

## WORLD AFTER COVID-19

In fact, on the contrary, the world seems greener than ever. Local and local governments have taken a charge in driving the fight against a pandemic which is by definition, global and requires global action - one world, one planet.

Individuals supporting national governments as they respond to the situation are more united than ever before. From the 150 million people participating in the global climate strike in September 2019 to the 100 million people who participated in the World Health Day March in April 2020.



# THE WORLD AFTER COVID-19

2020

## CORONAVIRUS: THE WORLD AFTER THE PANDEMIC

Other international organisations, including the UN, WHO and the EU have also been instrumental in the containment of the disease. Organisations like the UNFCCC have called for a "green recovery" and the European Commission has proposed a "European Green Deal" which includes a "European Climate Law".

# FINAL COURSE PROJECT:

# ANALYZING U.S. COVID-19 DATA

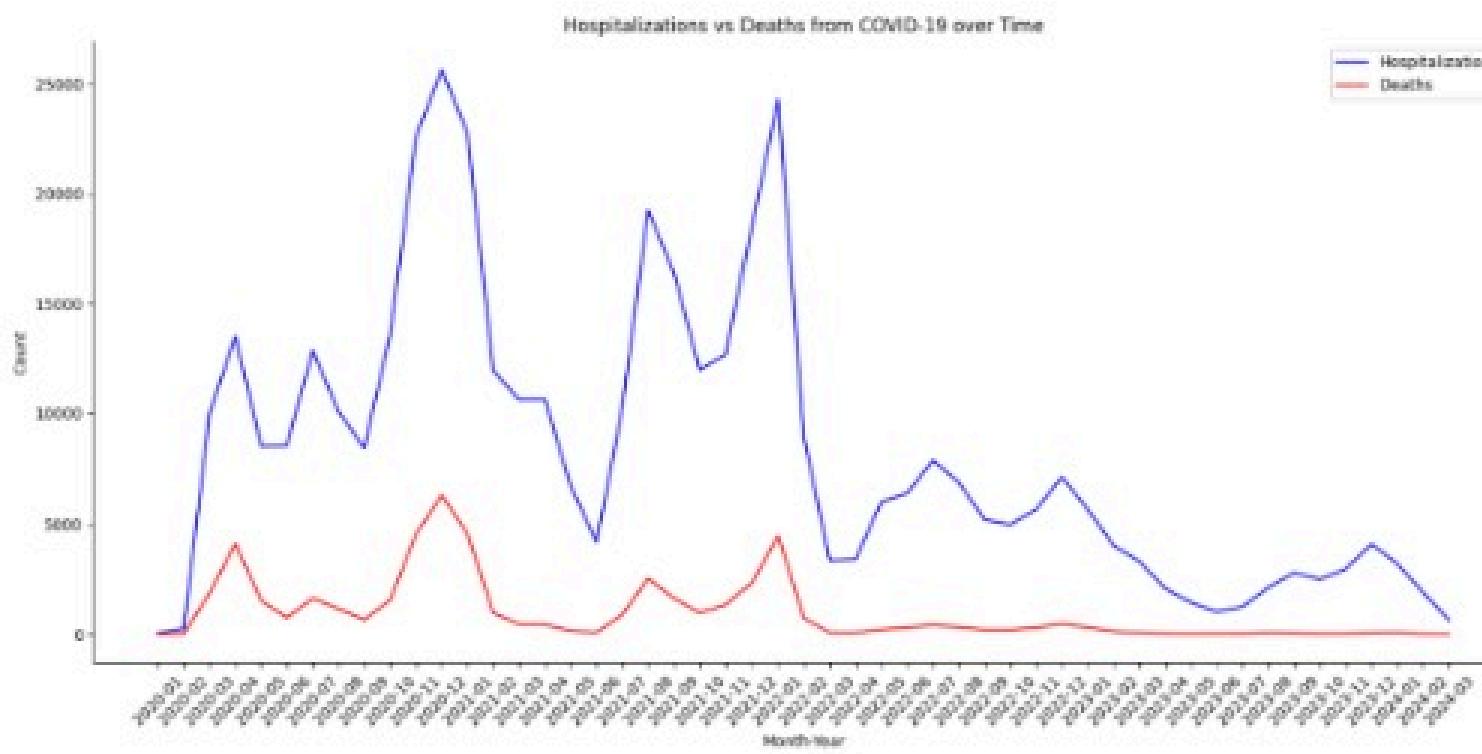
AHMED MOHAMED	202101027
Mahmoud Elshahed	202100678
Omar awad	202100699
Sara MAhmoud	202100163

# PART 1: EXPLORATORY ANALYSIS:

# 1

The total number of hospitalizations versus deaths from COVID-19 over the entire US per month-year timestamp

## 2.1 Q1: Hospitalizations vs Deaths from COVID-19 over Time

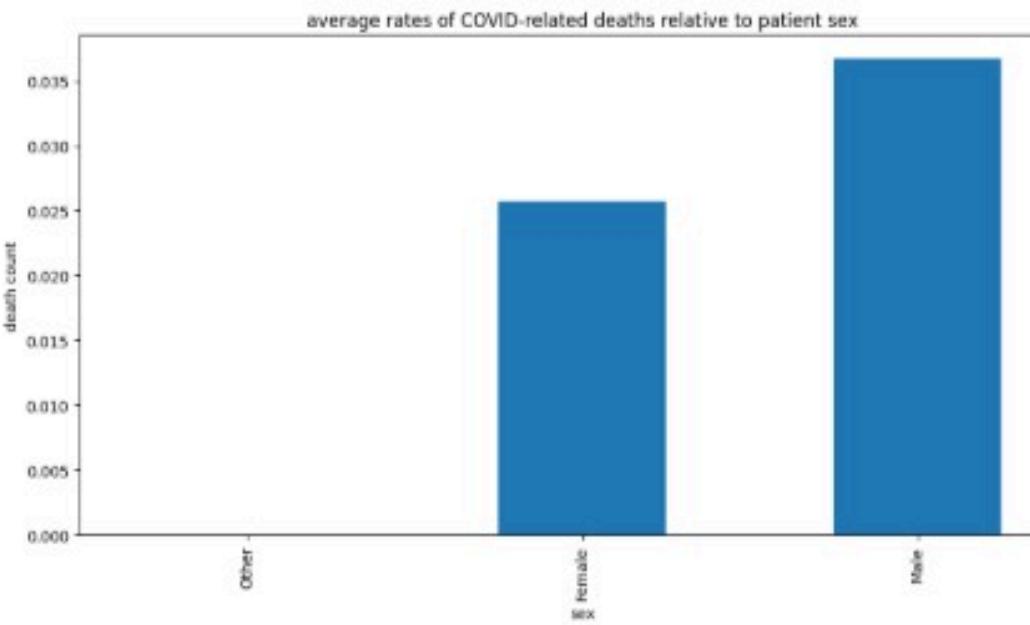


comment: as we see the peak of the two line charts appears in September 2020 which is the most value COVID spreads

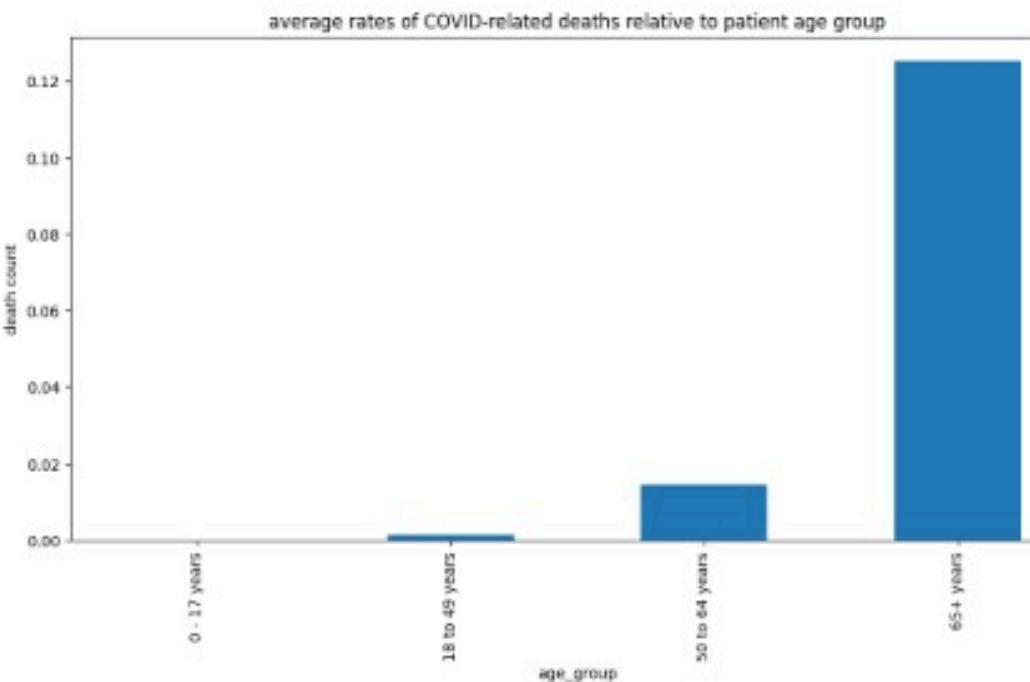
# 2

The average rates of COVID-related deaths  
relative to patient demographics

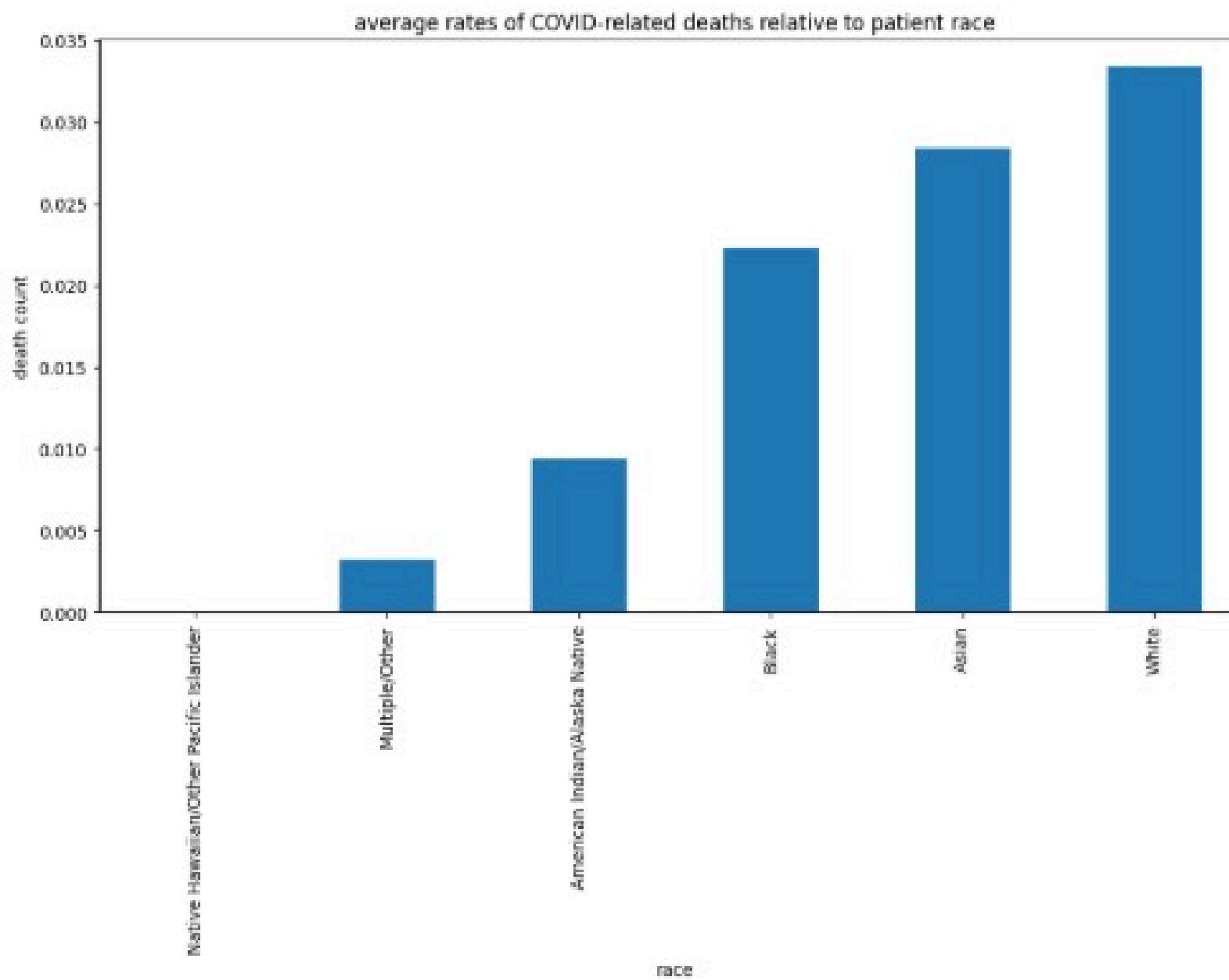
## 2.2 Q2: The average rates of COVID-related deaths relative to patient demographics



the bar chart clearly illustrates that men have a higher death rate compared to women and Other( ).



The bar chart unmistakably indicates that the 65 years and older category exhibits a notably higher death rate compared to younger age groups.

