Experimental Evidence on the Effectiveness of Non-experts for Improving Vaccine Demand

Marcella Alsan
Harvard University
NBER

Sarah Eichmeyer
University of Munich

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Motivation

Preventative health investments:

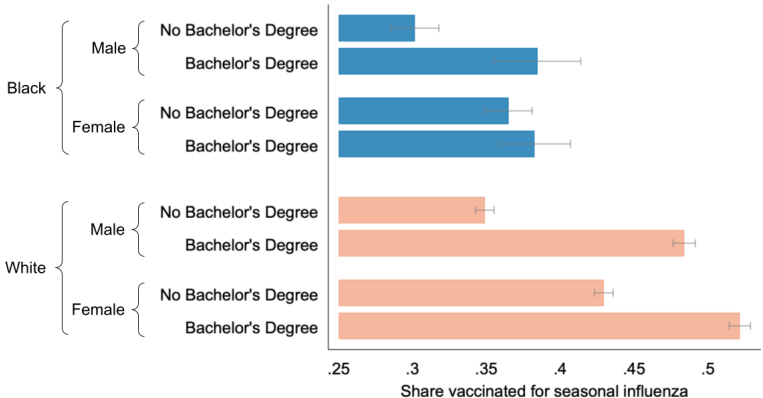
- Can yield considerable benefits for individuals and society.
- But: often adopted at low rates.

Leading example: immunization against infectious disease. E.g. influenza vaccine.

- Near-universal recommendation in U.S., federally mandated cost-sharing under the ACA.
- Yet: take-up rate averages only 45%.
- Particularly low among men, lower income and Black Americans.

$\Rightarrow$ Contributes to race/sex-health gradients

Flu shot take-up rate by race, sex, and education



Notes: Figure is based on data from the 2017 Behavioral Risk Factor Surveillance System survey (CDC2018). Panel (A) reports means by sex, race, education level, and household income. Panel (B) reports the intersectionality of race, sex and education. Observations are weighted using survey sample weights. 95% confidence intervals are shown.

Stated reasons for non-take-up

In our sample of ca. 2,900 unvaccinated men w/o college degree:

- Very common: pessimistic views on benefits and non-pecuniary costs.
  - 30% say "I don't need it"
  - 19% say "I don't believe in flu vaccines"
  - 14% worry about side effects
- Less common:
  - financial costs (3%) or
  - lack of recommendation by health professional (3%).

Background

- $\Rightarrow$ Scope to change views on vaccination through provision of credible information.
- This study: Test interventions that may increase trust in medical advice about vaccines among the vaccine-hesitant.
- Online survey experiment. Distribute standardized **video message** about safety and effectiveness of **flu vaccine** among 2,900 Black and non-Hispanic White men with less than a college education.
- Videos varied along 3 policy-relevant dimensions:
  1. **Expertise**: perceived medical expertise of message sender.
  2. **Acknowledgement**: admission/omission of acknowledgement of past injustice committed by the medical community.
  3. **Concordance**: race of the sender.

Implications for COVID-19?

Two separate points:

1. Do findings generalize to COVID? A priori, not obvious. ▸ Attitudes highly correlated
2. Are there spill-overs to COVID vaccination intentions? Possibly, if treatments impact general vaccine hesitancy. $\Rightarrow$ Test for this.

This study: One season pre-COVID (Fall 2019), one during COVID (Fall 2020, before EUA).

Outline

1. Treatment variation
2. Survey design
3. Results
4. Concluding remarks

Treatment Variation

Produced film infomercials about flu vaccine, 40 seconds long.

- Each infomercial featured one person ("sender").
- Each respondent saw one video.
- Hired 10 actors, 5 Black men & 5 White men.[1]
- Reading *same* script from teleprompter.

[1] Actors from a SF-based company hired by Stanford media.

▸ Main Script ▸ Appendix

Treatment Variation

Four treatment conditions:

1. Race-concordant expert[1]
2. Race-concordant lay *(Black respondents only)*
3. Race-discordant expert
4. Race-discordant expert + acknowledgement message *(Black respondents only)*

[1] Expert role: dressed in white coat and stethoscope.
[2] Lay role: dressed in white t-shirt.

▸ Acknowledgement Script ▸ Example videos

▸ Sender photos: Expert Role - Racial Variation ▸ Sender photos: Racial Concordance - Expertise Variation

▸ Sender Ratings ▸ Actor Balance Table by Hypo.

Why these treatments?

Promising, scalable, policy-relevant:

- Sender **expertise**: Lay person vs. expert *(Black respondents only)*
- **Signal**: Standard message vs. explicit acknowledgement of past injustices/breaking of trust by medical community *(Black respondents only)*
- Sender **race**: concordant vs. discordant expert

Why these treatments?

Promising, scalable, policy-relevant:

- Sender **expertise**: Lay person vs. expert *(Black respondents only)*
  - Practical consideration (offline): pipeline issues.
  - Why may lay sender hold promise? Mistrust in medical establishment + lay person more socially proximate to low SES respondents.
- **Signal**: Standard message vs. explicit acknowledgement of past injustices/breaking of trust by medical community *(Black respondents only)*
- Sender **race**: concordant vs. discordant expert

Why these treatments?

Promising, scalable, policy-relevant:

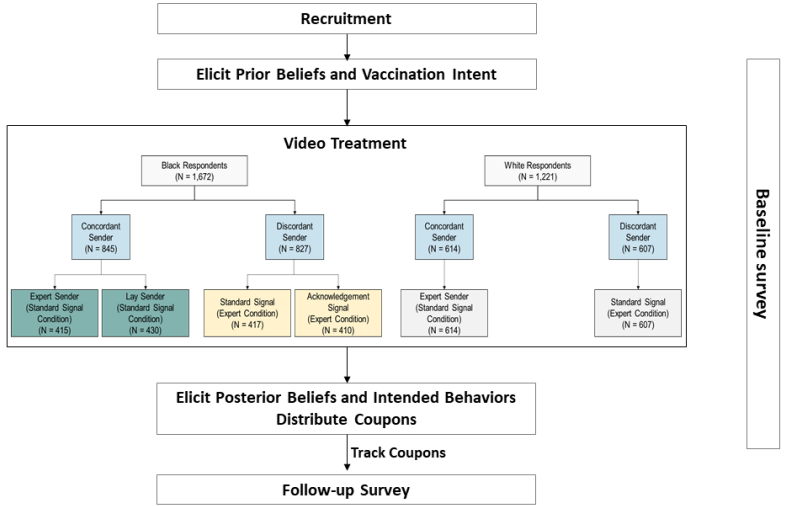
- Sender **expertise**: Lay person vs. expert *(Black respondents only)*
- **Signal**: Standard message vs. explicit acknowledgement of past injustices/breaking of trust by medical community *(Black respondents only)*
  - Why test this? Used in practice (e.g. recommended in 2021 Annals of Internal Medicine editorial on how to respond to vaccination concerns), need to evaluate if it works!
- Sender **race**: concordant vs. discordant expert

Why these treatments?

Promising, scalable, policy-relevant:

- Sender **expertise**: Lay person vs. expert *(Black respondents only)*
- **Signal**: Standard message vs. explicit acknowledgement of past injustices/breaking of trust by medical community *(Black respondents only)*
- Sender **race**: concordant vs. discordant expert
  - Shown to matter in in-person settings, unclear if it matters in 1-way communication settings, such as infomercials.
  - Is there heterogeneity across race?

