Combating Skepticism Toward a Vaccine for COVID-19

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About Me

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2013-2018: PhD in Political Science from the University of Minnesota (2013-2018)

2018-2019: Science Communication Postdoctoral Fellow at Yale University & U. of Pennsylvania

2019 - : Assistant Professor of Political Science at Oklahoma State

From: Providence, RI

Enjoy: Running, Podcasts, Boston Sports

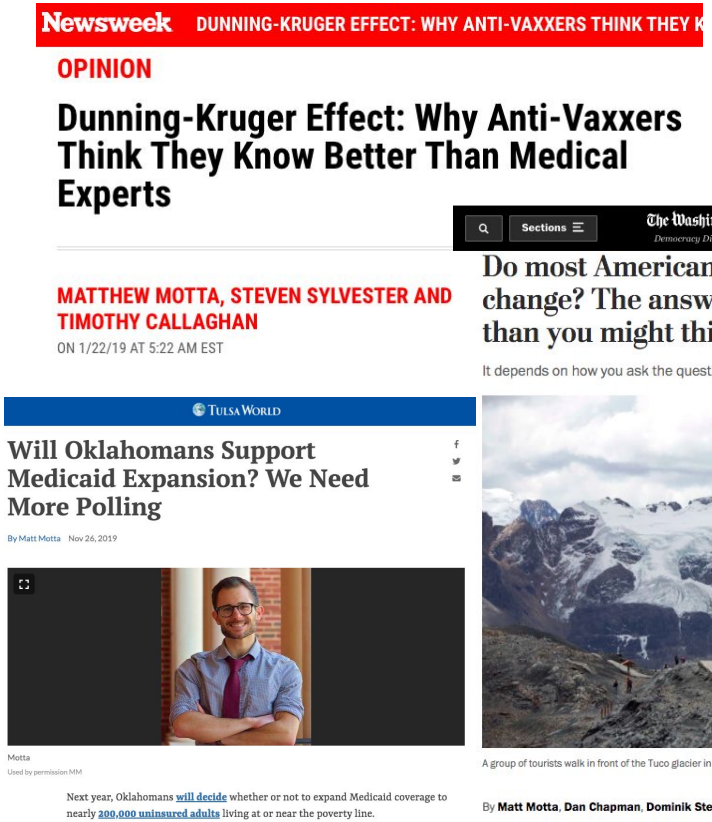
What I Study

Public Opinion: What Americans think about -- Health Policy, Climate Attitudes, Political Misinformation & Conspiracy Theories

Science Communication: Correcting misinformation about health and environmental topics

Political Psychology: How people formulate attitudes about politically relevant topics

Campaigns & Elections: STEM advocacy, voter turnout.



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Using the *Science of Science Communication* to Improve COVID-19 Vaccine Uptake

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I. The Problem

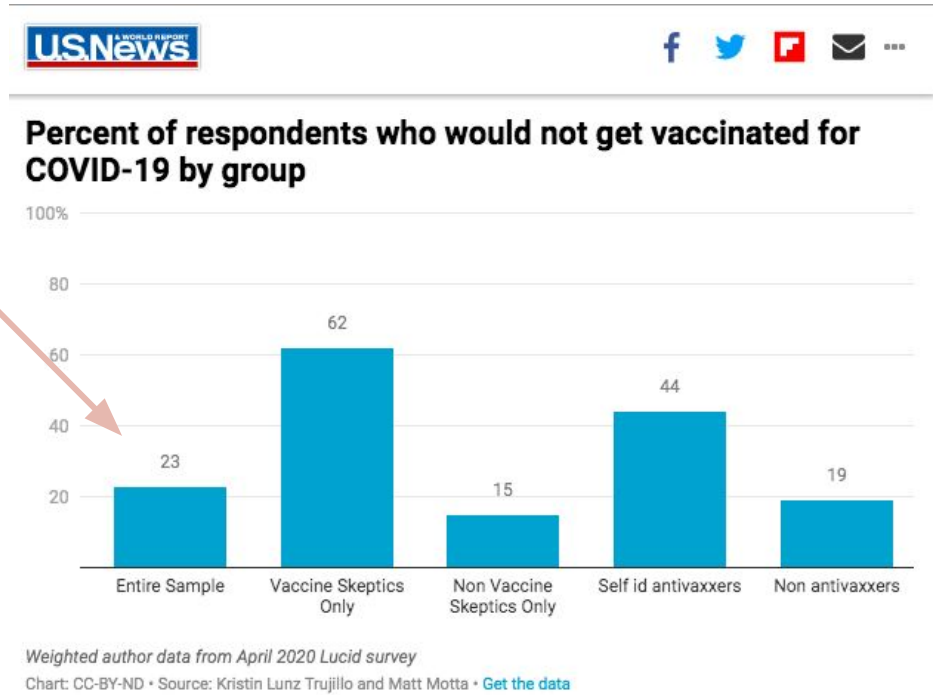
COVID-19 Vaccine Refusal

Many Americans plan to refuse a vaccine for COVID-19 (between 1/5 to 1/3, depending on the survey).

Intended refusal highest among:

- Women (vs. Men)
- African Americans
- Political conservatives

From: Lunz-Trujilo & Motta 2020.



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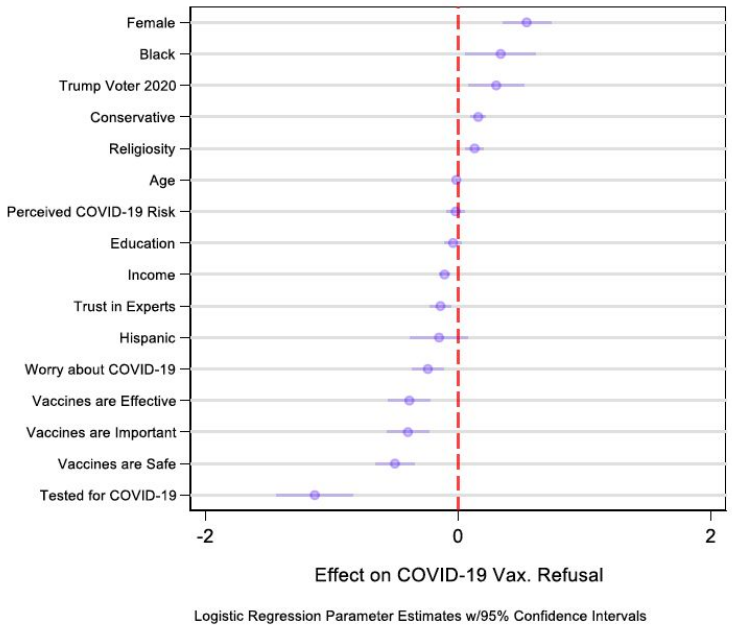

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Safety concerns

Access concerns

From: Callaghan, Moghaderi, Lueck, Hotez, Strych, Dor, Fowler, & Motta (n.d.)

