Don't Procrastinate, Vaccinate

An Experiment to Understand the Causal Effects of Raising Awareness on Preventive Healthcare

Alex Dessouky, Matt Kawa, Sonali Serro

W241 | Section 002 | Spring 2020

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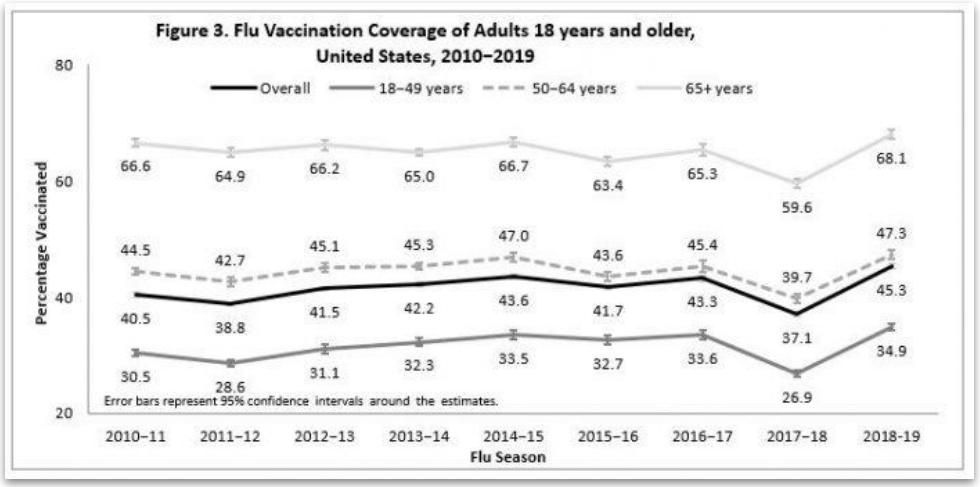
Research Question



Adult Flu Vaccination Coverage United States, 2010–2019, graph courtesy CDC

Can raising awareness around the risks to self and others cause more individuals to promote effective prevention of infectious diseases?

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Hypothesis

Individuals with a *higher propensity* for preventive healthcare will be *more responsive* to our intervention

- What is your age?
- How often do you get a health checkup?
- Would you agree that it is important for everyone to get an influenza (flu) vaccine each year?

Intervention

Treatment #1: 1-minute Informational Video

- ➔ Timing metrics can help identify non-compliance

Treatment #2: Multiple Choice Quiz

- ➔ Average quiz score: 4.8 out of 7
- ➔ ~25% of respondents believed that one can get the flu from the flu shot

