

Demographic Factors that Impact Anxiety Levels

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Abstract

The world is currently experiencing the scariest pandemic of our decade. Every day, society hears the death toll increasing by the hundreds. With the federal government mandating all non-essential citizens to stay home and not go out, the anxiety level has certainly increased. This paper studies the relationship between 5 demographic factors—race, gender, ethnicity, geographic location, and age—and anxiety levels. A SurveyMonkey (SurveyMonkey.com) form was sent out through Instagram and Facebook to create the survey, the Generalized Anxiety Disorder-7 was selected to assess the results of an individual's survey. The GAD-7 survey tool is a well-established validated survey tool to assess anxiety: it represents an anxiety measure based on seven items which are scored from zero to three, and the whole scale score can range from 0 to 21. To assess the results, the Mann-Whitney U and Kruskal-Wallis tests were utilized because of the major positive skew in the data. After conducting the tests, the data identifies the five demographic factors surveyed were all statistically significantly associated with anxiety levels. When studying anxiety during the COVID-19 pandemic era, more consideration should be given to these demographic factors as they may impact how one experiences anxiety.

1. Introduction

The purpose of this project is to see if there is reason to believe that demographic factors impact anxiety levels during a pandemic. This project was inspired by a recent study done by Sasha Rudenstine and Adriana Espinosa on Latent comorbid depression and anxiety symptoms across sex and race/ethnic subgroupings in a national epidemiologic study. There are several common demographic factors in the literature that are associated with variance in anxiety levels. For example, Brenes has shown that generally "older adults report less worry than younger adults".[1] A meta-analysis by Tarricone and colleagues has demonstrated that significant variations were found in the prevalence of anxiety and depression across ethnicities. [2] These studies have shown that there is a potential connection between certain demographic factors and anxiety levels. Additionally, a study done on the impact of the COVID-19 pandemic on mental health and quality of life among Chinese residents in Liaoning Province, mainland China.[5] In short, there are studies that show demographic factors associated with anxiety levels during the pre-COVID era. But studies looking at anxiety during the pandemic may have not considered the impact of key demographic factors as in their analyses. In this project, the author looks at linking these demographic factors to how one experiences anxiety during a pandemic.

Keywords

anxiety, COVID-19, demographics, GAD-7

2. Using the GAD-7 to Assess the Association between Demographics and Anxiety

In order to create the survey, the author used the GAD-7 (Löwe et al. 2008) to assess the results of a respondent's survey. The GAD-7 represents an anxiety measure based on seven items, each scored from zero to three, resulting in a total score ranging from 0 to 21. The GAD-7 survey tool was used instead of creating custom questions because it is a well-established validated survey tool to assess anxiety (Löwe et al. 2008). The respondent was asked how often have they been bothered by the following over the past 2 weeks:

- Feeling nervous, anxious, or on edge
- Not being able to stop or control worrying

- Trouble relaxing
- Being so restless that it's hard to sit still
- Becoming easily annoyed or irritable
- Feeling afraid as if something awful might happen

In addition to the GAD-7 questions, the respondent was asked a variety of questions to ascertain their demographic profile:

- What is your age range?
- I identify my race as...
- Am I of Hispanic, Latino, or Spanish descent?
- What is your gender?
- In what country do you live?

The GAD-7 total score distribution is the following: less than 5 for no anxiety, 5 to 9 for mild anxiety, 10 to 14 for moderate anxiety, and over 15 for severe anxiety.

To gather data, the author shared the survey with friends and family—who are predominantly Asian and Caucasian—via Instagram and Facebook. The purpose of sharing the survey link through the internet was to guarantee a higher percentage of honest answers, because of the added layer of pressure if the survey were done in-person. The data was also collected at a Walmart in Walpole, MA, to survey people in-person. The surveyor targeted African American and Hispanic shoppers because of the low number of respondents that identified in those categories. For respondents who failed to complete the initial online survey within the first 2 days, the platform sent them an automated email reminder. The cost of SurveyMonkey is \$5 per month. The survey was first sent out on April 10, 2020, and was closed on April 26, 2020: this gave the surveyor roughly two weeks to collect a total of 302 responses.

