because they included factors like race, political party affiliation, and reliability on specific public health which wasn't relevant to the study. The purpose of the follow-up questions on public health is to further develop qualitative themes on the relation between misinformation and how it impacts the way students perceive the effectiveness of federal public health institutions (Harvard T.H. Chan School of Public Health & Robert Wood Johnson Foundation, 2020).

The participants received a digital survey through Google Forms via their school emails and selected their responses on a scale of 1-5 for the first 18 items and ratings for the last question. A digital survey is convenient and, during the COVID-19 pandemic, safer. The sample size for the school was 92, with a confidence interval of 10%, calculated utilizing a survey software solution known as Creative Research Systems. In my study, the core demographic considered was the age group. This study was a representation of the views and acceptance a general population of 14-18-year-olds have on social media misconceptions on COVID-19. The importance of this age group is that their currently shaped views on determining credible public health versus misinformation through social media will later have greater implications for society, such as decision-making and the health of the general population.

Results/Discussion

The total number of subjects that participated in this study was 61. All participants varied from the ages of 14 to 18 and attended the same high school. A Cronbach's alpha reliability test was conducted for the determination of scale reliability, and the calculation depicted excellent internal consistency with a value of 0.97. The first section of the survey consisted of 8 COVID-19 misperceptions regarding the virus (**Table 1**).

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Table 1
COVID-19 Misperceptions

Items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The coronavirus is no worse than the seasonal flu.	26 (42.6%)	14 (23%)	12 (19.7%)	6 (9.8%)	3 (4.9%)
Drinking water every 15 minutes will help prevent the coronavirus.	36 (59%)	12 (19.7%)	9 (14.8%)	4 (6.6%)	0 (0%)
The Chinese government developed the coronavirus as a bioweapon.	40 (65.6%)	9 (14.8%)	8 (13.1%)	1 (1.6%)	3 (4.9%)
Homeopathy and home remedies can help manage and prevent the coronavirus.	11 (18%)	16 (26.2%)	17 (27.9%)	11 (18%)	6 (9.8%)
The coronavirus was caused by the consumption of bats in China.	25 (41%)	6 (9.8%)	17 (27.9%)	9 (14.8%)	4 (6.6%)
Vitamin C can ward off the coronavirus.	15 (24.6%)	14 (23%)	18 (29.5%)	12 (19.7%)	2 (3.3%)
High temperatures, such as from saunas and hair dryers, can kill the coronavirus.	36 (59%)	10 (16.4%)	7 (11.5%)	6 (9.8%)	2 (3.3%)
The number of deaths related to the coronavirus has been exaggerated.	32 (52.5%)	14 (23%)	3 (4.9%)	7 (11.5%)	5 (8.2%)

By normal standards, the association between attitudes towards COVID-19 virus theories and public health perception regarding handling COVID-19 health threats would not be considered statistically significant ($p=0.288$). The Spearman's Rank Correlation Coefficient indicated a weak negative association ($r_s = -0.138$), hence when one variable increases the other decreases, in this case public health perception and susceptibility to virus misinformation. The value still represents a weak correlation, however. Since the p value is greater than 0.05, the null hypothesis is accepted indicating a negative correlation.

The second section of the survey consisted of an additional 10 pieces of misinformation regarding COVID-19 vaccines (**Table 2**). Vaccine hesitancy has been prevalent throughout medical history, and their safety and effectiveness are questioned by non-credible sources, especially on social media platforms. Ten of the most frequent pieces of vaccine misinformation

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were derived from a Myth Versus Fact analysis done by Johns Hopkins Medicine that aimed to review the most common myths circulating the recent COVID-19 vaccine.

