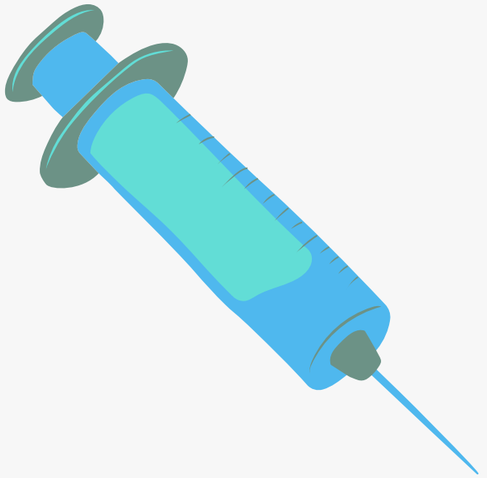
Children’s health is the foundation of their growth and future.

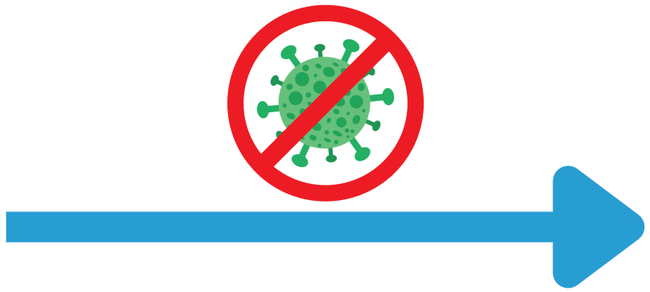
Analyzing Measles' Vaccination Rates Across U.S. Elementary Schools (2017-2019)



