PNAS
www.pnas.org

Supporting Information for

A 680,000-Person Megastudy of Nudges to Encourage Vaccination in Pharmacies

Katherine L. Milkman[1], Linnea Gandhi[1], Mitesh S. Patel[2], Heather N. Graci[1], Dena M. Gromet[1], Hung Ho[3], Joseph S. Kay[1], Timothy W. Lee[4], Jake Rothschild[1], Jonathan E. Bogard[5], Ilana Brody[5], Christopher F. Chabris[6], Edward Chang[7], Gretchen B. Chapman[8], Jennifer E. Dannals[9], Noah J. Goldstein[5], Amir Goren[6], Hal Hershfield[5], Alex Hirsch[1], Jillian Hmurovic[1], Samantha Horn[8], Dean S. Karlan[4], Ariella S. Kristal[7], Cait Lamberton[1], Michelle N. Meyer[6], Allison H. Oakes[1], Maurice E. Schweitzer[1], Maheen Shermohammed[6], Joachim Talloen[8], Caleb Warren[10], Ashley Whillans[7], Kuldeep N. Yadav[1], Julian J. Zlatev[7], Ron Berman[1], Chalanda N. Evans[1], Rahul Ladhania[11], Jens Ludwig[3], Nina Mazar[12], Sendhil Mullainathan[3], Christopher K. Snider[1], Jann Spiess[13], Eli Tsukayama[14], Lyle Ungar[1], Christophe Van den Bulte[1], Kevin G. Volpp[1], and Angela L. Duckworth[1]

[1]University of Pennsylvania
[2]Ascension Health
[3]University of Chicago
[4]Northwestern University
[5]University of California, Los Angeles
[6]Geisinger Health System
[7]Harvard University
[8]Carnegie Mellon University
[9]Dartmouth College
[10]University of Arizona
[11]University of Michigan
[12]Boston University
[13]Stanford University
[14]University of Hawai`i-West O`ahu

* Katherine L. Milkman
Email: kmilkman@wharton.upenn.edu

Classification: (1) Social Sciences, Economic Sciences; (2) Biological Sciences, Medical Sciences
Keywords: vaccination, COVID-19, nudge, influenza, field experiment

Table of Contents

1. Intervention Messages

Flu shot waiting for you (2 texts: initial text + 3 d later)
N = 27,669 (1/25 probability of assignment)

This intervention was designed by: Noah J. Goldstein (UCLA Anderson School of Management) and Jon Bogard (UCLA Anderson School of Management) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! It's flu season & you can get a flu shot at Walmart. To help you remember, you'll receive another text in a few days. Flu vaccines prevent getting or spreading the flu. INFO = info, STOP = opt out.
Message 2 day	3 days after Message 1
Message 2 content	WalmartRx - Remember a flu shot is waiting for you at Walmart.

Flu shot waiting for you, encourage others to get flu shot (3 texts: initial text + 1 d later + 3 d later)
N = 34,483 (1/20 probability of assignment)

This intervention was designed by: Noah J. Goldstein (UCLA Anderson School of Management) and Jon Bogard (UCLA Anderson School of Management) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! It's flu season & you can get a flu shot at Walmart. To help you remember, you'll receive another text in a few days. Flu vaccines prevent getting or spreading the flu. Will you encourage 1 person to vaccinate? Reply Y & you'll receive a text you can send them. INFO = info, STOP = opt out.
Reply to message 1	*[If Y]* Hey, I'm getting a flu shot this year to protect myself & the people I care about. Just sending you a reminder to get one too! *[If no response for 24 hours]* WalmartRx - Consider sending this to a friend: Hey, I'm getting a flu shot this year to protect myself & the people I care about. Just sending you a reminder to get one too!
Message 2 day	3 days after Message 1
Message 2 content	WalmartRx - Remember a flu shot is waiting for you at Walmart.