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Table 2
COVID-19 Vaccine
Misperceptions

Items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The COVID-19 vaccine can affect women's fertility.	24 (39.3%)	10 (16.4%)	19 (31.1%)	8 (13.1%)	0 (0%)
If I've already had COVID-19, I don't need a vaccine.	40 (65.6%)	6 (9.8%)	7 (11.5%)	6 (9.8%)	2 (3.3%)
Researchers rushed the development of the COVID-19 vaccine, so its effectiveness and safety cannot be trusted.	22 (36.1%)	17 (27.9%)	15 (24.6%)	2 (3.3%)	5 (8.2%)
Getting the COVID-19 vaccines means I can stop wearing my mask and taking coronavirus precautions.	37 (60.7%)	14 (23%)	3 (4.9%)	4 (6.6%)	3 (4.9%)
Getting the COVID-19 vaccine gives you COVID-19.	36 (59%)	9 (14.8%)	5 (8.2%)	7 (11.5%)	4 (6.6%)
The side effects of the COVID-19 vaccine are dangerous.	15 (24.6%)	15 (24.6%)	16 (26.2%)	6 (9.8%)	9 (14.8%)
The COVID-19 vaccine enters your cells and changes your DNA.	39 (63.9%)	9 (14.8%)	6 (9.8%)	5 (8.2%)	2 (3.3%)
The messenger RNA technology used to make the COVID-19 vaccine is brand new.	17 (27.9%)	15 (24.6%)	23 (37.7%)	6 (9.8%)	0 (0%)
The COVID-19 vaccine was developed with or contains controversial substances.	21 (34.4%)	8 (13.1%)	19 (31.1%)	12 (19.7%)	1 (1.6%)
Now that we have a vaccine for COVID-19, we can make vaccines for the common cold, HIV, and other diseases.	7 (11.5%)	22 (36.1%)	20 (32.8%)	8 (13.1%)	4 (6.6%)

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The final question of the survey analysis was used to determine the correlation between the 18 items listed and ratings on the public health system regarding dealing with COVID-19, represented in **Figure 1**. Based on the data, the association between COVID-19 vaccine hesitancy and public health perception is not statistically significant ($p= 0.842$). The Spearman's rank correlation coefficient, however, was closer to 0, indicative of a weak poor correlation between both variables with a value of -0.026 . Since the p value is greater than 0.05, the null hypothesis is accepted. Compared to virus misinformation, vaccine misinformation and public health perception had a much weaker correlation, denying my hypothesis and indicating that there is closer correlation to susceptibility to virus misconceptions compared to vaccine misconceptions and national public health perception.

Importantly, many participants agreed to statements with reference to vaccine misinformation. 14.8% of students strongly agreed that the COVID-19 vaccine has dangerous side effects, and this statement also had a high mean value of 2.65. Since the introduction of vaccinations, an abundance of vaccine myths and controversies have surrounded the conversation around vaccine acceptance. As expected, such misinformation influences public perception of vaccinations and the degree to which individuals trust public health agencies to distribute vaccines. For instance, a presumed correlation in France between the hepatitis b vaccine and multiple sclerosis resulted in the suspension of universal vaccination programs in the 1990s (Dube et al., 2013).

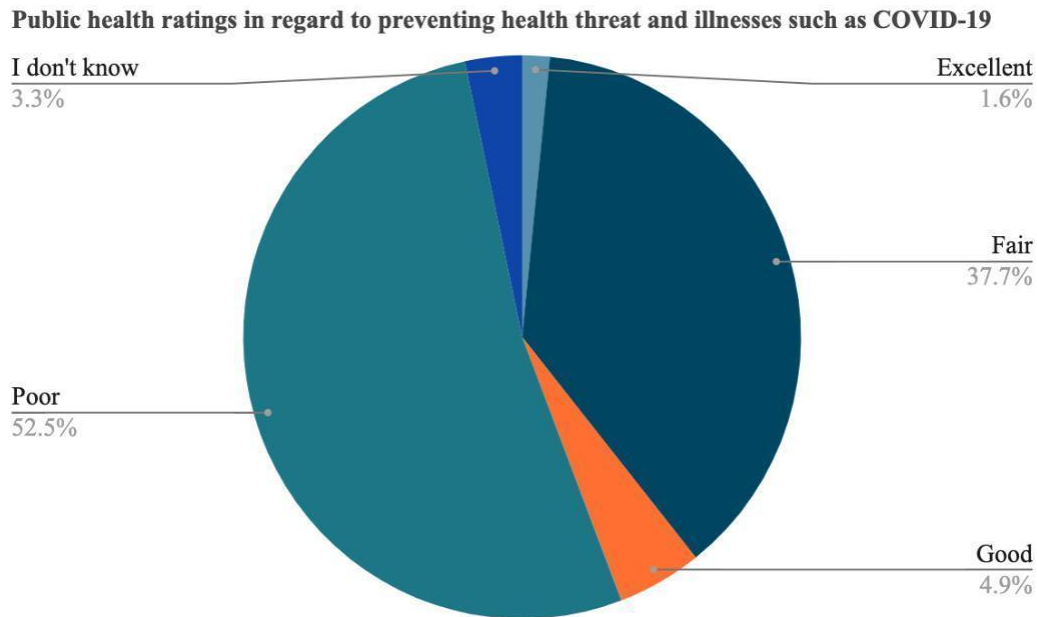
As evident in numerous previous studies, vaccination programs have contributed to the decline in mortality and morbidity of several infectious diseases and are credited with the worldwide eradication of smallpox and elimination of poliomyelitis in the Americas. Additionally, vaccination is one of the greatest achievements of public health in reducing the spread of vaccine preventable diseases (VPD). On important doubts and concerns regarding vaccination, although less than 5-10% of individuals have strong anti-vaccination convictions, a significant proportion could be characterized as being vaccine hesitant (Dube et al., 2013).