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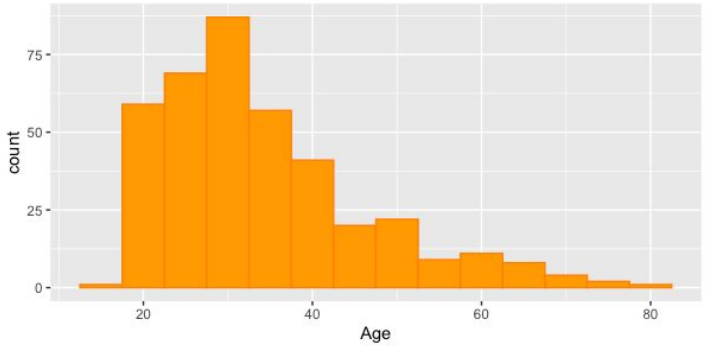
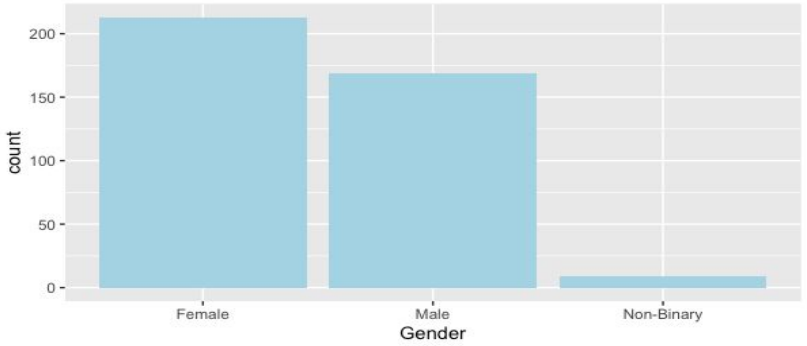
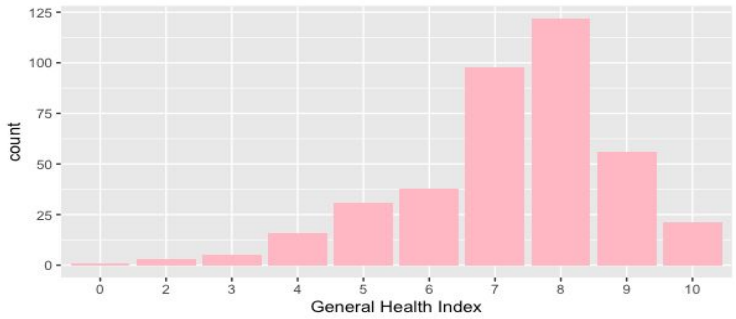
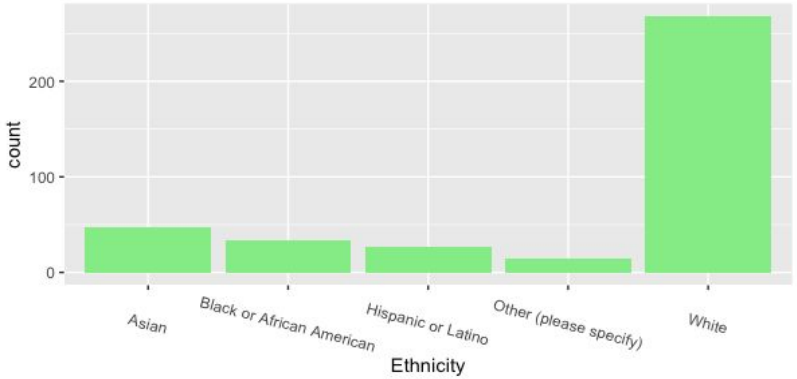
Measurement Units

- Survey launched on Prolific on Tuesday, March 17th, 2020
- Adult individuals currently residing in the United States invited to participate
- 391 completed survey responses received
- Participants spent ~2.5 minutes, on average, to complete the survey









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Randomization

Table 1: Demographic and General Health Characteristics across Treatment and Control

	Table of Means			
	Control (131)	Video Treatment(130)	Quiz Treatment (130)	p-value (aov)
Age	32.992	34.923	34.515	0.395
	(11.433)	(13.530)	(11.062)	
Female	0.542	0.492	0.600	0.219
Nonwhite	0.336	0.277	0.331	0.527
High School degree or equivalent	0.351	0.369	0.315	0.651
General health index	7.160	7.192	7.469	0.237
	(1.592)	(1.694)	(1.546)	
Health insurance	0.824	0.877	0.869	0.427
Annual health checkup	0.420	0.300	0.392	0.111
Vaccine belief	7.252	6.862	7.338	0.361
	(2.780)	(3.110)	(2.695)	