Table 1. Reasons for Hesitancy to pursue a COVID-19 vaccine by Proportion of the United States Population

Reason for Refusal	Overall Percentage	White vs. Black	Male vs. Female
Vaccine Won't be Safe	17.83% (16.67, 18.99)	16.79% vs. 25.82% (15.50, 18.08 vs. 22.03, 29.61) -9.03**	13.22% vs. 22.35% (11.76, 14.69 vs. 20.56, 24.15) -9.13**
Vaccine Won't be Effective	15.55% (14.44, 16.67)	13.49% vs. 24.35% (12.29, 14.69 vs. 20.57, 28.13) -10.86**	11.45% vs. 19.46% (10.06, 12.84 vs. 17.73, 21.20) -8.01**
Lack of Insurance	6.22% (5.44, 7.00)	5.08% vs. 12.89% (4.27, 5.88 vs. 9.70, 16.09) -7.81**	6.50% vs. 5.71% (5.40, 7.61 vs. 4.62, 6.80) +0.79
Lack of Financial Resources	6.17% (5.40, 6.95)	5.27% vs. 9.14% (4.45, 6.09 vs. 6.36, 11.92) -3.87**	6.10% vs. 5.86% (5.02, 7.17 vs. 4.76, 6.96) +0.24
Already had COVID-19	3.31% (2.72, 3.90)	3.14% vs. 4.84% (2.49, 3.78 vs. 2.72, 6.96) -1.70**	3.89% vs. 2.79% (3.01, 4.77 vs. 2.00, 3.57) +1.10*
Other Reasons	7.41% (6.56, 8.25)	7.21% vs. 9.47% (6.27, 8.15 vs. 6.64, 12.29) -2.26**	4.93% vs. 9.75% (3.95, 5.91 vs. 8.38, 11.12) -4.82**

** $p<0.01$, * $p<0.05$

Notes: Percentages in the overall percentage column indicate the percentage of the American population who intend to forgo COVID-19 vaccination for each reason. Percentages in the Black vs. White and Male vs. Female columns indicate the proportion of Whites, Blacks, Males, and Females that intend to forgo vaccination for each reason respectively. Respondents who indicated they intend to refuse the vaccine were allowed to select as many of the options listed here as they liked. Quantities in parentheses indicate 95% confidence intervals. Significance determined using t-tests.

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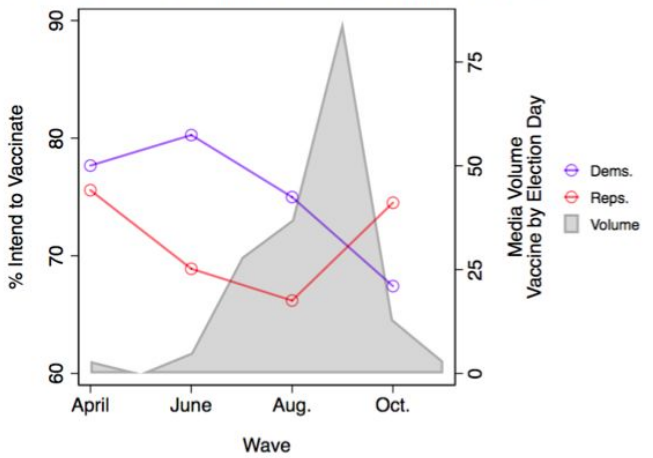
- **Political conservatives (but...)**

From: Motta (forthcoming).

Figure 1. COVID-19 Vaccination Intentions by Partisanship (April - October 2020)



Note. Combined N = 4,002.. Mean levels of vaccine refusal across survey waves. Respondents were asked to report whether they are "very likely," "somewhat likely," "not too likely," or "not likely at all" to "request to be vaccinated" against COVID-19 "when a vaccine for the novel coronavirus becomes widely available." Respondents were also asked a standard (branched) partisan identification question (with those "leaning" toward the Democratic or Republican parties coded as Independents). Responses were collected via Lucid Theorem's online opt-in internet service, which used quota sampling to target demographic representativeness on respondents' age, race, gender, educational attainment, income, partisan identification, and residential region. I apply post-stratification weights to account for any remaining differences between the sample and US population on the basis of age, income, educational attainment, gender, and race. Media volume data reflect all US newspaper articles and television closed caption data where the terms "Trump," "vaccine," and ("before Election Day" or "by Election Day") co-occur in the same piece. Media data were obtained via ESCO-host.

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COVID-19 Vaccine Refusal

From: Motta (n.d.)

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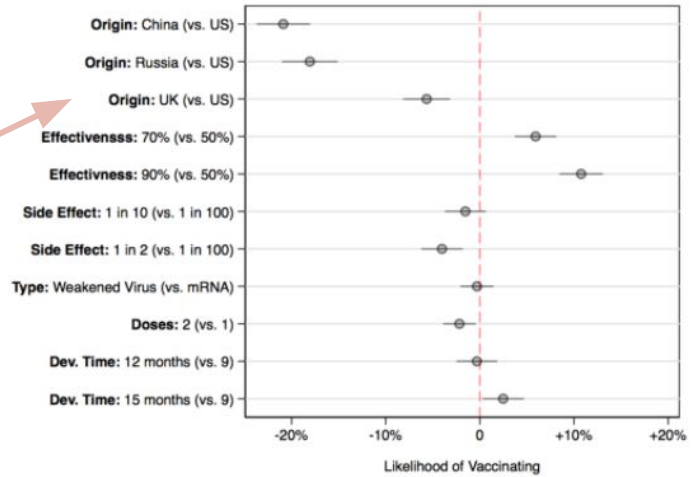
Americans' vaccine preferences may not match the vaccine we ultimately get.

- Strong preferences for US vs. non-US made vaccines (including UK vaccines)
- Efficacy and risk (of minor side effects) expectations may be unrealistic
- Even under *ideal* conditions, refusal levels >30%

Figure 1. The Effect of Hypothetical Coronavirus Vaccine Characteristics on Vaccination Intentions



Note. OLS regression coefficients presented (circles) with 95% confidence intervals extending from each one. Standard errors are clustered at the respondent level. All independent variables are dichotomous, and the outcome variable is scored to range from 0-1. Coefficients are

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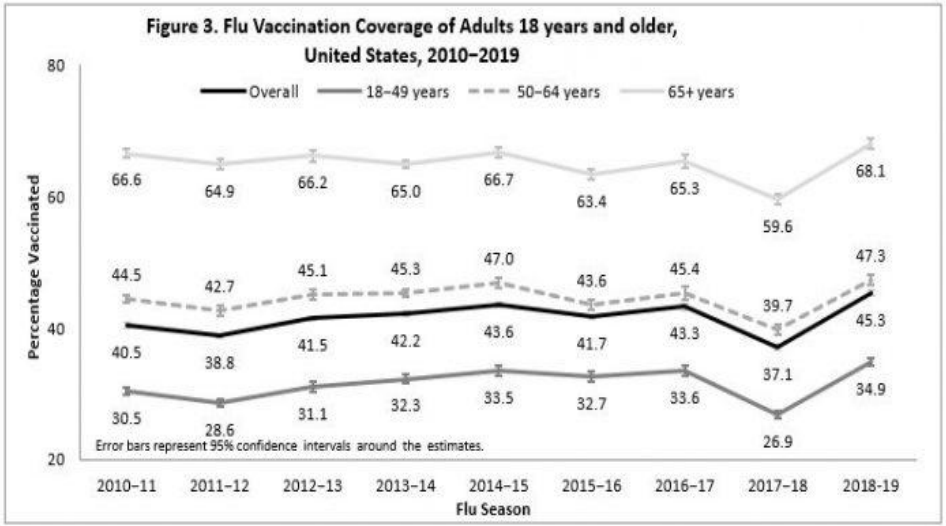
Why is Vaccine Refusal Problematic?

A Perfect Storm?

