

# Impact of COVID-19 on Socioeconomic Factors

DATA 512: Human-centered Data Science

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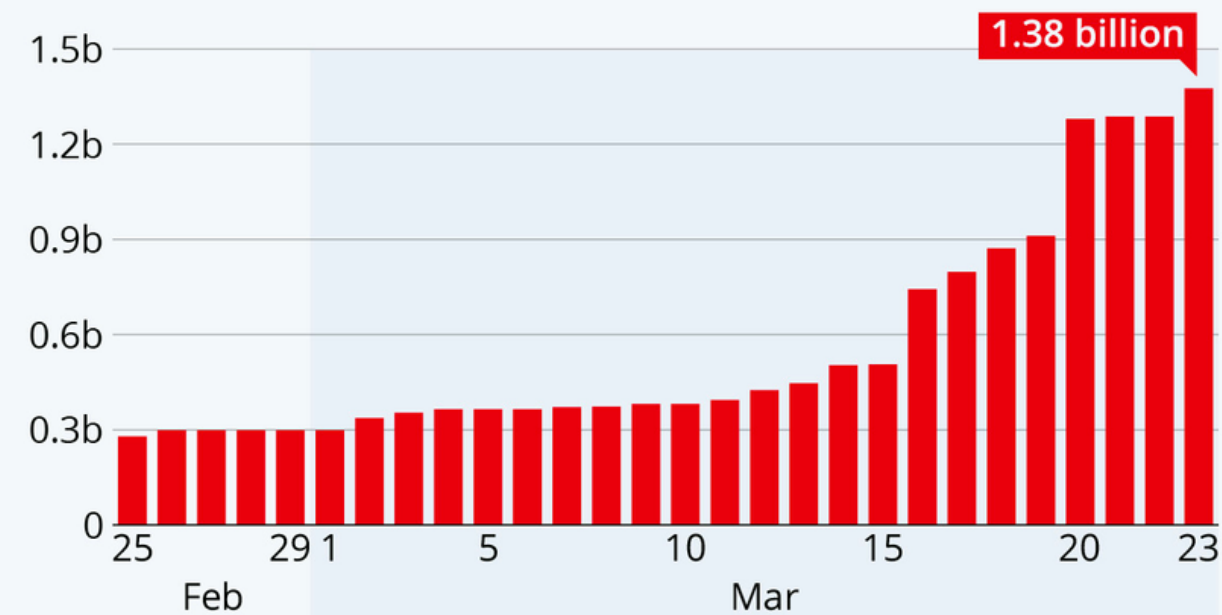


# Motivation

US GDP reduced  
by 2.35%  
(Larger drop  
than 2008)

## COVID-19's Staggering Impact On Global Education

Number of learners impacted by national school closures  
worldwide



Figures refer to learners enrolled at pre-primary, primary, lower-secondary, and upper-secondary levels of education, as well as at tertiary education levels.

