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Understanding Risk Perception and Xenophobic Attitudes during the Coronavirus Disease 2019 (COVID-19) Pandemic in the United States

Sera Yoo
Cooper Medical School of Rowan University, yooser86@rowan.edu

William Eger
Yale University School of Medicine, william.eger@yale.edu

Ashley Moore
Yale University School of Public Health, ashley.moore@yale.edu

Emily Miron
Yale University, emily.miron@yale.edu

Marney A. White
Yale University School of Public Health, marney.white@yale.edu

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Original Clinical Investigations

Understanding Risk Perception and Xenophobic Attitudes during the Coronavirus Disease 2019 (COVID-19) Pandemic in the United States

Sera Yoo, MPH, Current MD candidate[1][a], William Eger, MPH[2], Ashley Moore, MPH[3], Emily Miron, MPH[4], Marney A. White, PhD, MS[5]

[1] Cooper Medical School of Rowan University, [2] Yale University School of Medicine, [3] ale University School of Public Health, [4] Yale University, [5] Yale University School of Public Health

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Introduction

There have been over 87 million cases of Coronavirus Disease 2019 (COVID-19) in the United States as of July 2022. Risk perception is an important determinant of protective behaviors and has been used to measure adherence to public health recommendations.

Objective

The objective of this study was to develop a novel questionnaire to assess risk perception of COVID-19 and xenophobic attitudes among adults in the US at the beginning of the pandemic.

Methods

An anonymous self-report questionnaire was developed for this study in February 2020, and was distributed using convenience sampling from March 10 to March 25, 2020. The questionnaire assessed knowledge and risk perceptions of COVID-19, as well as attitudes toward individuals of various races and ethnicities.

Results

662 US adults completed the questionnaire. On a scale from 1 (low) to 5 (high), the mean risk perception was 3.44. Those with knowledge of COVID-19 and higher education levels reported higher risk perception and higher feelings of warmth towards Asian people. Forty percent of the sample had recently witnessed or experienced anti-Asian attitudes at the time of the survey. The majority of participants reported having heard about COVID-19 from news media, social media, and family or friends.

Conclusions

Our sample had a moderate level of risk perception, potentially due to the time period of data collection (i.e., early in the pandemic course). The results suggest that knowledge about COVID-19 informed perceived risk and affected willingness to engage in healthy protective behaviors. Our study provides historic context of how people perceived the virus at the beginning of the pandemic, and gives insight into the aftermaths regarding quarantine and attitudes towards Asian Americans.

INTRODUCTION

As of July 2022, there are 87 million cases and over 1 million deaths due to Coronavirus Disease 2019 (COVID-19) in the United States (US).[1] Cases have skyrocketed over the past two years; comparably, in May 2020, there had been approximately 1.6 million cases and 97,700 deaths in the nation.[2] In January 2020, as cases began to rise in the US and around the world, we found increasing importance to understand public perceptions of the virus and how the outlets in which people learn new information impact such perceptions. Risk perception, defined as a sub-

a Corresponding author: yooser86@rowan.edu. Please note: All authors contributed equally to the study.

jective judgement that people make about the characteristics and severity of a risk, is an important determinant of protective behaviors and has been used to measure adherence to public health recommendations.[3-5] Those with higher perceived risk for contracting a disease have greater motivation to seek protective health behaviors. Tools that assess risk perception have been used for many epidemics with pandemic potential, including Severe Acute Respiratory Syndrome (SARS), Ebola Virus Disease, and H1N1 influenza.[6-8] At the time of this questionnaire development, there were no published questionnaires on the risk perception assessment of COVID-19.

We created a novel questionnaire in February 2020 to assess knowledge-based perceptions related to COVID-19 within the US population. At the time, little was known about how people living in the US perceived COVID-19 in terms of their awareness and beliefs of the virus itself, the origin of the outbreak, and those who have acquired the virus. We hypothesized that accurate knowledge of COVID-19, demographic characteristics (e.g., educational attainment), and sources of information (e.g., government, friends and family) relate to risk perception. Empirical studies examining other infectious disease outbreaks have identified similar influences on perception of risk.[6,7] Our study further aimed to assess xenophobic attitudes towards Asians and Asian Americans in the US, as Asian Americans had faced intense stigma and harassment since the onset of the COVID-19 outbreak in December 2019.[9] The goal of our study was to elucidate the relationship between knowledge of COVID-19 and risk perception and the extent to which other variables influence adherence and opinion surrounding public health measures.