2.1 Hypotheses

The surveyor hypothesized that there will be higher levels of anxiety among minority groups as they are typically the most vulnerable populations and suspected no differences between gender and anxiety levels. However, the surveyor assumed there would be higher levels of stress in the US and among older individuals as elderly are more susceptible to COVID-19.

3. Data and Statistical Analyses

The survey results show that there were more female, Asian, non-Hispanic, North American, and minors who responded to the survey (see Table 1). To study the impact of demographic factors on the variance of anxiety, two Mann-Whitney U tests were used for gender and ethnicity, and three Kruskal-Wallis tests were used for race, geographic location, and age. The tests conclude that race, gender, ethnicity, geographic location, and age are statistically significant when assessing levels of anxiety during the COVID-19 pandemic. Specifically, the data suggests that males, Hispanics, Caucasians, people who reside in North America, and who are under 18 years old are the ones who are mostly affected. Section 3.1 presents descriptive statistics of the survey respondents and the distribution of answers selected. Sections 3.2 and 3.3 show the results of each analysis and reason behind the statistical test choice.

3.1 Data Presentation

This graph shows the overall distribution of the survey results. The average score for each question are as follows:

- Being so restless that it's hard to sit still: 17% (no symptoms of anxiety)
- Not being able to stop or control worrying: 21% (no symptoms of anxiety)
- Feeling afraid as if something awful might happen: 23% (no symptoms of anxiety)
- Trouble relaxing: 25% (mild symptoms of anxiety)
- Feeling nervous, anxious, or on edge: 29% (mild symptoms of anxiety)
- Becoming easily annoyed or irritable: 30% (mild symptoms of anxiety)
- Worrying too much about different things: 30% (mild symptoms of anxiety)

Standard deviation: 25%
 Mean: 25%
 Median: 19%

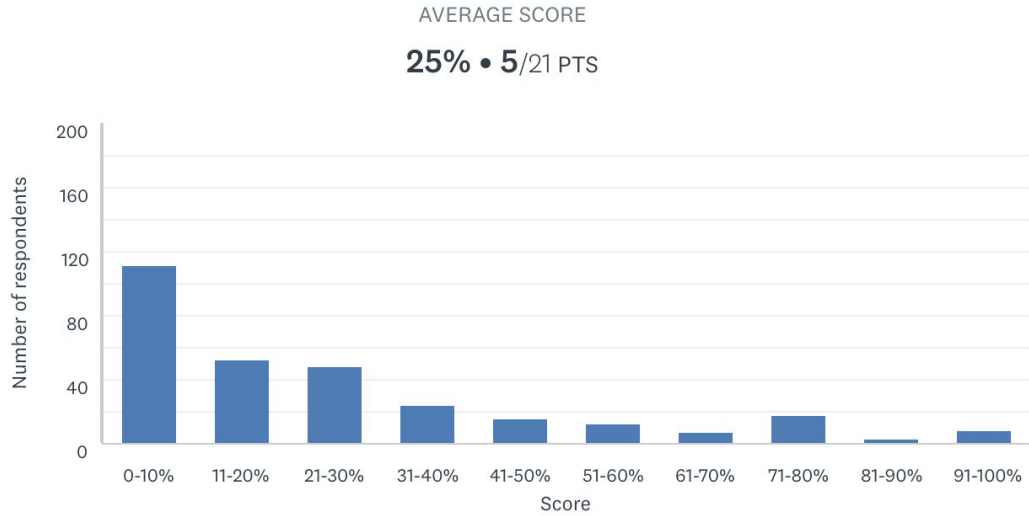


Figure 1. Quiz Summary

This figure shows a positively skewed distribution because the majority outcome of the survey showed “no symptoms of anxiety.” This is a good sign. But it is unclear whether respondents were providing truthful answers or whether they were compelled to answer in a manner to be perceived more positively.