Reminder to get a flu shot (2 texts: initial text + 3 d later)
N = 34,034 (1/20 probability of assignment)

This intervention was designed by: Edward Chang (Harvard Business School), Jennifer Dannals (Tuck School of Business, Dartmouth College), and Julian Zlatev (Harvard Business School) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! It's flu season & you can get a flu shot at Walmart. To help you remember, you'll receive another text in a few days. INFO = info, STOP = opt out.
Message 2 day	3 days after Message 1
Message 2 content	WalmartRx - This is a reminder to get your flu shot at Walmart.

Protect others & avoid unnecessary COVID-19 exposure (2 texts: initial text + 3 d later)
N = 27,715 (1/25 probability of assignment)

This intervention was designed by: Michelle Meyer (Geisinger Health System), Amir Goren (Geisinger Health System), Christopher Chabris (Geisinger Health System), and Maheen Shermohammed (Geisinger Health System) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! It's flu season and you can get a flu shot at Walmart. Next time you go to Walmart, be sure to ask for your flu shot. If you get it, you'll help protect family & friends from the flu & possible hospitalization. This also helps free up scarce equipment, beds, & healthcare workers to fight COVID-19. Text Y if you agree to ask for your flu shot. INFO = info, STOP = opt out.
Reply to message 1	*[If Y]* Great choice! To help you remember, you'll receive another text in a few days.
Message 2 day	3 days after initial message
Message 2 content	WalmartRx - As a reminder, you can get a flu shot at Walmart to protect family & friends from the flu & free up scarce resources to fight COVID-19.

More Americans are getting flu shot than in the past (2 texts: initial text + 3 d later)
N = 34,614 (1/20 probability of assignment)

This intervention was designed by: Edward Chang (Harvard Business School), Jennifer Dannals (Tuck School of Business, Dartmouth College), and Julian Zlatev (Harvard Business School) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! More Americans are getting the flu shot than ever in the last decade. It's flu season & you can get a flu shot at Walmart. To help you remember, you'll receive another text in a few days. INFO = info, STOP = opt out.
Message 2 day	3 days after Message 1
Message 2 content	WalmartRx - This is a reminder to get your flu shot at Walmart. More Americans are getting the flu shot than ever in the last decade.

Come back and get your flu shot (1 text)
N = 27,690 (1/25 probability of assignment)

This intervention was designed by: Jillian Hmurovic (The Wharton School, University of Pennsylvania), Dean Karlan (Kellogg School of Management, Northwestern University), Catherine Lamberton (The Wharton School, University of Pennsylvania), and Caleb Warren (University of Arizona) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! Congrats on getting your flu shot last year at Walmart. Please come back & get your 2020 flu shot, available now at any Walmart. INFO = info, STOP = opt out.

Protect yourself & avoid unnecessary COVID-19 exposure (2 texts: initial text + 3 d later)
N = 27,603 (1/25 probability of assignment)

This intervention was designed by: Michelle Meyer (Geisinger Health System), Amir Goren (Geisinger Health System), Christopher Chabris (Geisinger Health System), and Maheen Shermohammed (Geisinger Health System) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! It's flu season and you can get a flu shot at Walmart. Next time you go to Walmart, be sure to ask for your flu shot. If you get it, you'll help protect yourself from the flu & avoid unnecessary exposure to COVID-19 by staying out of the hospital during the pandemic. Text Y if you agree to ask for your flu shot. INFO = info, STOP = opt out.
Reply to message 1	*[If Y]* Great choice! To help you remember, you'll receive another text in a few days.
Message 2 day	3 days after initial message
Message 2 content	WalmartRx - As a reminder, you can get a flu shot at Walmart to protect yourself from the flu & avoid unnecessary exposure to COVID-19 in the hospital.

Protect yourself by getting a flu shot (2 texts: initial text + 3 d later)
N = 27,790 (1/25 probability of assignment)

This intervention was designed by: Michelle Meyer (Geisinger Health System), Amir Goren (Geisinger Health System), Christopher Chabris (Geisinger Health System), and Maheen Shermohammed (Geisinger Health System) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! It's flu season and you can get a flu shot at Walmart. Next time you go to Walmart, be sure to ask for your flu shot. If you get it, you'll help protect yourself from the flu & the serious complications it can cause, including hospitalization. Text Y if you agree to ask for your flu shot. INFO = info, STOP = opt out.
Reply to message 1	*[If Y]* Great choice! To help you remember, you'll receive another text in a few days.
Message 2 day	3 days after initial message
Message 2 content	WalmartRx - As a reminder, you can get a flu shot at Walmart to protect yourself from the flu.