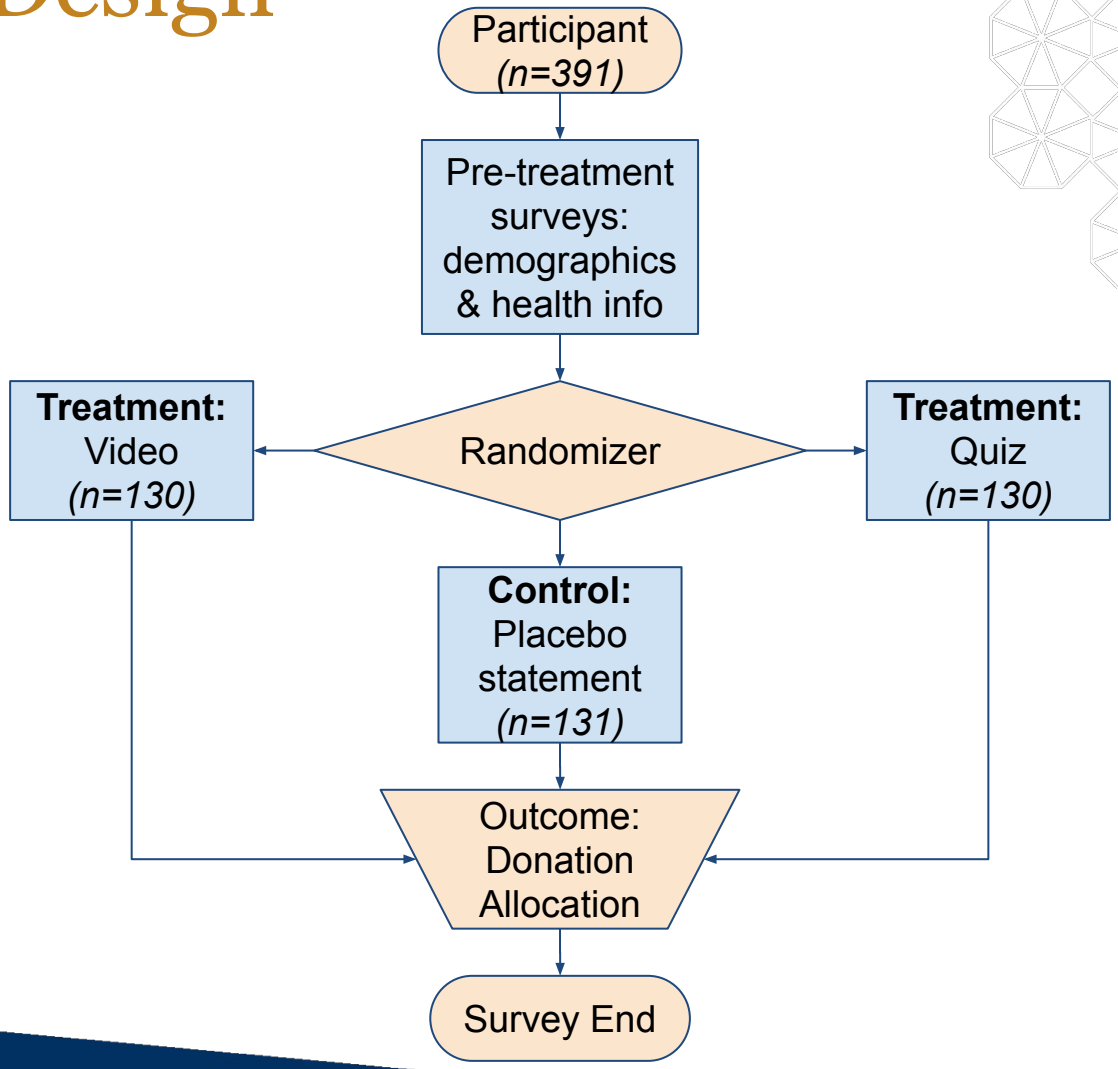
Notes:
Num observations in column headers
Standard deviations in brackets

- ➔ Participants gathered through recruiting platform *Prolific*.
- ➔ Randomized via Qualtrics's built-in mechanisms to assign participants into either control or one of two treatment groups.

