



# Analyzing Optimism Bias, Risk Perception and Behavioral Outcomes in the Context of COVID-19 in the Autonomous University of Queretaro's Community: A Pilot Study

San Roman-Orozco O<sup>1,2\*</sup>, Martinez-Delgadillo R<sup>1</sup>, Jimenez-Hoyos M<sup>1</sup>, Gonzalez-Lopez E<sup>1</sup>, Novetsky S<sup>2</sup>, Gutierrez-Alvarez I<sup>1</sup>

<sup>1</sup>Applied Global Public Health Initiative, Universidad Autonoma de Queretaro, Mexico

<sup>2</sup>Applied Global Public Health Initiative, School of Global Public Health, New York University, USA

## Research Article

Volume 5 Issue 2

Received Date: June 21, 2021

Published Date: August 20, 2021

DOI: [10.23880/phoa-16000187](https://doi.org/10.23880/phoa-16000187)

\*Corresponding author: Oscar San Roman Orozco, Global Public Health Initiative, School of Global Public Health, New York University, NY, US, Email: [oscarsanroman@gmail.com](mailto:oscarsanroman@gmail.com)

## Abstract

**Background:** The coronavirus pandemic is a major health crisis that presents new and unprecedented challenges, including challenging how individuals deal with risk. Individuals' perceptions and behavioral responses to the outbreak are essential determinants of the spread of COVID-19. Understanding individuals' perceived risk provides insight into their engagement in preventive behavior. Optimism bias plays a significant role in the perceptions of those who underestimate their risk compared to others with similar risk.

**Objective:** This pilot study aims to determine the level of optimism bias, risk perception and risk response for COVID-19 among a convenience sample from the UAQ community - and to analyze the relationship among behavioral outcomes and information seeking intentions with the previous indicators - in order to propose a model of behavior of residents of Queretaro that will be tested in a further study.

**Methods:** This study used a cross-sectional survey designed on the Qualtrics platform. The survey was distributed to the UAQ community through an online platform: The Universidad Autonoma de Queretaro's (UAQ) official Facebook page. Out of 1048 responses received, a total of 810 valid responses were included in the multivariate linear regression analyses to determine the relationship between optimism bias, risk perception, information seeking intentions, and behavioral outcomes.

**Results:** Results showed that among this population, of which the majority had no previous conditions and did not contract COVID-19, there was a low level of optimism bias. The low levels of optimism bias are associated with a higher level of risk perception. These findings were also associated with high levels of information seeking intentions, specifically receiving information from relatives with public health or medical knowledge. The results show that among this population, fear was a significant determinant impacting safer decision-making and efforts to reduce exposure. Age and education of this population are also important factors to consider when analyzing the results of this study.

**Conclusion:** The study findings indicate that decreased optimism bias is associated with increased risk perception which strengthens individuals' motivation to take precautionary measures and preventive action during the COVID-19 pandemic. Further research is needed to expand on the theory and test the proposed model as well as inform policy decisions and public health campaigns to stop the spread of COVID-19.

**Keywords:** Behavioral Outcomes; Coronavirus; Optimism Bias; Risk Response; Risk Perception

**Abbreviations:** OB: Optimism Bias; SI: Seek Information; UAQ: Universidad Autonoma de Queretaro; WHO: World Health Organization; BO: Behavioral Outcomes; RP: Risk Perception; RR: Risk Response.

## Introduction

Beginning on February 27, 2020, when the first positive case of COVID-19 in Mexico was confirmed, the cases of contagion began to increase. By March 11, 2020, the World Health Organization (WHO) declared a pandemic, and 12 days after, the National Healthy Distance Program began in Mexico. The state of Querétaro is a territory characterized by having a high rate of urban expansion, and a constant exchange of economic and human resources. With a population of 2,038,372 habitants [1], mainly concentrated in the Metropolitan Zone (Municipalities of Queretaro, Corregidora, and El Marques); hugely diverse both due to its social, economic, ethnic, and cultural condition. The Universidad Autonoma de Queretaro (UAQ) is ranked as the 10th top University [2], in the country with a population of approximately 40,000 members, including students, professors, researchers, and personnel. Since the pandemic began, the UAQ began with screening, clinical follow-up, rehabilitation, and a vaccine research project that positioned the University in the national framework of innovation and response. Shortly after, UAQ built a COVID-19 clinic as well.