1. **Coverage:** May need 40-60% of Americans to develop immunity (either through exposure, or a vaccine).
2. **Efficacy:** Final vaccine candidates may have an 80% effectiveness ceiling.
3. **Non-compliance:** Vaccine will be elective. Most Americans must *choose* to get it.



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II. How can we use the *Science of Science Communication* to Increase Vaccine Uptake?

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The *Science* of Science Communication

1. Determine **how many** Americans hold views that are inconsistent with best available scientific evidence. (Survey Research)
2. Suggest/test the potential **causes** of those beliefs (Correlational Analysis; sometimes Longitudinal Survey Analyses).
3. Use what we know about why some people reject scientific evidence to **inform communication interventions** that correct misperceptions, change behavior, etc. (Randomized Controlled Trials).

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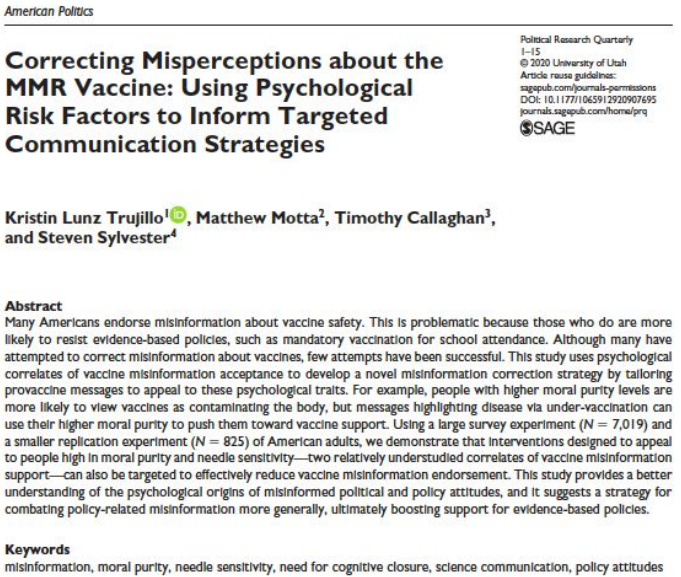
For example: approximately 1/4 Americans believe that the MMR vaccine can cause autism…



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Correcting Misperceptions about the MMR Vaccine: Using Psychological Risk Factors to Inform Targeted Communication Strategies

Kristin Lunz Trujillo[1], Matthew Motta[2], Timothy Callaghan[3], and Steven Sylvester[4]

Abstract

Many Americans endorse misinformation about vaccine safety. This is problematic because those who do are more likely to resist evidence-based policies, such as mandatory vaccination for school attendance. Although many have attempted to correct misinformation about vaccines, few attempts have been successful. This study uses psychological correlates of vaccine misinformation acceptance to develop a novel misinformation correction strategy by tailoring provaccine messages to appeal to these psychological traits. For example, people with higher moral purity levels are more likely to view vaccines as contaminating the body, but messages highlighting disease via under-vaccination can use their higher moral purity to push them toward vaccine support. Using a large survey experiment ($N = 7{,}019$) and a smaller replication experiment ($N = 825$) of American adults, we demonstrate that interventions designed to appeal to people high in moral purity and needle sensitivity—two relatively understudied correlates of vaccine misinformation support—can also be targeted to effectively reduce vaccine misinformation endorsement. This study provides a better understanding of the psychological origins of misinformed political and policy attitudes, and it suggests a strategy for combating policy-related misinformation more generally, ultimately boosting support for evidence-based policies.

Keywords

misinformation, moral purity, needle sensitivity, need for cognitive closure, science communication, policy attitudes

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Table 2. Baseline Predictors of Antivaccine Misinformation Endorsement for the Original Experiment, Including Treatment Controls.

	Baseline
Needle sensitivity	**1.88** (0.14)**
Need for closure	**−0.70** (0.22)**
Purity	**1.24** (0.17)**
Party ID (Republican = 1)	**0.13** (0.12)**
Sex: female	**0.51** (0.06)**
Black	**0.88** (0.09)**
Hispanic	**0.62** (0.10)**
Education	**−0.01* (0.02)**
T: vax works	**−0.34** (0.09)**
T: measles	−0.09
	(0.09)
T: roots	−0.08
	(0.09)
T: no needle	0.04
	(0.09)
τ_1	**0.81** (0.18)**
τ_2	**2.65** (0.19)**
τ_3	**4.38** (0.19)**
N	6,517

Ordered logistic regression coefficients presented; standard errors in parentheses. Table contains all baseline effects of NS, NCC, and purity, adjusting for experiment assignment. Baseline models restricting analysis to the control group only are available in the

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Table 1. Summary of Experimental Conditions.

Condition	Article title	Key quotation	Targeted trait
1 ("control")	Language development in babies	N/A	None (control condition)
2 ("vaccines are safe")	Yes, vaccines are safe	"The vast majority of scientists, doctors, and vaccine experts agree that vaccines are safe and effective, . . . and that they do not cause autism."	Need for cognitive closure
3 ("roots of autism")	The roots of autism are less mysterious than you think	"However, many researchers do have a good idea of the contributing factors of Autism Spectrum Disorder (ASD)."	Need for cognitive closure
4 ("measles")	Measles infections are real, and they are serious	". . . Jenna examined Sofia's throat and noticed that sickly bluish-white bumps had infiltrated the one-year-old's cheeks."	Moral purity
5 ("no needles")	No needles? No problem	"Medical researchers in recent years have been developing new ways to protect us against dangerous and deadly diseases without the use of needles."	Needle sensitivity

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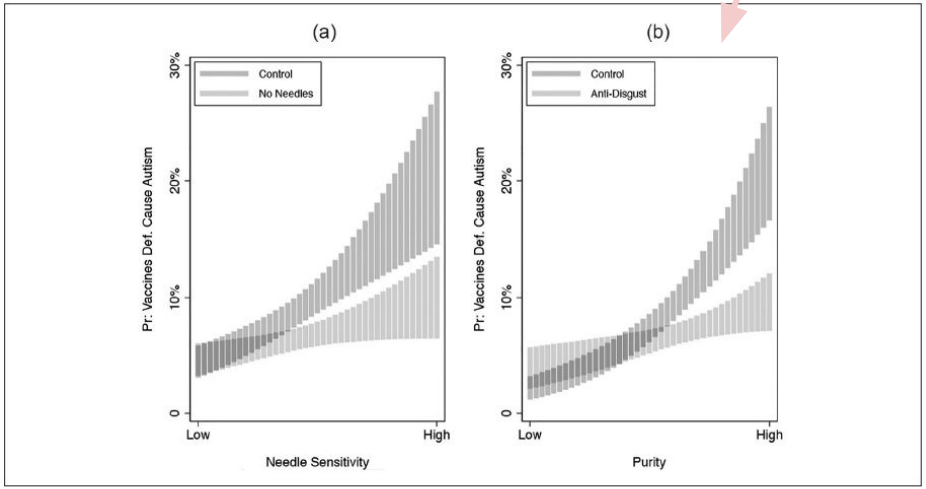

Figure 1. The predicted effects of NS (a) and MP (b) on the probability of strongly endorsing antivaccine misinformation in the original study.
Predicted probabilities are presented as 95% confidence intervals (see Kahan et al. 2017) across the control (darker gray) and targeted treatment (lighter gray) conditions. MP = moral purity; NS = needle sensitivity.