Table 1. Quiz Results

	Frequency	Percentage
Gender		
Male	79	26.16%
Female	221	73.18%
Other	2	0.66%
Ethnicity		
Non-Hispanic	268	88.74%
Hispanic	34	11.26%
Age Groups		
Under 18	103	34.11%
18-34	33	10.93%

35-54	88	29.14%
55+	78	25.83%
Race		
Asian	135	44.70%
Caucasian	109	36.09%
Other	58	19.21%
Geographic Location		
North America	217	71.85%
Europe	32	10.60%
Asia	36	11.92%
Other	17	5.63%

The following table exhibits the results of the quiz sent out to friends and family. The table shows a high percentage of female (73.18%), Asian (44.70%), and North American respondents (71.85%). Additionally, a high percentage of minors (34.11%) answered.

3.2 Mann-Whitney U Test

The author chose the Mann-Whitney U test to assess the relationship between gender and anxiety, rather than a t-test because the differences between the two independent groups are highly skewed.

Null hypothesis: the probability is 50% that a randomly drawn member of the first population will exceed a member of the second population.

H₁: the two samples come from the same population and, therefore, have the same median.

Gender and Anxiety levels Mann-Whitney U test (Figure 2):

Mean Ranks for					
Sample A	Sample B	U _A =	10830	P ₍₁₎	P ₍₂₎
141	177.1	z =	-3.17	0.0008	0.0015

Figure 2. Gender and anxiety levels

Sample A = Female

Sample B = Male

Result: Median latencies in groups A and B were 141 and 177.1; the distributions in the two groups differed significantly (P < 0.05 two-tailed). The data shows that males were more anxious than females. This result is somewhat unexpected. However, one can postulate a potential explanation as to why males are more anxious. Males are more likely to be involved in contact sports such as football, basketball or hockey. With the current social distancing mandate, those extracurricular activities are no longer possible. As a result, social isolation may cause more anxiety among males than females.

Ethnicity and Anxiety levels Mann-Whitney U test (Figure 3):

Mean Ranks for				
Sample A	Sample B	$U_A =$	$P_{(1)}$	$P_{(2)}$
150.4	160.3	4856.5	0.2643	0.5287
		$z =$		
		-0.63		

Figure 3. Ethnicity and anxiety levels

Sample A = non-Hispanic

Sample B = Hispanic

Result: Median latencies in the non-Hispanic and Hispanic groups were 150.4 and 160.3; the distributions in the two groups differed significantly ($P < 0.05$ two-tailed). The data suggests that Hispanics are more anxious than non-Hispanics. This was expected because Hispanics are considered a minority group and are more susceptible to financial struggles due to COVID-19. Furthermore, hispanics have had a much higher rate of infection compared to other populations in Boston. Many of them work in the service industry, which unfortunately increases their risk of exposure to the virus. Many hispanic families have several generations living under the same roof, which further puts the elderly hispanic population at risk. Finally, non-english speakers are at a disadvantage as most news and education around how to protect oneself during a pandemic is in english. These are all potential reasons why hispanics have a higher level of anxiety as compared to non-hispanics.

3.3 Kruskal-Wallis Test

The author used the Kruskal-Wallis test — that determines whether the means of two or more groups are different — to see whether there was an association between race, age, geographic location, and anxiety because there was a major positive skew in the data the author collected. Additionally, the data presented include two independent groups as well as ordinal data.

H_0 : the samples (groups) are from identical populations.

H_1 : at least one of the samples (groups) comes from a different population than the others.

Race and anxiety levels Kruskal-Wallis test (Figure 4):

Mean Ranks for Sample			
A	B	C	
122.3	180.3	165.3	$H =$ 28.37
			$df =$ 2
			$P =$ <0.0001 *

Figure 4. Race and anxiety levels

A = Asian

B = Caucasian

C = Other

Result: statistically significant association between race and anxiety level, meaning that we should reject the null hypothesis. This is because the critical value is 5.99 for a level of significance of 0.05 and the H-value is 28.37. One of the three groups differ significantly, and it seems that Asians and Caucasians differ the most since they have the

greatest differences (180.3 and 165.3). Caucasians were the most anxious among the 3 groups. This result is somewhat surprising. The results could be skewed simply by the lack of randomization. Also, all race groups besides asian and white were combined because of the small sample size. Further studies with larger sample sizes of each race will be necessary to confirm this result. Another reason why this result might be inaccurate is because all caucasians surveyed are based in North America where the epicenter of the pandemic resides, whereas a significant portion of asians who responded live in Asia, where the virus is under control.