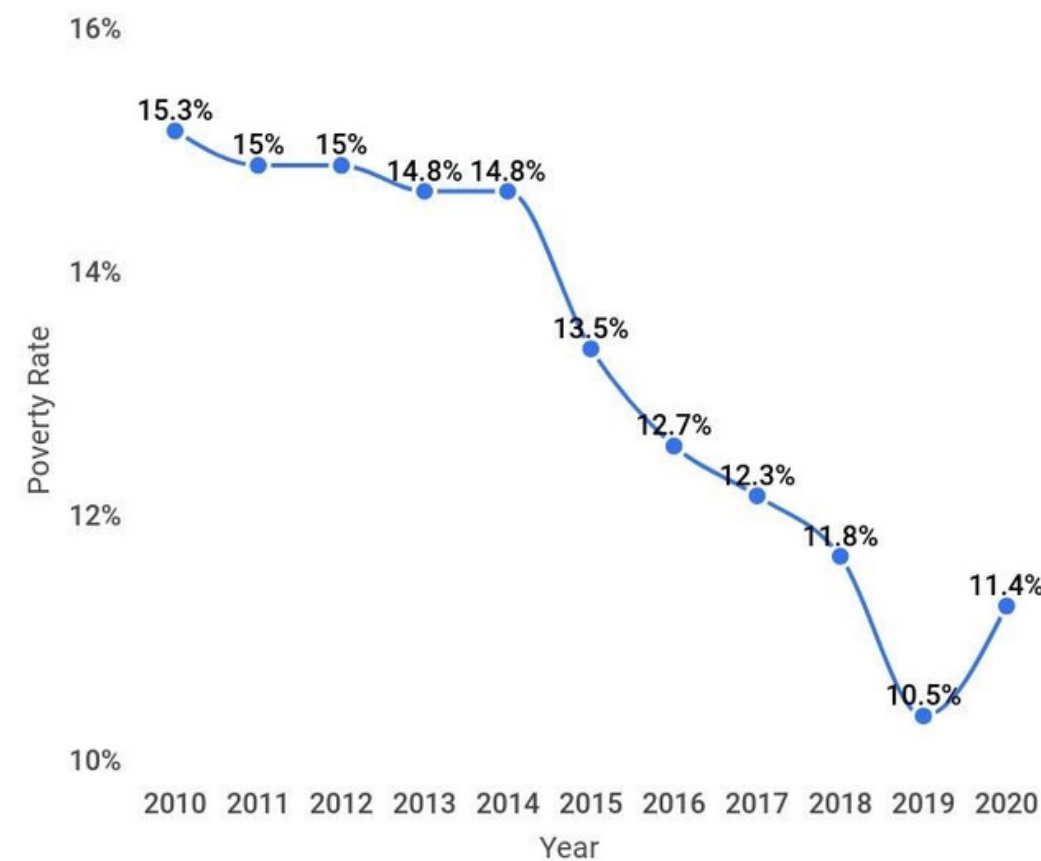
Source: UNESCO



statista

[World Economic Forum](https://www.weforum.org/)

## POVERTY RATE OVER TIME



[Statista](https://www.statista.com/)

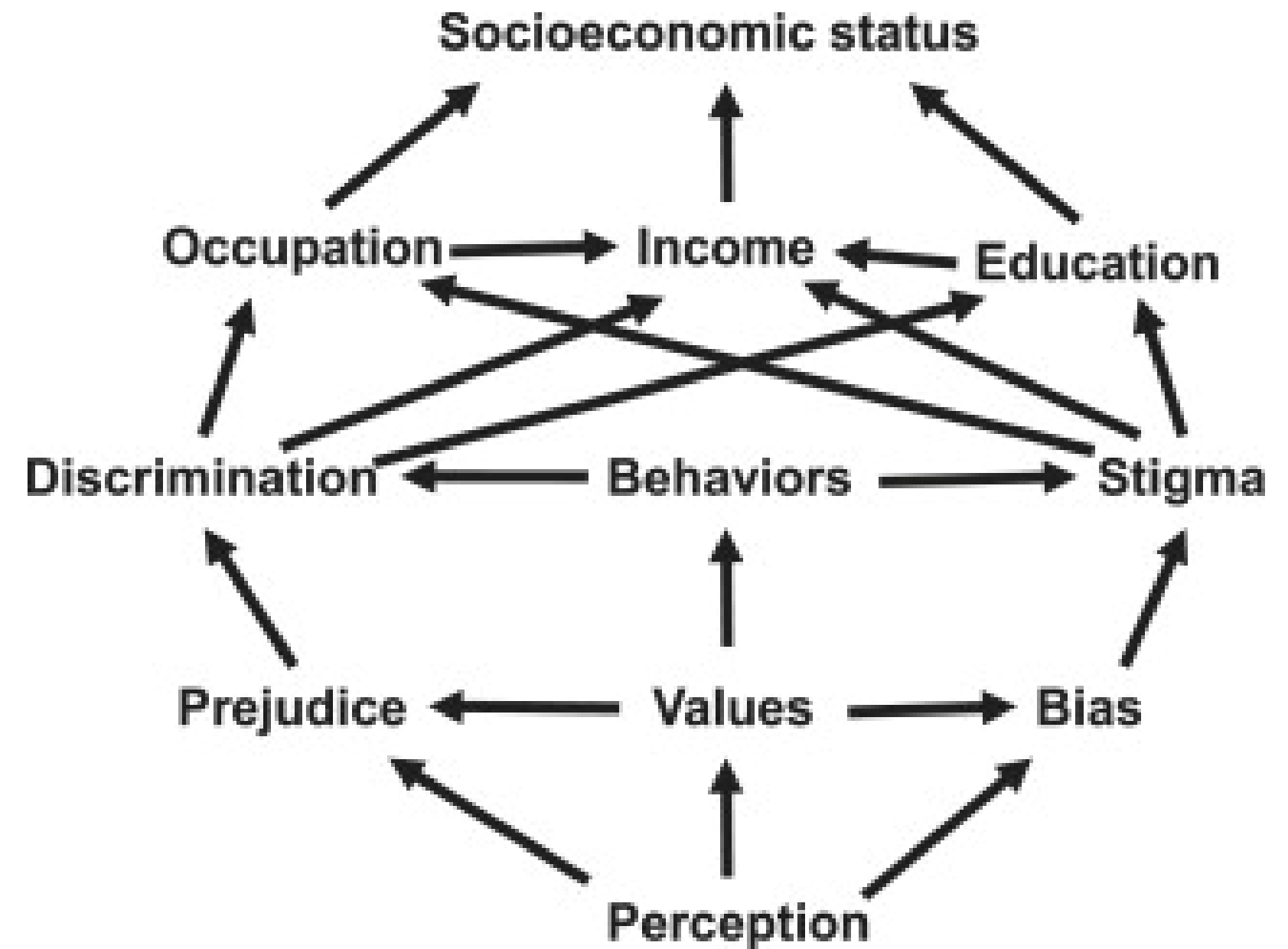
Unemployment  
rate peaked in  
April 2020  
(14.7%)