GROUP 4: ALEX, DAVID, SAIXIAO

Link：https://github.com/WSJ/measles-data/tree/master?tab=readme-ov-file

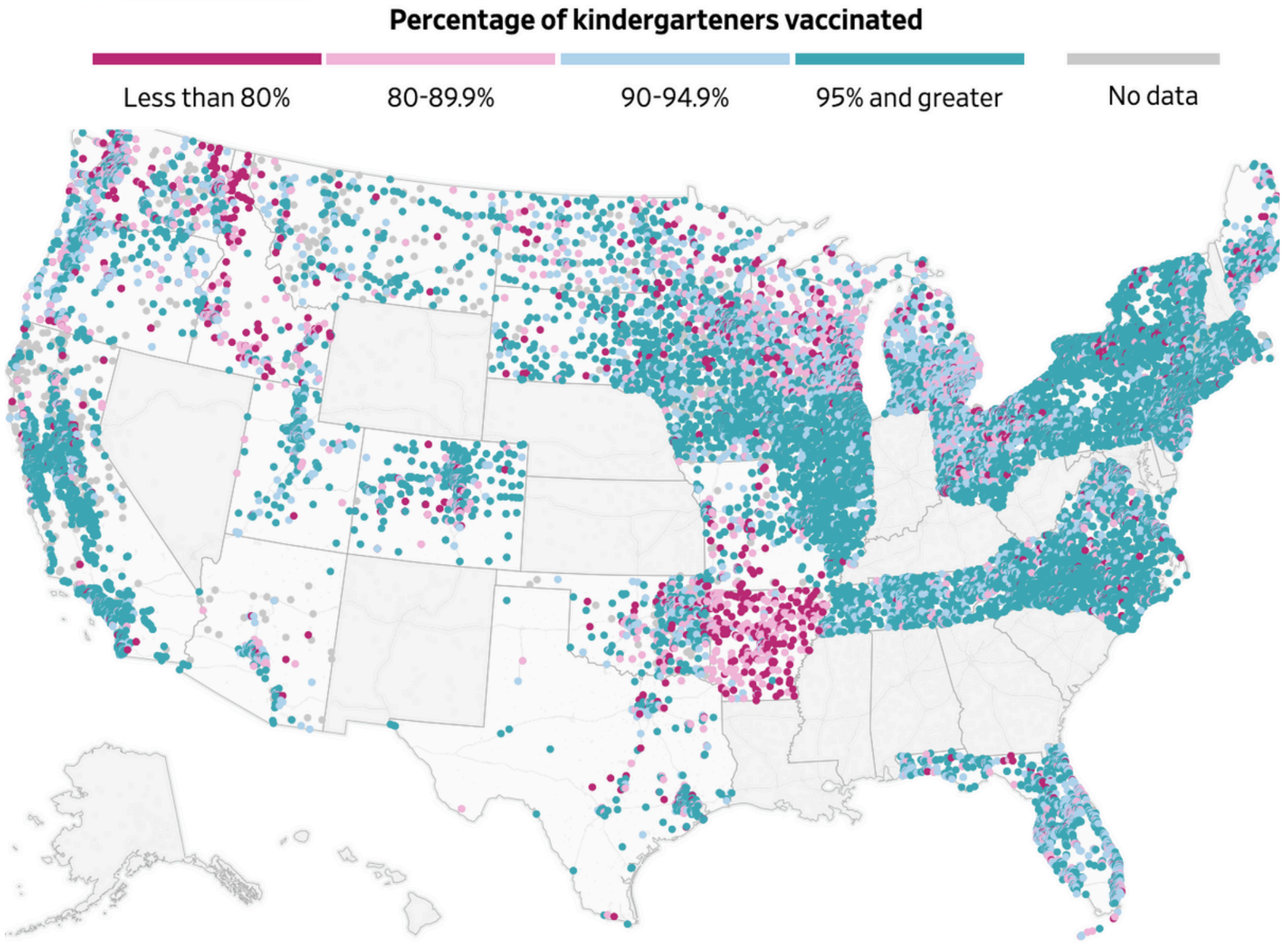
Introduction



MMR Vaccine

WHO: 95% coverage rate

Introduction



- The Wall Street Journal
- 46411 elementary schools, 32 states
- 2017-2019
- **Variables**: Location, MMR Vaccination Rate (mmr ≥ 95%, mmr < 95%), School Type (Public, Charter, Private), percent of children exemption from vaccine (medical, personal, religous)

Research Questions:

(1)

- Are more than 80% (the majority) of U.S. elementary schools meeting the 95% MMR vaccination target?
- One-Proportion Z-Test

(2)

- Are vaccination rates independent of school type?
- Chi-Square Test

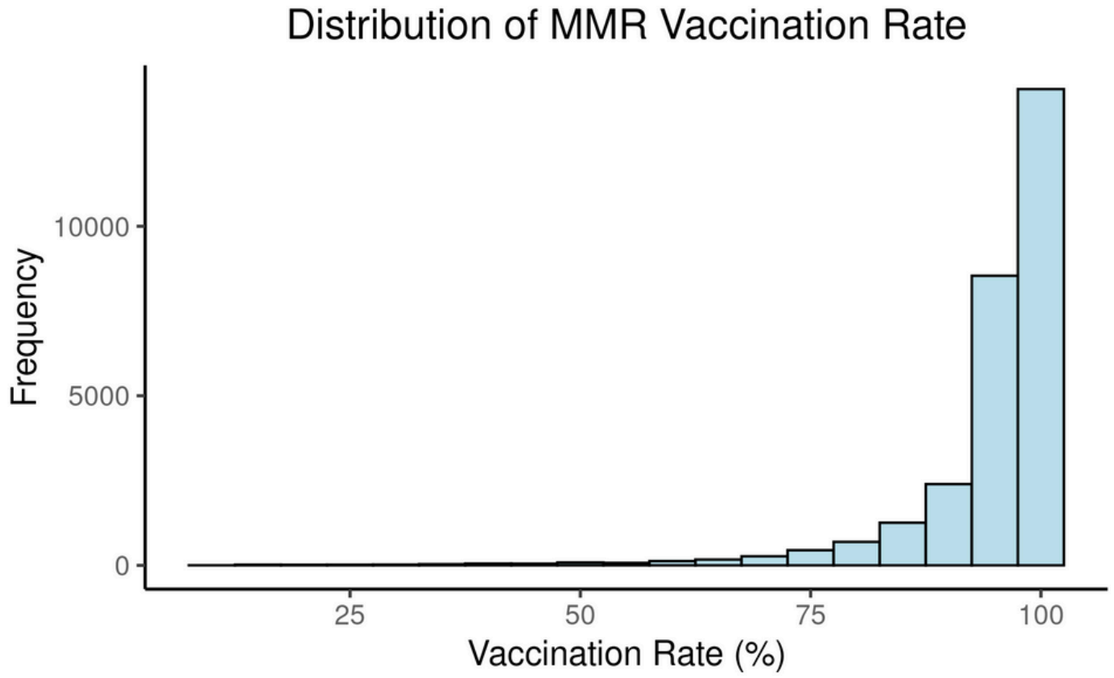
One proportion test

Hypothesis:
H_0: 80% of schools have MMR vaccination rates ≥ 95%.
H_1: More than 80% of schools have MMR vaccination rates ≥ 95%.