Study Flow


Recruitment
Elicit Prior Beliefs and Vaccination Intent
Video Treatment
Black Respondents (N = 1,672)
White Respondents (N = 1,221)
Concordant Sender (N = 845)
Discordant Sender (N = 827)
Concordant Sender (N = 614)
Discordant Sender (N = 607)
Expert Sender (Standard Signal Condition) (N = 415)
Lay Sender (Standard Signal Condition) (N = 430)
Standard Signal (Expert Condition) (N = 417)
Acknowledgement Signal (Expert Condition) (N = 410)
Expert Sender (Standard Signal Condition) (N = 614)
Standard Signal (Expert Condition) (N = 607)
Elicit Posterior Beliefs and Intended Behaviors
Distribute Coupons
Track Coupons
Follow-up Survey
Baseline survey

Recruitment and Inclusion Criteria

- Via Qualtrics, Lucid, and CloudResearch online survey panels as well as Facebook.
- Oct-Dec of 2019 and 2020.

Screening criteria

- Men ages 25-51: Education $\leq$ HS degree
- Flu shot: not received in current season yet
- Black and White men (70%/30%)

Sample size:

- Total recruited: about 3000

Prior elicitation Map

Outcomes

- **Flu vaccination intent**
- **Covid-19 vaccination intent**
- Rating of sender (general trust re:medical advice)
- Rating of signal

Outcomes

- **Flu vaccination intent**
  - How likely are you to get a flu shot between now and February 2020/2021?
  - 0 (not at all likely) to 10 (extremely likely)
- **Covid-19 vaccination intent**
- Rating of sender (general trust re:medical advice)
- Rating of signal

Outcomes

- **Flu vaccination intent**
- **Covid-19 vaccination intent**
  - Suppose a vaccine against COVID-19 becomes available to everyone, at no cost. Would you or would you not get vaccinated against COVID-19?
  - 0 (definitely no) to 10 (definitely yes)
- Rating of sender (general trust re:medical advice)
- Rating of signal

Outcomes

- **Flu vaccination intent**
- **Covid-19 vaccination intent**
- Rating of sender (general trust re:medical advice) (inv. cov.-weighted index)
  details
  - *Qualification*: Person is qualified to give me medical advice
  - *Trustworthiness*: I trust person to give me medical advice
  - *Advice seeking*: If person was available, would ask him about other health issues
- Rating of signal

Outcomes

- **Flu vaccination intent**
- **Covid-19 vaccination intent**
- Rating of sender (general trust re:medical advice)
- Rating of signal (inv. cov.-weighted index) details
  - *Relevance*: Information in video applies to "people like me"
  - *Recommend video*: Likelihood of recommending video to family/friends
  - *Recommend flu shot*: Likelihood of recommending flu shot to family/friends

Outcomes

- **Flu vaccination intent**
- **Covid-19 vaccination intent**
- Rating of sender (general trust re:medical advice)
- Rating of signal

Secondary:

- Self-Reported Vaccination Status (at follow-up ca. 2 wks later, resp.rate 23%)
- Demand (WTP for coupon and link demand for redemption locations)
- Safety Beliefs (point belief and certainty)
- Recall (minimum age and vaccine ingredient: no active flu virus)

Descriptive Statistics

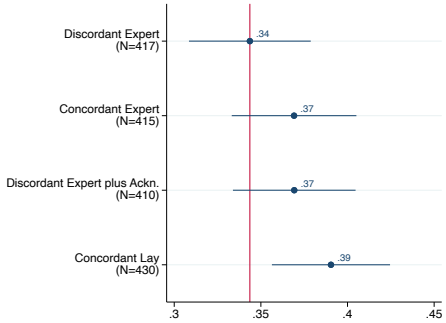
▸ Summary Statistics ▸ Balance ▸ Balance: Follow-up ▸ Attrition Analysis

▸ Histogram: Prior Intent for Flu shot ▸ Correlation of flu and COVID vaccination intent

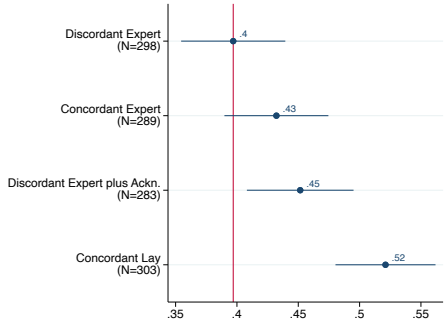
Results

Means by treatment arm, Black respondents

Self-reported likelihood of receiving vaccine by end of flu season [COVID: once available].



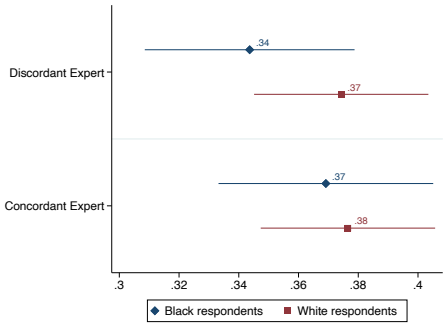
(A): Flu Vaccination Intent



Panel (B): COVID Vaccination Intent

- Lay treatment also has highest self-reported flu vaccine take-up rate at follow-up (56%) $\Rightarrow$ 15pp higher than Concordant Expert. And highest content recall.

Race concordance effects: differences by race?



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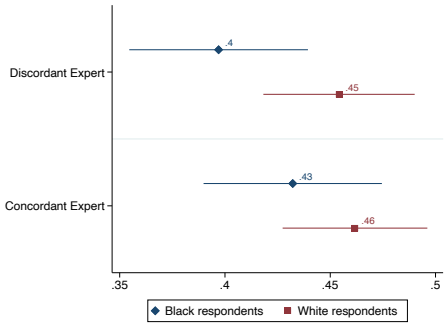


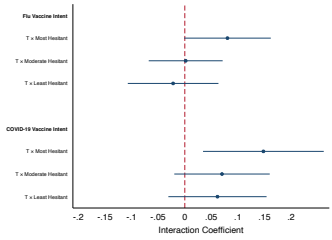
Panel (B): COVID Vaccination Intent

- No effect on White respondents.

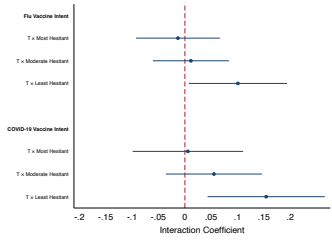
Heterogeneity by vaccine hesitancy

- Pre-specified multiple dimensions of heterogeneity (flu season, income, ...).
- Most striking: heterogeneity by baseline **vaccine hesitancy**
  - Measured by never, ever, or recent flu vaccine take-up.
  - Lay-person treatment particularly persuasive among never-takers.
  - Concordance & acknowledgement treatments particularly persuasive among recent-takers.