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Strategies That Could Boost Vaccination Intentions

Message design features:

- Eliciting concern about *personally* getting sick
- Eliciting concern about getting *others* sick
- Eliciting concern about *economic* costs
- Avoiding “shaming”
- Messages voiced by ordinary people (but experts may be effective as well).
- Mixed evidence on fact-based “debunking”
- Stronger evidence for fact or logic based “de-bunking”

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HEALTH COMMUNICATION
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Routledge
Taylor & Francis Group

Check for updates

How Localized Outbreaks and Changes in Media Coverage Affect Zika Attitudes in National and Local Contexts

Kathryn Haglin[a], Daniel Chapman[b], Matthew Motta[c], and Dan Kahan[d]

[a]Department of History, Political Science and International Studies, University of Minnesota-Duluth; [b]Annenberg Public Policy Center, University of Pennsylvania; [c]Department of Political Science, Oklahoma State University; [d]Yale Law School, Yale University

ABSTRACT

Public opinion researchers often find changing attitudes about pressing public health issues to be a difficult task and even when attitudes do change, behaviors often do not. However, salient real-world events have the ability to bring public health crises to the fore in unique ways. To assess the impact of localized public health events on individuals' self-reported behavior, this paper examines Floridians' intentions to take preventative measures against the Zika virus before and after the first locally transmitted case of Zika emerged in Florida. We find that local and national media coverage of Zika increased significantly following its first transmission in the U.S. Critically, we also find that Floridians surveyed after this increase in media coverage were more likely to pay attention to Zika-related news, and self-report intentions to take protective action against the virus. These results suggest that behavioral intentions can shift as health threats become more proximate.

Public health campaigns often seek to create behavioral change in the mass public, either by encouraging the uptake of a new behavior or the reduction of an old one. Over time, such efforts have covered a wide range of health topics. Some examples of such campaigns include educating individuals on healthy diet and exercise habits, informing the public about the safety and importance of vaccines in disease prevention, and the appropriate use of antibiotic therapies to prevent the development of antimicrobial-

these appeals are unsuccessful, what sort of information can change behavior? Real world events have the potential to change behavior by elevating risk perceptions in the general public. In this paper, we use the case of the first locally transmitted Zika virus infection that occurred in Florida in July 2016 to test whether specific, localized public health events and outbreaks can shift behavioral intentions in the public.

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From: Motta & Goren n.d.

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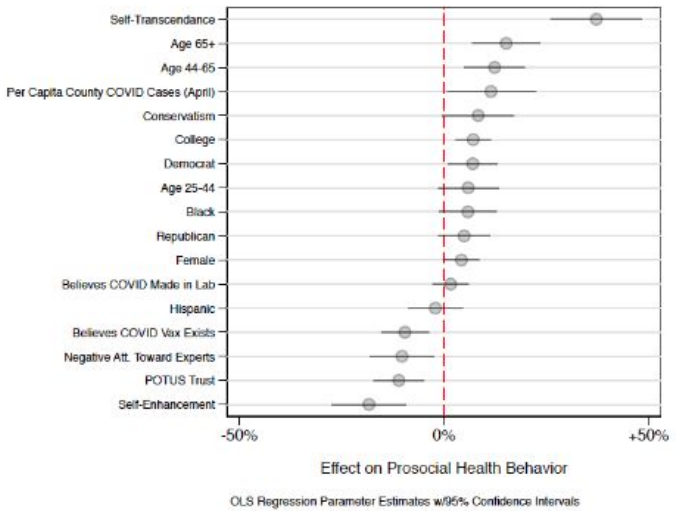
From Motta & Goren, n.d.

Figure 1. The Effect of ST & SE Values on Self-Reported PSHB (April 2020 Survey)



Note. N = 1,1015. OLS parameter estimates with 95% confidence intervals presented. Please refer to the Supplemental Materials for full model output. Post-stratification weights are applied.

[6] https://today.yougov.com/topics/politics/articles-reports/2020/04/16/coronavirus-social-distancing-americans-not-so-div

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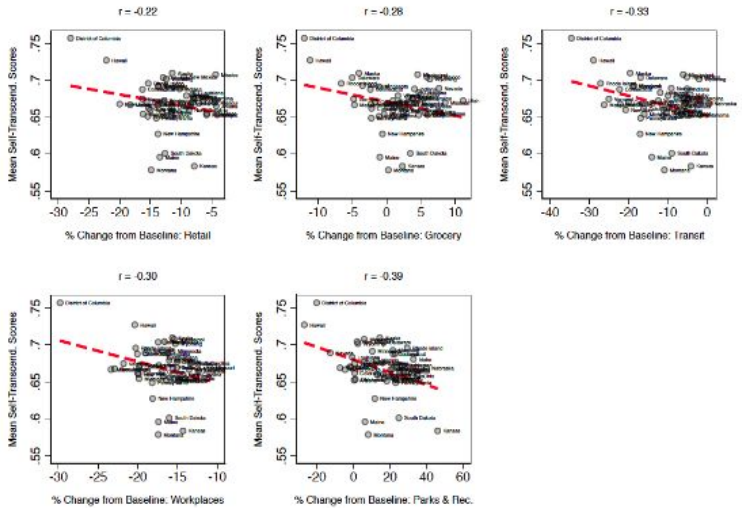
Figure 2. The Effect of ST Values on State-Level Social Distancing Behavior (Phone Tracking Data)



Note. Scatterplot with a line of best fit presented. State-level data are derived from a nationally representative 2011 YouGov survey of N=10,000 U.S. Adults, and matched to phone-tracking data from Google (comparing average daily movement from 2/15-4/17, 2020 to baseline daily estimates from 1/3-2/6, 2020).

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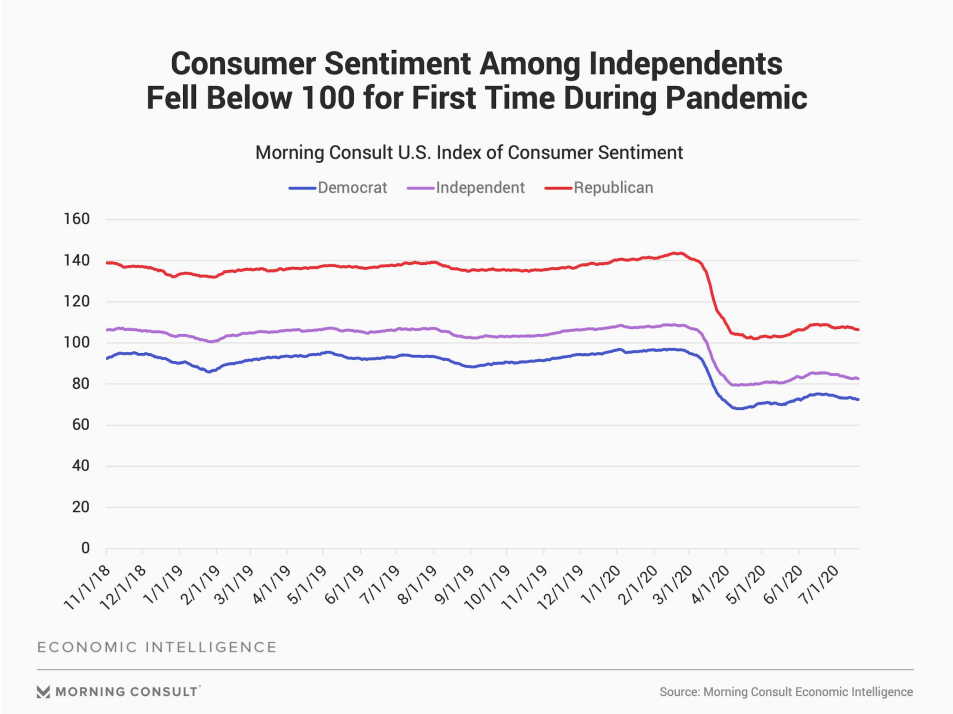