Recent studies have indicated that 52% of those who have visited online health sites believe that "almost all" or "most" of the health information they find online is credible. A study done by Robert M. Wolfe et al., concluded that antivaccination websites express a range of concerns related to vaccine safety and varying levels of distrust in medicine (2002). As a result, vaccines, one of the greatest achievements of biomedical science and public health, are jeopardized by antivaccination movements and vaccine hesitancy.

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Figure 3

Public health ratings regarding preventing health threat and illness, such as COVID-19



Many participants showed a neutral/unsure standpoint with majority of the statements. This indicates there is a lack of knowledge on COVID-19, which is an enormous implication, considering that this virus has been in the global spotlight for two years. It is also indicative of a gap in awareness and knowledge. For example, statements regarding COVID-19 preventive measures and vaccine trust had the most agreements, which indicates that vaccine hesitancy is occurring, and not enough accurate awareness of preventive measures exists. 23% of participants agreed that vitamin C can ward off the coronavirus, which is not scientifically supported, but rather circulates as a misconception on the Internet. Despite being recognized as one of the most successful public health measures, vaccination is perceived as unsafe and unnecessary by a growing number of individuals. Lack of confidence in vaccines is now considered a threat to the success of vaccination programs. Vaccine hesitancy is believed to be responsible for decreasing vaccine coverage and an increased risk of vaccine-preventable disease outbreaks and epidemics (Dube et al.).

Almost a quarter of the participants believed that the COVID-19 vaccine contained controversial substances and led to dangerous side effects. This pattern indicates that students aren't confident in the COVID-19 vaccine. Almost 52% of the participants rated the nation's public health system as poorly managing COVID-19.

These findings indicate that most of the sample had neutral standpoints on many of the common misconceptions presented, and no statistical correlation was proven between attitudes for COVID-19 misinformation and public health functioning during times of COVID-19. Additionally, more than half of the sample perceived public health as poor regarding the prevention of illness such as COVID-19. The results matched the previously formulated hypothesis because although certain statements didn't have discrepancies, some had more of a bell

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curve response, which indicates more familiarity with those statements. The statement with the highest acceptance was “Now that we have a vaccine for COVID-19, we can make vaccines for the common cold, HIV, and other diseases” with a mean value of 2.67 and 19.7% of participants in agreement/strong agreement with the statement. In addition, 21.3% of surveyors agreed/strongly agreed that the COVID-19 vaccine was developed with or contains controversial substances. Although the U.S. FDA has approved distributions of COVID-19 vaccines and the CDC recommends people vaccinate against COVID-19, high school students appear to have concerns regarding the safety of the COVID-19 vaccine.