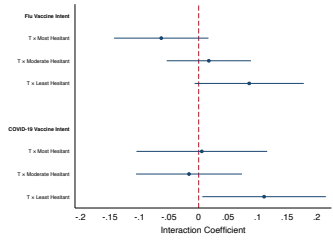
Heterogeneity By Vaccination Hesitancy



(A): Lay vs. Expert



(B): Ackn. vs. std. message



(C): Conc. vs. Disc. Expert

Notes: Figures show interaction coefficients of treatment with hesitancy dummies from following specification: $y_i = \alpha + \beta_1 T_i \times Most_i + \beta_2 T_i \times Moderate_i + \beta_3 T_i \times Least_i + \gamma_1 Moderate_i + \gamma_2 Least_i + \mu X_i + \epsilon_i$. *Most Hesitant* is a binary variable equal to 1 if the respondent has never received the flu shot. *Moderate Hesitant* is a binary variable equal to 1 if the respondent received the flu shot more than 2 years ago. *Least Hesitant* is a binary variable equal to 1 if the respondent received the flu shot within the past 2 years, not including the current season. ▸ more heterogeneity margins

Mechanism?

Results consistent with 2 key processes that may shape updating about vaccines among vaccine-hesitant individuals:

1. Trust in medical advice from experts (vs. lay persons) may differ for vaccines vs. other care.
   - Find 0.56 sd unit **lower** trust in general medical advice of lay sender.
   - But **higher** vaccination intent/take-up compared to those assigned to experts.

2. Decision to follow medical advice about vaccines may go through mental "short-cuts":
   - Find increase in vacc. intent despite no/little updating about vaccine safety.
   - Short-cut approach: Do I trust the person when it comes to vaccine advice?
   - May depend on many factors (e.g. social proximity, such as through race, SES, age, etc.)

Robustness & Extensions

- Lasso-selected controls
- Test for differential sender effects
- Alternative definitions of flu vaccination take-up.

Conclusion

In sample of unvaccinated low SES men:

- Message delivered by race-concordant layperson led to greatest increases flu and COVID-19 vacc. intent, and self-rep. take-up of the flu vaccine.
  - Effects concentrated among respondents with the least prior experience with vaccination.
- Acknowledgement message and race concordance delivered smaller & noisier (suggestive) positive effects.
  - Both more effective among those with more prior experience with vaccination.
- No concordance effects among White respondents.

$\Rightarrow$ Lay person campaigns hold promise, tailoring message (e.g. through social media ads) important.

Thank you!

Layperson vs. Expert

Among race-concordant senders, standard message.

	(1) Rating Sender	(2) Rating Signal	(3) Flu Vaccine Intent	(4) COVID-19 Vaccine Intent
PANEL A: Layperson vs. Expert - Black Respondents				
Layperson Treat	-0.540	-0.081	0.019	0.088
	(0.071)	(0.067)	(0.025)	(0.030)
	[0.000]	[0.231]	[0.455]	[0.003]
Mean in control	0.00	0.00	0.37	0.43
Observations	845	845	845	592

Notes: Table reports OLS estimates. Each dependent variable in columns (1) and (2) is an inverse-covariance-weighted index and standardized to a mean of 0 and standard deviation of 1. Dependent variables in columns (3) and (4) are on a scale of 0 to 1. COVID-19 vaccine intent was asked during the 2020-2021 flu season only. Stratifying variables (platform and season) are included as controls in the regression but not reported. Robust standard errors are in parentheses. *p*-values are in brackets. ▸ Secondary Outcomes

⇒ lay person considered less trustworthy regarding general medical advice.

Layperson vs. Expert

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- But: more persuasive re: vaccines.
- Also: 15pp increase in self-reported flu vaccine take-up at follow-up (p-value 0.075).

Acknowledgement vs. Standard Message

Among race-discordant expert senders.

	(1) Rating Sender	(2) Rating Signal	(3) Flu Vaccine Intent	(4) COVID-19 Vaccine Intent
PANEL B: Acknowledgement vs. Standard Message - Black Respondents				
Acknowledgement Signal Treat	0.100	0.142	0.027	0.054
	(0.068)	(0.069)	(0.025)	(0.031)
	[0.145]	[0.040]	[0.287]	[0.080]
Mean in control	0.00	0.00	0.34	0.40
Observations	827	827	827	581

Notes: Table reports OLS estimates. Each dependent variable in columns (1) and (2) is an inverse-covariance-weighted index and standardized to a mean of 0 and standard deviation of 1. Dependent variables in columns (3) and (4) are on a scale of 0 to 1. COVID-19 vaccine intent was asked during the 2020-2021 flu season only. Stratifying variables (platform and season) are included as controls in the regression but not reported. Robust standard errors are in parentheses. *p*-values are in brackets. ▸ Secondary Outcomes

- Acknowledgement increases signal rating.
- Increases self-reported COVID-19 vaccination intent.
- But: noisy negative estimate on self-reported flu take-up ($-12pp$).

Concordant Expert vs. Discordant Expert

	(1) Rating Sender	(2) Rating Signal	(3) Flu Vaccine Intent	(4) COVID-19 Vaccine Intent
PANEL C: Concordant vs. Discordant Expert Sender - Black Respondents				
Concordance Treat	0.183	0.139	0.026	0.035
	(0.067)	(0.070)	(0.025)	(0.031)
	[0.007]	[0.049]	[0.302]	[0.254]
Mean in control	0.00	0.00	0.34	0.40
Observations	832	832	832	587
PANEL D: Concordant vs. Discordant Expert Sender - White Respondents				
Concordance Treat	-0.075	-0.009	0.003	0.009
	(0.057)	(0.057)	(0.021)	(0.025)
	[0.189]	[0.876]	[0.868]	[0.719]
Mean in control	0.00	0.00	0.37	0.45
Observations	1221	1221	1221	866

Notes: Table reports OLS estimates. Each dependent variable in columns (1) and (2) is an inverse-covariance-weighted index and standardized to a mean of 0 and standard deviation of 1. Dependent variables in columns (3) and (4) are on a scale of 0 to 1. COVID-19 vaccine intent was asked during the 2020-2021 flu season only. Stratifying variables (platform and season) are included as controls in the regression but not reported. Robust standard errors are in parentheses. *p*-values are in brackets.

▸ Secondary Outcomes

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▸ Secondary Outcomes

Appendix

Infomercial Script

The Centers for Disease Control and Prevention, or CDC, recommends everyone 6 months and older get the flu shot. ← *(1) Official recommendation*

The shot protects you from getting sick by cutting your chance of catching the flu in half. ← *(2) Effectiveness*

It's also very safe: less than 1 in 100 vaccinated people experiences a side effect such as fever or chills. ← *(3) Safety I*

The flu shot does not contain an active flu virus, so you cannot get the flu virus from the shot. ← *(4) Safety II*

I get the flu shot every year to protect myself, my family, and my community. ← *(5) Endorsement*

I recommend you look into getting vaccinated as soon as possible. ← *(6) Recommendation*

▸ Intervention production process

Source for (1)-(2) : CDC 2019-2020 Flu Vaccine FAQ; source for (3): Meta-analysis of 52 RCTs on 82,000 people by Demicheli et al. (2018); source for (4): CDC 2019 Key Facts About the Seasonal Flu Vaccine.

Example Video

Baseline script: Standard message on safety and effectiveness of flu shot, recommendation to get vaccinated.