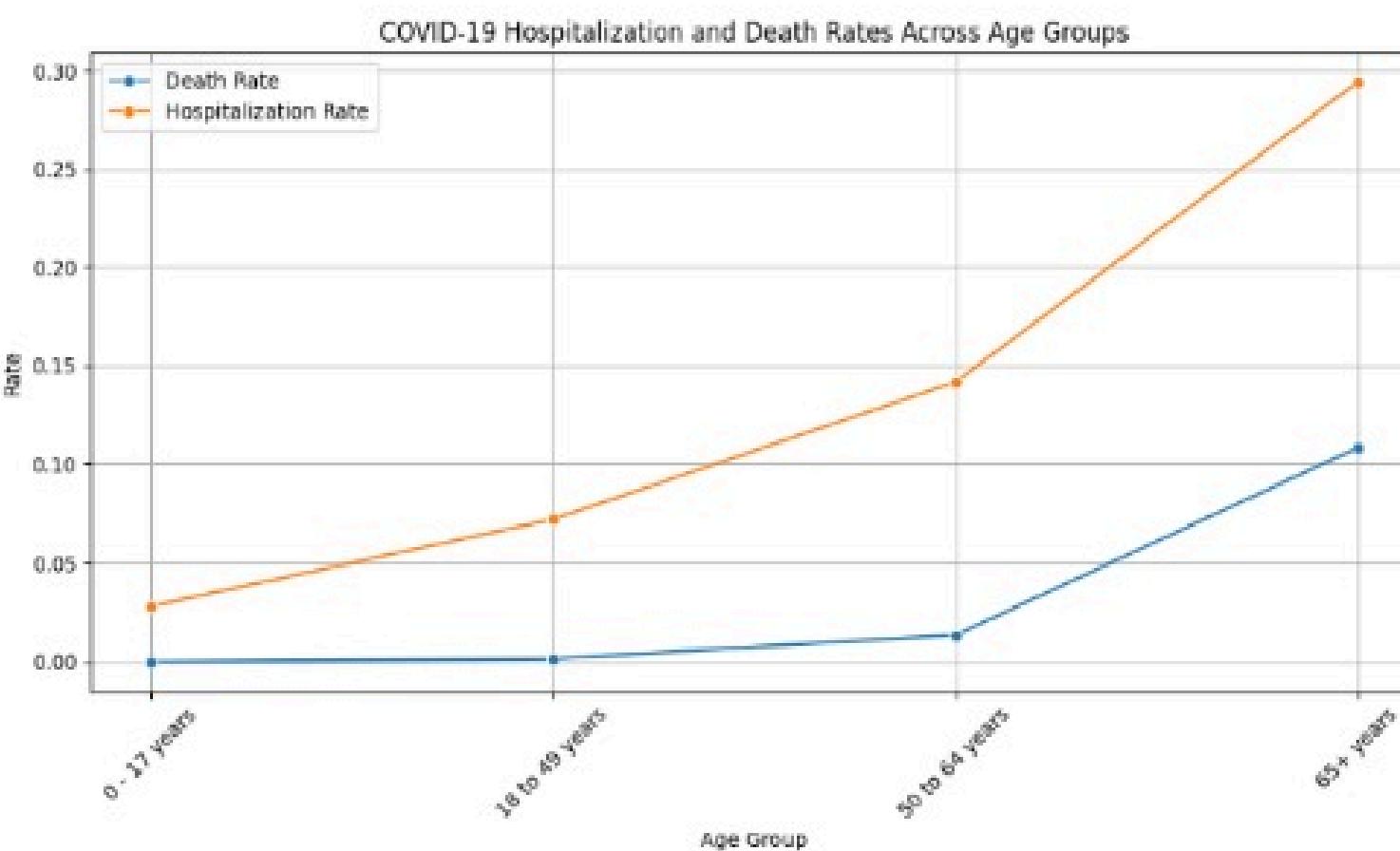


The bar chart unmistakably demonstrates that individuals of the white race experience a higher death rate compared to individuals of other races.

# 3

The rates of COVID-related hospitalization  
and death with age (across age groups).

## 2.3 Q3:COVID-19 Hospitalization and Death Rates Across Age Groups

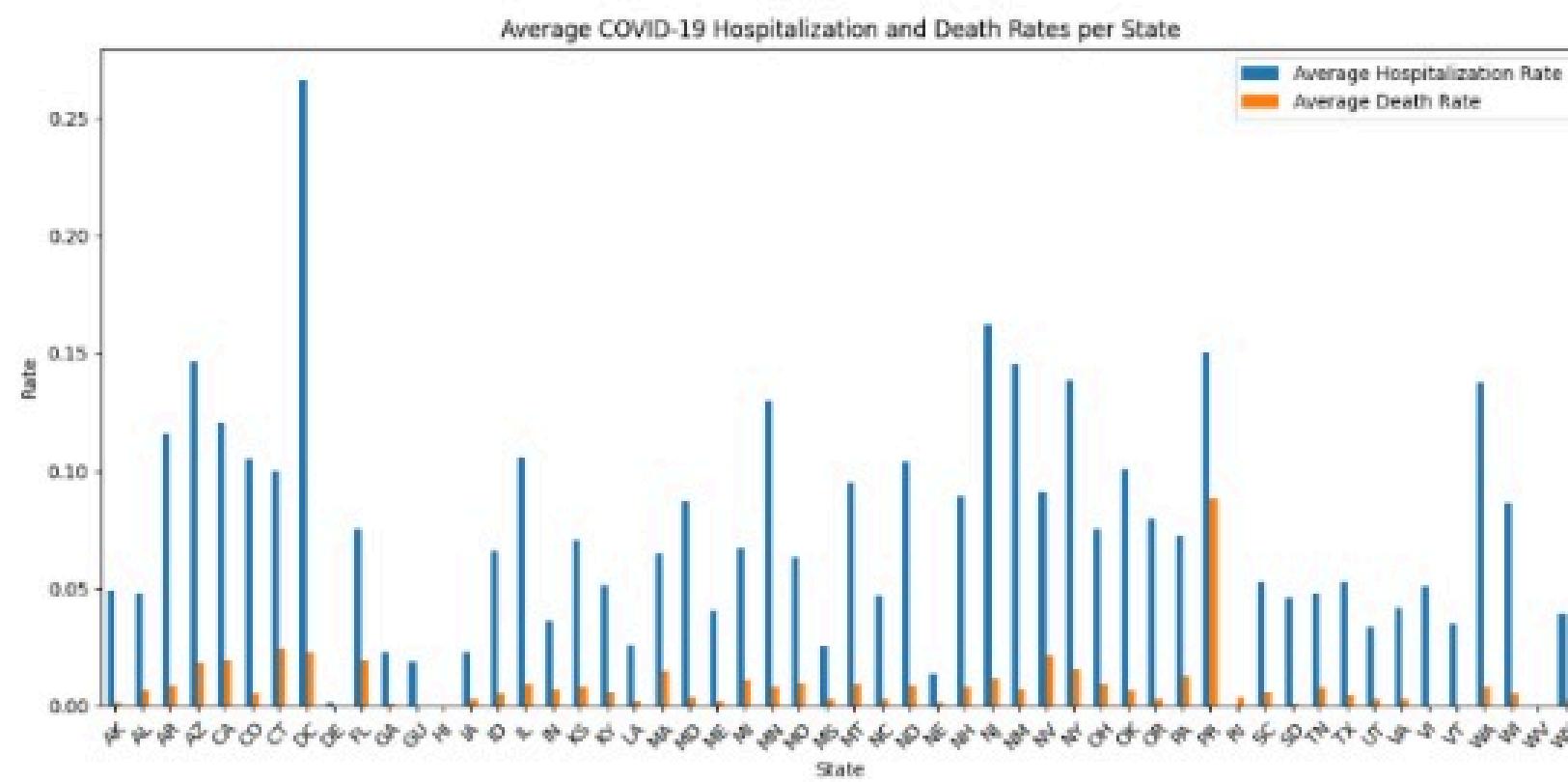


In this graph, it's evident that the death rates increase with age, particularly among older individuals.

# 4

Average rate of COVID-related hospitalization  
and death per state over the entire study  
period.

## 2.4 Q4:Average COVID-19 Hospitalization and Death Rates per State

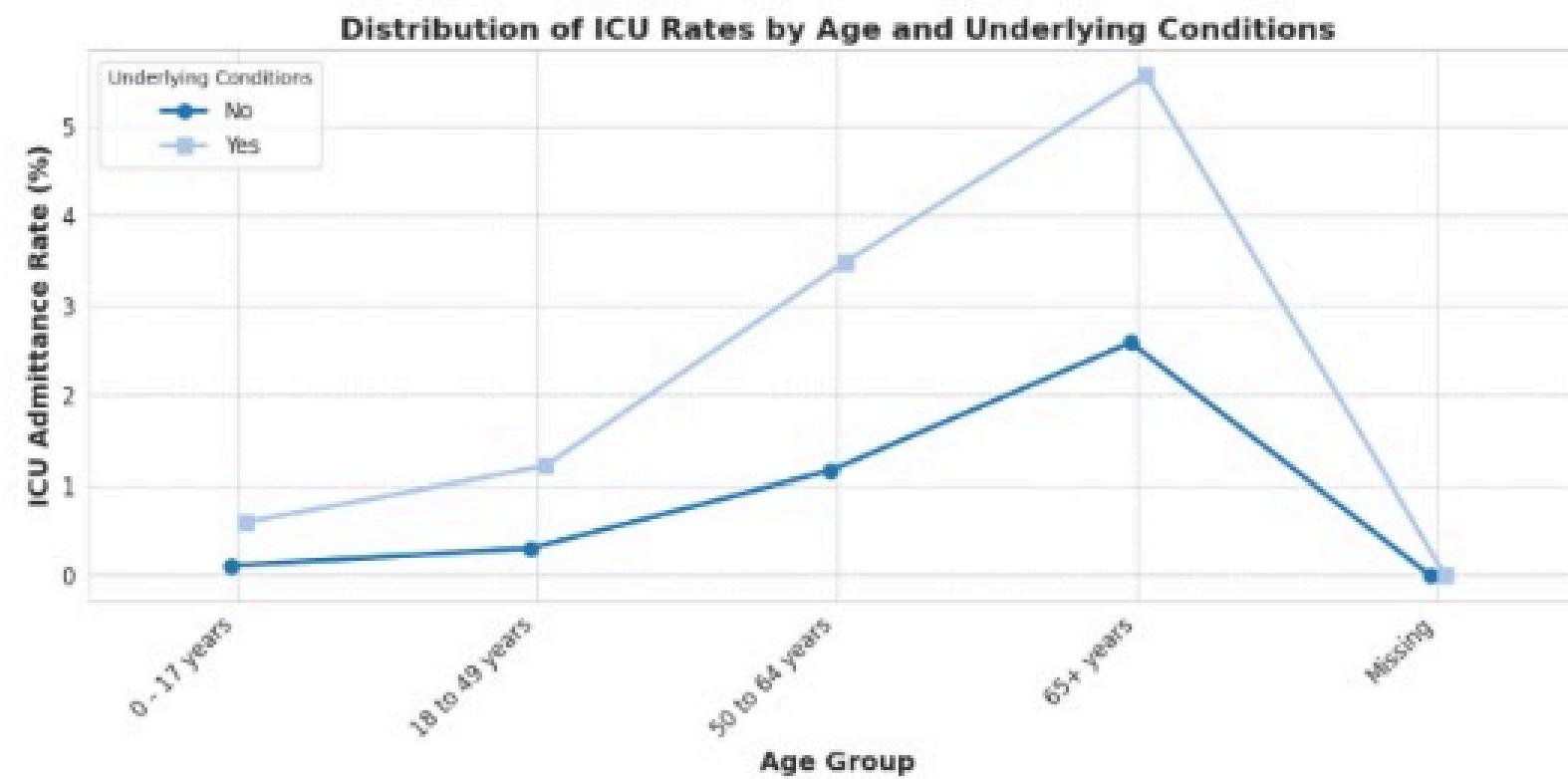


This graph highlights Washington's notably higher number of hospitalizations and the highest death rate in Puerto Rico.

# 5

The relationship between age, pre-existing medical conditions and/or risk behaviors, and rate of admittance to the ICU.

## 2.5 Q5: Hospitalizations vs Deaths from COVID-19 over Time

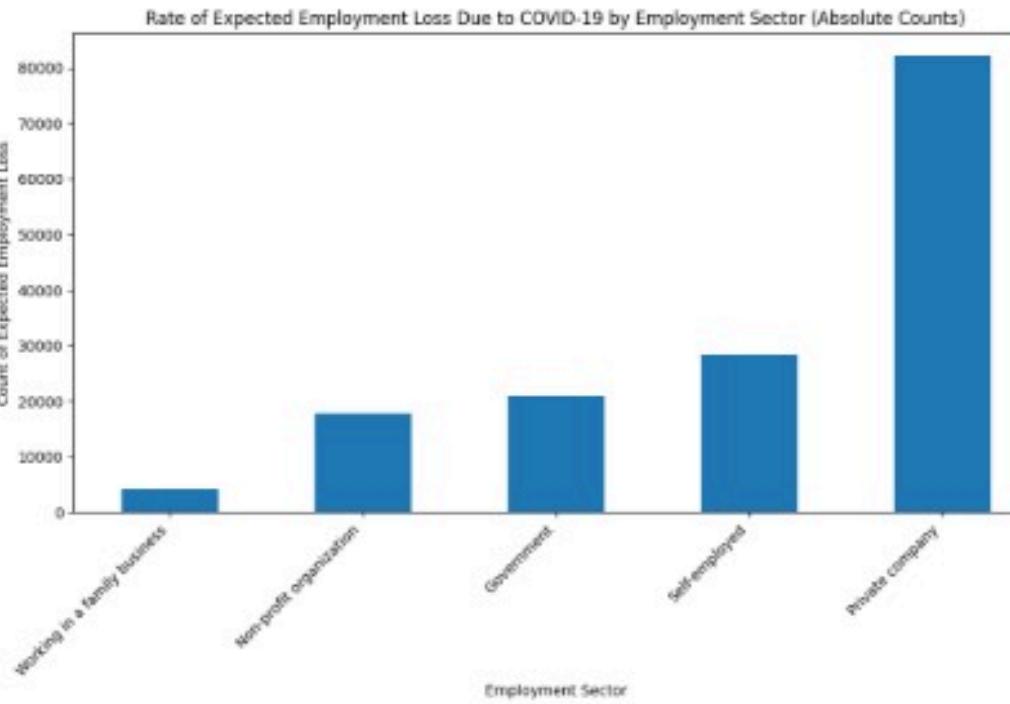


as we see here there a relation between **relationship between age, pre-existing medical conditions and/or risk behaviors, and rate of admittance to the ICU.** because we also do  $\chi^2$  test and found the  $p = 0$