Limitations

Participants of this research may misinterpret some of the statements. In addition, this survey analysis was conducted voluntarily with the advantage of receiving an hour of community service, hence those interested took the survey. The target sample size for this study was 92, and 61 responses were gathered. This is an acceptable value in accordance with the central limit theorem, which states that sample values equal to or greater than 30 are sufficient. The high school that participants were derived from has a medical academy, which allows students to earn medical certifications and gain hands-on experience to successfully transition into the healthcare workforce in the future. This may be a trivial limitation to my study because students that have interest and exposure to the medical field will most likely be able to differentiate between scientific, irrefutable facts, and unreliable information. Nevertheless, even the healthcare community is vulnerable to spreading misinformation; therefore, this limitation isn't notably expected to skew my data. Although this does not create a shift in my data, it could possibly result in these high school students having a greater knowledge of COVID-19 than the general population of adolescents of the same age.

Conclusions and Future Research

In conclusion, this study indicated that there is a very weak negative correlation between susceptibility towards vaccine and virus misinformation and public health perception. Regardless, there is still hesitancy about vaccinations and COVID-19 public safety. Also, more than half of the participants agree that public health functioning has been poor regarding dealing with COVID-19. The results met my expectations; although there was no correlation between COVID-19 misinformation and public health perception, there was still heightened acceptance towards COVID-19 misinformation and poor ratings of public health as hypothesized. The implications of this study shed light on the future of reactions to public health functioning and recommendations and initiatives. COVID-19 misconceptions are a threat to public health and raise concerns on how incredible information make its way into society. There must be a greater focus on how misinformation, especially medical misinformation, can be decreased on the internet and social media, along with strengthening the safety and efficacy of vaccinations. My findings contribute to exploring the prevalence of COVID-19 misconceptions, and any medical misinformation within high school students along with educating and encouraging vaccinations for younger generations inclusive of accurate scientific knowledge on the importance of them.

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Appendix A

Table 1
COVID-19 Misperceptions

Items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The coronavirus is no worse than the seasonal flu.	26 (42.6%)	14 (23%)	12 (19.7%)	6 (9.8%)	3 (4.9%)
Drinking water every 15 minutes will help prevent the coronavirus.	36 (59%)	12 (19.7%)	9 (14.8%)	4 (6.6%)	0 (0%)
The Chinese government developed the coronavirus as a bioweapon.	40 (65.6%)	9 (14.8%)	8 (13.1%)	1 (1.6%)	3 (4.9%)
Homeopathy and home remedies can help manage and prevent the coronavirus.	11 (18%)	16 (26.2%)	17 (27.9%)	11 (18%)	6 (9.8%)
The coronavirus was caused by the consumption of bats in China.	25 (41%)	6 (9.8%)	17 (27.9%)	9 (14.8%)	4 (6.6%)
Vitamin C can ward off the coronavirus.	15 (24.6%)	14 (23%)	18 (29.5%)	12 (19.7%)	2 (3.3%)
High temperatures, such as from saunas and hair dryers, can kill the coronavirus.	36 (59%)	10 (16.4%)	7 (11.5%)	6 (9.8%)	2 (3.3%)
The number of deaths related to the coronavirus has been exaggerated.	32 (52.5%)	14 (23%)	3 (4.9%)	7 (11.5%)	5 (8.2%)

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Appendix B

Table 2
COVID-19 Vaccine
Misperceptions

Items	Strongly agree	Disagree	Neutral	Agree	Strongly agree
The COVID-19 vaccine can affect women's fertility.	24 (39.3%)	10 (16.4%)	19 (31.1%)	8 (13.1%)	0 (0%)
If I've already had COVID-19, I don't need a vaccine.	40 (65.6%)	6 (9.8%)	7 (11.5%)	6 (9.8%)	2 (3.3%)
Researchers rushed the development of the COVID-19 vaccine, so its effectiveness and safety cannot be trusted.	22 (36.1%)	17 (27.9%)	15 (24.6%)	2 (3.3%)	5 (8.2%)
Getting the COVID-19 vaccines means I can stop wearing my mask and taking coronavirus precautions.	37 (60.7%)	14 (23%)	3 (4.9%)	4 (6.6%)	3 (4.9%)
Getting the COVID-19 vaccine gives you COVID-19.	36 (59%)	9 (14.8%)	5 (8.2%)	7 (11.5%)	4 (6.6%)
The side effects of the COVID-19 vaccine are dangerous.	15 (24.6%)	15 (24.6%)	16 (26.2%)	6 (9.8%)	9 (14.8%)
The COVID-19 vaccine enters your cells and changes your DNA.	39 (63.9%)	9 (14.8%)	6 (9.8%)	5 (8.2%)	2 (3.3%)
The messenger RNA technology used to make the COVID-19 vaccine is brand new.	17 (27.9%)	15 (24.6%)	23 (37.7%)	6 (9.8%)	0 (0%)
The COVID-19 vaccine was developed with or contains controversial substances.	21 (34.4%)	8 (13.1%)	19 (31.1%)	12 (19.7%)	1 (1.6%)
Now that we have a vaccine for COVID-19, we can make	7 (11.5%)	22 (36.1%)	20 (32.8%)	8 (13.1%)	4 (6.6%)