Link (expert sender)

Link (lay sender)

Intervention production process

Infomercial Signal Variation - Acknowledgement of Past Injustice

Additional paragraph (20 sec long):

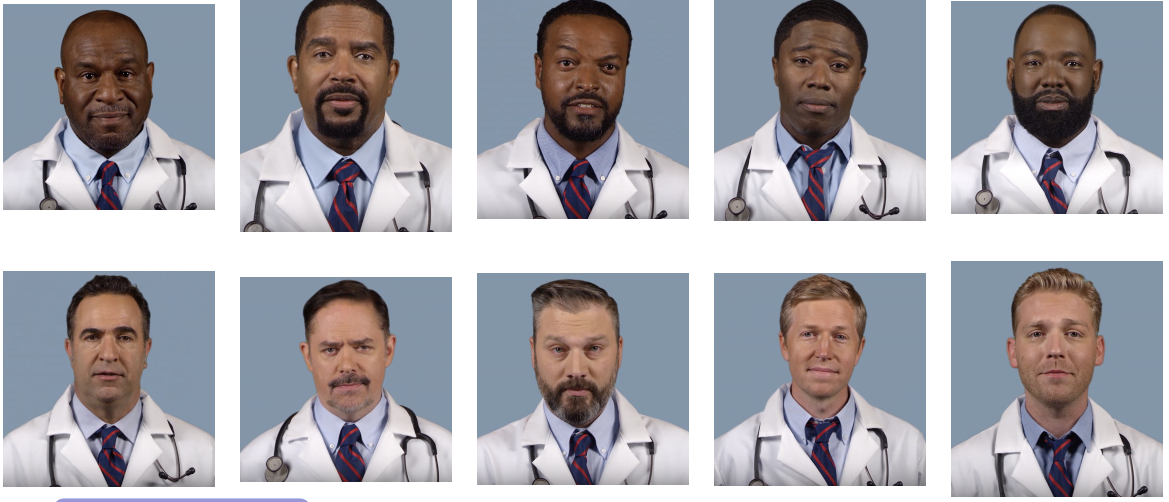
I know some people are nervous to follow medical advice about vaccines.

In the past, there may have been times when the medical community broke your trust.

But I hope that sharing some information with you can help you understand how important the flu shot is.

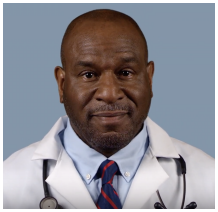
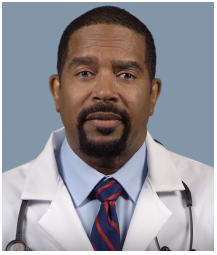
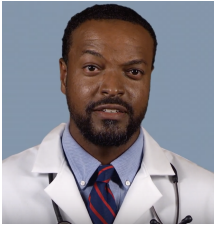
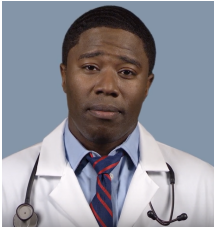
▸ Intervention production process

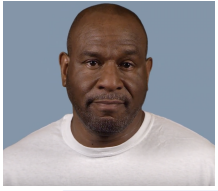
Expert Role - Racial Variation



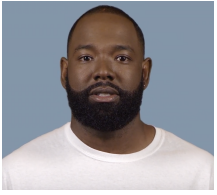
▸ Intervention production process

Racial Concordance - Expertise variation

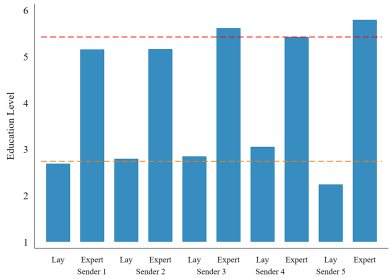




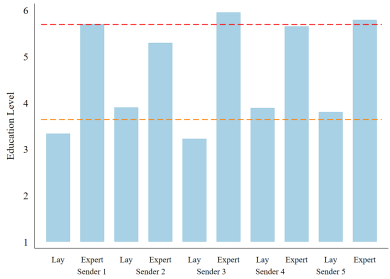


▸ Intervention production process

Sender Ratings



Panel (A): Black Senders



Panel (B): White Senders

Notes: Figure displays the mean of MTurkers' ratings of sender education by race and role of senders based on a sample of 381 Mturkers. Each sender was rated on their level of education on a scale of 1 (lowest; less than high school education) to 6 (highest; a graduate degree), in both a layperson and expert role. The red lines represent the mean education rating in an expert role for all Black senders (Panel (A)) and White senders (Panel (B)). The orange lines represent the mean education rating in a layperson role for all Black senders (Panel (A)) and White senders (Panel (B)).

▸ Intervention production process

Balance Table on Sender Ratings

	Layperson vs. Expert - Black Rs			Concordant vs. Discordant - Black Rs			Concordant vs. Discordant - White Rs		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Age	Education	Attractiveness	Age	Education	Attractiveness	Age	Education	Attractiveness
Layperson Role	-0.300	-1.743	-0.584						
	(0.174)	(0.185)	(0.219)						
	[0.088]	[0.000]	[0.009]						
Black Sender				0.019	-0.153	0.349	-0.527	-2.841	-0.339
				(0.189)	(0.233)	(0.162)	(0.202)	(1.045)	(0.218)
				[0.918]	[0.512]	[0.034]	[0.010]	[0.008]	[0.124]
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Observations	102	102	102	103	103	103	89	89	89

Notes: Table reports OLS estimates based on the MTurk sample. Dependent variables are perceptions of age, education and attractiveness. The outcomes are described in Appendix Section **??** and standardized to a mean of 0 and a standard deviation of 1. Columns (1) to (6) include ratings from Black Mturk respondents only. Columns (1) to (3) include sender fixed effects, thus comparing MTurkers' ratings of the same sender, assuming a different identity (lay vs. expert). Columns (4) to (9) compare MTurkers' ratings of Black vs. White experts. Columns (7) to (9) include ratings from White Mturk respondents only. The mean of each dependent variable for the omitted group is shown. Robust standard errors are in parentheses, and *p*-values are in brackets.

▸ Intervention production process

Use of actors

Design choice so as to more tightly control variation in sender and signal.

- Medical doctors would have had to role play as lay persons or vice versa. Choose actors to play the part of doctors since we were able to select individuals of approximately the same age, camera experience and attractiveness.
  - Tradeoff: Actors may have less authenticity than real doctors
  - Though used a script precisely to reduce "noise" from vernacular variation & expert senders were rated as more qualified than lay senders even when conditioning on person fixed effects.
- Actors comfortable transitioning between roles (i.e. white coat and stethoscope vs. white t-shirt) while precisely narrating the **exact** same script which contained **medically accurate** information.
- IRB approval, respondents debriefed about infomercial actors and coupon tracking at endline.
- Actors easy to blind to the overall purpose of the study since its a commonplace for them to change costumes.

back

Perceptions of Sender

- *How much do you agree or disagree with the following statements?* (5-point Likert scale from "Disagree strongly" to "Agree strongly")
  - The person in the video is qualified to give me medical advice.
  - I trust the person in the video to give me medical advice.

- *If a person like the one in the video was located near you, would you want to ask him about other health issues?* (yes/no)

▸ Outcome overview

Perceptions of Signal

- *How much do you agree or disagree with the following statements?* (5-point likert scale from "Disagree strongly" to "Agree strongly")
  - The information in the video applies to people like me.
- 11-point Likert scale:
  - *How likely are you to recommend this video to your friends or family?*
  - *How likely are you to recommend the flu shot to a family member or friend?*

Outcome overview

Priors: Vaccination intent and safety beliefs

Followed best practices for eliciting probabilistic beliefs.