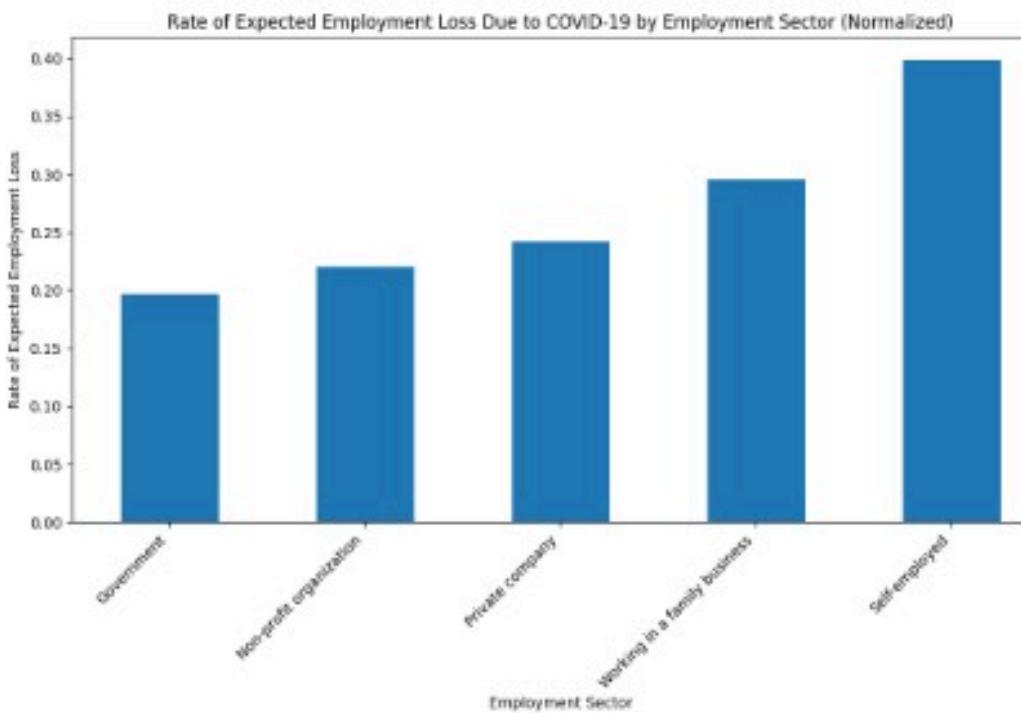


The rate of expected employment loss due to COVID-19 and sector of employment.

## 2.6 Q6: Hospitalizations vs Deaths from COVID-19 over Time



It's evident from the data that private sector workers are the most affected by COVID-19



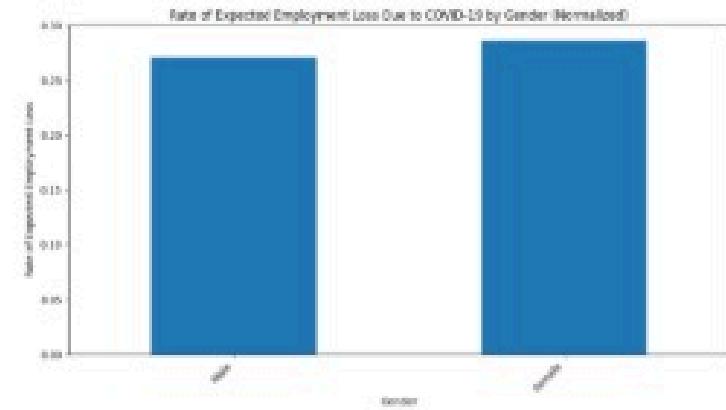
but if we normalize the data we see that the self employed people are the most effect by COVID-19

# 7

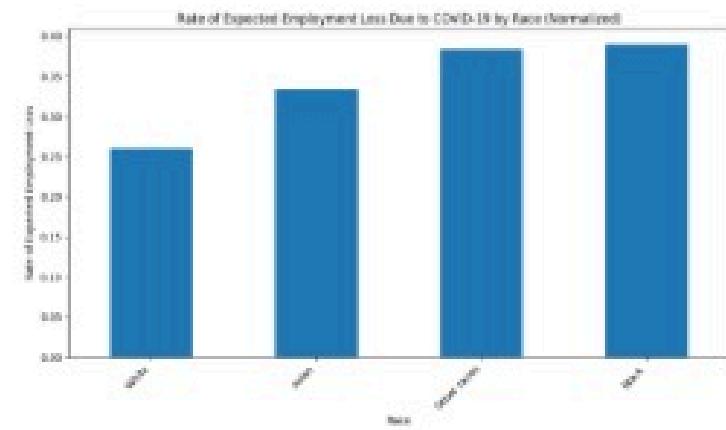
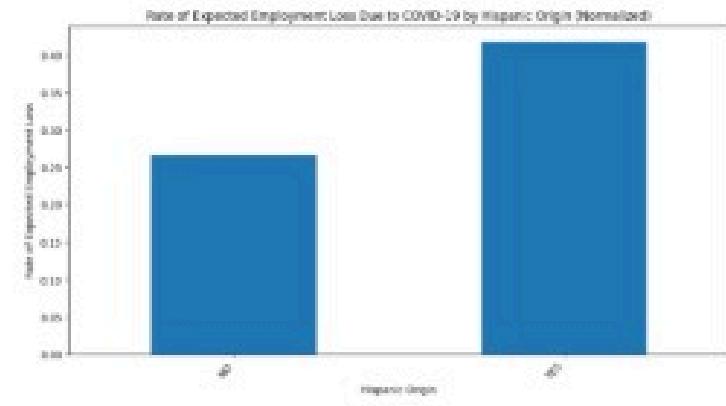
The rate of expected employment loss due to COVID-19 relative to responders demographics.

## 2 Exploratory Data Analysis (EDA) Q7: Hospitalizations vs Deaths from COVID-19 over Time

### 2.7 Q7: Hospitalizations vs Deaths from COVID-19 over Time

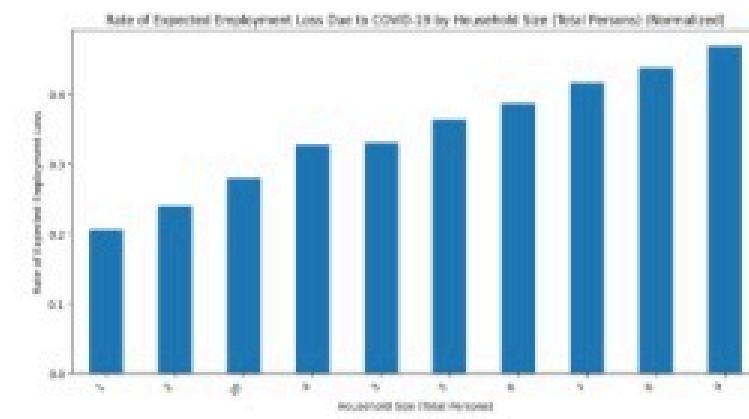
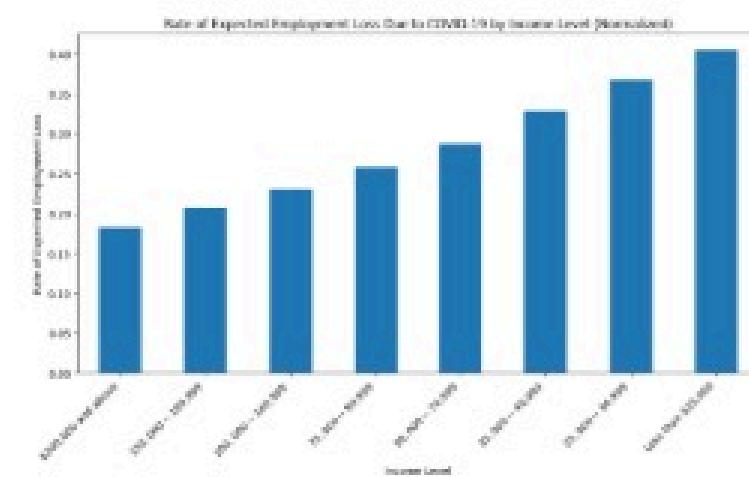
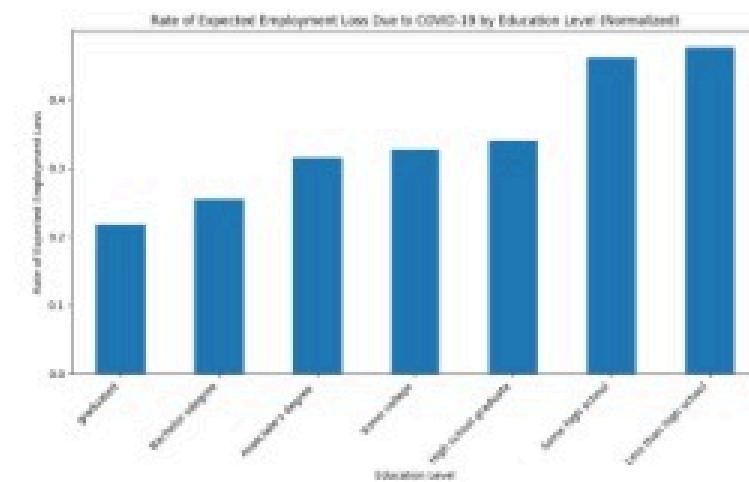


From the figure, we can see that there is a slight difference between males and females.



The figure reveals that white individuals anticipate the least employment loss, while other genders, notably black individuals, show higher percentages, prompting concern.

## 2 Exploratory Data Analysis (EDA) Q7: Hospitalizations vs Deaths from COVID-19 over Time

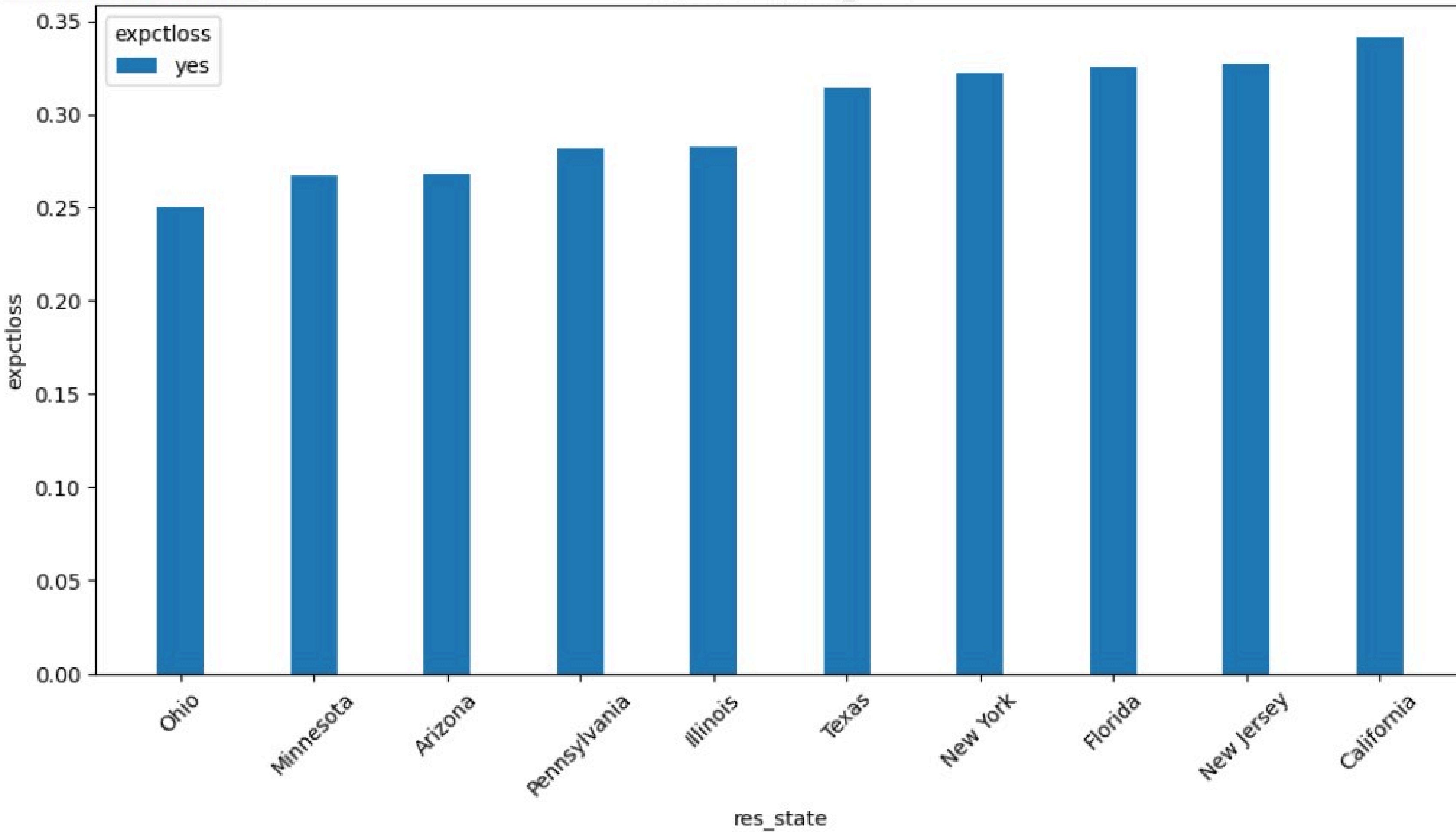




# 8

The rate of expected employment loss due to COVID-19 for the top 10 states with the highest rate of COVID hospitalization.