METHODS

We reviewed risk perceptions of epidemics, such as SARS and the Ebola virus, to develop a novel questionnaire that evaluated perceptions of personal and community risk of acquiring COVID-19, perceptions of certain groups' likelihood of spreading COVID-19, and avoidance of travel.[6, 7] Sample items included, "How likely do you think it is that you will get [COVID-19] in the next six months?" and "Since you have heard of COVID-19, how willing are you to travel outside of the US in the next six months?" (Table 1) The scale demonstrated adequate reliability (Cronbach's α=0.771). The study was granted an exemption from IRB review under federal regulation 45CFR56.104 (1)(ii) by the authors' university Institutional Review Board (protocol #: 2000027611).

Risk perception was the key outcome calculated as an average of all items within the scale; scores could range from 1.00 (low risk perception) to 5.00 (high risk perception). Knowledge score was determined using a binary scale based on four true/false prompts that asked about COVID-19. Some statements described COVID-19 as a respiratory disease (true) or a bacterial infection (false). People who answered all of the knowledge prompts correctly were classified as having accurate knowledge, and people who answered any one of the prompts incorrectly were classified as having inaccurate knowledge.

We used convenience sampling to recruit participants from March 10 to March 25, 2020 via posts on social media channels (e.g., Facebook, Instagram, Twitter and LinkedIn) and direct email. Qualtrics (Utah, USA), an electronic survey development software, was used to create the survey. Respondent data were limited to adult participants (at least 18 years of age) who provided informed consent prior to taking the survey. Not included in the construct items that made up the inter-item reliability were demographic information and anti-Asian attitudes, which were included in the overall questionnaire. Demographic information was attained, including age, gender, race/ethnicity, educational attainment, US region of residence, area of residence, and occupational status. Attitudes towards various racial/ethnic groups in the context of COVID-19 were measured using the following prompt, "In the context of COVID-19, how do you feel towards the following groups of people?" Responses could range from zero ("cold") to ten ("warm"). An additional question, "Since you've heard about COVID-19, have you or someone you know experienced or witness anti-Asian attitudes or actions?" was included to ask particularly about possible xenophobic attitudes after the rise of the pandemic (Appendix 1). Analyses were conducted in SPSS (Armont, NY) and R (Boston, MA) software. Statistical analyses included ANOVA, independent t-tests, paired t-tests, and correlations.

RESULTS

662 US residents participated in the survey (Table 2). Participants' mean age was 35.23 years. Most of the sample's racial identity was White/Caucasian, and the predominant gender identity was woman. Most of the sample (88.5%) had obtained a college degree, while nearly one-third reported being a current student. Additionally, the majority reported living in the Northeast US and in suburban areas.

The mean risk perception score of the overall sample was 3.44 with a distribution skewed to the right. Region of residence and educational attainment were significantly associated with risk perception. People living in the Western US had significantly higher risk perception than people living in the Northeast. In addition, people with greater than a college education had a significantly higher risk perception than people with a college degree or less. Risk perception analysis can be found in Table 3.

The knowledge questions showed that 48.1% of the sample had accurate knowledge of COVID-19 (data not shown). Risk perception differed significantly among those who had complete knowledge and those who did not ($t[657]=5.73$, $p<0.001$). People with accurate knowledge reported a higher risk perception than those with inaccurate knowledge. Knowledge also differed significantly with educational attainment. Participants with less than a college education were less likely to have accurate knowledge than those with a college degree (-0.581, 95% CI:-1.12,-0.044, p=0.034). Knowledge also differed among region of residence (p=0.019). The Northeast was the only region that did not

Table 1. Questionnaire Subconstructs and Related Factor Loadings for Construct Items