Median  
household  
income dropped  
by 2.8%

# Problem Statement

What were the immediate and gradual impacts of COVID-19 on socioeconomic factors at the community and industrial level in Maricopa County in Arizona?

# Why human- centered?



[ScienceDirect](#)



# DATA AT A GLANCE

Granularity: Daily, Monthly, Annual

Categories: **Individual**, **Industry**, **COVID-19**

Unemployment Rates

Civilian Labor Force

Percentage of Graduates

Socioeconomic Indexes

Overall Risk Index

Economic Indexes

COVID-19 Cases

Masking Survey

CDC Recommended Masking Guidelines



# ➤ Research Questions



- What was the influence of the pandemic on the unemployment rate and Civil Labor Force in the county?
- How did the socioeconomic factors (Education, Median Household Income, and Gross Domestic Product) change during the early stage of the pandemic?
- How did the COVID-19 cases affect the economic indexes of the county in different industries?
- What are the other factors that help measure the overall community risk for similar epidemics/pandemics in the future?

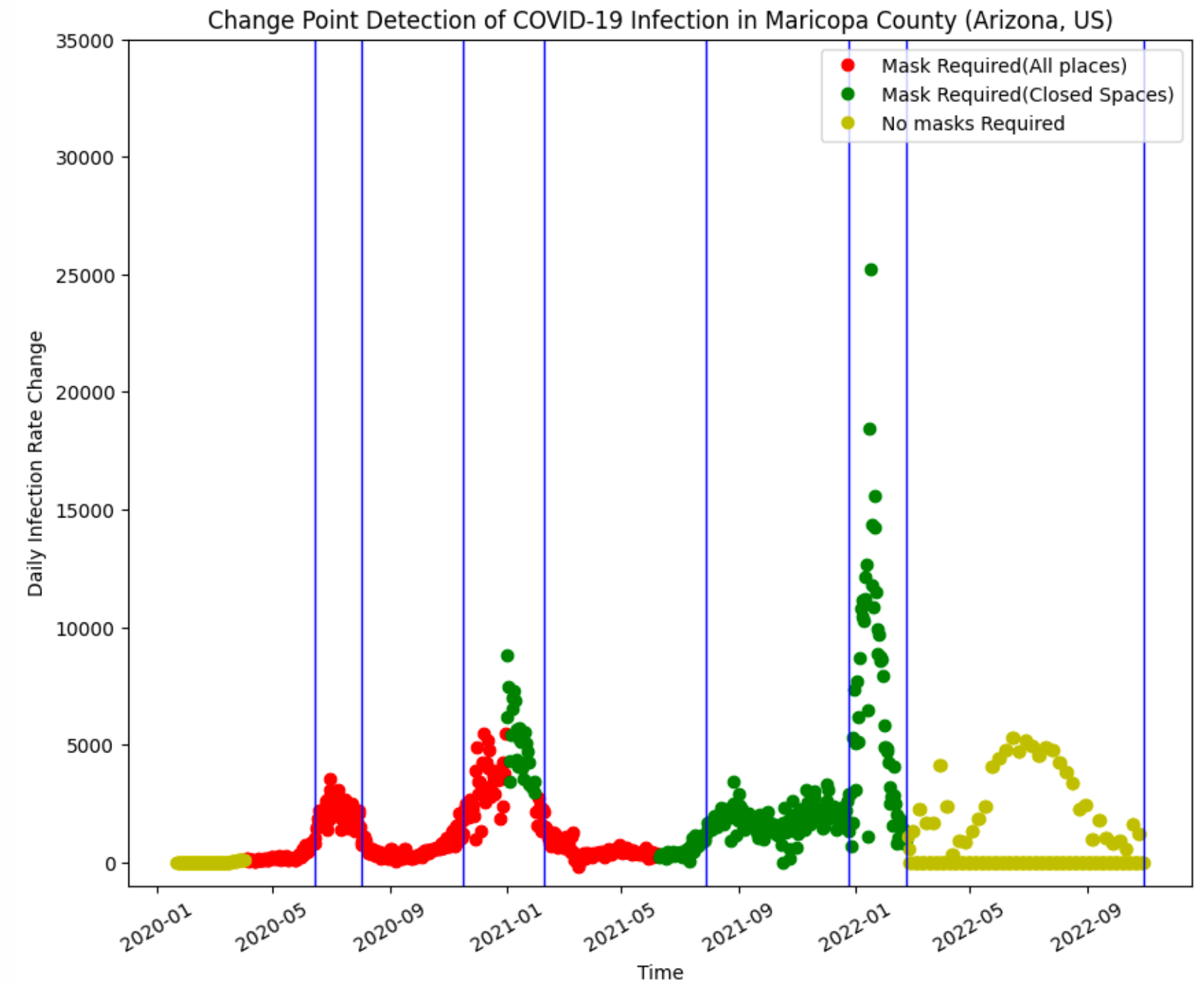
# Methods

- Change point detection for the impact of masking policies on COVID-19 cases
- Time-lagged crosscorrelation for COVID-19 cases on Unemployment
- Pearson's Correlation for Percentage Employment vs Economic Index
- Exploratory Data Analysis of Socioeconomic factors
- Linear Regression for measuring overall community risk



# ➤ Results (Masking vs Cases)

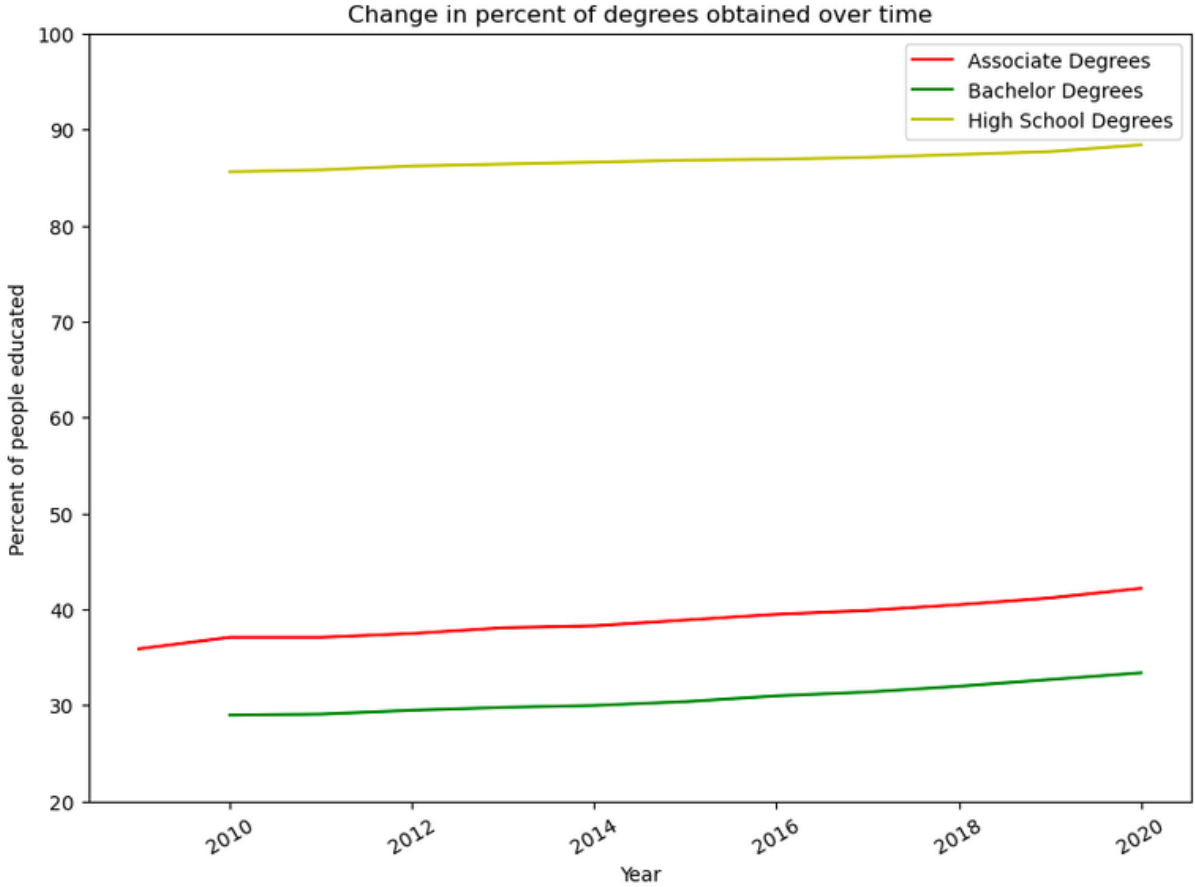
- No state mask mandate dates are available
- Closest option: CDC Recommended Guidelines
- Masking Survey Data: 89% of people wore masks frequently/always
- No direct evidence of masking policies impacting COVID-19 cases found