Get a flu shot to avoid getting the flu or spreading it to others (2 texts: initial text + 3 d later)
N = 34,598 (1/20 probability of assignment)

This intervention was designed by: Allison Oakes (Perelman School of Medicine, University of Pennsylvania), Ariella Kristal (Harvard Business School), and Ashley Whillans (Harvard Business School) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! It's flu season. If you get a flu shot, you will be less likely to get the flu or spread it to others. You can get a flu shot at Walmart. If you want a reminder to get a flu shot at Walmart in a few days, text Y for Yes. INFO = info, STOP = opt out.
Reply to message 1	*[If Y]* Thank you for your response. To help you remember, you'll receive another text in a few days.
Message 2 day	3 days after Message 1
Message 2 content	WalmartRx - As a reminder, you can get your flu shot at Walmart.

Commit to getting flu shot (2 texts: initial text + 3 d later)
N = 34,623 (1/20 probability of assignment)

This intervention was designed by: Allison Oakes (Perelman School of Medicine, University of Pennsylvania), Ariella Kristal (Harvard Business School), and Ashley Whillans (Harvard Business School) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! It's flu season. If you get a flu shot, you will be less likely to get the flu or spread it to others. You can get a flu shot at Walmart. Many people find it helpful to make a plan to get their shot. If you plan to get a flu shot at Walmart, commit by texting back: I will get a flu shot. INFO = info, STOP = opt out.
Reply to message 1	*[If "I will get a flu shot"]* Thank you for your commitment. To help you remember, you'll receive another text in a few days.
Message 2 day	3 days after Message 1
Message 2 content	*[If participant responded to Message 1]* WalmartRx - As a reminder, you committed to getting your flu shot at Walmart. *[Everyone else receives:]* WalmartRx - As a reminder, you can get your flu shot at Walmart.

Protect others by getting a flu shot (2 texts: initial text + 3 d later)
N = 27,821 (1/25 probability of assignment)

This intervention was designed by: Michelle Meyer (Geisinger Health System), Amir Goren (Geisinger Health System), Christopher Chabris (Geisinger Health System), and Maheen Shermohammed (Geisinger Health System) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! It's flu season and you can get a flu shot at Walmart. Next time you go to Walmart, be sure to ask for your flu shot. If you get it, you'll help protect your family & friends from the flu & the serious complications it can cause, including hospitalization. Text Y if you agree to ask for your flu shot. INFO = info, STOP = opt out.
Reply to message 1	*[If Y]* WalmartRx - Great choice! To help you remember, you'll receive another text in a few days.
Message 2 day	3 days after initial message
Message 2 content	WalmartRx - As a reminder, you can get a flu shot at Walmart to protect your family & friends from the flu.

45% of Americans get the flu shot, more than in the past (2 texts: initial text + 3 d later)
N = 34,362 (1/20 probability of assignment)

This intervention was designed by: Edward Chang (Harvard Business School), Jennifer Dannals (Tuck School of Business, Dartmouth College), and Julian Zlatev (Harvard Business School) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! More Americans are getting the flu shot than ever in the last decade. Last year, 45% of American adults got one. It's flu season & you can get a flu shot at Walmart. To help you remember, you'll receive another text in a few days. INFO = info, STOP = opt out.
Message 2 day	3 days after Message 1
Message 2 content	WalmartRx - This is a reminder to get your flu shot at Walmart. More Americans are getting the flu shot than ever in the last decade. Last year, 45% of American adults got one.