Subconstruct	Factor Loadings*	Construct Item
Likelihood of spreading COVID-19	0.885	Evaluate the likelihood that [older adults] could spread COVID-19.
	0.712	Evaluate the likelihood that [people who live in urban areas] could spread COVID-19.
	0.675	Evaluate the likelihood that [people who live in rural areas] could spread COVID-19.
	0.420	Evaluate the likelihood that [children] could spread COVID-19.
Likelihood of getting COVID-19	0.912	How likely do you think it is that you will get [COVID-19] in the next six months?
	0.865	How likely do you think it is that one of your friends or family will get COVID-19 in the next six months?
	0.531	How likely is it for a person in [North America] to get COVID-19 in the next six months?
Travel Avoidance Behaviors	0.870	Since you have heard of COVID-19, how willing are you to travel by bus, plane, or train within the U.S. in the next six months?
	0.846	Since you have heard about COVID-19, how willing are you to travel outside of the U.S. in the next six months?
	0.575	Since you have heard about COVID-19, how likely are you to avoid crowded places?

*Factor loadings are from an exploratory factor analysis on the items of our questionnaire related to COVID-19 risk perception.

have a majority of people with accurate knowledge of COVID-19. Knowledge of COVID-19 did not differ significantly across other demographic characteristics.

Participants reported multiple sources of information for COVID-19. Most of the participants heard about COVID-19 from news media, followed by social media, and family or friends. People who received information about COVID-19 from government and scholarly reports, clinical professionals, and university communications were more likely to have accurate knowledge than those who received information exclusively from news media, social media, and friends and family.

In general, the sample felt warmth towards people of all racial identities, and there was no significant correlation between risk perception and feelings towards others (data not shown). We focused on attitudes towards Asians and Asian Americans for further analysis due to the increasing number of news articles highlighting COVID-19-related stigma among this group.[10] Around 40% of the sample witnessed or experienced anti-Asian attitudes or actions. Analysis of the demographic characteristics of those who said "yes" versus "no" were compared, and found a significant difference in mean warmth towards Asian people among education groups, with an incremental increase in warmth towards Asian people with every increase in education level. Those having less than a college degree, those with a college degree, and those with more than a college degree showed a mean of 7.45, 8.22, and 8.65, respectively ($F[2,429]=4.45$, $p=0.012$). Post-hoc tests indicated that those with more than a college degree differed significantly to those with less than a college degree. There was also a significant difference in mean warmth towards Asian people by knowledge, with those having accurate knowledge of COVID-19 indicating higher warmth towards Asian people ($t[412]=3.87$, $p<0.001$).

DISCUSSION

This study explored risk perceptions of COVID-19 in early March 2020. The risk perception construct consisted of questions about perceptions of personal and community risk of getting COVID-19, perceptions of certain groups' likelihood of spreading COVID-19, and avoidance of travel. In the overall construct, the mean risk perception for the sample population was moderate, possibly due to the early distribution of the questionnaire. People who correctly answered all four knowledge questions ("accurate knowledge") had higher risk perception, were more likely to have higher educational attainment, and were less likely to come from the Northeast.

Prior to vaccine approval and rollout, social distancing and individual-level mitigation behaviors (e.g., wearing masks, washing hands) were our best tools to stop the spread of COVID-19.[11] However, uptake of these interventions were not universal. Other studies have since revealed that uptake of mitigation strategies for COVID-19 is associated with perceived risk and several demographic factors, including knowledge of the virus and educational attainment.[12,13] While our results here are consistent with most of the literature on risk perception,[12] three qualitative studies revealed that being more educated was associated with increased protective behaviors but not with risk perception.[14,15] These authors' hypothesized that this may be because higher education can help people understand how to engage in risk mitigation strategies, but potentially protect them from an irrational fear of being infected.[11] We also saw differences in knowledge between regions of the US, with the Northeast having a relatively low knowledge of COVID-19. While we found little evidence of this association in the published literature, one study focused on vaccine acceptance across the US also revealed that the Northeast US was least accepting of a vaccine prior to the vaccine's official rollout (May 2020).[16] We may hypothesize