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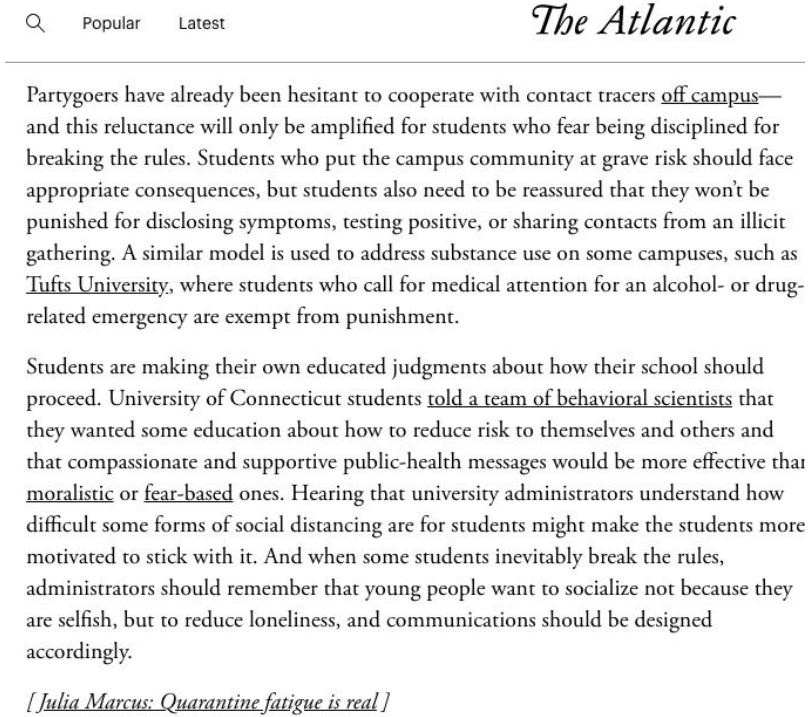

Popular Latest

The Atlantic

Partygoers have already been hesitant to cooperate with contact tracers off campus—and this reluctance will only be amplified for students who fear being disciplined for breaking the rules. Students who put the campus community at grave risk should face appropriate consequences, but students also need to be reassured that they won't be punished for disclosing symptoms, testing positive, or sharing contacts from an illicit gathering. A similar model is used to address substance use on some campuses, such as Tufts University, where students who call for medical attention for an alcohol- or drug-related emergency are exempt from punishment.

Students are making their own educated judgments about how their school should proceed. University of Connecticut students told a team of behavioral scientists that they wanted some education about how to reduce risk to themselves and others and that compassionate and supportive public-health messages would be more effective than moralistic or fear-based ones. Hearing that university administrators understand how difficult some forms of social distancing are for students might make the students more motivated to stick with it. And when some students inevitably break the rules, administrators should remember that young people want to socialize not because they are selfish, but to reduce loneliness, and communications should be designed accordingly.

[Julia Marcus: Quarantine fatigue is real]

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% of Americans who "Greatly Trust" each of the following groups to "do what is right."

	April	**June**	**Aug.**	**Oct.**
Medical Doctors	48	44	43	48
The CDC	38	31	32	33
Scientists	44	33	36	41

Source: SciPol I-IV. Motta 2020.

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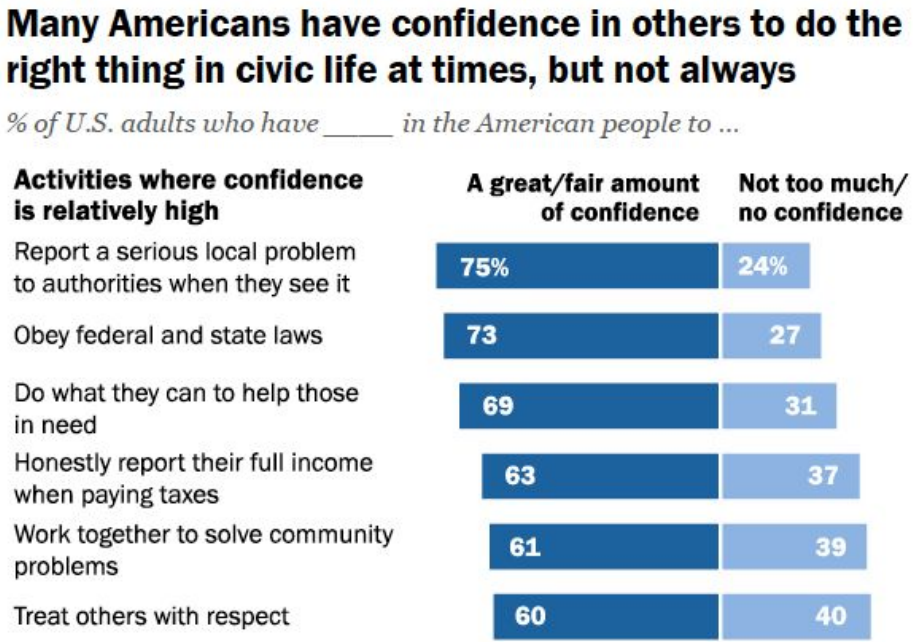

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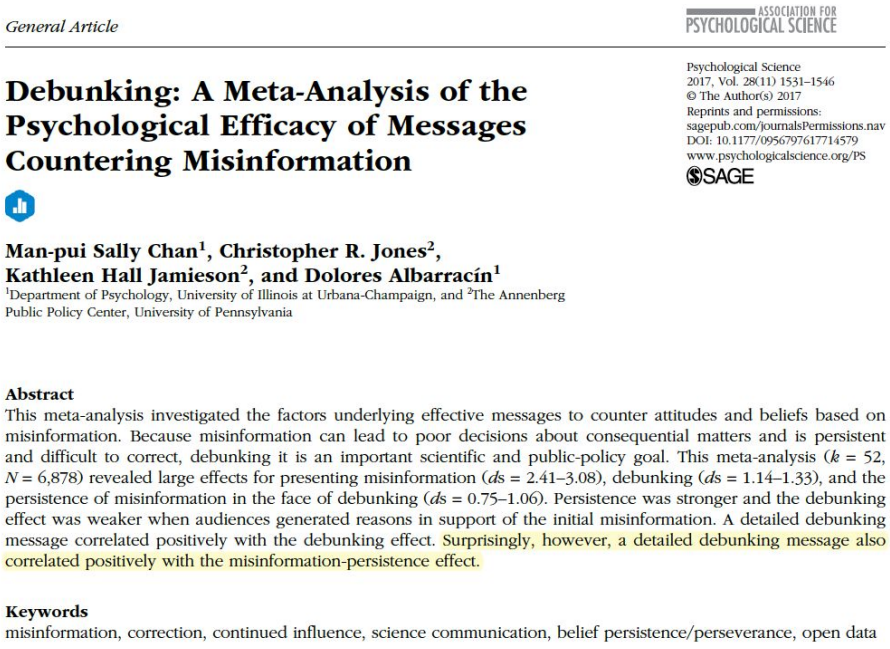

General Article

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Debunking: A Meta-Analysis of the Psychological Efficacy of Messages Countering Misinformation

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Abstract
This meta-analysis investigated the factors underlying effective messages to counter attitudes and beliefs based on misinformation. Because misinformation can lead to poor decisions about consequential matters and is persistent and difficult to correct, debunking it is an important scientific and public-policy goal. This meta-analysis (k = 52, N = 6,878) revealed large effects for presenting misinformation (ds = 2.41–3.08), debunking (ds = 1.14–1.33), and the persistence of misinformation in the face of debunking (ds = 0.75–1.06). Persistence was stronger and the debunking effect was weaker when audiences generated reasons in support of the initial misinformation. A detailed debunking message correlated positively with the debunking effect. Surprisingly, however, a detailed debunking message also correlated positively with the misinformation-persistence effect.