- Likert scale for own likelihood to get flu vaccine ▸ details
- First and second moment of belief to get flu from flu shot ▸ first m ▸ second m

$\Rightarrow$ Elicited again after video. ▸ Back

Prior elicitation - Flu shot safety

Getting flu from flu shot: Common misconception. Clearly refuted by science.

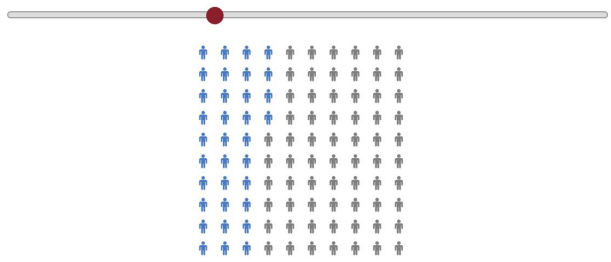
Survey question:

Take 100 adult men from your community, selected at random.

Let's say **all of the 100 adult men** selected at random from your community **receive a flu shot** at the start of the flu season.

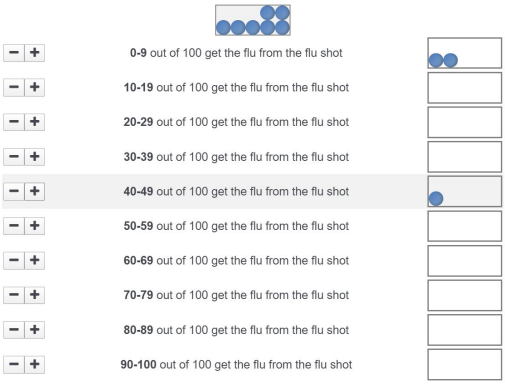
How many of them, **do you believe,** will get the flu from the flu shot?

0 10 20 30 40 50 60 70 80 90 100



▸ Survey structure

Prior Distribution Elicitation - Balls and Bins

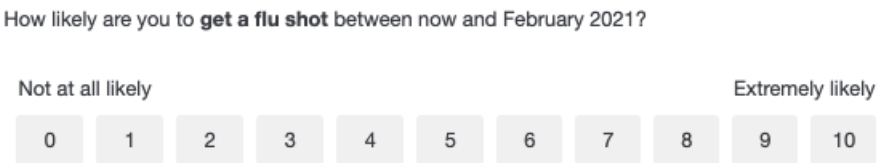


"Again, consider the group of 100 adult men selected at random from your community, and suppose all of them get the flu shot.

You have 10 balls that you can put in 10 different bins, reflecting what you believe are the chances out of 10 that the number of men who get the flu from the flu shot falls in each bin. The more likely you think it is that the number of men who get the flu from the flu shot falls in a given bin, the more balls you should place in that bin.

For example, if you put all the balls in one bin, it means you are certain the number of men that will get the flu from the flu shot is somewhere in that range."

Flu Vaccination Intent Elicitation



▸ Survey structure

Summary statistics

	Scale	All			Black			White		
	(1)	(2) Mean	(3) SD	(4) N	(5) Mean	(6) SD	(7) N	(8) Mean	(9) SD	(10) N
Panel A: Demographic Characteristics										
Age	(C)	36.83	6.74	2893	35.87	6.56	1672	38.14	6.76	1221
Low Income	(B)	0.53	0.50	2893	0.60	0.49	1672	0.42	0.49	1221
Completed High School	(B)	0.88	0.32	2893	0.88	0.33	1672	0.89	0.31	1221
Married	(B)	0.25	0.43	2893	0.19	0.39	1672	0.32	0.47	1221
South	(B)	0.52	0.50	2879	0.58	0.49	1667	0.44	0.50	1212
Panel B: Health Characteristics										
Insured	(B)	0.63	0.48	2809	0.60	0.49	1602	0.66	0.47	1207
Subjective Health Status	[1,5]	3.47	1.03	2893	3.64	1.02	1672	3.23	0.99	1221
Subjective Flu Shot Cost	(C)	33.56	70.94	2893	39.71	82.60	1672	25.15	49.62	1221
Has Primary Care Provider	(B)	0.47	0.50	2893	0.44	0.50	1672	0.53	0.50	1221
Never Taker	(B)	0.27	0.45	2893	0.27	0.45	1672	0.28	0.45	1221
Ever Taker	(B)	0.45	0.50	2893	0.45	0.50	1672	0.45	0.50	1221
Recent Taker	(B)	0.28	0.45	2893	0.28	0.45	1672	0.28	0.45	1221
Panel C: Prior Elicitation										
Flu Vaccine Intent	[0,10]	2.57	3.23	2893	2.57	3.26	1672	2.56	3.19	1221
Likelihood of Contracting Flu	[0,10]	2.48	2.77	2893	2.21	2.83	1672	2.84	2.65	1221
Belief about Safety of Flu Vaccine	[0,100]	57.22	28.09	2893	54.45	27.86	1672	61.02	27.98	1221

Note: Columns (2)-(4) are for all respondents. Columns (5)-(7) [(8)-(10)] restrict the sample to black (white) respondents. *Low Income* id dummy $= 1$ if household income $\leq$ median income of black respondents in the sample (=**$**30k). *Subjective Health Status* is on 5-point Likert scale (1 is poor and 5 is excellent). *Subjective Flu Shot Cost* is in US**$**. *Most Hesitant* is a dummy $= 1$ if the respondent has never received the flu shot. *Moderate Hesitant* dummy $= 1$ if the respondent has received the flu shot more than 2 years ago. *Least Hesitant* accordingly. *Likelihood of Contracting Flu* is the respondent's subjective likelihood of contracting flu before the end of the flu season elicited on an 11-point Likert scale. *Belief about Safety of Flu Vaccine* is belief over how many individuals out of 100 will *not* contract the flu from the flu shot. (C) indicates continuous variable; (B) indicates binary variable.

▸ Descriptive Statistics

Balance Table

	Black Rs: Lay vs Expert			Black Rs: Acknow. vs Standard			Black Rs: Concor. vs Discor.			White Rs: Concor. vs Discor.			
	Coeff. (1)	Mean (2)	N (3)	Coeff. (4)	Mean (5)	N (6)	Coeff. (7)	Mean (8)	N (9)	Coeff. (10)	Mean (11)	N (12)	F-stat. (13)
Panel A: Demographic Characteristics													
Age	-0.381	35.920	845	-0.276	36.125	827	-0.258	36.125	832	-0.008	38.165	1221	0.766
	(0.438)			(0.458)			(0.452)			(0.353)			[0.513]
	[0.385]			[0.547]			[0.568]			[0.982]			
Low Income	-0.028	0.627	845	0.021	0.580	827	0.046	0.580	832	-0.015	0.432	1221	0.639
	(0.034)			(0.034)			(0.034)			(0.028)			[0.590]
	[0.411]			[0.543]			[0.179]			[0.597]			
Completed High School	0.019	0.865	845	-0.031	0.897	827	-0.032	0.897	832	0.024	0.878	1221	0.939
	(0.023)			(0.023)			(0.022)			(0.018)			[0.421]
	[0.416]			[0.167]			[0.157]			[0.176]			
Married	-0.027	0.754	845	0.021	0.715	827	0.040	0.715	832	-0.009	0.593	1221	0.629
	(0.030)			(0.031)			(0.031)			(0.028)			[0.596]
	[0.370]			[0.509]			[0.187]			[0.755]			
South	0.099	0.522	843	0.031	0.570	824	-0.049	0.570	828	-0.019	0.450	1212	3.166
	(0.034)			(0.034)			(0.035)			(0.028)			[0.024]
	[0.004]			[0.369]			[0.156]			[0.499]			

Notes: The reported *F*-statistic in Column (13) are to test the null hypothesis that the effects of all four treatments are the same, among the sample of Black respondents; p-values in brackets are for the F-statistic.