Table 2. Sample Characteristics, United States, March 10-25, 2020

Characteristic	Participants*
Age (years), mean (SD)	35.23 (15.87)
Gender, n (%)	
Man	145 (21.9)
Woman	508 (76.7)
Transgender man	1 (0.2)
Transgender woman	0 (0.0)
Non-binary	4 (0.6)
Race/ethnicity, n (%)	
Asian/Pacific Islander	49 (7.4)
Black/African American	11 (1.7)
Hispanic/Latinx	29 (4.4)
Native American/American Indian	1 (0.2)
White	558 (84.3)
Other	12 (1.8)
Educational attainment, n (%)	
Less than a college degree	74 (11.2)
College degree	373 (56.3)
More than a college degree	213 (32.2)
US region of residence, n (%)	
Alaska, Hawaii, US territories	1 (0.2)
Midwest	21 (3.2)
Northeast	447 (67.5)
South	70 (10.6)
West	123 (18.6)
Area of residence, n (%)	
Rural	113 (17.1)
Suburban	331 (50.0)
Urban	210 (31.7)
Other	6 (0.9)
Occupational status, n (%)	
Employed	379 (57.3)
Not employed	65 (9.8)
Student	217 (32.8)

*Ns may not sum to 662 due to missing data and multiple responses.
Percentages may not sum to 100% because of rounding.

this is the case because of the nature of the pandemic's spread. The US Northeast was the initial epicenter of the pandemic in the US; therefore, at the time of this survey, these individuals may have had more access to misinformation or potentially conflicting information from the government.[17-20] The influx of information may therefore have negatively impacted respondents' responses from this region.

A high percentage of people in our sample witnessed or experienced anti-Asian attitudes. The questionnaire did not assess causes of anti-Asian attitudes in the context of COVID-19, but these results aligned with those from recent articles about the rise of xenophobic behaviors towards Asian Americans.[21] We found that education and knowledge were significantly associated with warmth towards Asian people. In particular, there was an incremental increase in warmth towards Asian people with increased educational attainment. Additionally, people who had complete knowledge of COVID-19 indicated significantly more warmth towards Asian people compared to those without complete knowledge. In other words, people who were knowledgeable of COVID-19 may have been aware that there were more factors involved in the spread of COVID-19 than the virus' origins in China. Another potential explanation for the higher warmth value is that more education gives the opportunity for people to learn about discrimination and to be introspective of their biases.[22] Self-awareness of these biases can potentially mitigate racism and xenophobia, which underscores the need for quality public health education.

Table 3. Risk Perception Analysis, United States, March 10-25, 2020

Characteristic	Mean risk perception (SD)	Statistics	*P***
Age	--	r=0.07	0.078
Gender		F(4,656)=1.59	0.176
Man	3.34 (0.63)		
Woman	3.46 (0.61)		
Transgender man	3.44 (--)		
Transgender woman	--		
Non-binary	3.68 (0.19)		
Race/ethnicity		F(5,654)=1.87	0.097
Asian/Pacific Islander	3.64 (0.51)		
Black/African American	3.42 (0.60)		
Hispanic/Latinx	3.39 (0.57)		
Native American/American Indian	2.80 (--)		
White	3.42 (0.62)		
Other	3.69 (0.52)		
Educational attainment		F(2,657)=3.65	**0.026**
Less than a college degree	3.36 (0.60)		
College degree	3.40 (0.61)*		
More than a college degree	3.53 (0.62)*		
US region of residence		F(4,657)=5.64	**<0.001**
Alaska, Hawaii, US territories	4.50 (--)		
Midwest	3.65 (0.49)		
Northeast	3.37 (0.62)*		
South	3.44 (0.58)		
West	3.62 (0.59)*		
Area of residence		F(3,656)=2.02	0.111
Rural	3.34 (0.60)		
Suburban	3.42 (0.64)		
Urban	3.51 (0.57)		
Other	3.58 (0.58)		
Occupational status		F(2,658)=0.13	0.878
Employed	3.44 (0.61)		
Not employed	3.47 (0.70)		
Student	3.43 (0.59)		

*Post-hoc test indicated significant differences among characteristics.
**Bolded value indicates significance at α=0.05.