Keywords
misinformation, correction, continued influence, science communication, belief persistence/perseverance, open data

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Strategies That Could Boost Vaccination Intentions

Message design features:

- Eliciting concern about *personally* getting sick
- Eliciting concern about getting *others* sick
- Eliciting concern about *economic* costs
- Avoiding "shaming"
- Messages voiced by ordinary people (but experts may be effective as well).
- Mixed evidence on fact-based "debunking"
- **Stronger evidence for fact or logic based "pre-bunking"**

Persuading Others to Avoid Persuasion: Inoculation Theory and Resistant Health Attitudes

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Inoculation theory, a theory of conferring resistance to persuasive influence, has established efficacy as a messaging strategy in the health domain. In fact, the earliest research on the theory in the 1960s involved health issues to build empirical support for tenets in the inoculation framework. Over the ensuing decades, scholars have further examined the effectiveness of inoculation-based messages at creating robust positive health attitudes. We overview these efforts, highlight the structure of typical inoculation-based health messages, and describe the similarities and differences between this method of counter-persuasion and other preparatory techniques commonly employed by health researchers and practitioners. Finally, we consider contexts in which inoculation-oriented health messages could be most useful, and describe how the health domain could offer a useful scaffold to study conceptual issues of the theory.

III. Initial Evidence: Effective COVID-19 Vaccine Communication Strategies

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What We Did

Surveyed 7,064 American Adults (demographically representative of the U.S. adult population).

Randomized Controlled Trial (RCT): assignment to 1 of 12 pro-vaccine messages.

Messages varied along three dimensions:

1. Frames (personal health; collective health; and economic risks of not vaccinating)
2. Sources (experts vs. non-experts)
3. “Pre-bunking” information (highlighting rigors of expedited clinical trials)

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Some Background Terminology:

Frames: the *arguments* messages make in favor of vaccination .

Sources: the *people* who communicate pro-vaccine arguments

"Pre-bunking:" efforts to *preempt and counteract* potential concerns about vaccine safety.

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Visualizing Our RCT

Frame	Source (Lay)	Source (Expert)
Personal Health Risk No Clinical Trial Info. vs. Clinical Trial Info (Pre-bunk)	Thinking about Skipping the COVID-19 Vaccine? Take it from Someone Who Had the Virus: That's a Bad Idea. *Corey Miller is an accountant from Austin, TX, who suffered complications from the novel coronavirus in March 2020.*	Thinking about Skipping the COVID-19 Vaccine? You're Putting Your Health at Risk *Dr. Corey Miller is a Medical Doctor at the University of Texas – Austin*
Economic Costs No Clinical Trial Info. vs. Clinical Trial Info (Pre-bunk).	Thinking about Skipping the COVID-19 Vaccine? Take it from Someone Who Lost Their Job: That's a Bad Idea. *Corey Miller is an accountant from Austin, TX, who suffered job loss as a result of the novel coronavirus in March 2020.*	Thinking about Skipping the COVID-19 Vaccine? Prepare for a Slower Economic Recovery *Dr. Corey Miller is a Professor in the Department of Economics at the University of Texas – Austin*
Collective Health Consequences No Clinical Trial Info. vs. Clinical Trial Info (Pre-bunk).	Thinking about Skipping the COVID-19 Vaccine? Tell that to People who Depend on You to Get Vaccinated. *Corey Miller is an accountant from Austin, TX, who is currently undergoing chemotherapy treatments for lung cancer.*	Thinking about Skipping the COVID-19 Vaccine? Prepare for More Deaths & Hospitalizations *Dr. Corey Miller is an Austin, TX based Pharmaceutical Consultant for Johnson & Johnson, a U.S. company developing a vaccine for COVID-19.*

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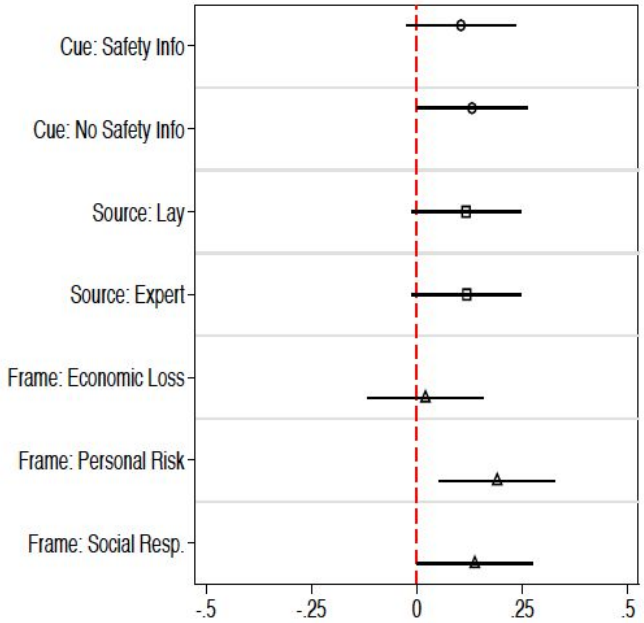
What We Found

Figure 1. Independent Effects of Frame, Source, & Clinical Info. Cue (Pooled)



Note. Ordered logistic regression coefficients presented, with 95% confidence intervals. Outcome variable is an ordinal indicator of COVID-19 vaccine intention (with higher scores reflecting increased intention to vaccinate). Coefficients which do not intersect with the dashed red line are statistically significant from control group effects at the $p < 0.05$, level (two-tailed). Results are derived from three models (denoted by different shapes, in the figure) which regressing vaccine intention on indicators denoting assignment to each design element listed on the left-hand side of the figure; pooled across all

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What We Found

About a 4-5% increase in vaccination intention

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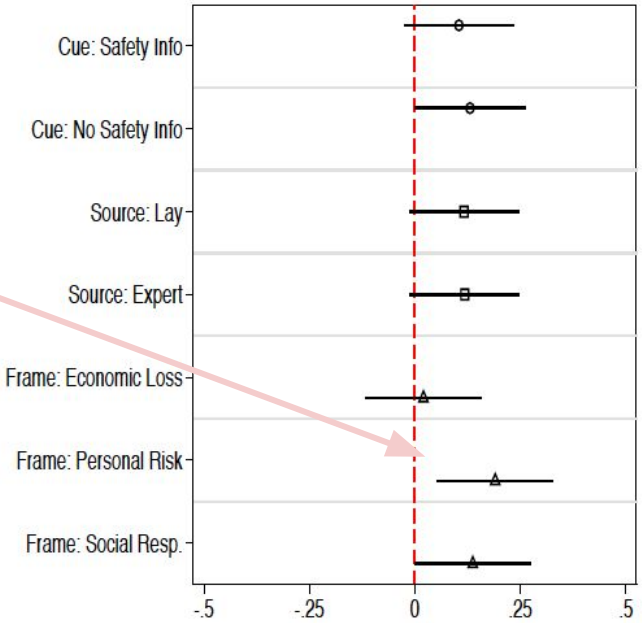