Balance Table (Cont'd)

	Black Rs: Lay vs Expert			Black Rs: Acknow. vs Standard			Black Rs: Concor. vs Discor.			White Rs: Concor. vs Discor.			
	Coeff. (1)	Mean (2)	N (3)	Coeff. (4)	Mean (5)	N (6)	Coeff. (7)	Mean (8)	N (9)	Coeff. (10)	Mean (11)	N (12)	F-stat. (13)
Panel B: Health Characteristics													
Insured	0.014	0.591	812	0.003	0.611	790	-0.020	0.611	797	0.010	0.653	1207	0.174
	(0.035)			(0.035)			(0.035)			(0.027)			[0.914]
	[0.695]			[0.939]			[0.566]			[0.719]			
Subjective Health Status	0.225	3.523	845	0.012	3.643	827	-0.117	3.643	832	-0.017	3.237	1221	3.637
	(0.069)			(0.072)			(0.070)			(0.057)			[0.012]
	[0.001]			[0.870]			[0.094]			[0.771]			
Subjective Flu Shot Cost	0.615	30.707	822	-2.866	28.691	811	2.015	28.691	811	-1.270	23.452	1215	1.381
	(3.425)			(3.035)			(3.378)			(2.111)			[0.247]
	[0.857]			[0.345]			[0.551]			[0.548]			
Has Primary Care Provider	-0.043	0.455	845	-0.043	0.460	827	-0.004	0.460	832	-0.009	0.532	1221	1.080
	(0.034)			(0.034)			(0.035)			(0.029)			[0.356]
	[0.212]			[0.215]			[0.904]			[0.762]			
Never Taker	-0.029	0.263	845	0.033	0.281	827	-0.019	0.281	832	0.004	0.275	1221	2.444
	(0.030)			(0.032)			(0.031)			(0.026)			[0.062]
	[0.322]			[0.305]			[0.528]			[0.867]			
Ever Taker	0.026	0.443	845	-0.045	0.468	827	-0.024	0.468	832	-0.003	0.446	1221	0.816
	(0.034)			(0.035)			(0.035)			(0.028)			[0.485]
	[0.455]			[0.196]			[0.486]			[0.902]			
Recent Taker	0.004	0.294	845	0.012	0.252	827	0.044	0.252	832	-0.001	0.278	1221	1.144
	(0.031)			(0.030)			(0.031)			(0.026)			[0.330]
	[0.899]			[0.690]			[0.156]			[0.976]			

Balance Table (Cont'd)

	Black Rs: Lay vs Expert			Black Rs: Acknow. vs Standard			Black Rs: Concor. vs Discor.			White Rs: Concor. vs Discor.			
	Coeff.	Mean	N	Coeff.	Mean	N	Coeff.	Mean	N	Coeff.	Mean	N	F-stat.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Panel C: Prior Elicitation													
Flu Vaccine Intent	0.213	2.554	845	0.049	2.446	827	0.118	2.446	832	0.083	2.529	1221	0.859
	(0.224)			(0.223)			(0.225)			(0.181)			[0.462]
	[0.342]			[0.825]			[0.600]			[0.648]			
Likelihood of Contracting Flu	-0.279	2.342	845	0.167	2.144	827	0.202	2.144	832	-0.146	2.913	1221	0.949
	(0.194)			(0.197)			(0.196)			(0.151)			[0.416]
	[0.150]			[0.397]			[0.303]			[0.334]			
Belief about Safety of Flu Vaccine	1.704	44.978	845	2.228	44.180	827	0.896	44.180	832	1.882	38.021	1221	0.802
	(1.898)			(1.950)			(1.976)			(1.592)			[0.493]
	[0.370]			[0.254]			[0.650]			[0.237]			
Panel D: Follow-up Survey													
Completed Follow-up Survey	0.010	0.173	845	0.010	0.161	827	0.012	0.161	832	-0.016	0.318	1221	0.238
	(0.026)			(0.026)			(0.026)			(0.026)			[0.870]
	[0.714]			[0.701]			[0.630]			[0.536]			

Notes: The number of respondents who completed follow up survey by treatment are: 72 for concordant-Black respondents; 67 for discordant-Black respondents; 184 for concordant-White respondents; 193 for discordant-White respondents; 70 for acknowledgement message treatment; 67 for standard message treatment; 79 for layperson treatment; 72 for expert treatment. back

Balance Table Follow-Up

	Black Rs: Lay vs Expert			Black Rs: Acknow. vs Standard			Black Rs: Concor. vs Discor.			White Rs: Concor. vs Discor.			
	Coeff. (1)	Mean (2)	N (3)	Coeff. (4)	Mean (5)	N (6)	Coeff. (7)	Mean (8)	N (9)	Coeff. (10)	Mean (11)	N (12)	F-stat. (13)
Panel A: Demographic Characteristics													
Age	-0.313	36.653	151	-1.460	37.597	137	-0.926	37.597	139	0.033	39.518	377	0.627
	(0.978)			(1.169)			(1.103)			(0.634)			[0.598]
	[0.749]			[0.214]			[0.403]			[0.959]			
Low Income	0.000	0.583	151	0.020	0.493	137	0.095	0.493	139	-0.003	0.472	377	0.625
	(0.082)			(0.086)			(0.085)			(0.052)			[0.599]
	[0.995]			[0.819]			[0.267]			[0.960]			
Completed High School	0.022	0.889	151	0.019	0.881	137	0.009	0.881	139	0.009	0.891	377	0.147
	(0.050)			(0.054)			(0.056)			(0.032)			[0.932]
	[0.653]			[0.720]			[0.869]			[0.772]			
Married	-0.090	0.736	151	-0.002	0.657	137	0.078	0.657	139	-0.064	0.627	377	0.592
	(0.076)			(0.082)			(0.078)			(0.051)			[0.621]
	[0.239]			[0.983]			[0.316]			[0.210]			
South	-0.088	0.606	150	0.127	0.463	137	0.136	0.463	138	-0.005	0.398	375	1.186
	(0.082)			(0.085)			(0.085)			(0.051)			[0.315]
	[0.287]			[0.141]			[0.110]			[0.927]			

Notes: Table reports estimates obtained from OLS regressions of each respondent characteristic (rows) on treatment variables by hypothesis based on the follow-up survey sample. The reported *F*-statistics in Column (13) test the null hypothesis that the effects of all four treatments (i.e. concordant expert, discordant expert (standard signal), concordant non-expert, and discordant expert (acknowledgement signal) are the same, among the sample of Black respondents. Robust standard errors are in parentheses. *p*-values are shown in brackets.