There are a few limitations to this study. The first limitation was that the questionnaire was distributed through convenience sampling, so the sample is not representative of the US population in many demographic factors. Similarly, the way in which we assessed demographic and geographic differences were slightly limited by our questionnaire's design. For example, further disaggregation of US regions (e.g., South versus Southeast) was not possible due to the nominal nature of our question. However, this method allowed for collection of data from people residing throughout the US in a short period of time. Second, the primary outcomes were measured with a new questionnaire that was created for the purposes of the current research but had not yet been validated. Nonetheless, the scale demonstrated adequate inter-item reliability. Additionally, it is important to note that knowledge and risk perception do not always translate into action, so these results should be taken with caution.[16] Likewise, self-reported perceptions and biases based on race and ethnicity are proven to be discordant with real or objective measures of bias.[23,24] Finally, assessing participants' knowledge as a binary variable may have missed those who had partial knowledge; however, our interest was in those who fully understood basic components of the virus versus those who did not.

Many of these limitations arose from the urgency to quickly gather information in the beginning of the pandemic, of which discourse was complicated by its association with certain racial/ethnic populations. For example, we did not perform a formal power calculation as information on COVID-19 was extremely limited at the time. While

a power analysis may have strengthened our results, we are confident in our findings based on our relatively large sample size. While other questionnaires regarding risk perceptions have since been released,[25-28] our study was one of the first to observe risk perceptions, providing an interesting insight into what perceptions of COVID-19 and of Asian attitudes used to be before quarantine beginning mid-March 2020 in the US.

CONCLUSION

Ultimately, the study found that there was moderate risk perception of COVID-19 for many people, which may have influenced people's behaviors in regards to travel plans and social interactions. It is important to understand the public's perception of COVID-19 because perceived risk and seriousness of COVID-19 may influence the frequency and degree to which persons engage in protective or risky health behaviors. Our study provides a unique snapshot of the beginnings of the COVID-19 pandemic with distribution of the survey beginning approximately the same time as the start of first wave of the US quarantine. While COVID-19 risk perception literature has since expanded, our study provides historic context that helps to better situate the progression of COVID-19 risk perception and health behaviors in the US.

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APPENDIX 1. QUESTIONNAIRE

Instructions: The following questionnaire refers to COVID-19 (also known as novel coronavirus, nCoV-2019, Wuhan coronavirus, or coronavirus-2019). Throughout this questionnaire we will be using the term COVID-19. The results of this survey could help inform practices of outbreak management. We very much appreciate your willingness to participate. Please answer questions to the best of your knowledge, as there are no right or wrong answers. This questionnaire is completely anonymous.

Q1 Are you familiar with the concept 'COVID-19''?

- Yes, I know what it is.
- I've heard of it, but do not know what it is.
- I've never heard of it.

Skip To: Instructions If Are you familiar with the concept "COVID-19°? = I've never heard of it

Q2 To the best of your knowledge, COVID-19 is (Check all that apply):

- A respiratory disease
- Spread via airborne droplets
- An infection that crossed over from animals into humans
- A bacterial infection

Q3 From which of the following sources have you heard about COVID-19 (Check all that apply)?

- Media (e.g., television, newspaper, radio)
- Social media (e.g., Facebook, Twitter, Instagram)
- Government reports
- Clinical professionals (e.g., doctors, PAs, nurses)
- College or university communications
- Scholarly reports
- Friends or family
- I've never heard of it
- Other, please specify

Skip To: Instructions If From which of the following sources have you heard about COVID-19 (Check all that apply)? = I've never heard of it

The following questions are in regards to your thoughts on COVID-19. Please remember there are no right or wrong answers.

Q4 How likely do you think it is that you will get the following diseases in the next six months?

	Very unlikely	Unlikely	Neither likely nor unlikely	Likely	Very likely
Common cold					
COVID-19					
Ebola					
Influenza (the flu)					
Stomach bug					

Q5 How likely do you think it is that you would become seriously ill if you were to get COVID-19?