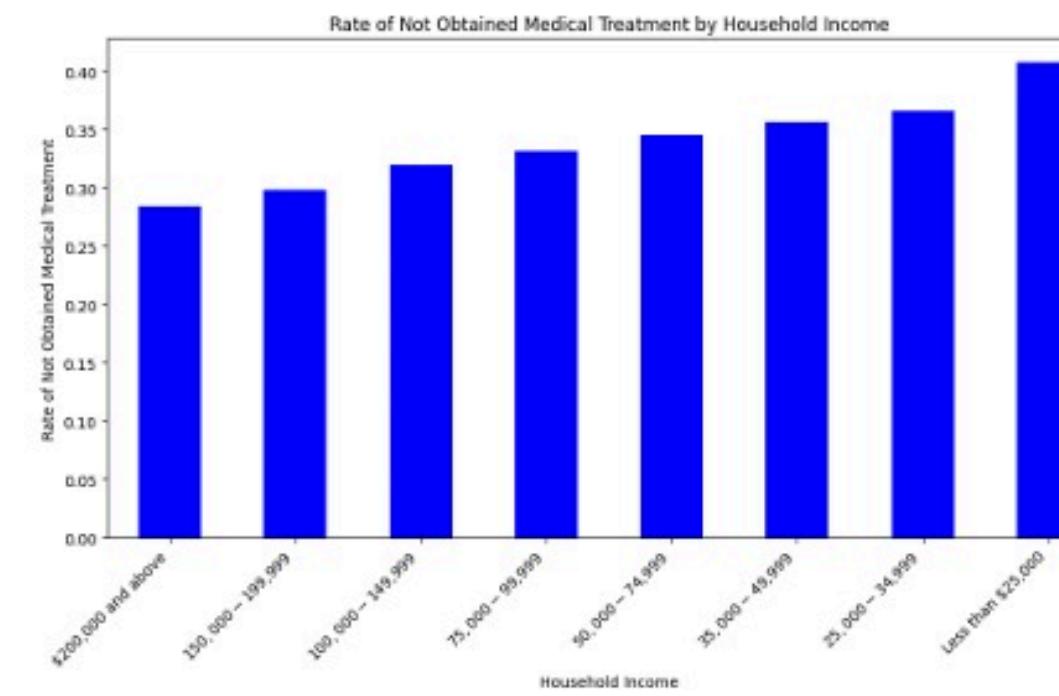
## expctloss by res\_state



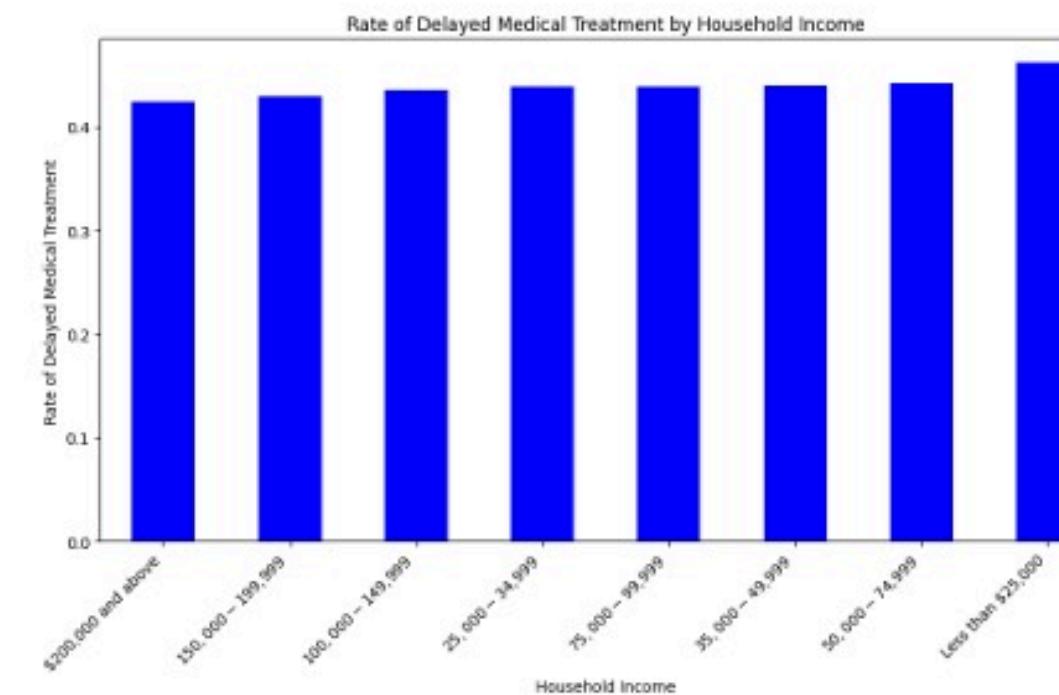
# 9

The relationship between household income and the rate of delayed/ OR unobtained medical treatment (Due to COVID or otherwise).

## 2.9 Q9: Hospitalizations vs Deaths from COVID-19 over Time



The graph indicates that individuals with low income have a lower rate of not obtaining medical treatment.

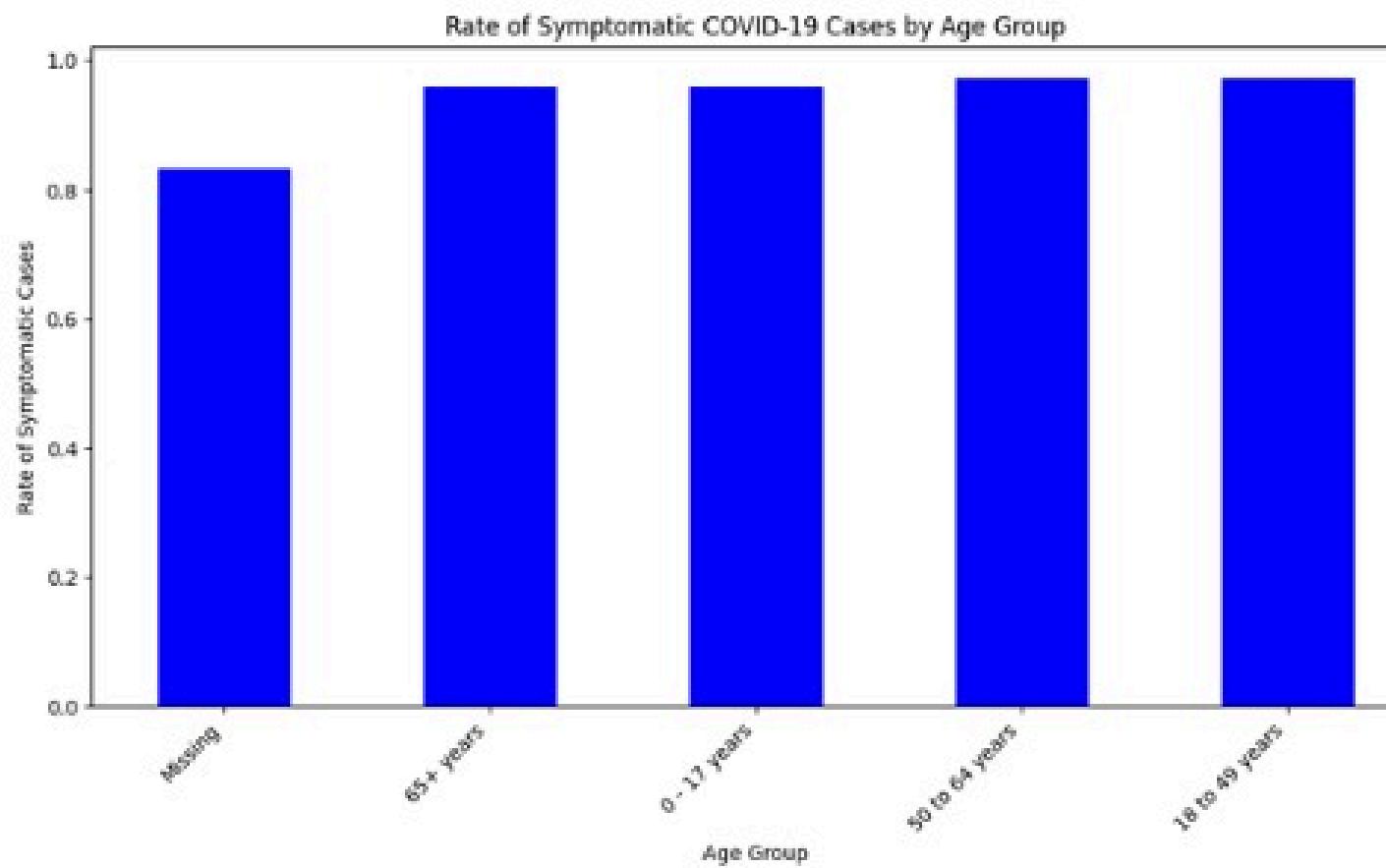


The graph indicates that individuals with low income have a higher rate delaying medical treatment.

# 10

The relationship between COVID-19  
symptom manifestation and age  
group.

## 2.10 Q10: The relationship between COVID-19 symptom manifestation and age group



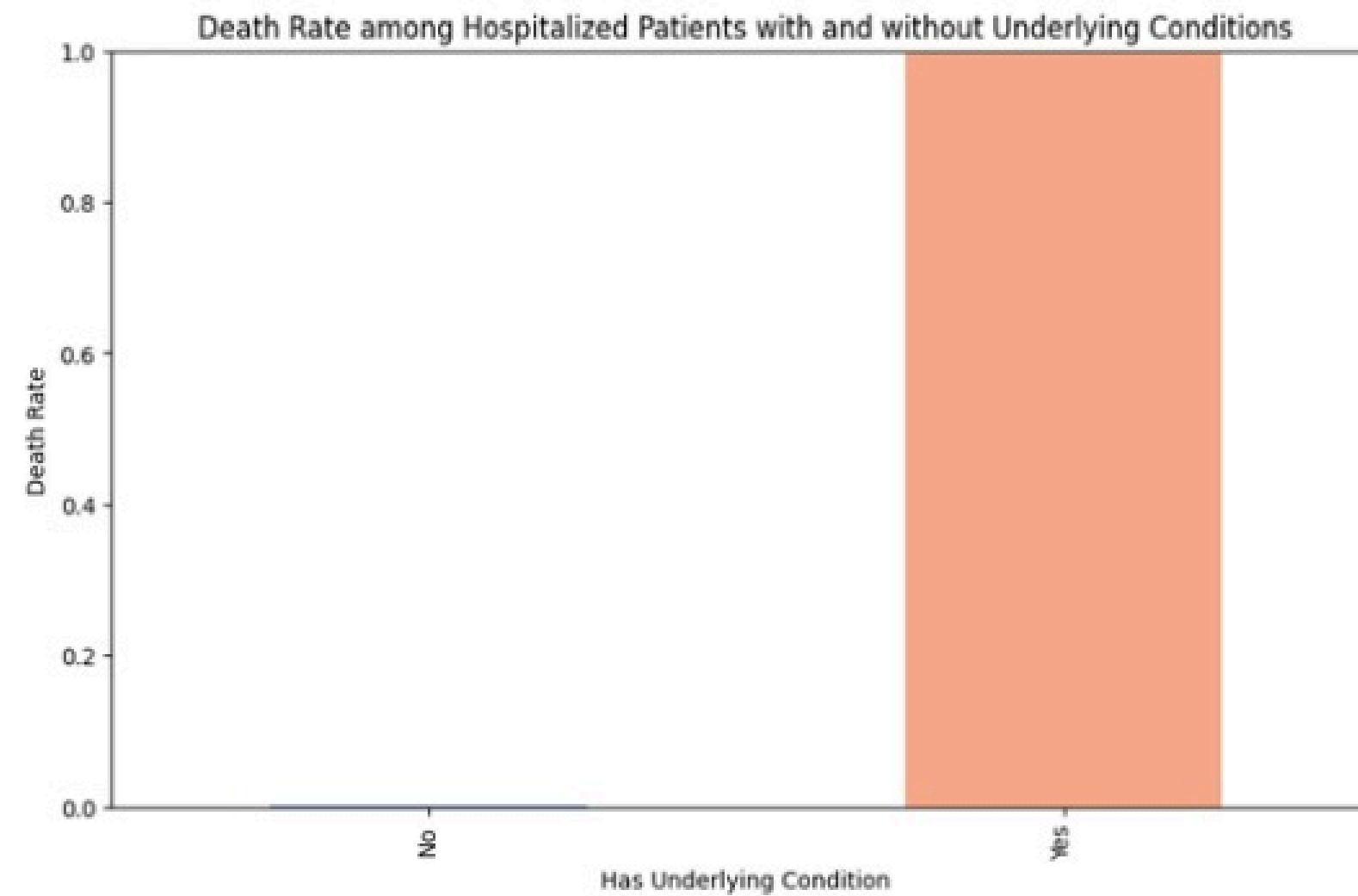
The graph presented above depicts COVID-19 symptoms and their occurrence rates across various age brackets. It's notable that symptomatic cases significantly outnumber asymptomatic ones across all age groups. Interestingly, both the 0-17 and 65+ age brackets exhibit relatively higher proportions of asymptomatic cases compared to other age groups. This discrepancy may be influenced by confounding variables, such as the presence of chronic diseases.

## PART 2: ANSWERING QUESTIONS:

# 1

Are hospitalized patients with underlying medical conditions and/or risk behaviors more likely to die from COVID-19?

### 3.1 Are hospitalized patients with underlying medical conditions and or risk behaviors more likely to die from COVID-19?

