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How Has the Anti-Vaccination Movement Impacted the Measles, Mumps, and Rubella (MMR) Vaccination Rates in Schools Across the US?

Introduction

- **Topic**: Measles, Mumps and Rubella (MMR) vaccination rates across US schools
- **Motivation**: Factors associated with the anti-vaccination movement and their impact on MMR vax rates

Introducing the Data

The original dataset had **16** variables and **66,113** observations. We analyzed the following variables:

DATASET

Data on MMR vaccination rates was collected by the *Wall Street Journal*.

MMR

Schools' MMR vaccination rates, formatted as a percentage.

TYPE

Whether a school in the dataset is public, private, or charter.

REGION

US region that each school's state belongs to, defined by the US Embassy to Korea.

PARTY

Political party of each school's state, based on last 5 pres. elections (excl. 2020).

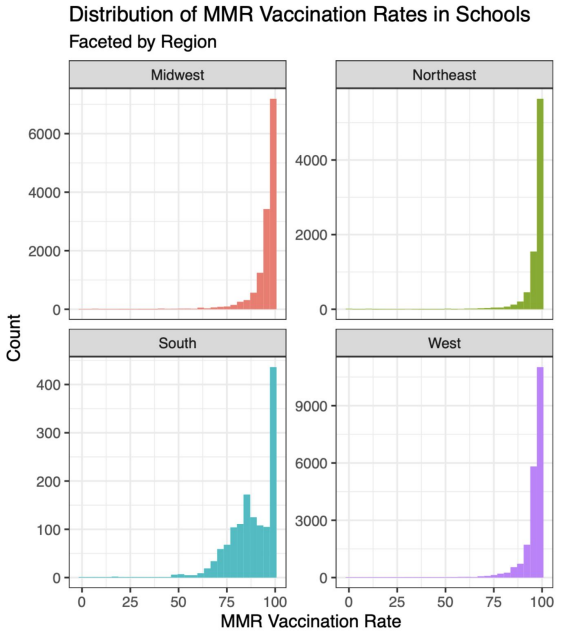
EXEMPTIONS

Whether each school's state offers both religious and personal exemptions.

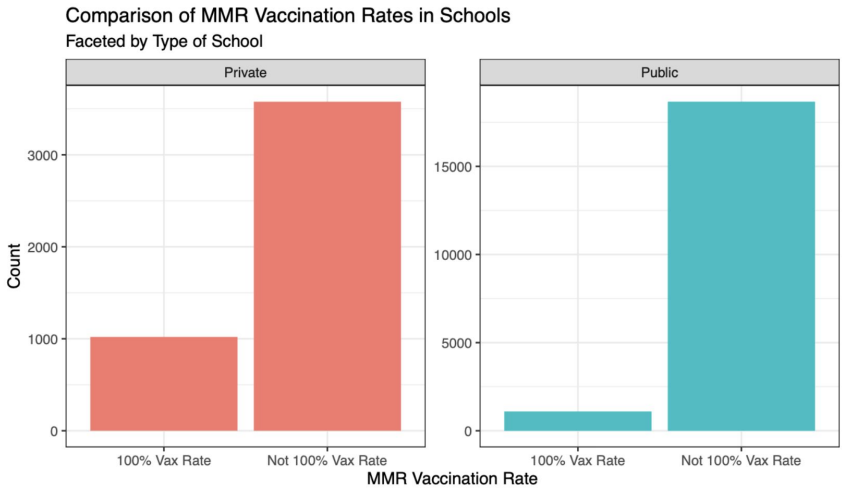
Variables titled in **red** were not included in the original *Wall Street Journal* dataset.

Exploratory Data Analysis

REGION



TYPE OF SCHOOL



Hypothesis Testing

(for difference in mean MMR vax rate)

POLITICAL PARTY

$H_0: \mu_R = \mu_D$, $H_a: \mu_R < \mu_D$

Observed Difference in Means = **-3.92**
P-Value = **0.00**
Evidence to suggest that the mean MMR vax rate in Republican states was **lower than** the mean MMR vax rate in Democratic states.

EXEMPTIONS

$H_0: \mu_E = \mu_N$, $H_a: \mu_E < \mu_N$

Observed Difference in Means = **-3.75**
P-Value = **0.00**
Evidence to suggest that the mean MMR vax rate in states with both exemptions was **lower than** the mean MMR vax rate in states without exemptions.

Linear Regression Models

	MODEL EQUATION
PARTY	95.785 **- 3.923** * *partyRepublican*
REGION	94.954 + **1.252** * *regionNortheast* **- 6.917** * *regionSouth* + **0.206** * *regionWest*
TYPE	93.318 + **2.839** * *typePublic*
EXEMPTIONS	96.147 **- 3.749** * *exemptionsYes*
EXEMPTIONS + PARTY	96.258 **- 2.745** * *exemptionsYes* **- 2.197** * *partyRepublican*

CONCLUSIONS

- Sufficient evidence that political party and exemptions impact MMR vax rates
- MMR vax rate doesn't differ much by region
- Wealth may not indicate anti-vaxx sentiment
- Party and exemptions were the strongest predictors

LIMITATIONS

- Data only from 32 states
- Number of public schools sampled greater than number of private schools
- Not many schools from the South
- R^2 values close to zero

FUTURE WORK

- Sample within our data to be more representative
- More comprehensive hypothesis testing and EDA
- Examine more factors associated with anti-vaxx movement
- Examine trends over time