Check Conditions:
Independence :All the observational units are randomly selected
n=28,306, p_0=0.8
np_0=22,644.8, $n(1-p_0)$=5661.2
Both conditions are greater than 10.

Test Statistic: -35.39951
p-value ≈ 1

Decision: Fail to reject the H_0.
Conclusion: We do not have enough evidence that the true proportion of vaccination rate more than 80%.



Chi-square Hypothesis Test

Hypothesis:
H_0: school type and vaccination rates are independent.
H_1: school type and vaccination rate are not independent.

Check Conditions:
Independence: the observational units are randomly selected.
Expected Counts: All greater than 5

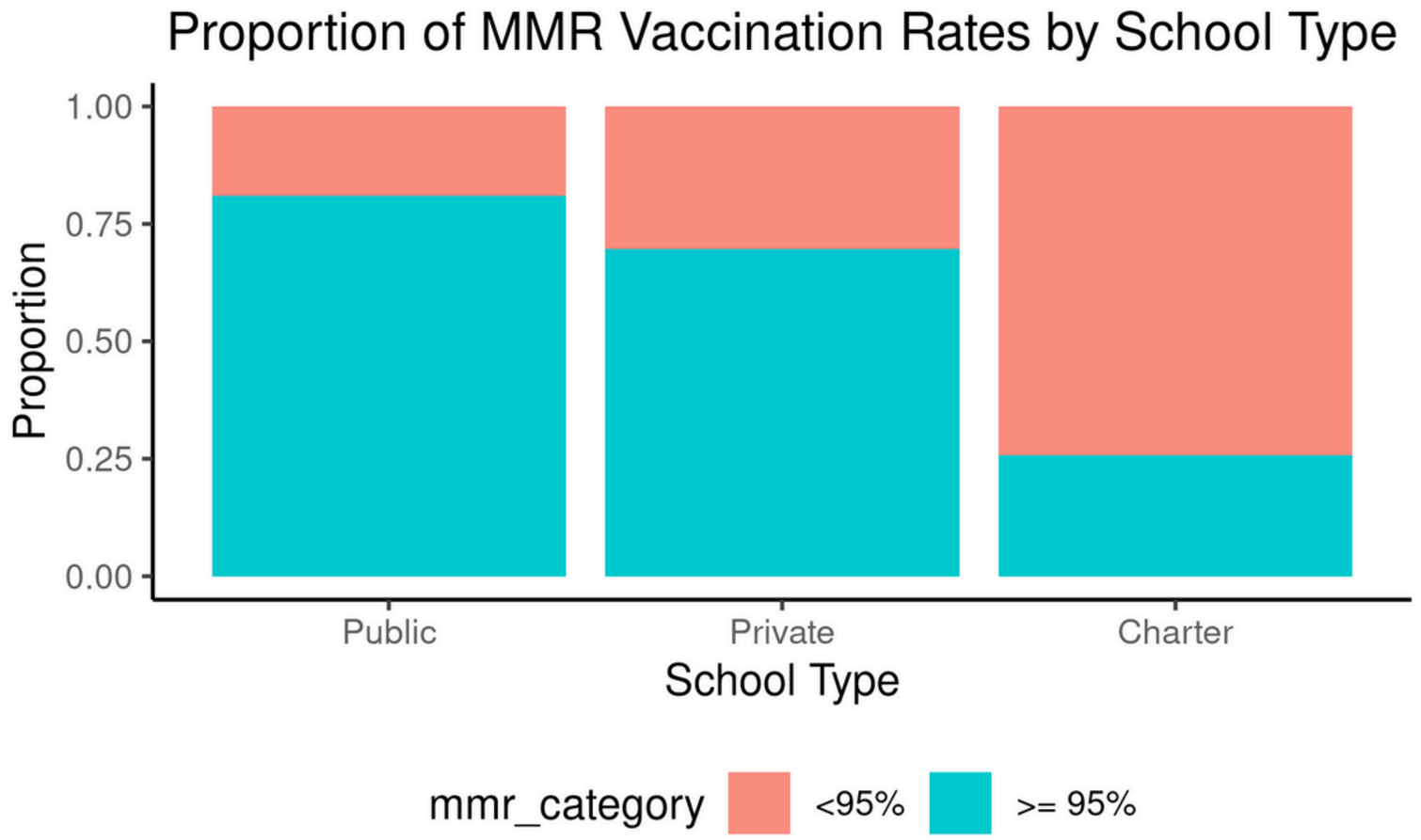
Test Statistic: 520.1772

p-value ≈ 0

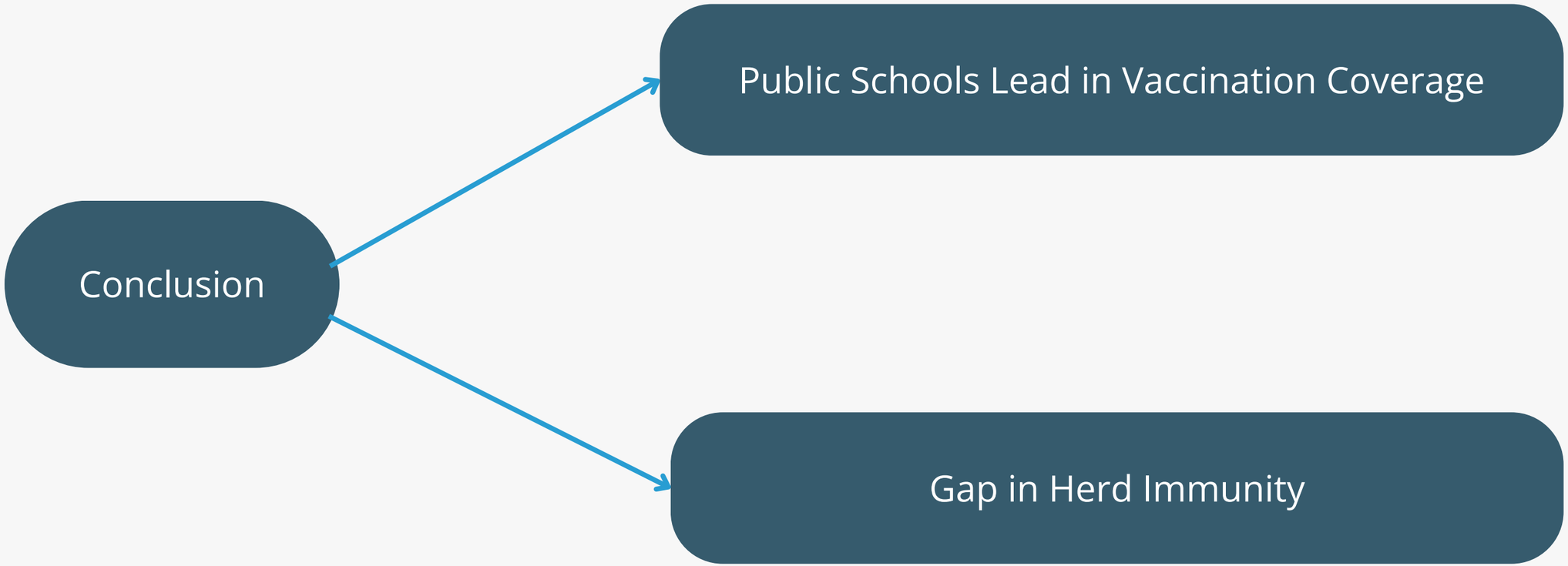
Decision: Reject the H_0.
Conclusion: We have enough evidence that the school type and vaccination rate are not independent.

	Expected Counts	
School type	<95%	>= 95%
Public	2615.27	9157.73
Charter	47.54	166.46
Private	698.19	2444.81