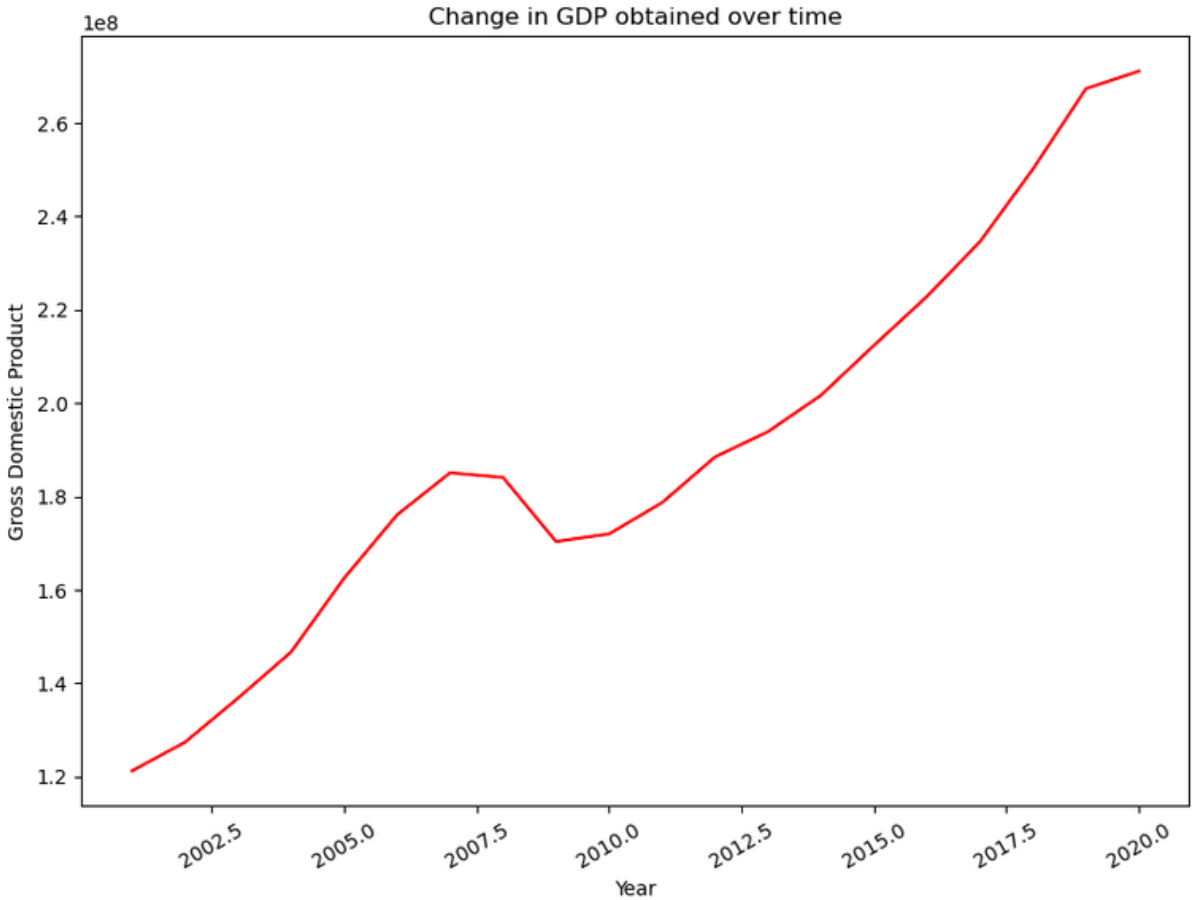


# Results (Immediate Impact?)

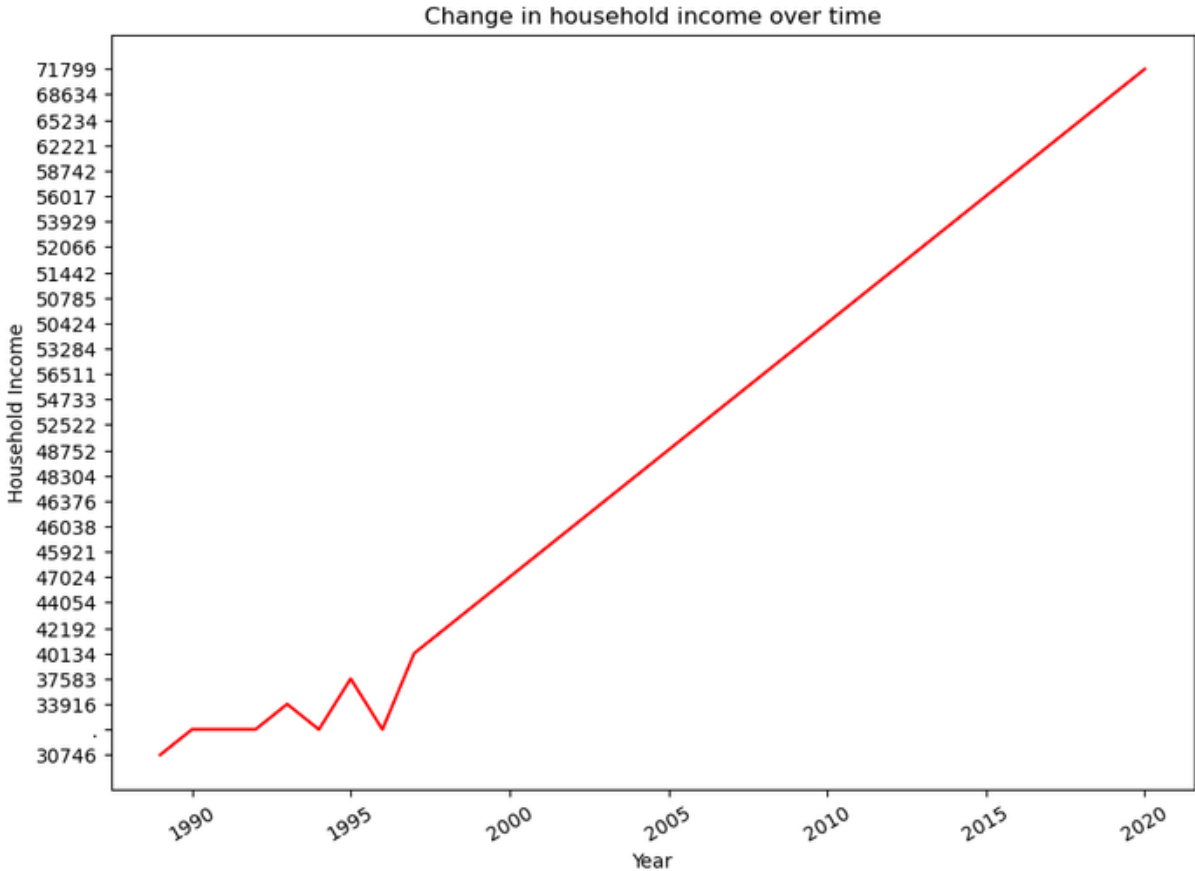
Percentage of people with degrees