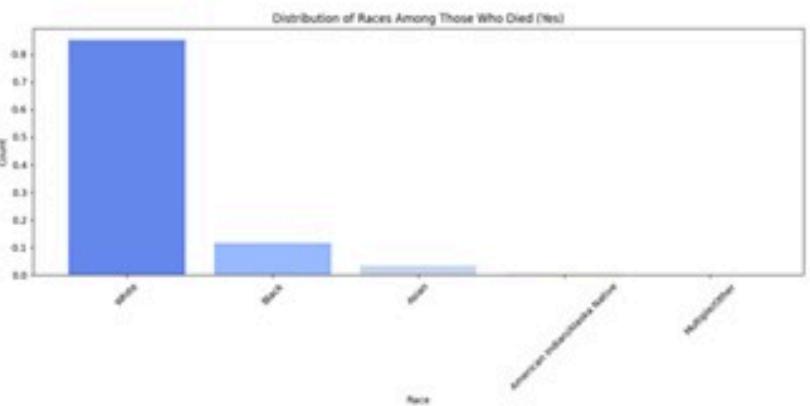
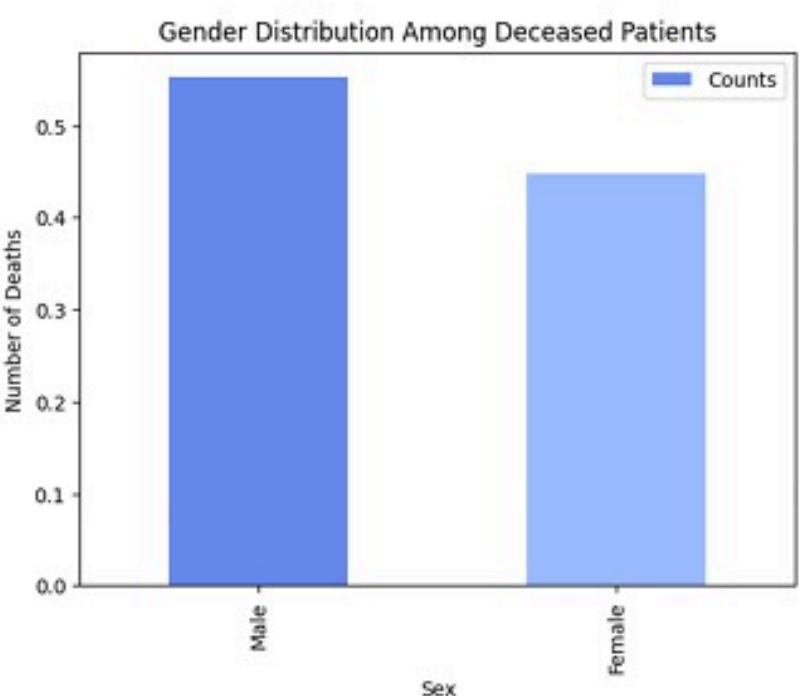
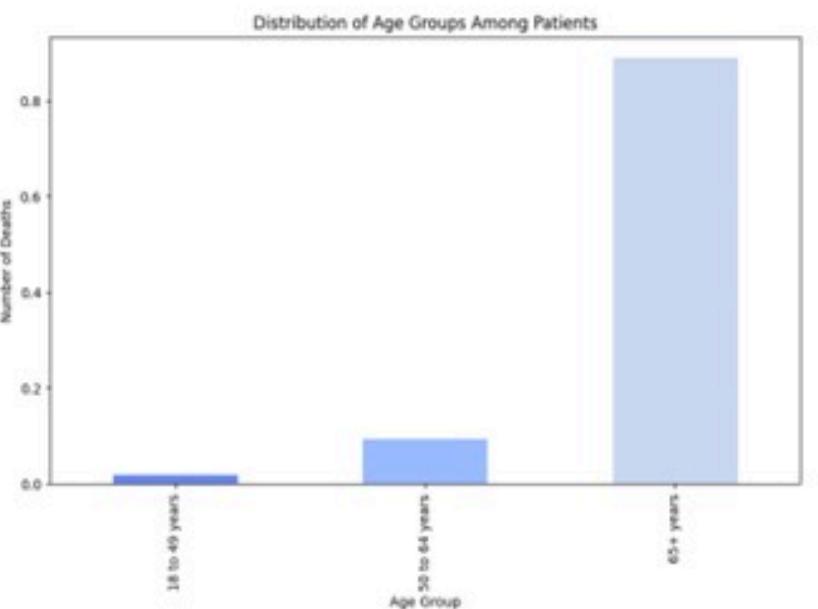


It found that hospitalized patients with underlying medical conditions more likely to die from COVID-19 than patients without underlying medical conditions.

# 2

Who are the people (the demographic segment) that appear to be most at risk of death due to COVID-19? Who is the least at risk?

**3.2 Who are the people (the demographic segment) that appear to be most at risk of death due to COVID-19? Who is the least at risk?**



# 3

What percent of patients who have reported exposure to any kind of travel / or congregation within the 14 days prior to illness onset end up hospitalized?

What percent of those go on to be hospitalized?

3.3 What percent of patients who have reported exposure to any kind of travel or congregation within the 14 days prior to illness onset end up hospitalized? What percent of those go on to be hospitalized?

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3 Question Answering

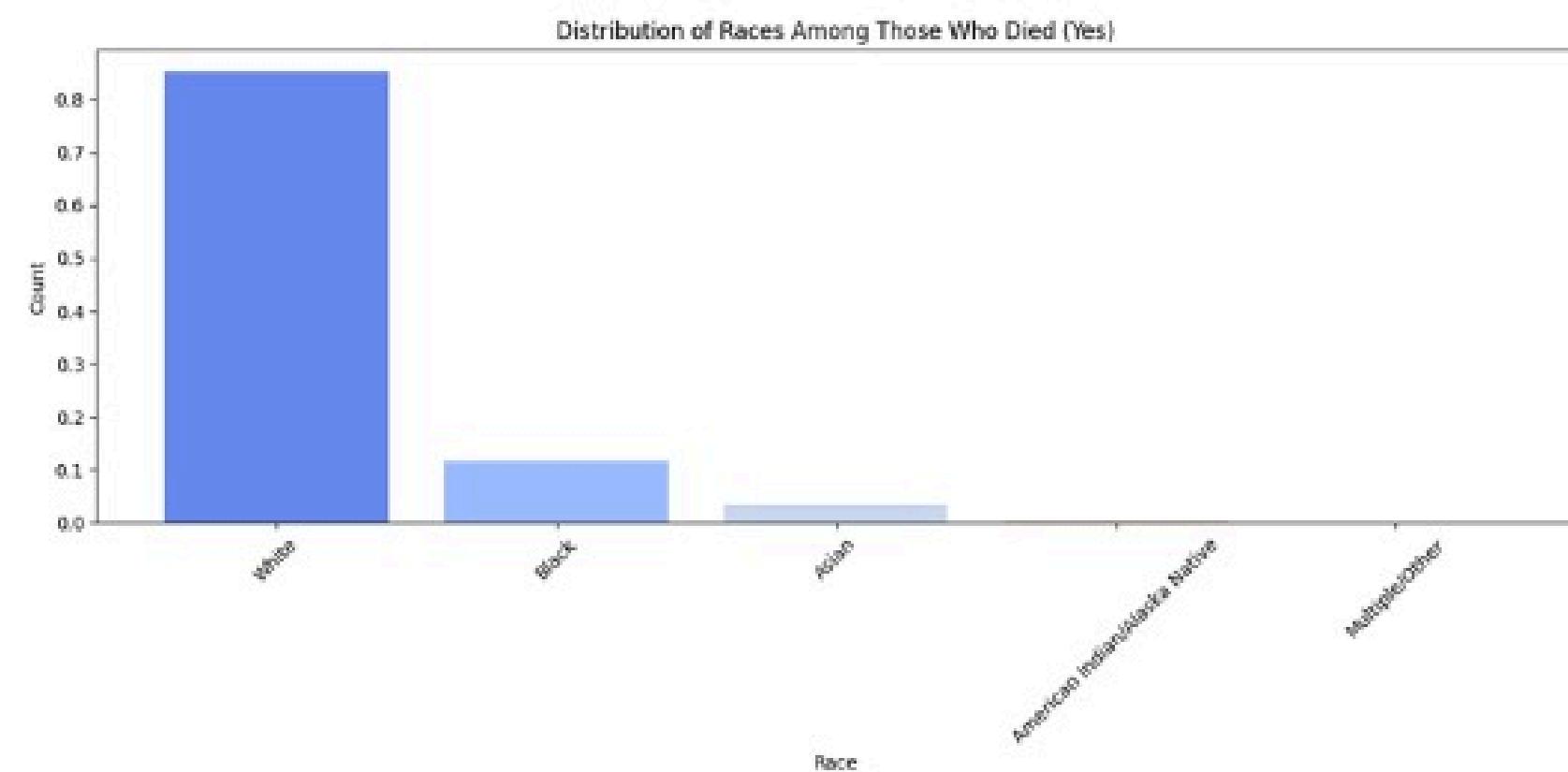
For most risk People:

- Age group: +65 years
- Sex: Male
- Race: White

For least at risk:

- Age group: 0-17 years
- Sex: Female
- Race: Multiple/other .

3.3 What percent of patients who have reported exposure to any kind of travel or congregation within the 14 days prior to illness onset end up hospitalized? What percent of those go on to be hospitalized?

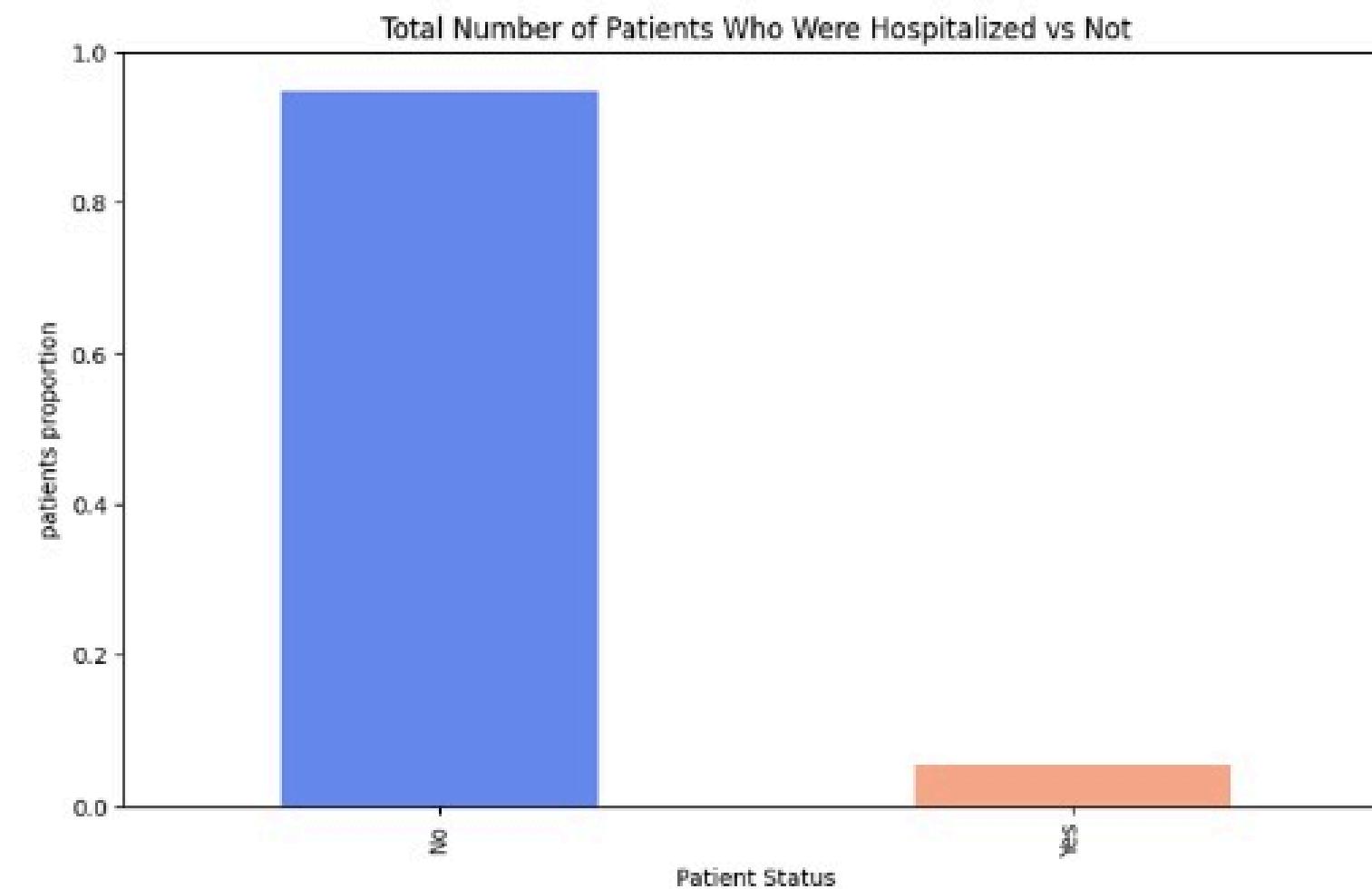


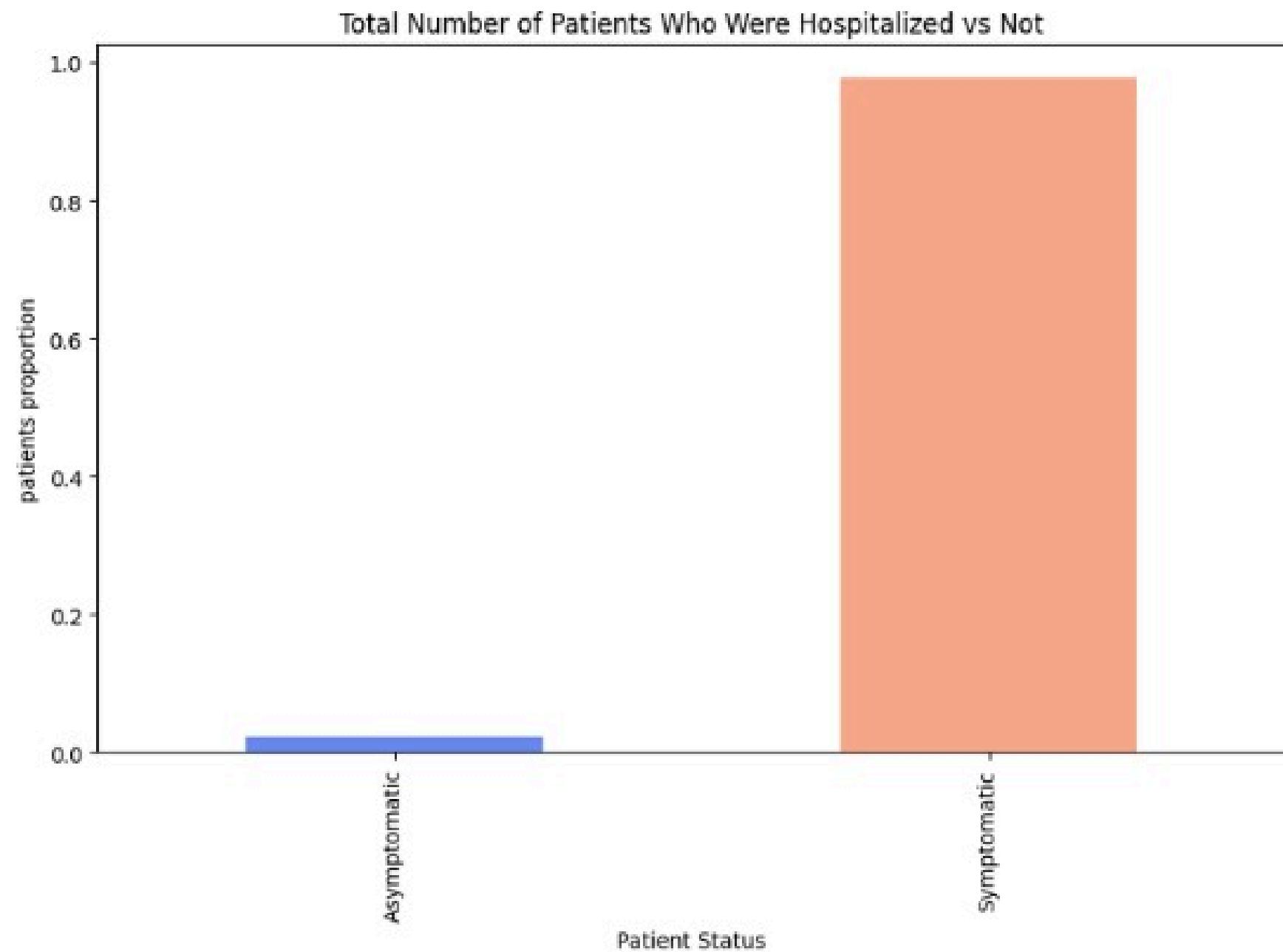
5.3 % is the percentage of patients who have reported exposure to any kind of travel or congregation within the 14 days prior to illness onset end up hospitalized

# 4

Are Asymptomatic COVID patients less likely to be hospitalized? Are they less likely to die from their illness?