Experimental Design

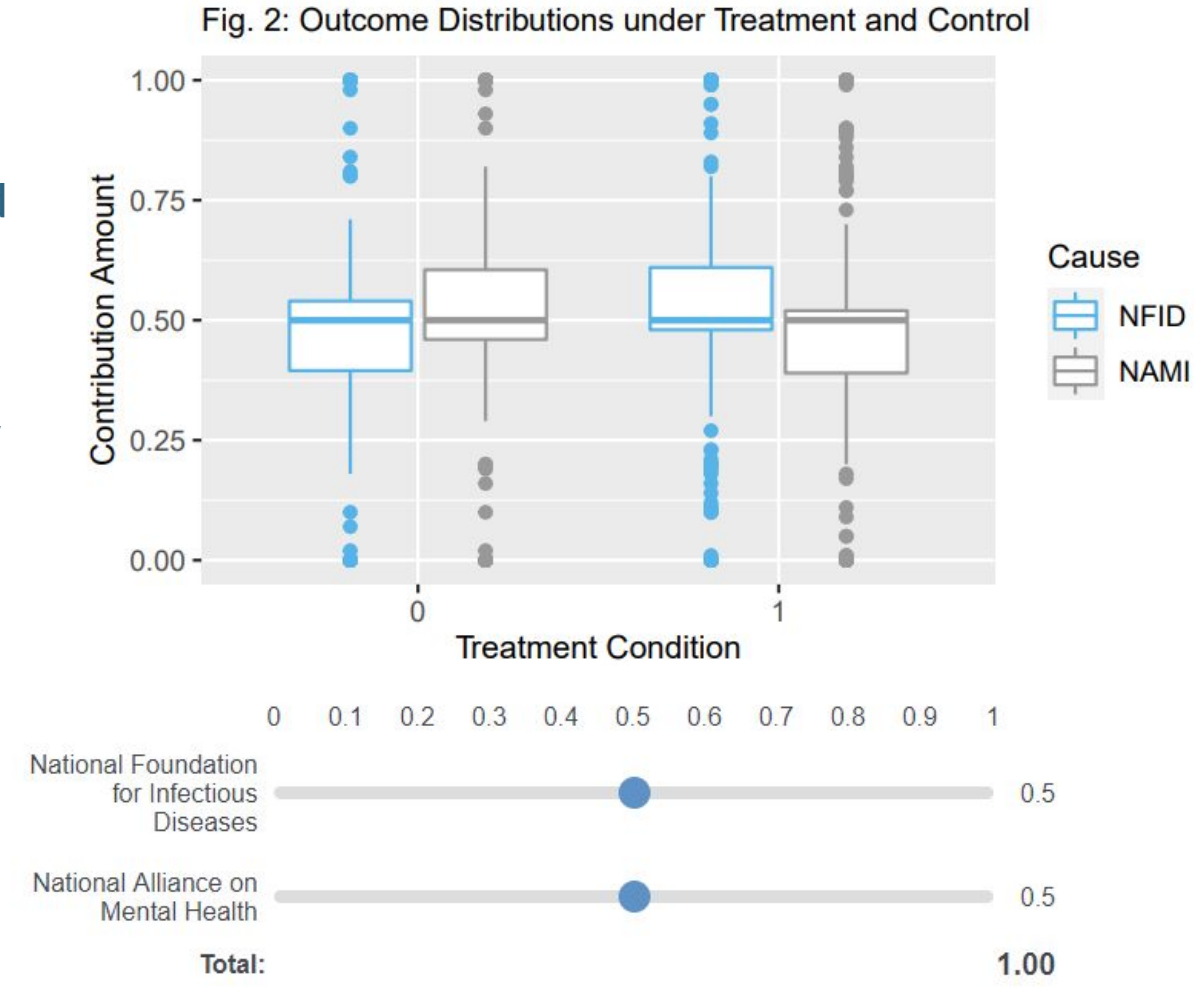
Control group: **R – O**
Treatment groups: **R X O**

Comparison drawn between observations of control group and post-intervention treatment groups.



Outcome Measures

- Participants were asked to allocate a $1 donation between two charities.
- Allocating more money to infectious disease education (NFID) is intended to indicate a stronger response to treatment.
- Roughly 40% allocated an equal amount to both charities.



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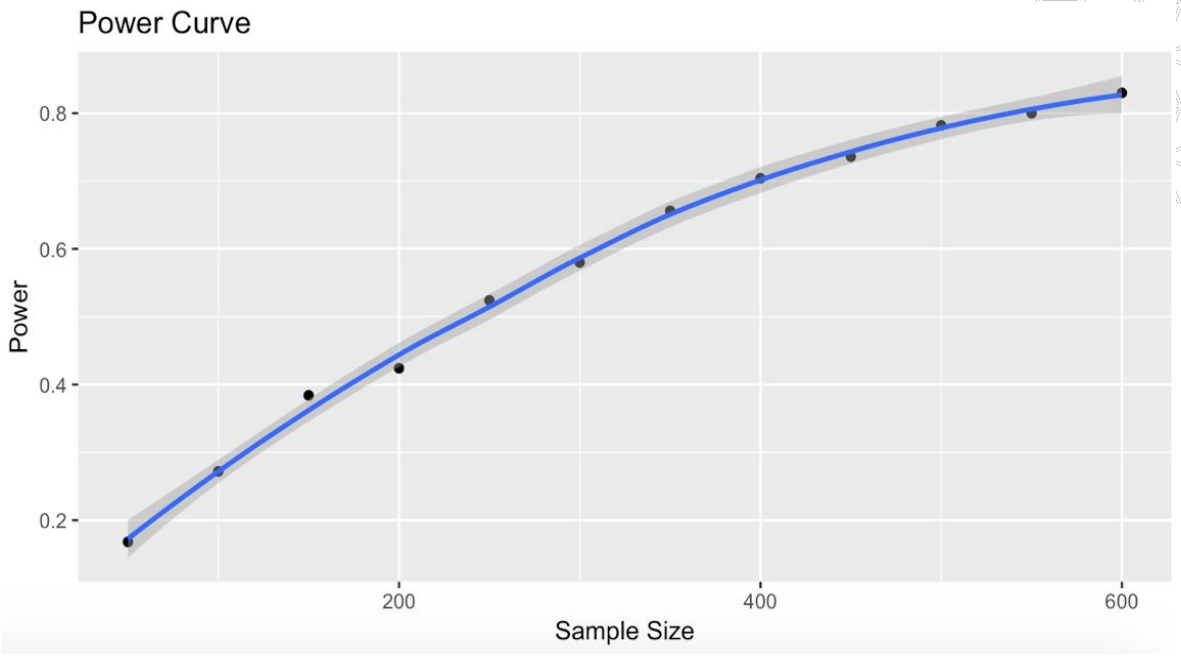
Power Analysis