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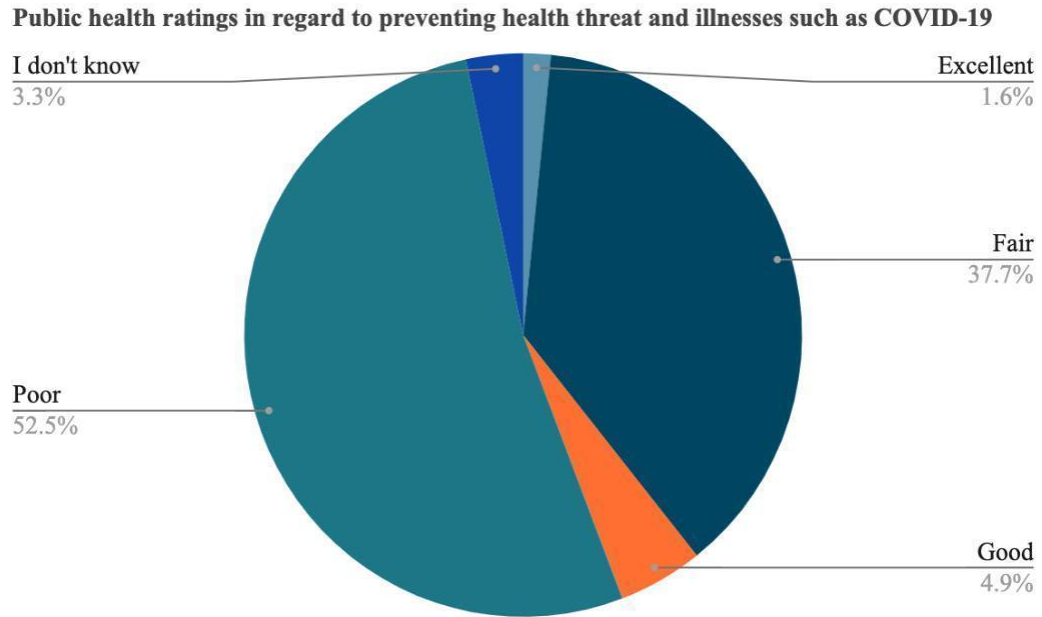
vaccines for the common cold, HIV, and other diseases.

Appendix C

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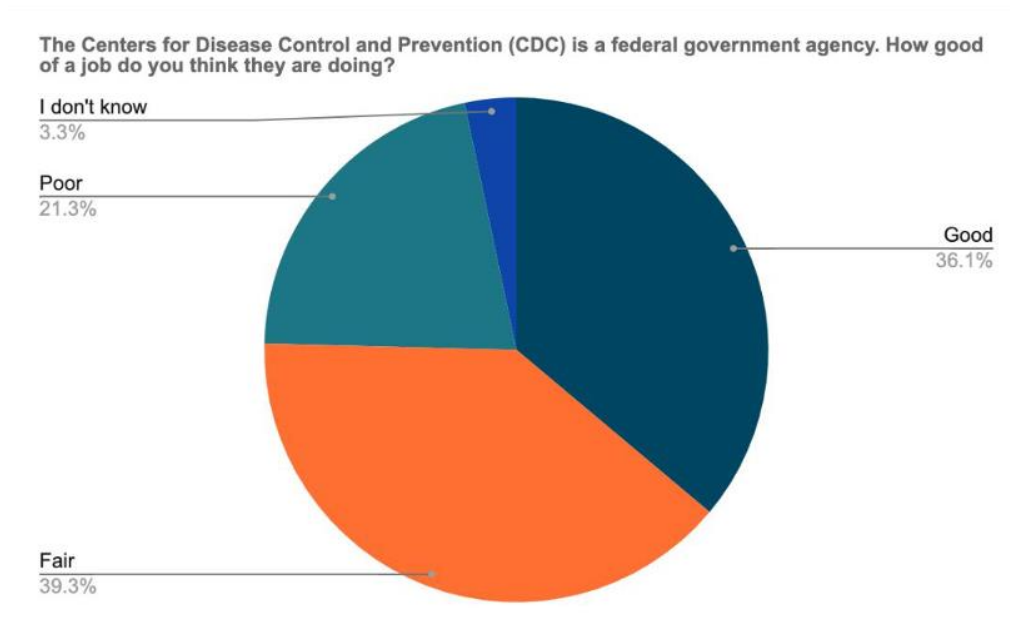
Figure 3