COVID-19 represented a major challenge for the entire world due to the complexity of its most severe symptoms, genetic understanding, and interventions to control the spread. The response to governmental measures to contain and control the pandemic had a wide margin - depending on the case - of personal decision regarding the preventive measures that the public chose to adopt or the activities that they would either continue to carry out or choose to suspend. Faced with the social reality in which it was impossible to establish all mandatory measures, their promotion by deterrence took on unsuspected relevance. During 2019, the increase in the number of cases and deaths from COVID-19 made the importance of understanding the population's perceived risk of contracting the disease [3] increasingly clear. That is, to what extent the population complied with government regulations and integrated prevention measures into their daily life, as well as the moderating factors on whether they did or did not.

The experience of previous recent pandemics-H1N1, Ebola, and SARS- revealed that the success of government containment policies in curbing the transmission of an infectious disease "depends largely on the public being aware of it. An accurate perception of personal and social risk factors" [4], Many authors agree that collective behavior

influences and can fundamentally alter the spread of disease, reducing or intensifying it [3,4]. Furthermore, the public's willingness to cooperate and adopt health protection behaviors during a pandemic depends on how the public is assessing the threat and how much they are perceiving the risk posed by the disease.

Several models have been developed to understand these assumptions, such as the Health Belief Model [5], Theory of Planned Behavior [6,7], Planned Risk Information Management [8], and Theory of Motivated Information Management [9]. These models overlap in that they try to explain that a key element or precursor to an individuals' engagement in preventive behavior is their perceived risk; and thus, individuals behave in a way that mitigates the threat when they perceive themselves as susceptible. Regarding COVID-19, individuals who fear they are at high risk of contracting the virus will behave in a way that mitigates their risk.

A recent study published by Park T, et al. [10] proposed a model for analyzing the optimism bias, risk perception, and their associated behaviors on behalf of COVID-19. Based on this model, the survey was designed to further include the proper communication materials to increase the risk perception of the University community. The main objective of this pilot survey was to determine the level of optimism bias, risk perception, and risk response for COVID-19 in a sample of the UAQ community and to analyze the relationship between these factors and the behavioral outcomes and information-seeking intentions. The findings will inform further research into best communication strategies to heighten risk perception to impact people's health behaviors, as well as develop a model to understand the risk related factors among the residents of Queretaro.

## Materials and Methods

For this pilot study, a cross-sectional survey adapted from Park, et al. [10] and a convenience sample identified as part of the University's Community -students, professors, researchers, or administrative personnel- were selected. The survey instrument was used to ask participants questions related to their Optimism Bias (OB), Risk Perception (RP), Seeking Information (SI), and Behavioral Outcomes (BO). It also included items to collect additional information, including "impact on daily decision making," "experience with the disease," and demographic information about the participants, such as age, sex, zip code, degree level, and occupation. The survey was distributed online through the Qualtrics platform and available through the University Official Facebook page.

The survey included several items; OB was measured by asking participants “How likely do I perceive being able to become infected with COVID?” and “Because of the activities or attitudes they usually have, how likely are people my age to get COVID-19?”; these questions were measured on a 5-point scale (1 = impossible, 2 = unlikely, 3 = moderately likely, 4 = very likely, 5 = definitely). RP was measured by perceived susceptibility and perceived gravity. The *perceived* susceptibility measurement item was “How likely am I to get COVID-19?” on a 5-point scale (1 = not likely, 2 = probably, 3 = likely, 4 = very likely, 5 = at very serious risk). The item to measure perceived gravity is on another 5-point scale (1 = not, 2 = moderately severe, 3 = mild health problem, 4 = severe, 5 = deadly), and the statement was “Covid-19 is a \_\_ health problem.” Risk Response (RR) items were measured to assess anxiety and fear. The item for anxiety was “I feel worried/anxious about COVID-19,” and it was measured on a 4-point scale (1 = I don’t feel worry or anxiety, 2 = rarely, 3 = frequently, 4 = constantly). Fear was quantified by asking: “Regarding COVID-19 I feel” and measured on a 3-point scale (1 = I’m not afraid, 2 = afraid, 3 = in a panic). SI was measured by asking participants “How likely are you to seek information at the interpersonal level with trained individuals or health professionals (known, close) about COVID-19, its prevention and control?”, “ How likely is it to collect information with doctors, scientists or pharmacists about COVID-19, its prevention and control?” and “How likely is it to collect information directly from my family, friends or others close to me about COVID-19, its prevention and control?” These questions were measured on a 5-point scale (1 = Impossible, 2 = Unlikely, 3 = moderately likely, 4 = Very likely, 5 = definitely). Finally, behavioral outcomes were measured with the items “I have modified one of the following activities because of fear of getting COVID-19: a) Taking public transport. b) Attend closed places for essential activities (supermarkets, pharmacies, banks). c) Attend closed places for recreational activities. d) Attend open public places for recreational activities (places, parks, sports courts, etc.). These were measured on a 3-point scale (1= I suspended it, 2 = I have reduced it, 3 = I have not modified it).