Receive a joke about the flu (1 text)
N = 27,365 (1/25 probability of assignment)

This intervention was designed by: Jillian Hmurovic (The Wharton School, University of Pennsylvania), Dean Karlan (Kellogg School of Management, Northwestern University), Catherine Lamberton (The Wharton School, University of Pennsylvania), and Caleb Warren (University of Arizona) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! Congrats on getting your flu shot last year at Walmart. Please come back & get your 2020 flu shot, available now at any Walmart. To help you remember to ask for your flu shot, here's a joke about the flu: Did you hear the joke about the flu? Never mind, we don't want to spread it around. INFO = info, STOP = opt out.

Share a joke about the flu (1 text)
N = 27,514 (1/25 probability of assignment)

This intervention was designed by: Jillian Hmurovic (The Wharton School, University of Pennsylvania), Dean Karlan (Kellogg School of Management, Northwestern University), Catherine Lamberton (The Wharton School, University of Pennsylvania), and Caleb Warren (University of Arizona) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! Congrats on getting your flu shot last year at Walmart. Please come back & get your 2020 flu shot, available now at any Walmart. To help you remember to ask for your flu shot, here's a joke about the flu: Did you hear the joke about the flu? Never mind, we don't want to spread it around. But what good is a joke you keep to yourself? Share that joke w/ a friend, or even better, the Walmart pharmacist when you go to get your flu shot! INFO = info, STOP = opt out.

People who get flu shots are less likely to get the flu (1 text)
N = 27,617 (1/25 probability of assignment)

This intervention was designed by: Maurice Schweitzer (Wharton School of Business, University of Pennsylvania), Alex Hirsch (Wharton School of Business, University of Pennsylvania), Kuldeep Yadav (Perelman School of Medicine, University of Pennsylvania) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! It's flu season. A National Institutes of Health study reveals that Americans who get flu shots are less likely to get the flu. You can get your flu shot at Walmart. Will you get your flu shot and be part of this group? Text Y for Yes or N for No. INFO = info, STOP = opt out.
Reply to message 1	*[If any reply]* Thanks for your response.

Get a flu shot to avoid getting sick (1 text)
N = 34,387 (1/20 probability of assignment)

This intervention was designed by: Hal Hershfield (UCLA Anderson School of Management) and Ilana Brody (UCLA Anderson School of Management) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! It's flu season and you can get a flu shot at Walmart. Getting a flu shot helps you avoid getting sick. Get a flu shot at Walmart. INFO = info, STOP = opt out.

Get a flu shot to avoid getting sick, reminder of previous sickness (1 text)
N = 34,462 (1/20 probability of assignment)

This intervention was designed by: Hal Hershfield (UCLA Anderson School of Management) and Ilana Brody (UCLA Anderson School of Management) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! It's flu season and you can get a flu shot at Walmart. Remember the last time you got sick? It probably interrupted your plans and wasn't much fun. Do you wish you could have avoided getting sick by getting a simple shot? Text Y for yes or N for no. INFO = info, STOP = opt out.
Reply to message 1	*[If Y or no response after 30 minutes]* You can learn from your past experience. Think about the future and get a flu shot at Walmart. *[If N]* Well, you can still learn from your past experience. Think about the future and get a flu shot at Walmart.

Think about risk of catching the flu (1 text)
N = 27,772 (1/25 probability of assignment)

This intervention was designed by: Gretchen Chapman (Carnegie Mellon University), Samantha Horn (Carnegie Mellon University), and Joachim Talloen (Carnegie Mellon University) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! It's flu season and you can get a flu shot at Walmart. Please take a minute to think about the risk of catching the flu. Please respond C to let us know you have received this message. Thank you. INFO = info, STOP = opt out.
Reply to message 1	*[If any response]* Thanks for your response.

Do yourself a favor by getting flu shot (2 texts: initial text + 2 hr later)
N = 27,554 (1/25 probability of assignment)

This intervention was designed by: Noah J. Goldstein (UCLA Anderson School of Management) and Jon Bogard (UCLA Anderson School of Management) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! It's flu season. Did you know that you can get a flu vaccine at Walmart? Reply Y for Yes. INFO = info, STOP = opt out.
Reply to message 1	*[If Y or no response after 2 hours]* WalmartRx - Do yourself a favor! Get your flu vaccine at Walmart.