- Very unlikely
- Unlikely
- Neither likely nor unlikely
- Likely
- Very likely

Q6 How likely do you think it is that you would become seriously ill if you were to get COVID-19?

- Very unlikely
- Unlikely
- Neither likely nor unlikely
- Likely
- Very likely

Q7 How likely do you think it is that one of your friends or family members will get COVID-19 in the next six months?

- Very unlikely
- Unlikely
- Neither likely nor unlikely
- Likely
- Very likely

Q8 How likely is it for a person in the following regions to get COVID-19 in the next six months?

	Very unlikely	Unlikely	Neither likely nor unlikely	Likely	Very likely
Africa					
Asia					
Europe					
North America					
South America					

Q9 Evaluate the likelihood that each of the following groups of persons could spread COVID-19.

	Very unlikely	Unlikely	Neither likely nor unlikely	Likely	Very likely
Children					
Older adults (>65 years old)					
People who live in urban areas					
People who are of Asian descent					
People who are of European descent					

Instructions: The following questions are in regards to your willingness or unwillingness to travel in the next six months.

Q10 Since you have heard about COVID-19, how willing are you to travel outside of the U.S. in the next six months?

- Very unlikely
- Unlikely
- Neither likely nor unlikely
- Likely
- Very likely

Q11 Since you have heard about COVID-19, how willing are you to travel by bus, plane, or train within the U.S in the next six months?

- Very unlikely
- Unlikely
- Neither likely nor unlikely
- Likely
- Very likely

Q12 Since you have heard about COVID-19, how likely are you to avoid crowded places?

- Very unlikely
- Unlikely
- Neither likely nor unlikely
- Likely
- Very likely

The following questions are in regards to your attitudes towards people of varying races and ethnicities.

Q13 In the context of COVID-19, how do you feel towards the following groups of people? Please move the slider to record your response.

	Cold	Warm
Asians		
Blacks		
Hispanics/Latinx		
Whites/Caucasians		

Q14 Since you have heard about COVID-19, have you experienced or witnessed anti-Asian attitudes or actions?

- Yes
- No
- Prefer not to say

Q15 Since you have heard about COVID-19, has someone you know experienced or witnessed anti-Asian attitudes or actions?

- Yes
- No
- Prefer not to say

Instructions: The following questions are related to your personal demographic characteristics. Please remember that you are not required to answer all questions and that this questionnaire is completely anonymous.

Q16 What is your race/ethnicity (Check all that apply)?

- Native American or American Indian
- Asian/ Pacific Islander
- Black or African American
- Hispanic/ Latinx
- White
- Other, please specify

Q17 What is your age?

Q18 What is your gender?

- Man
- Woman
- Transgender man
- Transgender woman
- Non-binary
- Prefer not to say
- Other, please specify

Q19 Where have you lived for most of your life?

- North America
- South America
- Europe
- Asia
- Africa
- Oceania

Q20 Where do you currently live?

- North America
- South America
- Europe
- Asia

- Africa
- Oceania

Display This Question: If Where do you currently live? = North America

Q21 If you live in the US, in what region do you live?

- Northeast
- Midwest
- South
- West
- Alaska, Hawaii, U.S. Territories
- I do not live in the U.S.

Q22 How would you define your area of residence?

- Rural
- Suburban
- Urban
- Other, please specify

Q23 What is your current occupation?

- Employed full time (at least 40 hours per week)
- Employed part time (39 hours or fewer per week)
- Unemployed and currently looking for work
- Unemployed and not currently looking for work
- Student
- Retired
- Homemaker
- Self-employed
- Unable to work

Q24 What is the highest level of education you have completed?

- Less than a high school diploma
- High school degree or equivalent
- Some college or no degree
- Associate's degree/career certificate
- Bachelor's degree (e.g., BA, BS)
- Graduate/professional degree (e.g., MA, MPH, PhD, MD)
- Other, please specify

Q25 Thank you for completing the survey! Please provide any additional feedback below (optional).