Balance Table Follow-Up (Cont'd)

	Black Rs: Lay vs Expert			Black Rs: Acknow. vs Standard			Black Rs: Concor. vs Discor.			White Rs: Concor. vs Discor.			
	Coeff.	Mean	N	Coeff.	Mean	N	Coeff.	Mean	N	Coeff.	Mean	N	F-stat.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Panel B: Health Characteristics													
Insured	0.136	0.625	151	0.025	0.723	132	-0.100	0.723	137	-0.004	0.689	373	1.216
	(0.075)			(0.078)			(0.081)			(0.048)			[0.304]
	[0.073]			[0.746]			[0.221]			[0.927]			
Subjective Health Status	0.119	3.569	151	-0.108	3.582	137	-0.003	3.582	139	0.002	3.119	377	0.562
	(0.157)			(0.188)			(0.179)			(0.105)			[0.641]
	[0.449]			[0.567]			[0.985]			[0.982]			
Subjective Flu Shot Cost	-10.972	27.782	146	-3.985	28.136	135	0.490	28.136	135	-2.353	19.380	374	2.116
	(5.478)			(6.939)			(7.334)			(2.668)			[0.098]
	[0.047]			[0.567]			[0.947]			[0.378]			
Has Primary Care Provider	0.260	0.375	151	0.123	0.448	137	-0.071	0.448	139	-0.065	0.575	377	4.356
	(0.079)			(0.083)			(0.084)			(0.051)			[0.005]
	[0.001]			[0.143]			[0.399]			[0.206]			
Never Taker	-0.079	0.306	151	0.066	0.239	137	0.069	0.239	139	0.016	0.269	377	0.666
	(0.073)			(0.077)			(0.075)			(0.046)			[0.574]
	[0.279]			[0.391]			[0.363]			[0.735]			
Ever Taker	-0.001	0.417	151	-0.144	0.463	137	-0.043	0.463	139	0.042	0.435	377	0.972
	(0.080)			(0.083)			(0.085)			(0.051)			[0.406]
	[0.986]			[0.087]			[0.615]			[0.416]			
Recent Taker	0.081	0.278	151	0.078	0.299	137	-0.026	0.299	139	-0.057	0.295	377	0.655
	(0.074)			(0.080)			(0.078)			(0.045)			[0.580]
	[0.280]			[0.335]			[0.737]			[0.207]			

Balance Table Follow-Up (Cont'd)

	Black Rs: Lay vs Expert			Black Rs: Acknow. vs Standard			Black Rs: Concor. vs Discor.			White Rs: Concor. vs Discor.			
	Coeff.	Mean	N	Coeff.	Mean	N	Coeff.	Mean	N	Coeff.	Mean	N	F-stat.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Panel C: Prior Elicitation													
Flu Vaccine Intent	1.109	2.861	151	0.420	3.269	137	-0.407	3.269	139	0.128	2.912	377	1.487
	(0.560)			(0.597)			(0.612)			(0.347)			[0.218]
	[0.050]			[0.483]			[0.507]			[0.713]			
Likelihood of Contracting Flu	0.698	2.667	151	0.001	2.552	137	0.121	2.552	139	-0.426	3.249	377	1.178
	(0.513)			(0.476)			(0.495)			(0.271)			[0.318]
	[0.176]			[0.998]			[0.807]			[0.116]			
Belief about Safety of Flu Vaccine	3.260	47.014	151	-1.570	44.239	137	2.863	44.239	139	3.503	34.005	377	1.096
	(4.600)			(4.802)			(4.751)			(2.851)			[0.351]
	[0.480]			[0.744]			[0.548]			[0.220]			

back

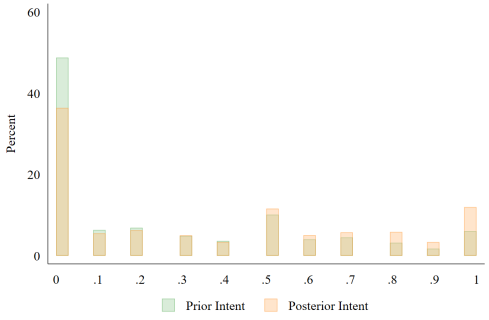
Attrition

	Attrition from BL		Attrition between BL and EL	
	(1) Black Respondents	(2) White Respondents	(3) Black Respondents	(4) White Respondents
Expert Discordant	-0.006	0.023	0.013	-0.018
	(0.022)	(0.014)	(0.026)	(0.026)
	[0.765]	[0.088]	[0.621]	[0.490]
Layperson Concordant	-0.000		-0.010	
	(0.022)		(0.026)	
	[0.990]		[0.698]	
Acknowledgement Signal Discordant	0.021		0.003	
	(0.022)		(0.026)	
	[0.341]		[0.916]	
p-value	0.627	n.a.	0.849	n.a.
Mean	0.13	0.05	0.83	0.70
Observations	1938	1307	1672	1221

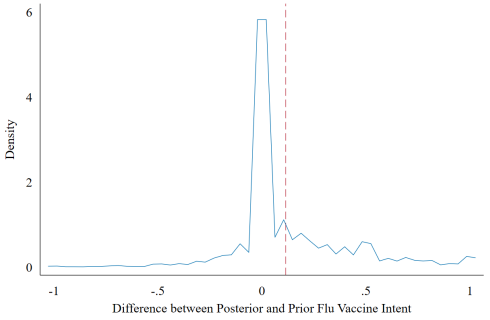
Notes: Table reports OLS estimates obtained from a regression of an attrition dummy on treatment indicators, with the "Expert Concordant" treatment arm being the left-out category. The dependent variable in columns (1) and (3) is attrition from the baseline survey, which is an indicator variable equal to 1 if the respondent was randomized but did not complete the baseline survey and 0 otherwise. The dependent variable in columns (2) and (4) is attrition between baseline and follow-up survey, which is an indicator variable equal to 1 if the respondent completed the baseline survey but did not complete the follow-up survey and 0 otherwise. Columns (1) and (3) correspond to the sample of Black respondents. Columns (2) and (4) corresponds to the sample of White respondents. "Mean" refers to the mean of the attrition outcome in the left-out category. The reported *p*-value at the bottom of the table tests the null hypothesis that the effect of all four treatments on attrition, among Black respondents, is the same. Stratifying variables (platform and season) are included as controls in the regression but not reported. Robust standard errors are in parentheses. *p*-values are in brackets.

back

Prior and Posterior Flu Vaccine Intent



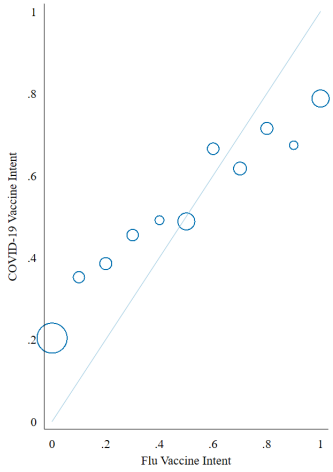
Panel (A): Histogram



Panel (B): Distribution of Difference

Notes: Panel (A) shows a histogram of prior and posterior flu vaccine intent. Panel (B) plots the histogram of the individual-level difference.

Flu and COVID-19 Vaccination Intention



Notes: Figure shows the relationship between Flu Vaccine Intent (on a scale of 0 to 1) and COVID-19 Vaccine Intent (on a scale of 0 to 1). The size of dots represents the number of respondents in each bin of Flu Vaccine Intent. The figure is based on the sample of respondents from the 2020-2021 flu season, as the question about COVID-19 Vaccine Intent was not asked during the 2019-2020 flu season.