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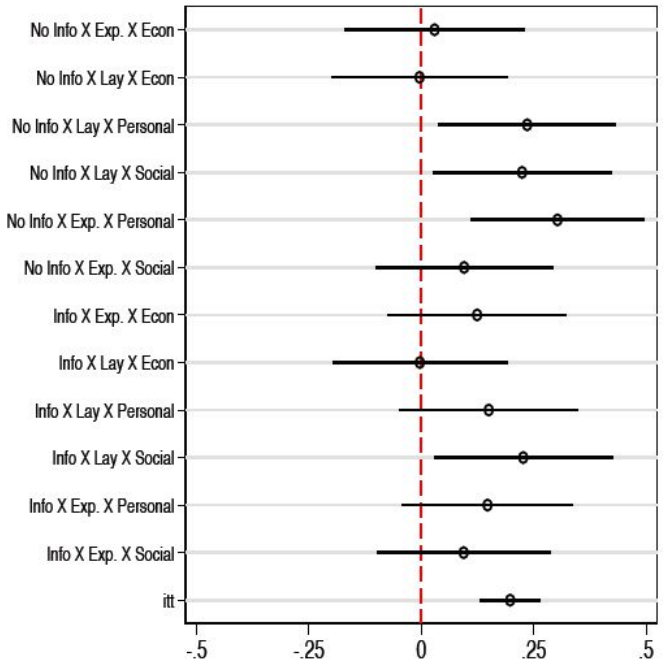
What We Found

Figure 3. Fully Disaggregated Treatment Effects



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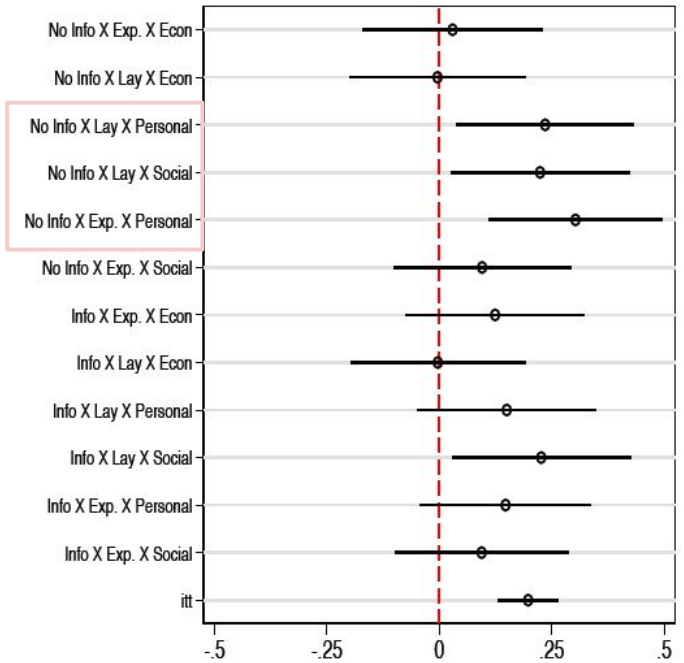

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Putting it All Together

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Recommendations

Do….

1. Highlight the availability, ease, and cost of vaccination – especially when speaking to marginalized audiences.
2. Promote messages that emphasize the *personal and/or collective health risks* of not vaccinating.
    a. Personal narratives that detail experience with the disease; highlight why the immune-compromised depend on widespread vaccination.
    b. Medical assessments of risk and social consequences can also be effective (but evidence is more mixed)

Don't…

1. Shame people for failing to vaccinate
2. Assume that providing misinformed people with "the facts" will be enough to change their minds.
    a. This may include efforts to highlight the safety and efficacy of vaccines produced under Operation Warp Speed.
    b. Note that, even if we can change minds, that does not necessarily imply that we can change *behaviors*.

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Other Trends to Watch

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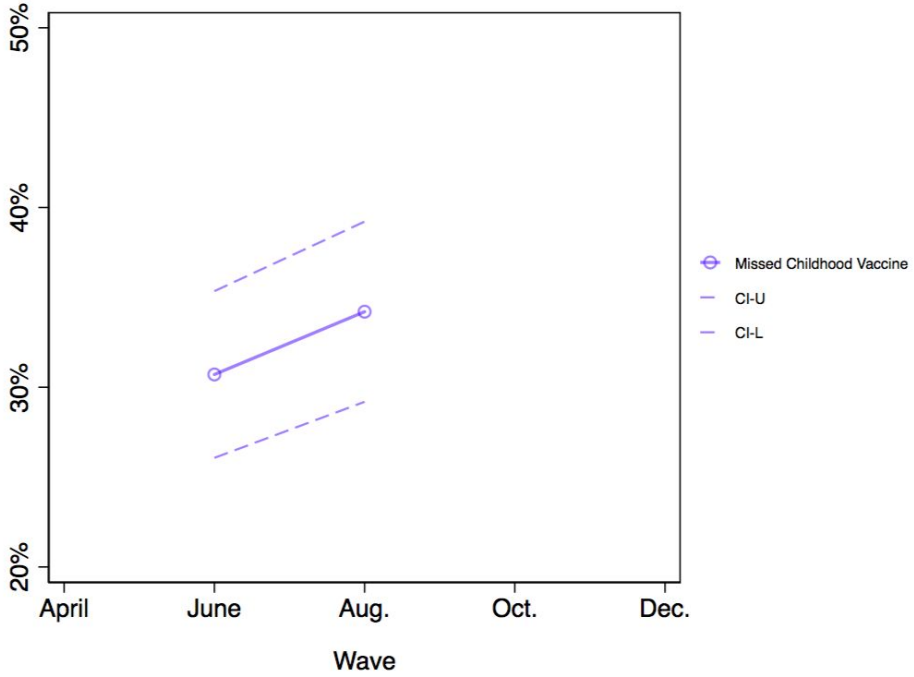
- In Aug, 36% of parents with children <18 reported issues keeping up with routine vaccination scheduling (SciPol II: Motta 2020).
- As of Aug, 39% of Americans plan to vaccinate against seasonal influenza
- Americans' *preferred* coronavirus vaccine may not match what we ultimately get. That could influence vaccine uptake.

Concern about the pandemic, and willingness to take action to help others, have dropped off significantly in recent months.