### 3.4 Are Asymptomatic COVID patients less likely to be hospitalized? Are they less likely to die from their illness?



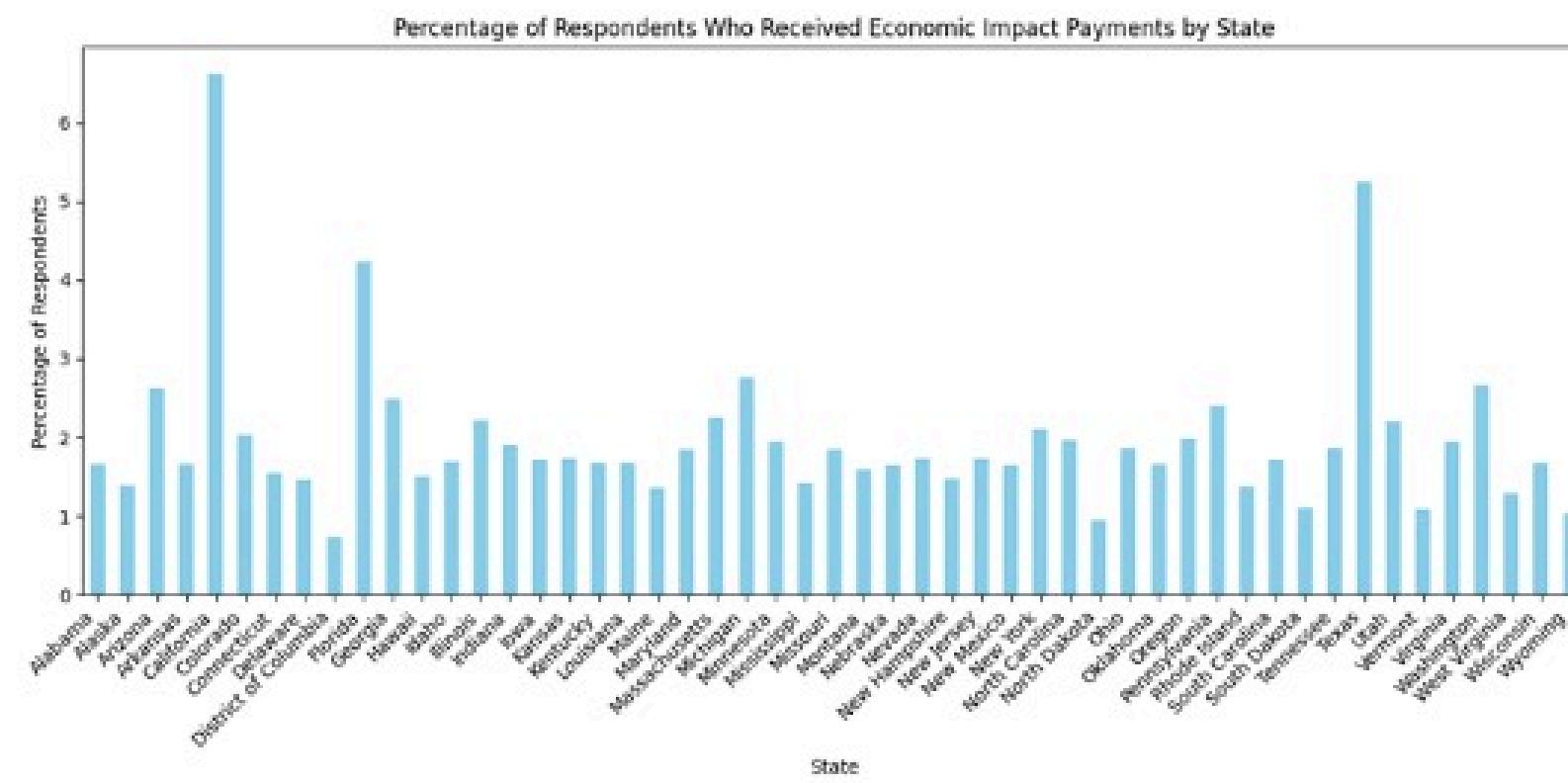


Asymptomatic COVID patients less likely to be hospitalized? Are they less likely to die from their illness compared to symptomatic COVID patients

# 5

Which state is associated with the highest percentage  
of Economic Impact  
(stimulus) payments among survey respondents?

### 3.5 Which state is associated with the highest percentage of Economic Impact (stimulus) payments among survey respondents?

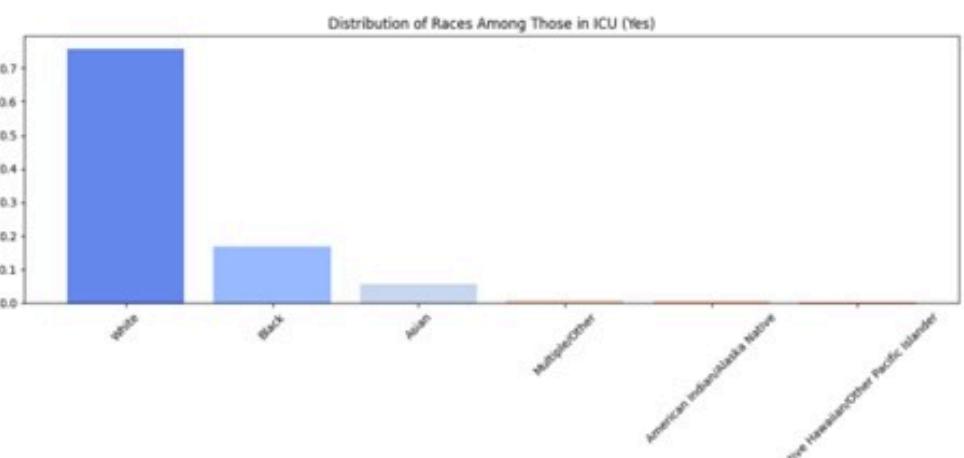
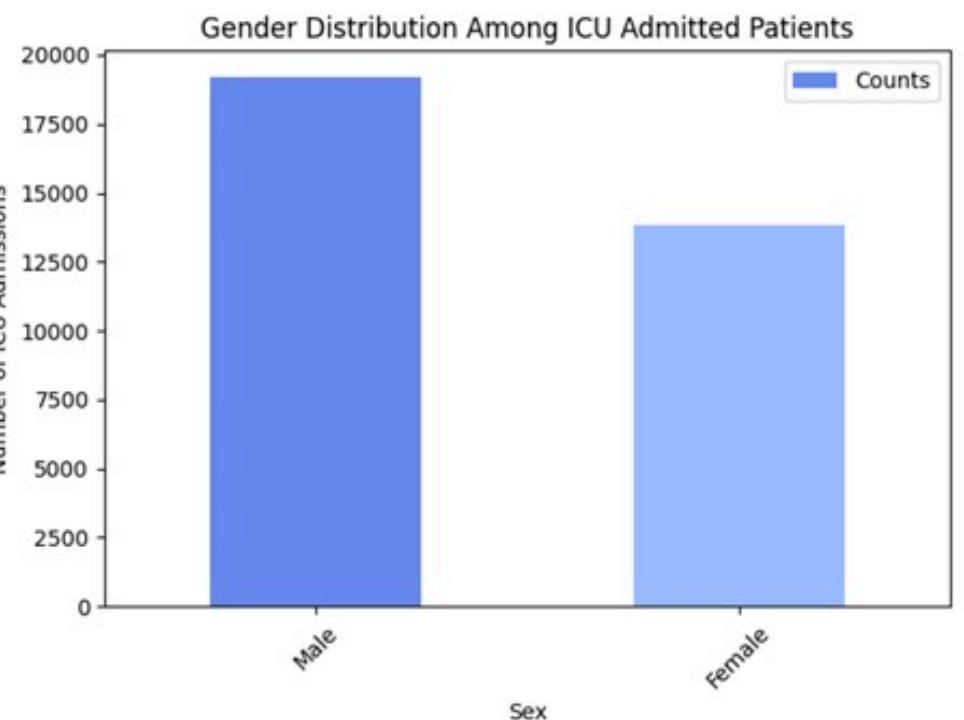
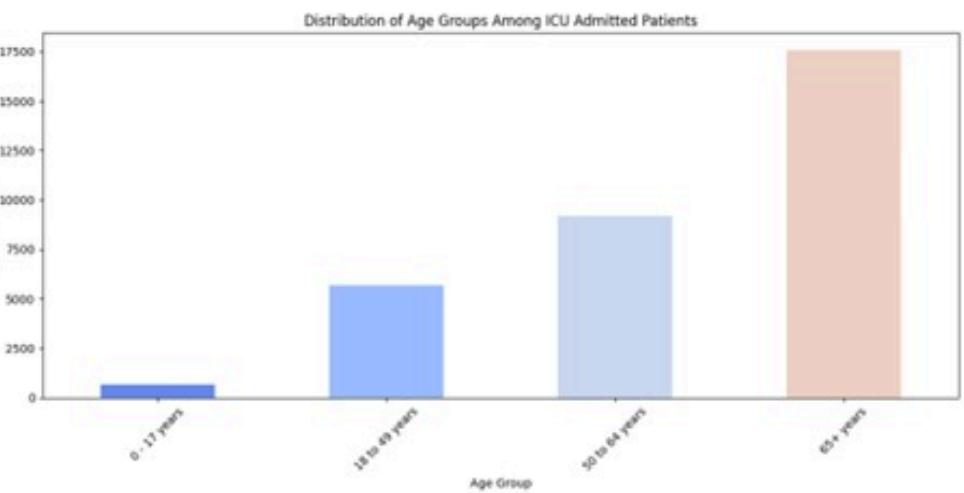


California is associated with the highest percentage of Economic Impact (stimulus) payments among survey respondents while Delaware is associated with the lowest percentage.



Who are the people (the demographic segment) that appear to be most at risk of entering ICU? Who is the least at risk?

### 3.6 Who are the people (the demographic segment) that appear to be most at risk of entering ICU? Who is the least at risk?

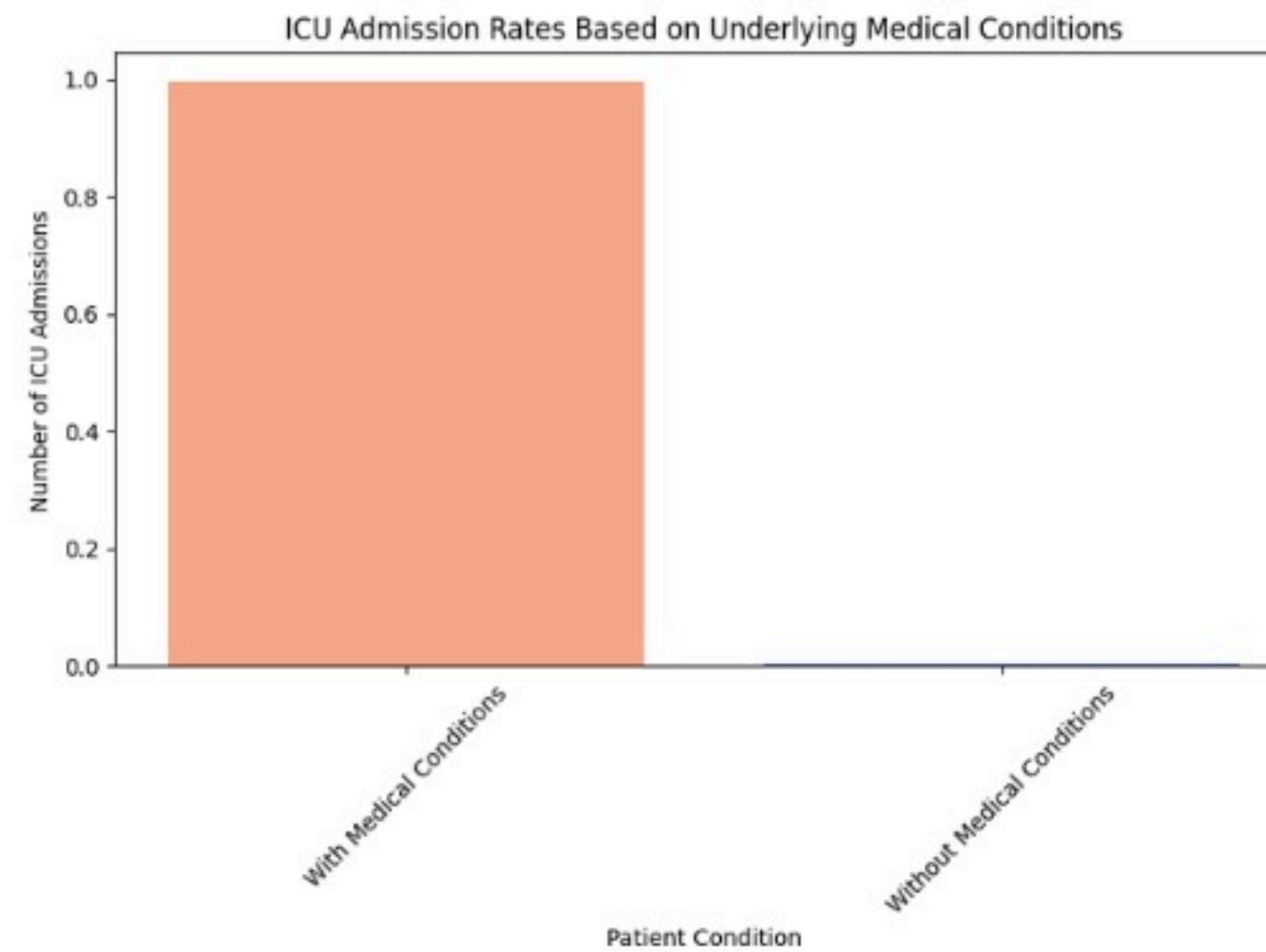


- For most risk People:
  - Age group: +65 years
  - Sex: Male
  - Race: White
- For least at risk:
  - Age group: 0-17 years
  - Sex: Female
  - Race: Native Hawaiian/Other Pacific Islander

# 7

Are patients without underlying medical conditions  
are less likely to enter ICU?