Change in GDP



Median Household Income

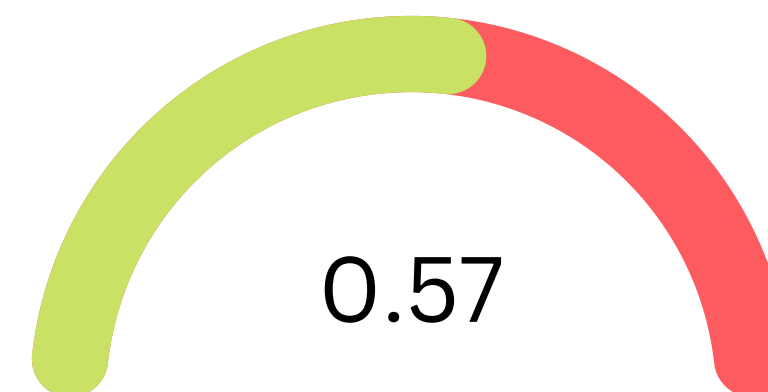




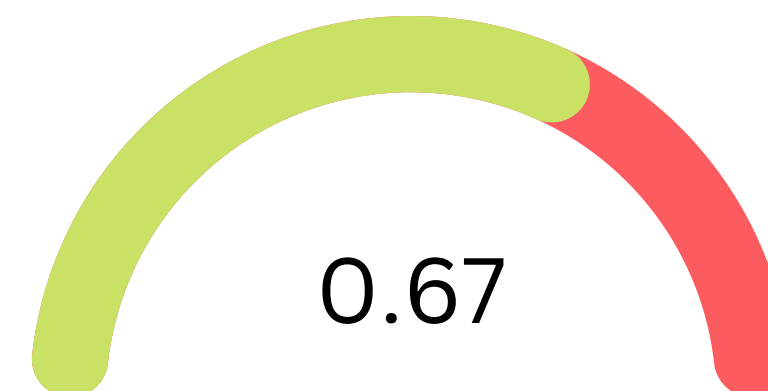
# Results (Gradual Impact)