Public health ratings regarding preventing health threat and illness, such as COVID-19



Appendix D

Extra data



Appendix E

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Items	Mean	Standard Deviation
Item 1	2.11	1.21
Item 2	1.69	0.95
Item 3	1.65	1.09
Item 4	2.75	1.23
Item 5	2.36	1.32
Item 6	2.54	1.63
Item 7	1.82	1.18
Item 8	2	1.34
Item 9	2.18	1.1
Item 10	1.75	1.19
Item 11	2.2	1.21
Item 12	1.72	1.14
Item 13	1.92	1.32
Item 14	2.65	1.35
Item 15	1.72	1.42
Item 16	2.3	1
Item 17	2.41	1.2
Item 18	2.67	1.06

Appendix F

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Parental Permission to Participate in Research Involving Minimal Risk

Information for parents to consider before allowing their child to take part in this research study

The following information is being presented to help you and your child decide whether or not your child wishes to be a part of a research study. Please read this information carefully. If you have any questions or if you do not understand the information, we encourage you to contact the researcher or teacher (contact information is included at the end of this form).

We are asking you to allow your child to take part in a research study called: **Public Health Perception: A Study on the Impacts of COVID-19 misinformation on High School students.**

The people who are in charge of this research study are: Isha Patel

The research will be conducted at West Boca Raton Community High School

Why is this research being done?

The purpose of this study is to measure the impact of misinformation on high school students. High school students spend an excessive amount of time on social media, where questionable conspiracy theories and misinformation is gradually increasing by the day. The purpose of this research is to see how COVID-19 misinformation impacts the perspectives that teenagers have on national healthcare. Does misinformation impact the decision-making of teenagers in regard to acquiring a vaccine for a preventable disease along with their perception of the virus and public health?

Why is your child being asked to take part?

We are asking your child to take part in this research study because this research is necessary to learn more about the dangers and impacts of misinformation on social media and how it raises questions on trust for health care institutions.

Should your child take part in this study?

This informed consent form tells you about this research study. You can decide if you want your child to take part in it. This form explains:

- Why this study is being done.
- What will happen during this study and what your child will need to do.
- Whether there is any chance your child might experience potential benefits from being in the study.

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- The risks of having problems because your child is in this study.

Before you decide:

- Read this form.
- Have a friend or family member read it.
- Talk about this study with the person in charge of the study or the person explaining the study. You can have someone with you when you talk about the study.
- Talk it over with someone you trust.
- Find out what the study is about.
- You may have questions this form does not answer. You do not have to guess at things you don't understand. If you have questions, ask the person in charge of the study or study staff as you go along. Ask them to explain things in a way you can understand.
- Take your time to think about it.

The decision to provide permission to allow your child to participate in the research study is up to you. If you choose to let your child be in the study, then you should sign this form. If you do not want your child to take part in this study, you should not sign the form.

What will happen during this study?

Your child will be asked to take a short 20 question survey

How many other people will take part?

50 high school students will take part in this study.

What other choices do you have if you decide not to let your child take part?

If you decide not to let your child take part in this study, that is okay.

Instead of being in this research study, your child can choose not to participate.