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Results for Secondary Outcomes

	(1) Signal Content Recall	(2) Safety Beliefs	(3) Coupon Interest	(4) Flu Vaccine Take-Up
PANEL A: Layperson vs. Expert - Black Respondents				
Layperson Treat	0.117	-0.024	-0.016	0.150
	(0.067)	(0.068)	(0.069)	(0.083)
	[0.082]	[0.722]	[0.813]	[0.075]
Mean in control	0.00	0.00	0.00	0.38
Observations	845	845	845	151
PANEL B: Standard vs. Acknowledgement Signal - Black Respondents				
Acknowledgement Signal Treat	0.004	-0.107	0.028	-0.120
	(0.069)	(0.069)	(0.069)	(0.085)
	[0.952]	[0.124]	[0.683]	[0.159]
Mean in control	0.00	0.00	0.00	0.48
Observations	827	827	825	137
p-value	0.241	0.396	0.647	0.021

Notes: Table reports OLS estimates. Each dependent variable in columns (1) and (2) is an inverse-covariance-weighted index and standardized to a mean of 0 and standard deviation of 1. Dependent variables in columns (3) and (4) are on a scale of 0 to 1. COVID-19 vaccine intent was asked during the 2020-2021 flu season only. Stratifying variables (platform and season) are included as controls in the regression but not reported. Robust standard errors are in parentheses. *p*-values are in brackets.

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Results for Secondary Outcomes

	(1) Signal Content Recall	(2) Safety Beliefs	(3) Coupon Interest	(4) Flu Vaccine Take-Up
PANEL C: Concordant vs. Discordant Expert Sender - Black Respondents				
Concordance Treat	-0.006	-0.098	-0.008	-0.077
	(0.069)	(0.069)	(0.067)	(0.087)
	[0.928]	[0.155]	[0.907]	[0.378]
Mean in control	0.00	0.00	0.00	0.48
Observations	832	832	831	139
PANEL D: Concordant vs. Discordant Expert Sender - White Respondents				
Concordance Treat	0.019	-0.028	-0.083	-0.014
	(0.057)	(0.058)	(0.056)	(0.049)
	[0.734]	[0.631]	[0.139]	[0.776]
Mean in control	0.00	0.00	0.00	0.38
Observations	1221	1221	1221	377
p-value	0.774	0.437	0.388	0.520

Notes: Table reports OLS estimates. Each dependent variable in columns (1) and (2) is an inverse-covariance-weighted index and standardized to a mean of 0 and standard deviation of 1. Dependent variables in columns (3) and (4) are on a scale of 0 to 1. COVID-19 vaccine intent was asked during the 2020-2021 flu season only. Stratifying variables (platform and season) are included as controls in the regression but not reported. Robust standard errors are in parentheses. *p*-values are in brackets.

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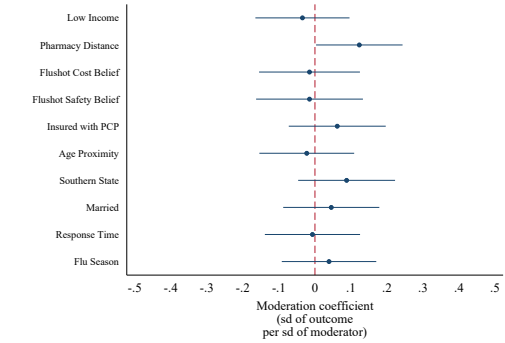
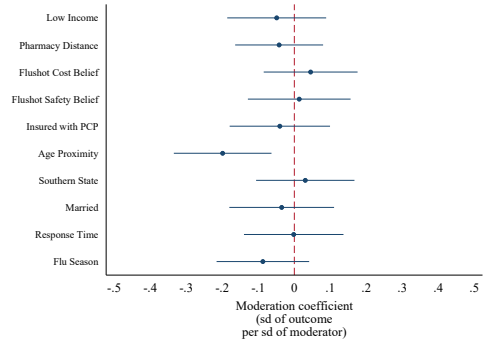
More Heterogeneity Margins



Panel (A): Layperson Treatment Heterogeneity



Panel (B): Acknowledgement Treatment Heterogeneity

Notes: Estimates are obtained from a regression of the variable *Flu Vaccine Intent* on the treatment indicator, moderator, and their interaction. Both the outcome and the moderator are standardized to a mean of 0 and standard deviation of 1. Moderators (before standardization) are defined as: Low Income = 1 if self-reported household income $\leq$ median income among Black respondents in the sample (=$30k); Pharmacy Distance = distance to nearest pharmacy in miles; Flushot Cost Belief = belief of out-of-pocket cost for flu shot; Flushot Safety Belief = prior belief: share who get flu from flu shot; Insured with PCP = has a PCP and has insurance; Age Proximity = sender and receiver age difference is no more than ten years; Southern State = residence in the U.S. South; Married = being married; Response Time = log of survey response time up to (but excluding) the video treatment screen; Flu Season = dummy for 2020-21 flu season (as opposed 2019-20). 95% confidence intervals using robust standard errors are shown.

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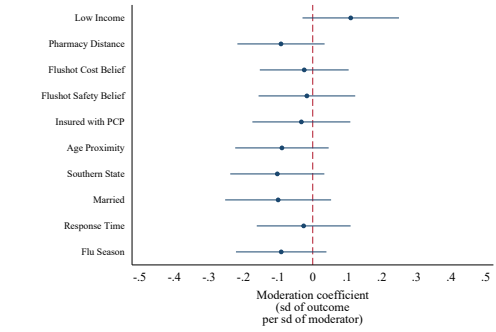
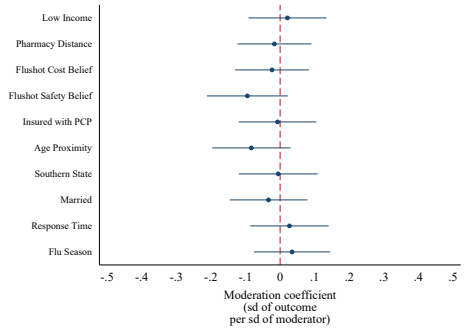
More Heterogeneity Margins





Panel (C): Concordance Treatment Heterogeneity - Black Respondents Panel (D): Concordance Treatment Heterogeneity - White Respondents

Notes: Estimates are obtained from a regression of the variable *Flu Vaccine Intent* on the treatment indicator, moderator, and their interaction. Both the outcome and the moderator are standardized to a mean of 0 and standard deviation of 1. Moderators (before standardization) are defined as: Low Income = 1 if self-reported household income $\leq$ median income among Black respondents in the sample (=$30k); Pharmacy Distance = distance to nearest pharmacy in miles; Flushot Cost Belief = belief of out-of-pocket cost for flu shot; Flushot Safety Belief = prior belief: share who get flu from flu shot; Insured with PCP = has a PCP and has insurance; Age Proximity = sender and receiver age difference is no more than ten years; Southern State = residence in the U.S. South; Married = being married; Response Time = log of survey response time up to (but excluding) the video treatment screen; Flu Season = dummy for 2020-21 flu season (as opposed 2019-20). 95% confidence intervals using robust standard errors are shown.