Assumptions

- Potential outcome in control is normally distributed with μ = \$0.50 and σ = \$0.20
- The effect of our treatment is \$0.05
- The effect of the video and quiz treatments are equivalent



Average Treatment Effect

Identification of "good controls"

- ➔ Stepwise regression approach
- ➔ Anova test to determine additional covariate(s)
- ➔ Stop criteria: no significant Anova results for remaining covariates

	Dependent variable:	
	Contribution to National Foundation of Infectious Diseases	
	(1)	(2)
Video Treatment	0.009	0.014
	(0.035)	(0.033)
Quiz Treatment	0.037	0.026
	(0.032)	(0.031)
Vaccine belief		0.022***
		(0.005)
Male (gender)		0.060**
		(0.027)
Non-Binary (gender)		−0.189*
		(0.105)
General health index		0.024***
		(0.009)
Age		0.003**
		(0.001)
Constant	0.490***	0.040
	(0.023)	(0.079)
Observations	391	391
R^2	0.003	0.121
Adjusted R^2	-0.002	0.105
Residual Std. Error	0.270 (df = 388)	0.255 (df = 383)
F Statistic	0.652 (df = 2; 388)	7.505*** (df = 7; 383)
Note:		*p<0.1; **p<0.05; ***p<0.01
		Robust Standard Errors

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Heterogeneous Treatment Effects

	Dependent variable:		
	Contribution to National Foundation of Infectious Diseases		
	Age (Binned)	Health Checkup Frequency	Vaccine Belief
	(1)	(2)	(3)
Video Treatment	0.005	−0.067	−0.189**
	(0.037)	(0.060)	(0.095)
Quiz Treatment	0.047	−0.024	0.062
	(0.035)	(0.056)	(0.106)
Vaccine belief	0.022***	0.023***	0.012
	(0.005)	(0.005)	(0.009)
Male (gender)	0.057**	0.042	0.062**
	(0.027)	(0.027)	(0.026)
Non-Binary (gender)	−0.199*	−0.215*	−0.192*
	(0.106)	(0.112)	(0.102)
General health index	0.024***	0.023**	0.024***
	(0.009)	(0.009)	(0.009)
Health checkup once a year		−0.096*	
		(0.056)	
Health checkup once in six months		−0.028	
		(0.072)	
Health checkup once in three months		−0.224	
		(0.149)	
Health checkup never		−0.101	
		(0.075)	
Age		0.003**	0.003**
		(0.001)	(0.001)
Video:Health checkup once a year		0.164**	
		(0.081)	
Video:Health checkup once in six months		0.004	
		(0.096)	
Video:Health checkup once in three months		0.191	
		(0.186)	
Video:Health checkup never		0.231	
		(0.194)	
Quiz:Health checkup once a year		0.046	
		(0.074)	
Quiz:Health checkup once in six months		0.017	
		(0.091)	
Quiz:Health checkup once in three months		0.168	
		(0.177)	
Quiz:Health checkup never		0.353***	
		(0.111)	
Video:Vaccine belief			0.029**
			(0.012)
Quiz:Vaccine belief			−0.005
			(0.013)
Age >= 40	0.075		
	(0.057)		
Video:Age >= 40	0.023		
	(0.081)		
Quiz:Age >= 40	−0.078		
	(0.076)		
Constant	0.123	0.119	0.115
	(0.076)	(0.091)	(0.099)
Observations	391	391	391
R^2	0.119	0.160	0.147
Adjusted R^2	0.098	0.117	0.127
Residual Std. Error	0.256 (df = 381)	0.254 (df = 371)	0.252 (df = 381)
F Statistic	5.692*** (df = 9; 381)	3.711*** (df = 19; 371)	7.300*** (df = 9; 381)
Note:			*p<0.1; **p<0.05; ***p<0.01
			Robust Standard Errors