Geographic location and anxiety levels test (Figure 5):

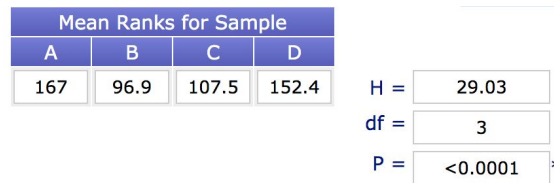


Figure 5. Geographic location and anxiety levels

- A = North America
- B = Asia
- C = Europe
- D = other

Result: The finding is statistically significant because the corresponding critical value is 7.81 ($p < 0.05$) and the H-value is 29.03. Therefore, the null hypothesis is rejected. One of the three groups differ significantly, and it seems that North America and other geographic locations differ the most since they have the greatest differences compared to Asia and Europe (167 and 152.4). The data concludes that respondents from North America have the highest level of anxiety compared to the other geographic locations the author assessed. This may be because North America has the highest number of confirmed coronavirus cases as compared to other countries.

Age and anxiety levels test (Figure 6)

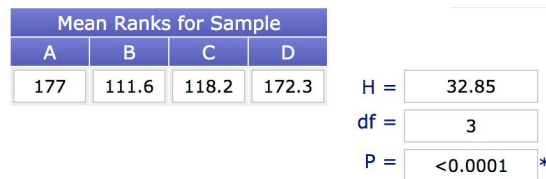


Figure 6. Age and anxiety levels

- A = Under 18
- B = 18-34
- C = 35-54
- D = 55+

Result: The finding is statistically significant between age and anxiety levels because the observed value ($H=32.85$) is larger than the critical value (7.81). One of the three groups differ significantly, and it seems that people under 18 and above 55 years old differ the most since they have the greatest differences compared to people who are in the

18-34 and 35-54 age group (177 and 172.3). The author believes this makes sense because individuals under 18 tend to thrive in their social lives. Once that is stripped away, it is possible that the person's anxiety levels will grow rapidly. Moreover, studies have shown that older groups (≥ 60) are more susceptible to COVID-19 (Liu et al. 2020) which can cause higher levels of anxiety for those who classify in the 55+ age group.

4. Conclusions

The results of this cross-sectional study suggest that the groups whose anxiety levels are most affected during a COVID-19 pandemic are males, Hispanics, Caucasians, people who reside in North America, and who are under 18 years old. Some of the results were expected because, for example, Hispanics are getting hit hard with job losses and financial struggles due to the pandemic. Additionally, United States citizens were also expected to have higher levels of anxiety because the United States had the highest number of confirmed COVID-19 cases at the time. However, other results were more surprising. For example, males being more anxious than females, or caucasians to be more anxious than other races. Some of the results may be impacted by the limitations of the study. For example, the lack of randomization and proper representation of the various groups were key weaknesses in this project. Further studies with larger samples need to be conducted to determine what are the potential causes and validity of these associations. However, despite these limitations, it is clear that demographic factors have a significant impact on how people experience COVID-19 during a pandemic. Therefore, the author suggests that future studies on anxiety during a pandemic should conduct sub analyses broken by demographic factors, as they are critical components to consider when addressing anxiety levels in the setting of a pandemic.

5. Future Work Opportunities and Limitations

However, there are some limitations to this study. First, the respondents to my survey are limited to my friends/family which is not randomized and limited to a general population. As a result, certain demographic factors are not fairly represented in this study. Additionally, some of the data was collected in-person. This can create an added layer of pressure, resulting in a biased response.

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Biography

Amelia Zai has a course from Johns Hopkins Center for Talented youth in Mathematical modeling and has taken Methodology of Science: Biology — a statistics course — with Stanford Online High School. She enjoys playing badminton, doing art, and coding in her spare time. She also frequently spends time tutoring middle school students in math and volunteers at her local food bank for those in need. Amelia would like to further dive into the field of statistics and pursue a career in space medicine.