Chi-square Hypothesis Test



Results & Discussion



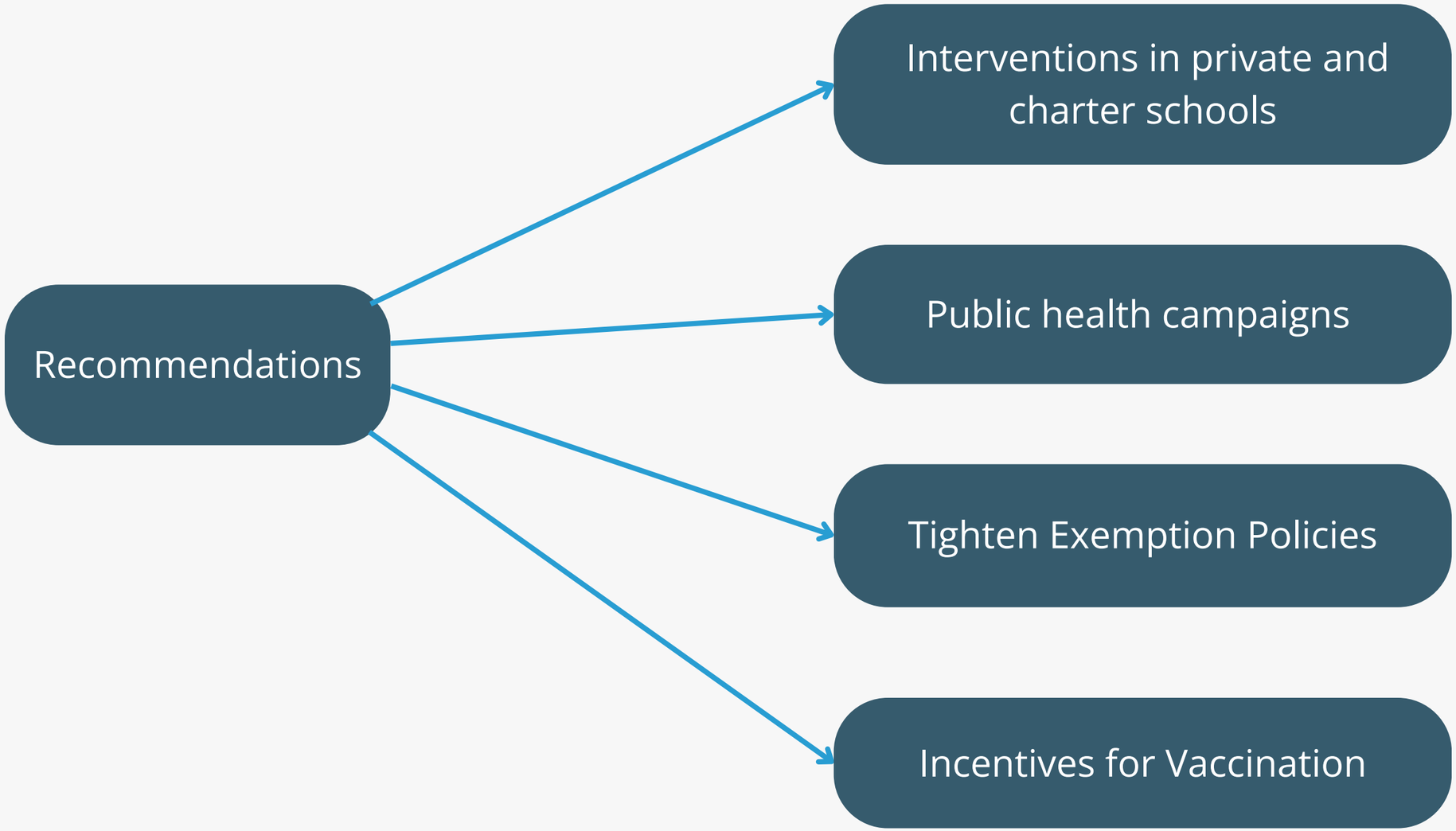
Results & Discussion

Factors to Explore → In the dataset, there are three variables that might contribute to these differences: exemptions for medical, personal, or religious reasons.

school_type <fctr>	mean_med_exempt <dbl>	mean_pers_exempt <dbl>	mean_rel_exempt <dbl>
Public	0.2475	7.216667	0.2516667
Private	1.2275	15.205000	3.3100000

Limitations → Exemption data does not include charter schools.

Results & Discussion



Results & Discussion

Future Research

Investigating the reasons behind the lower vaccination rates in “charter schools” can provide actionable insights to policymakers.

References

[1] Patel M, Lee AD, Clemmons NS, et al. National Update on Measles Cases and Outbreaks — United States, January 1–October 1, 2019. MMWR Morb Mortal Wkly Rep 2019;68:893–896. DOI: http://dx.doi.org/10.15585/mmwr.mm6840e2.

[2] https://www.cdc.gov/measles/data-research/index.html

[3] https://www.wsj.com/graphics/school-measles-rate-map/

Q & A

Thank you

FOR YOUR TIME AND ATTENTION

Link：https://github.com/WSJ/measles-data/tree/master?tab=readme-ov-file