A descriptive statistical analysis was developed to analyze the risk perception, optimism bias, and related behaviors. Moreover, multivariate linear regression analyses were performed to determine the sequential relationship between each individual variable (1) OB and RP (2) RP and SI (3) SI and BO. Scores of all items were averaged to generate a unique representative value from which OB and BO items were reversed coded, plus age and gender were added as covariates to avoid potential cofounders. All regression analyses were performed using R with 10,000 bootstrapping resamples and the level of significance for all statistics is reported [11,12].

## Results

A total of 1048 responses were received, from which 810 responses were complete and considered valid to be included in the analyses. The population is described in Table 1.

Variables	
<b>Ages</b>	<b>%</b>
18-30	54.13
31-50	30.46
51-70	14.18
71 and over	1.11
Mean of Ages	33.41 (+-13.62)
Male, %	36.67
Female, %	61.85
High School Degree, %	21.29
Bachelor's Degree, %	61.25
Graduate Degree, %	14.36
At least 1 Pre-Existing Condition	32.03
<b>Personal Experience with the disease</b>	
Tested positive, %	25.77
Never tested positive, %	74.11

**Table 1:** Characteristics of study respondents (n=810).

First, the initial questions asked about the level of optimism bias (OB), the results showed that 54.20% of the sample had a high perception of vulnerability to getting COVID-19 -Low OB-, while 10.47% found it unlikely or impossible to contract the disease -High OB-. Furthermore, based on their age and daily activities 55.80% think that it is very likely to get infected and 25.19% believe that there is a slight chance. Secondly, another set of questions focused on their risk perception based on their sense of susceptibility and gravity. The susceptibility within the studied population reports a high-risk perception rate (43.14%) to the likelihood of contagion of COVID-19. A 0.57% perceives it impossible to get infected. It is a severe problem for 55.43%, mortal for 35.68%, and moderate or mild for 8.15 % of the respondents.

Thirdly, with a set of 4 questions respondents were asked about their information seeking intentions. 604 individuals agreed with seeking information at the personal level with known or close trained individuals or health professionals. Furthermore, 64.94% of the sample responded that definitely or very likely would ask a health professional about COVID-19, its prevention and control even if they didn’t know that person. 41.11% of the respondents preferred other means of communication than the ones listed (TV,

Newspaper, Radio, social media) providing answers like Peer-Reviewed Magazines, Internet Official Sites, or Articles. The fourth section about the risk response focused on the sense of anxiety and fear. 441 (54.44%) of the respondents frequently and constantly felt anxiety, and 65.93% of them had a sense of fear regarding COVID-19.

Finally, with several possible answers we could measure certain activities that have been modified or suspended by the population such as taking public transport or attending indoor activities (supermarket, recreational activities, public places or gathering with friends and family). The results showed that 69.14% of the population has suspended the use of public transport as a preventive measure. 77.78% have reduced the essential activities such as getting groceries directly from a supermarket, 72.72% suspended indoor

recreational activities, 49.01% suspended their assistance to recreational activities in outdoor public places (malls, parks, etc.) and 67.53% have reduced friends and family reunions.

Results from multivariate linear regression analyses are shown in Table 2. First model showed that Optimism Bias (OB) is significantly and negatively related to risk perception, which could be interpreted as respondents perceived that they were less likely to get infected due to their optimism bias. Second model, with a less significant value, can be interpreted as optimistically biased respondents were less likely to seek information (SI), and that the higher the perceived risk the more likely they were to seek information. Last model, with a higher significant value in age, can be interpreted as the younger the age of the respondents, the more they tend to change their behavior.