### 3.7 Are patients without underlying medical conditions are less likely to enter ICU?

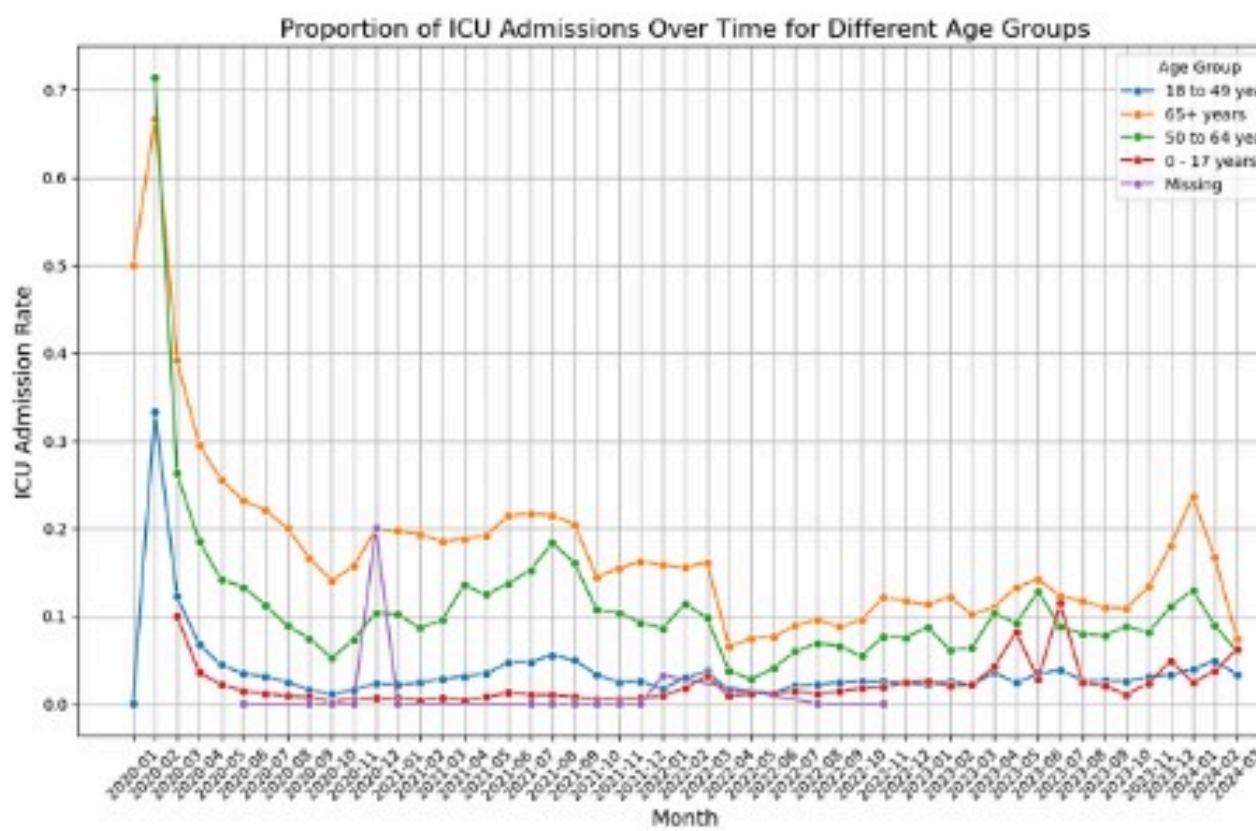


patients without underlying medical conditions are less likely to enter ICU Compared with patients who have underlying medical conditions.

# 8

What is the proportion of COVID-19 cases that result in ICU admissions over time for different age groups?

### 3.8 What is the proportion of COVID-19 cases that result in ICU admissions over time for different age groups?

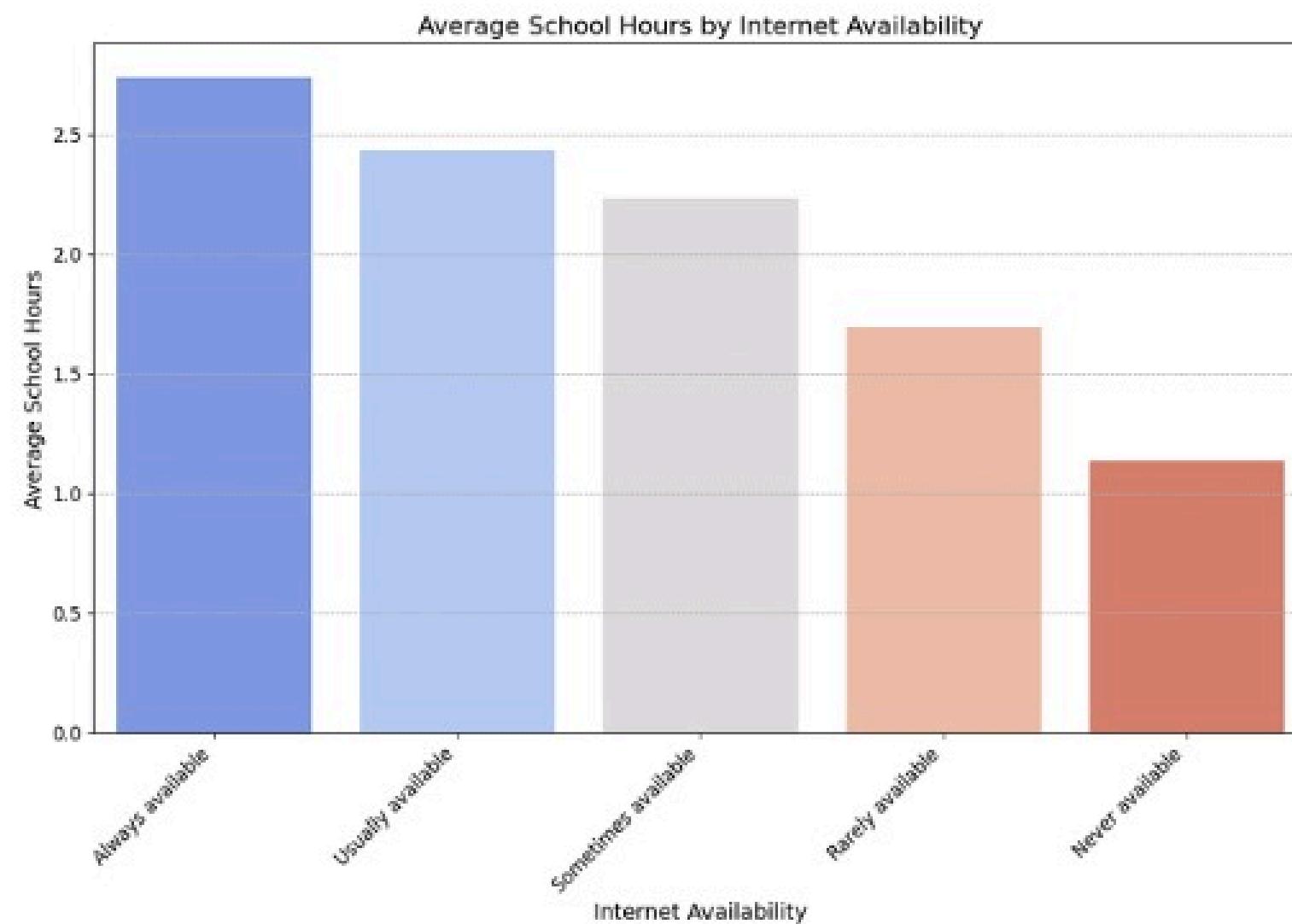


- For Age Group 18 to 49 years:
  - Highest rate month: Feb-2020
  - Lowest rate month: Oct-2022
- For Age Group 50 to 64 years:
  - Highest rate month: Feb-2020
  - Lowest rate month: Mar-2023
- For Age Group +65 years:
  - Highest rate month: Feb-2020
  - Lowest rate month: Apr-2023



How does internet availability at home impact the likelihood of children receiving remote education during the pandemic?

### 3.9 How does internet availability at home impact the likelihood of children receiving remote education during the pandemic?

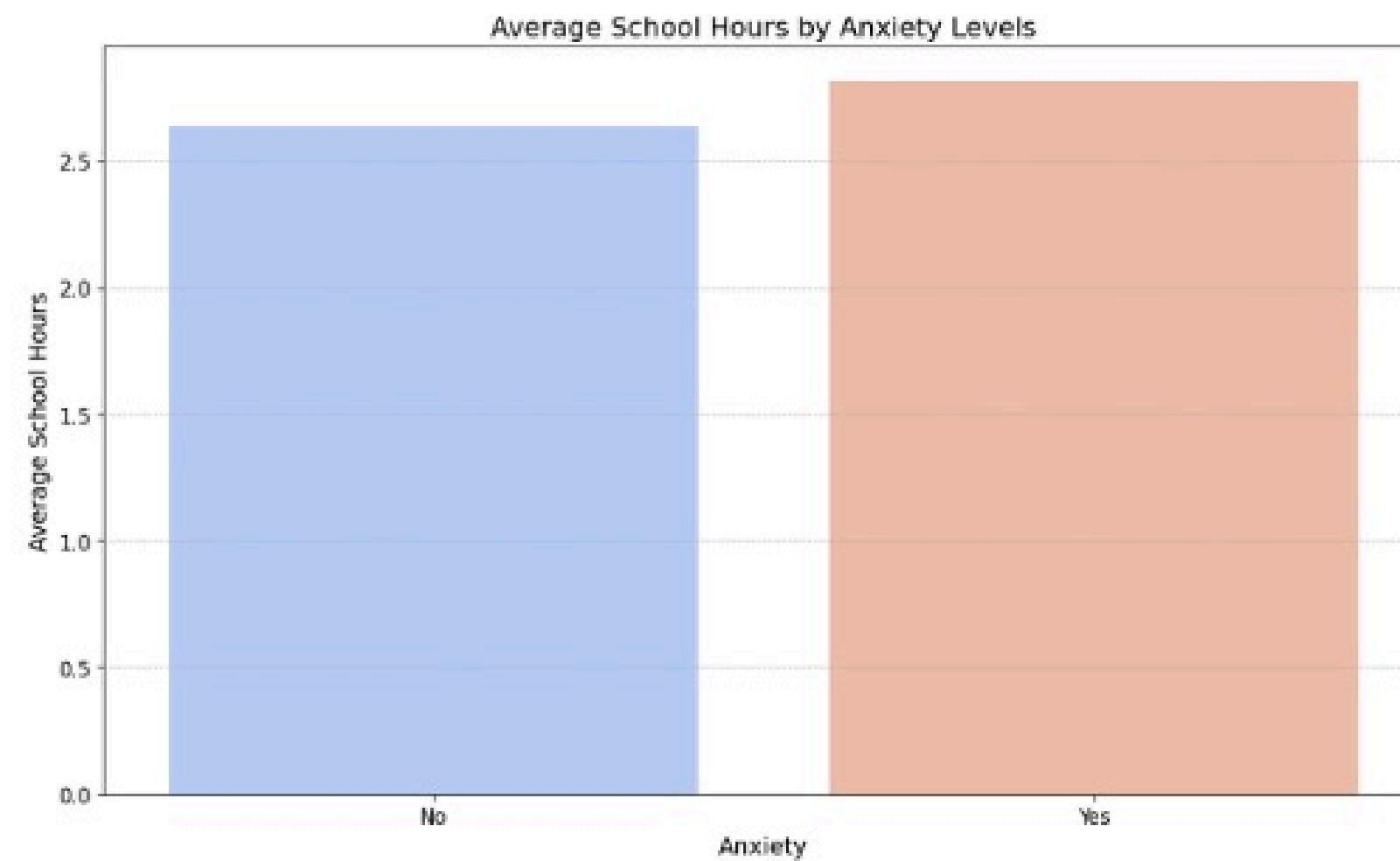


The average School hours are highest when internet is always available, While The average School hours are lowest when internet is never available.

# 10

What is the relationship between anxiety, worry, and average school hours?

### 3.10 What is the relationship between anxiety, worry, and average school hours?



Answer: Anxiety level increase as long as average school hours increases

# PART 3: Hypothesis Testing:

# PART 3: Hypothesis Testing:

**1.Claim:** “There is a strong association between probability of death due to COVID-19 and patient demographics”

**Null hypothesis (H0):** There is no association between the probability of death due to COVID-19 and patient demographics

**Alternative hypothesis (H1):** There is an association between the probability of death due to COVID-19 and patient demographics

we will use The Chi-Square Test as Chi-Square Test of Independence is suitable for this analysis because it is designed to assess whether there is a significant association between two categorical variables. In this case, the categorical variables are the combined demographics and the death outcome.

**Results:**



Chi-square statistic: 126131.64445956664  
p-value: 0.0

we will Reject the null hypothesis ( $H_0$ ) as the p value is less than the significance level : There is an association between the probability of death due to COVID-19 and patient demographics.

**2.Claim:** “Investigate whether patients with exposure are more likely to die.”

**Null hypothesis (H0):** There is no significant association between exposure and the proportion of patients that death.