Conclusion

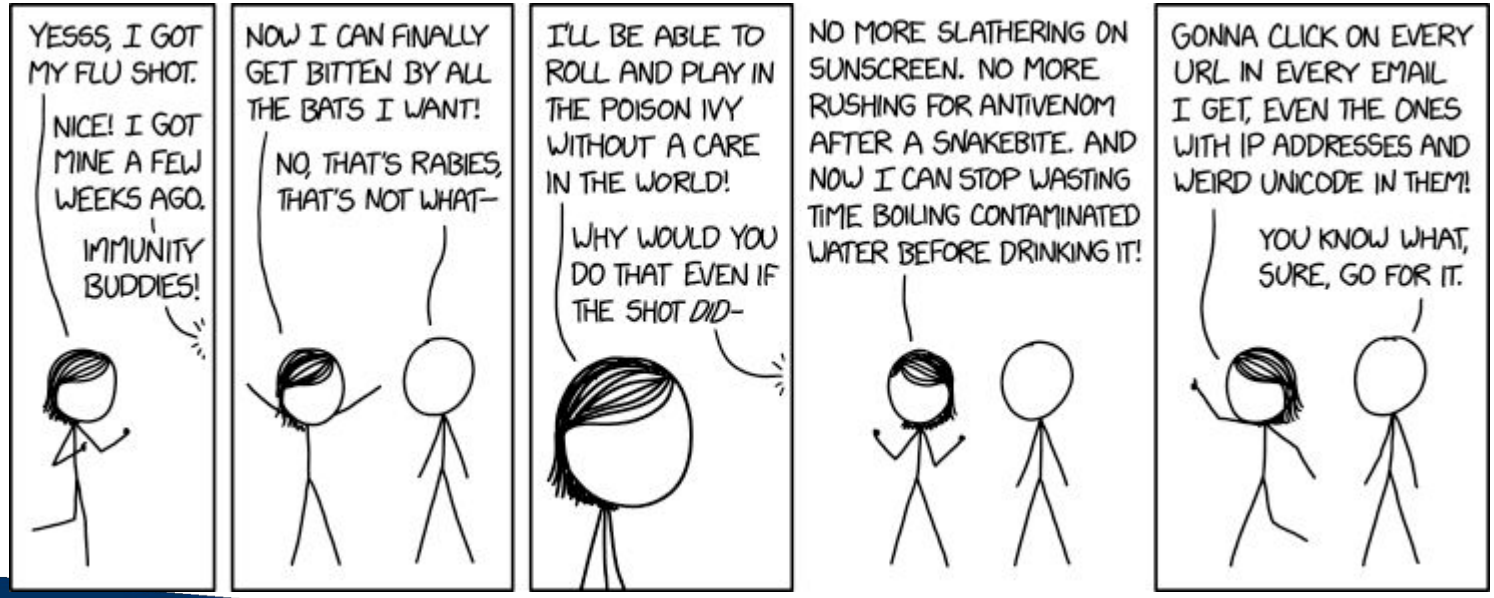
Raising awareness did cause health-conscious individuals to promote prevention of infectious diseases.

Outstanding Questions

- How generalizable is our experiment?
- What other outcome measure(s) might have been meaningful?
- If our participant's ages were more balanced, would we observe any heterogeneous effects by age?
- Direction of COVID-19 bias on our treatment effect?
- Using the "right" method to adjust our p-values for multiple comparisons

References, and thank-you!

1. Estimating the annual attack rate of seasonal influenza among unvaccinated individuals: A systematic review and meta-analysis
2. https://www.cdc.gov/flu/fluvaxview/coverage-1819estimates.htm](https://www.cdc.gov/flu/fluvaxview/coverage-1819estimates.htm
3. 41 Percent of Americans Do Not Intend to Get a Flu Shot this Season
4. Survey Reveals Common Misconceptions About Flu, Vaccination



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