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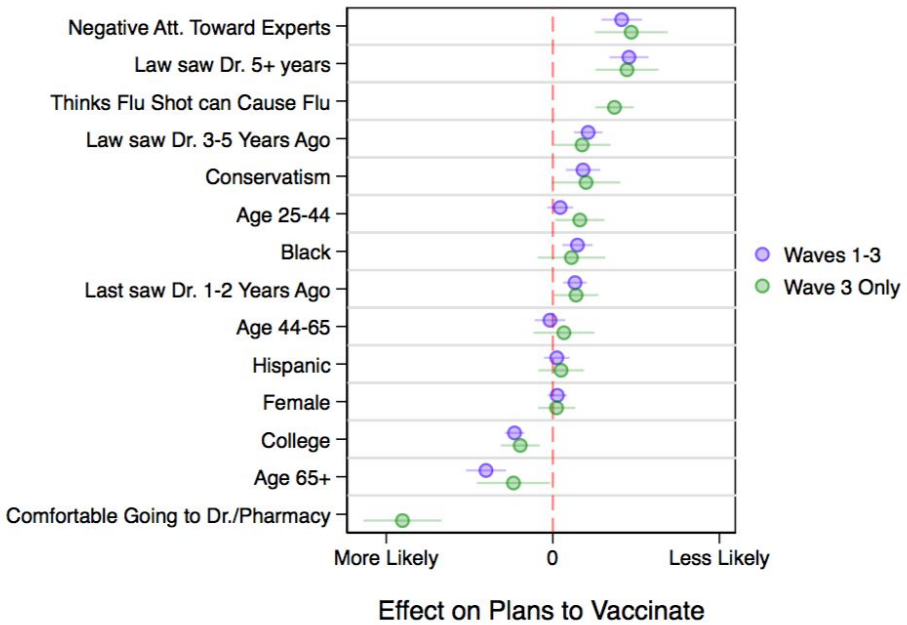

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Other Trends to Watch

- In June, 31% of parents with children <18 reported issues keeping up with routine vaccination scheduling (SciPol II: Motta 2020).
- As of June, 41% of Americans plan to vaccinate against seasonal influenza
- Americans' *preferred* coronavirus vaccine may not match what we ultimately get. That could influence vaccine uptake.

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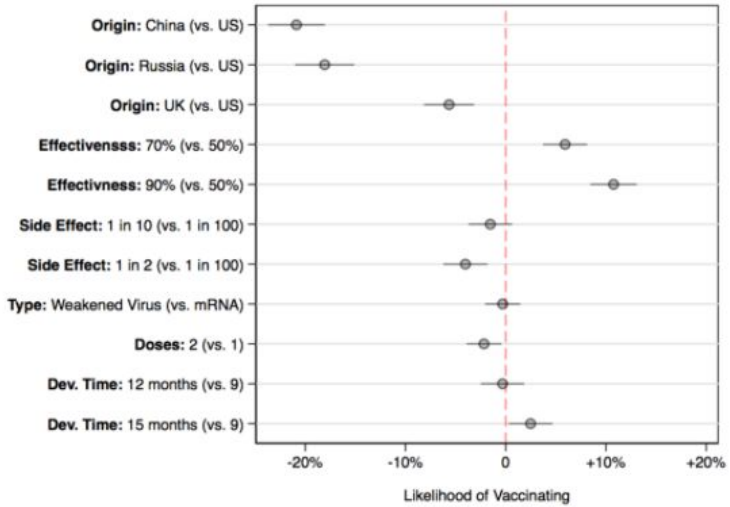
Figure 1. The Effect of Hypothetical Coronavirus Vaccine Characteristics on Vaccination Intentions



Note. OLS regression coefficients presented (circles) with 95% confidence intervals extending from each one. Standard errors are clustered at the respondent level. All independent variables are dichotomous, and the outcome variable is scored to range from 0-1. Coefficients are

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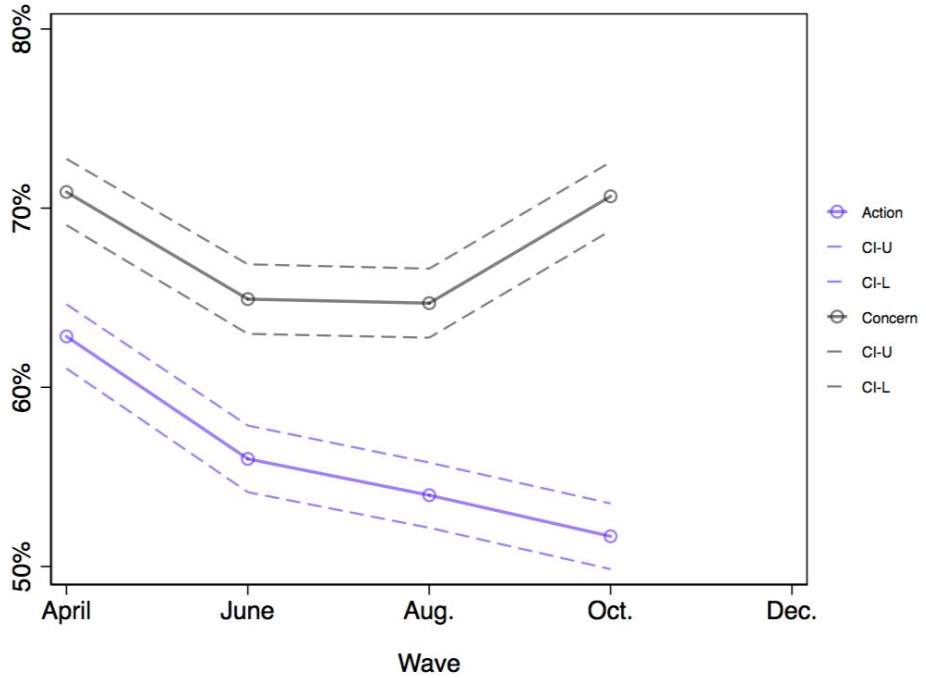

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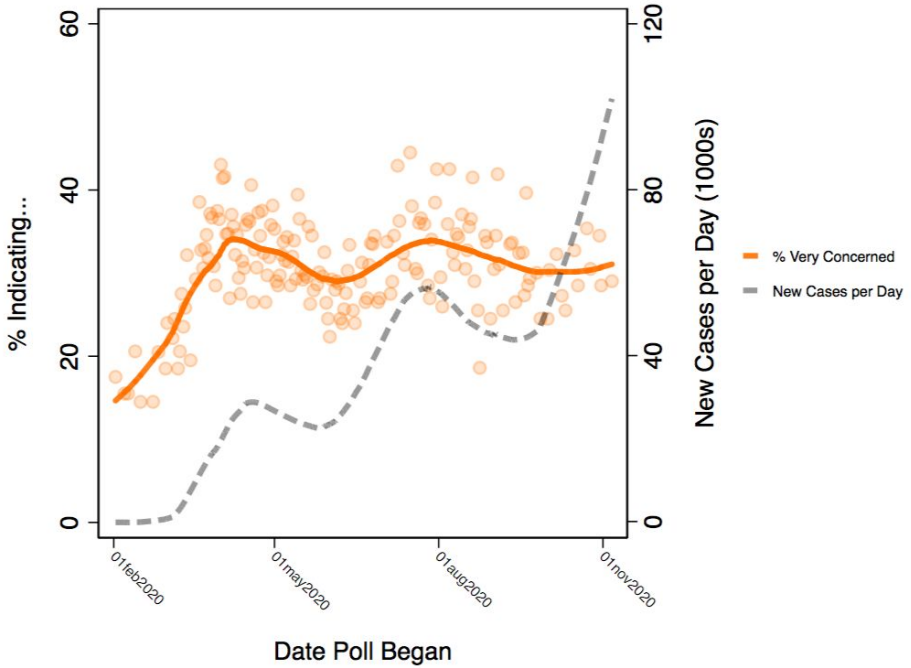
Are “On the Ground” Conditions Shaping COVID Concern?

- Some have argued that POTUS contracting COVID may have encouraged some Americans to take the disease more seriously.
- Others argue that a “second” or “third” wave will boost concern, thereby engendering support for a vaccine.
- I find little evidence of growth in concern in the aftermath of POTUS’ diagnosis

And while contraction rates were strongly associated with concern at the early stages of the pandemic, those effects have become more muted, lately.



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Thanks!

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