Percentage Change in Employment for Industrial Sector	Correlation with COVID-19 cases	Lag (in months)
Miscellaneous computer and electronic products	-0.66	19
Textile product mills	-0.6	19
Furniture and home furnishings stores	-0.562	19
Oil and gas extraction	-0.56	15
Support Activities for mining	-0.55	15

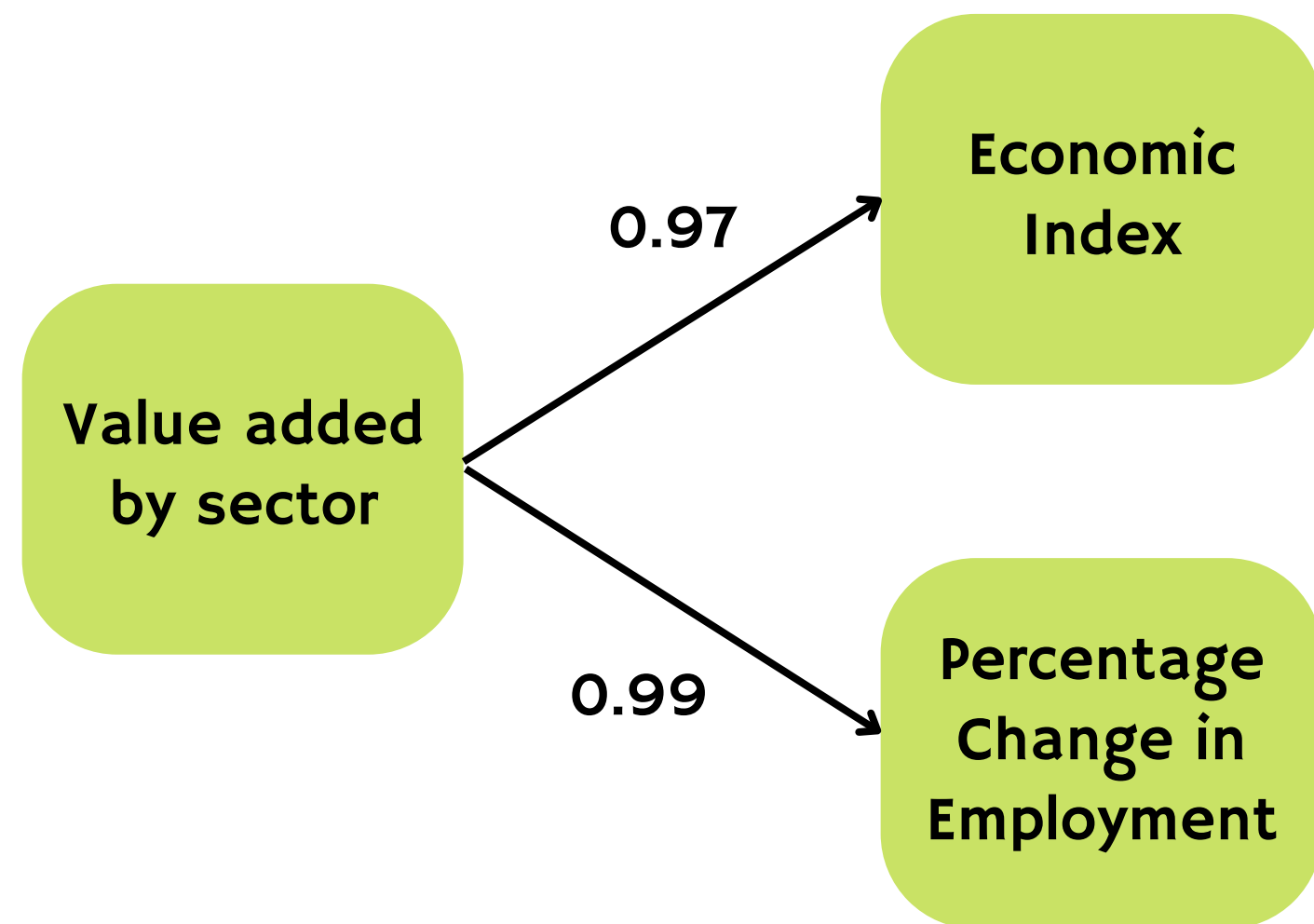


**Unemployment,  
Lag - 21 months**

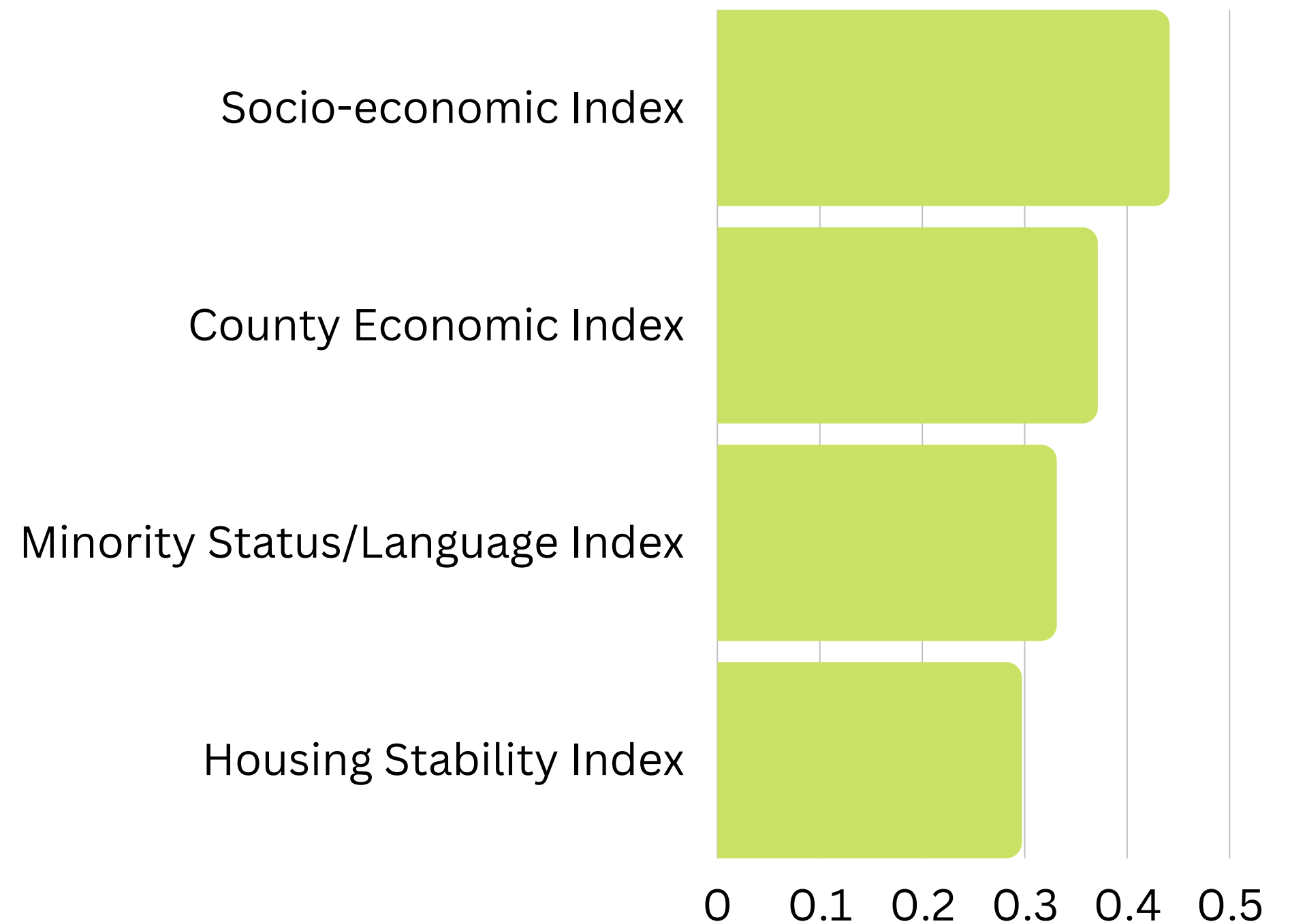


**Labor Force Participation,  
Lag - 22 months**

# ➤ Results (Overall Impact)



Overall Community Risk Percentage  
prediction error: 0.07%



# ➤ Impact, Improvements, Limitations

## PREPARING FOR THE FUTURE



- Most vulnerable industries in terms of their employment
- Overall community risk for epidemics/pandemics in future

## IMPROVEMENTS



- Deeper analysis of all the factors involved including discrimination/biases
- Prediction of the impact/COVID-19 using autoregressive models

## UNCERTAINTY



- Cannot be ubiquitously applied outside Maricopa County
- Social factors data limitation impacted gauging their long-term impact