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Will your child be compensated for taking part in this study?

There will be no payment or compensation for taking part in this study.

What will it cost you to let your child take part in this study?

It will not cost you anything to take part in this study.

What are the potential benefits to your child if you let him / her take part in this study?

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1 community service hour will be given to participants of this study. Community service hours are a requirement to graduate High School. Community service is valuable and shows the contribution to the community.

What are the risks if your child takes part in this study?

There are no known risks to those taking part in this study.

Privacy and Confidentiality

We will keep your child's study records private and confidential. Certain people may need to see your child's study records. By law, anyone who looks at your child's records must keep them completely confidential. The only people who will be allowed to see these records are:

- The research team, including the Principal Investigator, study coordinator, and all other research staff.
- Certain government and university people who need to know more about the study. For example, individuals who provide oversight on this study may need to look at your records. This is done to make sure that we are doing the study in the right way. They also need to make sure that we are protecting your rights and your safety.
- Any agency of the federal, state, or local government that regulates this research. This includes the Department of Health and Human Services (DHHS) and the Office for Human Research Protection (OHRP).
- The Institutional Review Board (IRB) and its related staff who have oversight responsibilities for this study.
- We may publish what we learn from this study. If we do, we will not include your child's name. We will not publish anything that would let people know who your child is.

What happens if you decide not to let your child take part in this study?

You should only let your child take part in this study if both of you want to. You or your child should not feel that there is any pressure to take part in the study to please the study investigator or the research staff.

If you decide not to let your child take part:

- Your child will not be in trouble or lose any rights he/she would normally have.
- Your child will still get the same services he/she would normally have.

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You can decide after signing this informed consent form that you no longer want your child to take part in this study. We will keep you informed of any new developments which might affect your willingness to allow your child to continue to participate in the study. However,

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you can decide you want your child to stop taking part in the study for any reason at any time. If you decide you want your child to stop taking part in the study, tell the study staff as soon as you can.

- We will tell you how to stop safely. We will tell you if there are any dangers if your child stops suddenly.

Even if you want your child to stay in the study, there may be reasons we will need to withdraw him/her from the study. Your child may be taken out of this study if we find out it is not safe for your child to stay in the study or if your child is not coming for the study visits when scheduled. We will let you know the reason for withdrawing your child's participation in this study.

You can get the answers to your questions, concerns, or complaints.

If you have any questions, concerns or complaints about this study, call Isha Patel, ihpatel04@gmail.com, 561-418-0944

If you have questions about your child's rights, general questions, complaints, or issues as a person taking part in this study, call Teacher, Nancy Jo Rademacker, 561-672-2001.

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Consent for My Child to Participate in this Research Study

It is up to you to decide whether you want your child to take part in this study. If you want your child to take part, please read the statements below and sign the form if the statements are true.

I freely give my consent to let my child take part in this study and authorize that my child's health information as agreed above, be collected/disclosed in this study. I understand that by signing this form I am agreeing to let my child take part in the research. I have received a copy of this form to take with me.

Signature of Parent of Child Taking Part in Study

Date

Printed Name of Parent of Child Taking Part in Study

Statement of Person Obtaining Informed Consent (THIS IS THE RESEARCHER)

I have carefully explained to the parent of the child taking part in the study what he or she can expect from their child's participation. I hereby certify that when this person signs this form, to the best of my knowledge, he/ she understands:

- What the study is about;
- What procedures/interventions/investigational drugs or devices will be used;
- What the potential benefits might be; and
- What the known risks might be.

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I can confirm that this research subject speaks the language that was used to explain this research and is receiving an informed consent form in the appropriate language. Additionally, this subject reads well enough to understand this document or, if not, this person is able to hear and understand when the form is read to him or her. The parent signing this form does not have a medical/psychological problem that would compromise comprehension and therefore makes it hard to understand what is being explained and can, therefore, give legally effective informed consent. The parent signing this form is not under any type of anesthesia or analgesic that may cloud their judgment or make it hard to

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understand what is being explained and, therefore, can be considered competent to give permission to allow their child to participate in this research study.

**Signature of Person Obtaining Informed
Consent Date**

Printed Name of Person Obtaining Informed Consent