**Alternative hypothesis (H1):** There is a significant association between exposure and the proportion of patients that death.

we will use z-test for proportions. This test is chosen because it assesses whether there is a significant difference in proportions between two independent groups (patients with exposure and patients without exposure). In this case, we are interested in comparing the proportion of deaths (a binary outcome) between these two groups. The z-test for proportions allows us to determine if the observed difference in proportions is statistically significant, providing valuable insights into the relationship between exposure and mortality risk in the patient population.

**Results:**

```
# Output the results  
z_score, p_value
```

→ (-70.24192843956261, 1.0)

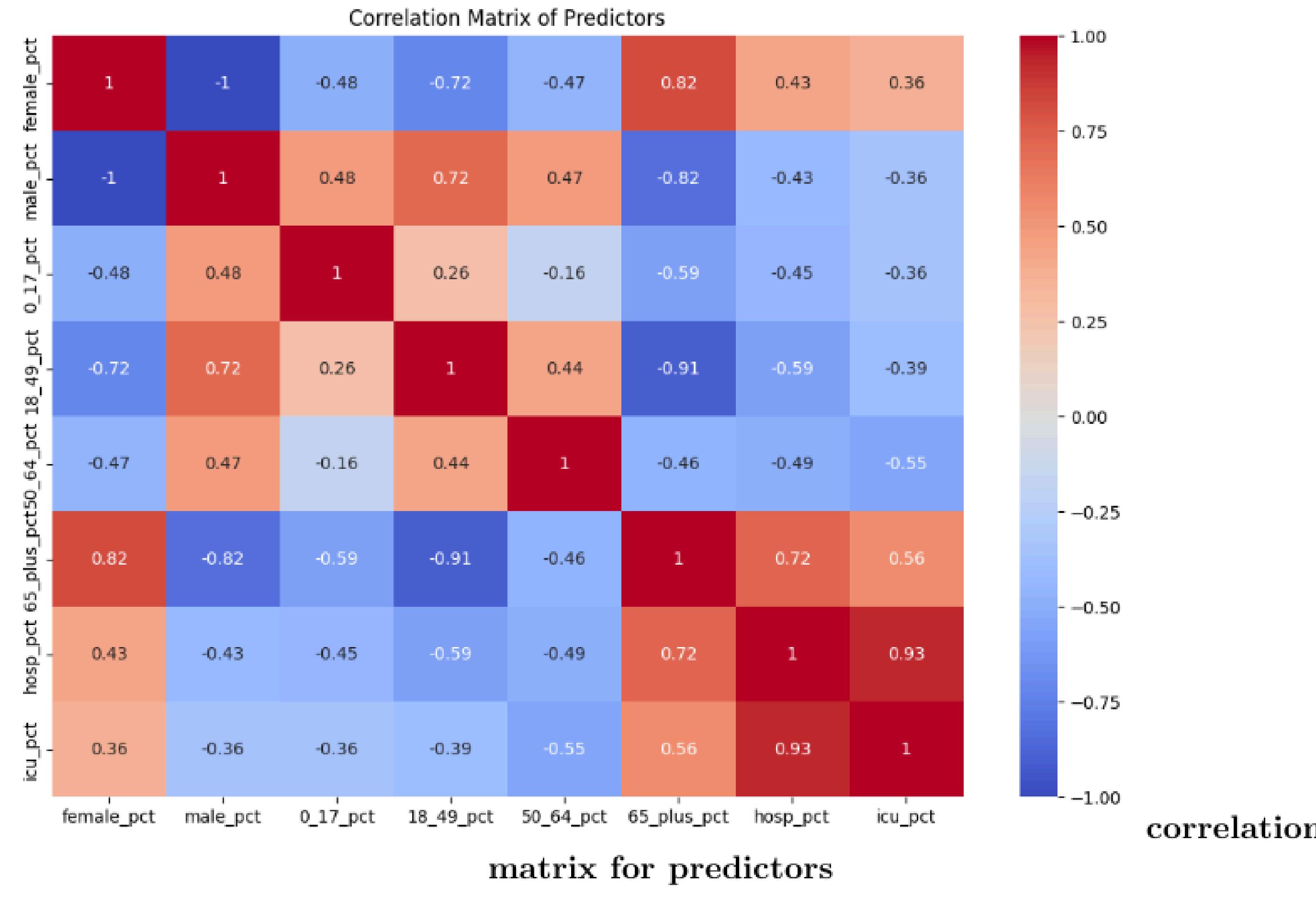
as shown p value is greater than the significance level "0.05" so we Fail to reject the null hypothesis: There is no significant association between exposure and the proportion of patients that death.

# PART 4: Regression Analysis:

OLS Regression Results						
Dep. Variable:	death_pct	R-squared (uncentered):	0.862			
Model:	OLS	Adj. R-squared (uncentered):	0.843			
Method:	Least Squares	F-statistic:	45.82			
Date:	Wed, 22 May 2024	Prob (F-statistic):	2.48e-17			
Time:	16:23:51	Log-Likelihood:	83.151			
No. Observations:	50	AIC:	-154.3			
Df Residuals:	44	BIC:	-142.8			
Df Model:	6					
Covariance Type:	nonrobust					
	coef	std err	t	P> t	[0.025	0.975]
female_pct	-0.0024	0.008	-0.308	0.760	-0.018	0.013
male_pct	0.0024	0.008	0.308	0.760	-0.013	0.018
0_17_pct	0.0031	0.010	0.312	0.756	-0.017	0.023
18_49_pct	-0.0039	0.010	-0.379	0.706	-0.025	0.017
50_64_pct	0.0088	0.012	0.746	0.459	-0.015	0.032
65_plus_pct	-0.0007	0.009	-0.074	0.941	-0.019	0.017
hosp_pct	-0.0760	0.029	-2.604	0.013	-0.135	-0.017
icu_pct	0.1876	0.025	7.539	0.000	0.137	0.238

Figure 7: p values and model coefficients

# beginfigure[H]



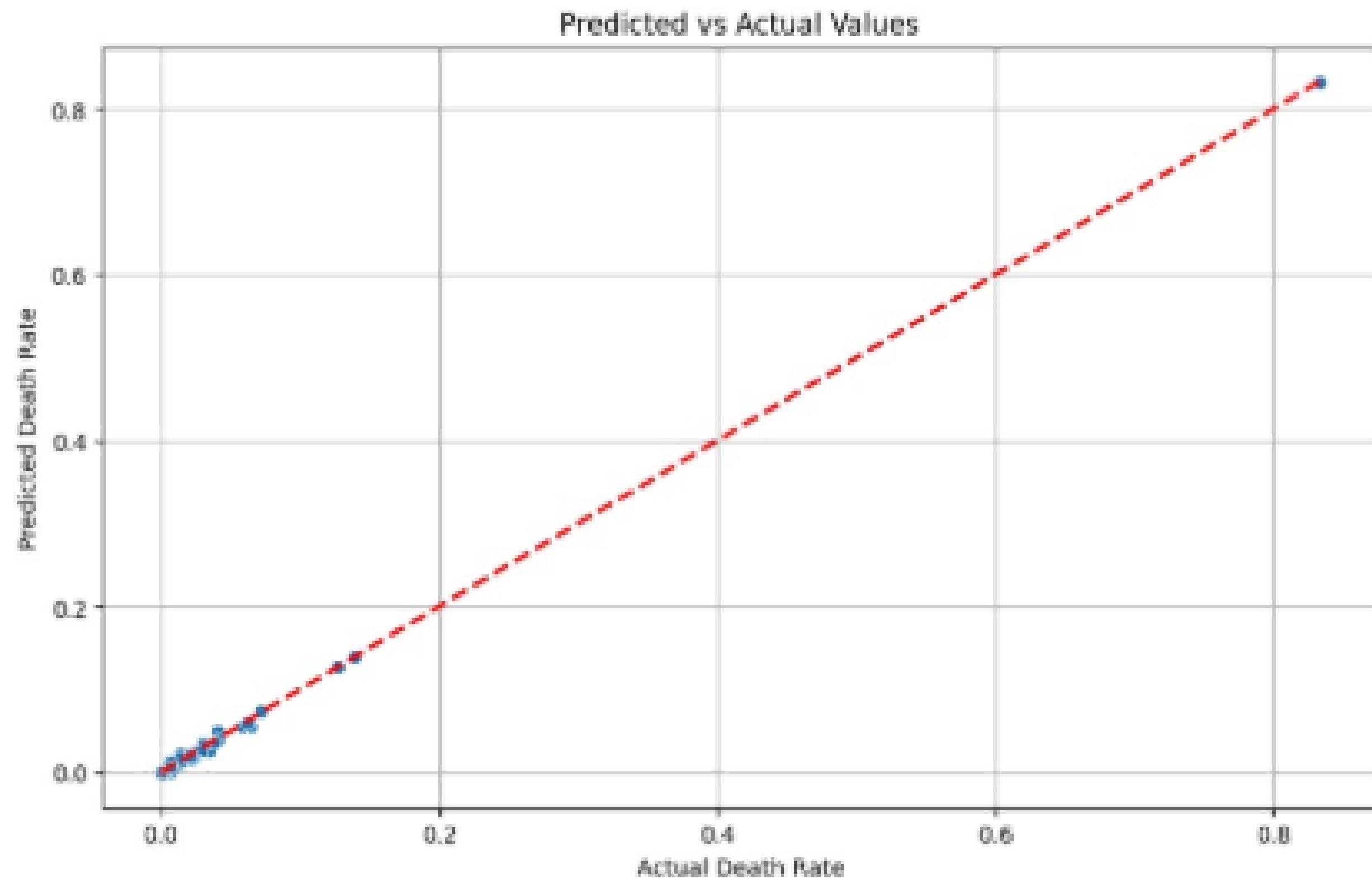


Figure 5: caption

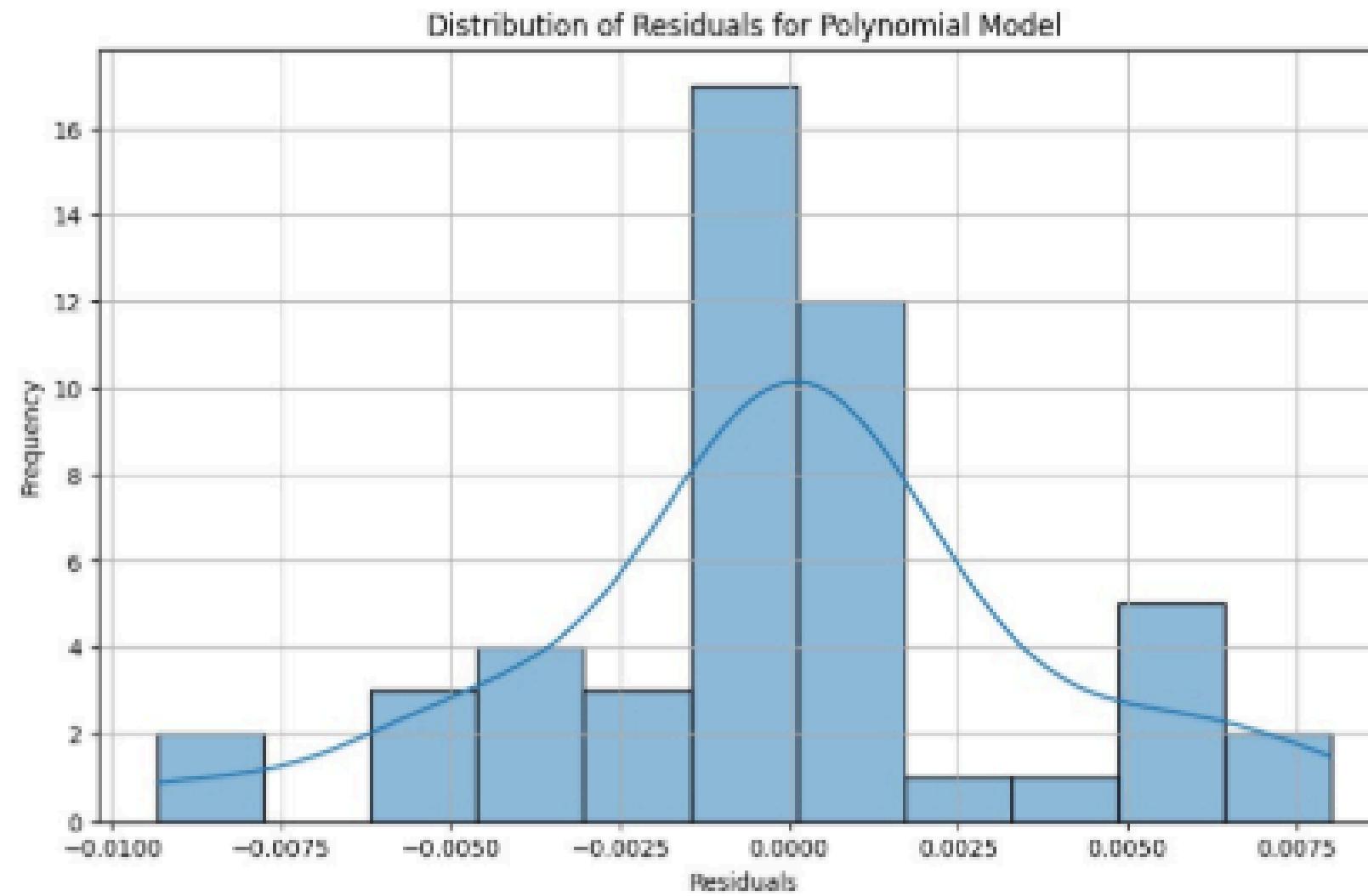


Figure 6: caption

,

**A histogram of the residuals is plotted to check their distribution.**

## **PART 5: Bonus Task:**

we conducted a data preprocessing, model building, training, and evaluation process for a neural network aimed at predicting the death status of patients based on their age group, sex,

### Results:

	precision	recall	f1-score	support
0	0.79	0.91	0.85	349394
1	0.01	0.07	0.02	9516
2	0.00	0.00	0.00	97248
accuracy			0.70	456158
macro avg	0.27	0.33	0.29	456158
weighted avg	0.61	0.70	0.65	456158

Accuracy: 0.6994221300514295



THANKS