Variables	First Model			Second Model			Third model		
	RP			SI			BO		
	Mean	Standard Error	p-value	Mean	Standard Error	p-value	Mean	Standard Error	p-value
OB	-0.429	-10.304	0	-0.031	-0.486	0.47	-0.007	-0.353	0.45
RP				0.056	0.866	0.38	0.009	0.473	0.48
SI							-0.006	-0.444	0.47
Age	0.001	1.161	0.32	0.004	1.81	0.17	-0.002	-3.689	0.008
Male gender	-0.009	-0.355	0.45	-0.068	-2.342	0.12	-0.013	-1.176	0.315

**Table 2:** Multivariate Linear Regression Analysis.

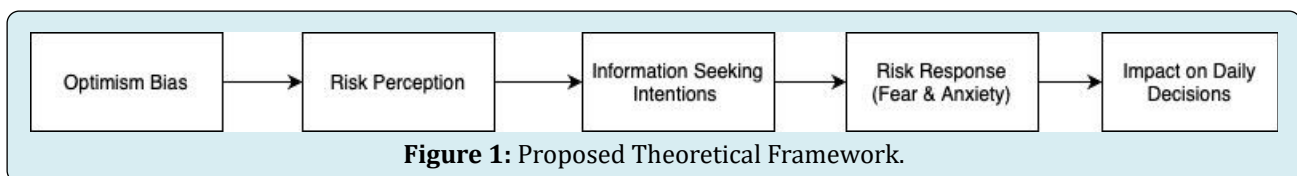
## Discussion

Based on the study findings, we can conclude that among this educated, young population, in which most people had no previous conditions and didn't contract COVID-19, there was a low level of optimism bias. These low levels of OB are associated with higher levels of risk perception which are also associated with information seeking intentions. Information was sought at the personal level from familiar or related trained individuals or health professionals. This population shows more fear than anxiety, which is associated with safer decision-making to reduce exposure.

The search for information for the prevention and control of COVID-19 through interpersonal relationships with familiar, trained individuals is a natural response following high levels of risk perception. Thus, a communication

campaign based on "task shifting" or "educating the educators" was launched. Building a task force of civilians educated and trained with information about the virus could impact the decision making and compliance of the population with the mandatory measures.

Based on the results, evidence review, and author's discussion, the proposed theoretical framework for further studies adapted from Park, et al. [10], can be defined by the following five dominions: optimism bias; risk perception; information seeking intentions; risk response; and impact on daily decisions (Figure 1). This model examines the sequential relations of optimism bias to perceived risk of COVID-19, and the subsequent information seeking and risk response, and the ultimate engagement or disengagement in preventive behaviors.



The limitations of this study should be noted. While the secondary objective of building a pilot study to assess the questionnaire, its reliability, and the clarity of questions was achieved, several factors limited the analysis. For example, Cronbach's alpha is over .5 in some models and below in others, and the p values were not statistically significant for two of the three models (Second & Third). The results in the Behavioral Outcome Model (BO) do not match with the Seeking Information Model (SI), which is likely a result of the BO evaluating scale being 1-3 while the SI scale is between 1-5. Additionally, the questions regarding anxiety and fear were not included, because they too use different scales from the rest of the variables. A second limitation of this study was the form of distribution, since this sample was based on the University community, it does not necessarily represent the whole population of Queretaro, Mexico.

### Conclusion

Based on the findings of this study, decreasing optimism bias and subsequently, increasing perceived risk is crucial in the public's decision to implement preventive measures and behaviors, ultimately decreasing the spread of COVID-19. By improving communication strategies to inform the public of actual risk, perceived risk will increase. Following this pilot study, another study will be conducted with an updated and current pandemic context and a revised survey questionnaire will be developed.

### Declaration of Competing Interest

No funding has been received to conduct this study. No conflicts of interest exist.

### Acknowledgment

The authors are grateful to Mariel Miranda, Consuelo Dominguez, Laura Ramirez, Marissa Dagda, Cesar Miranda and Jose Luis Salinas field staff who participated in data collection. Also, we are thankful to Dr Chris Dickey for the support to the satellite lab. This paper is published with the approval of the Academic Dean of the Universidad Autonoma de Queretaro, Dr. Javier Avila to whom we are deeply grateful for his support.

### Author Contributions

This study was proposed by O.S.R.O and all contributed to study materials and methods. O.S.R.O, E.G.L. analyzed the data and R.M.D, M.J.H helped in the interpretation of the results. O.S.R.O and S.N drafted the manuscript under the supervision of I.G.A. Finally, all authors reviewed the manuscript for formatting, grammar and novelty before the

submission of the final manuscript.

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