Do others a favor by getting the flu shot (2 texts: initial text + 2 hr later)
N = 27,475 (1/25 probability of assignment)

This intervention was designed by: Noah J. Goldstein (UCLA Anderson School of Management) and Jon Bogard (UCLA Anderson School of Management) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! It's flu season & you can get a flu shot at Walmart. Think of 2 people who'd want you to get the flu vaccine to stay healthy & avoid infecting others. Thought of 2? Reply Y for Yes. INFO = info, STOP = opt out.
Reply to message 1	*[If Y or no response after 2 hours]* WalmartRx - Do a favor for the people you care about! Get your flu vaccine at Walmart.

People who get flu shots are healthier, wealthier, more educated (1 text)
N = 27,573 (1/25 probability of assignment)

This intervention was designed by: Maurice Schweitzer (Wharton School of Business, University of Pennsylvania), Alex Hirsch (Wharton School of Business, University of Pennsylvania), Kuldeep Yadav (Perelman School of Medicine, University of Pennsylvania) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! It's flu season. A National Institutes of Health study reveals that Americans who get flu shots are healthier, wealthier, and more educated. You can get your flu shot at Walmart. Will you get your flu shot and be part of this group? Text Y for Yes or N for No. INFO = info, STOP = opt out.
Reply to message 1	*[If any reply]* Thanks for your response.

Think about risk of catching the flu at specific locations (1 text)
N = 27,449 (1/25 probability of assignment)

This intervention was designed by: Gretchen Chapman (Carnegie Mellon University), Samantha Horn (Carnegie Mellon University), and Joachim Talloen (Carnegie Mellon University) with input from Katherine L. Milkman (The Wharton School, University of Pennsylvania), Mitesh S. Patel (Ascension Health), Angela L. Duckworth (School of Arts and Sciences and The Wharton School, University of Pennsylvania), and the Research Staff at the Behavior Change for Good Initiative (Heather Graci, Dena Gromet, Hung Ho, Joseph Kay, and Timothy Lee)

Message 1 content	WalmartRx - Hi John! It's flu season & you can get a flu shot at Walmart. Please take a minute to think about the risk of catching the flu. Where do you think you're *most* likely to catch the flu? Please reply 1 for 'At work' 2 for 'At home' 3 for 'At the grocery store' 4 for 'At a bar or restaurant' 5 for 'Any other places you regularly visit' INFO = info, STOP = opt out
Reply to message 1	*[If any response]* Thanks for your response.

2. Participant Characteristics and Balance Checks

Our final sample included 689,693 patients from all 50 states—a complete geographical breakdown of our patients is included in Table S2. To evaluate how well balanced our different intervention conditions were on observable patient characteristics, we conducted the following analyses. First, we regressed each control variable from our main analysis on indicators for each of our 22 intervention conditions (the business-as-usual condition was omitted). The control variables analyzed as dependent variables in these balance tests included patient age, an indicator for patient gender, indicators for patient race, and the racial composition of the patient's county (percent white, percent Black, and percent Hispanic). Each model was an OLS regression with robust standard errors to correct for heteroskedasticity. We then conducted an F-test to confirm that all of the beta coefficients from each of the 22 intervention conditions were jointly equal to zero. P-values from these F-tests are shown in Table S1 and confirm that our megastudy's 23 conditions were well balanced across age, gender, race, and county racial composition (all p-values > 0.05).

Table S1. Summary of patient characteristics for patients in the full sample, the 22 intervention conditions (pooled), and the business-as-usual control group. P-values from the F-tests described above are included for balance tests run on each control variable. Note that we used design-based F-tests to summarize results across all race categories.

	Full Sample	Control	22 Intervention Conditions (Pooled)	F-Test p-value
Age (years)	60.4	60.6	60.4	0.083
Female	62%	61%	62%	0.755
Race				
White	13%	12%	13%	
Black Non-Hispanic	1%	1%	1%	
Hispanic	1%	1%	1%	0.408
Asian	1%	0%	1%	
Other	84%	85%	84%	
County Racial Composition				
% White	69%	69%	69%	0.741
% Black	13%	13%	13%	0.073
% Hispanic	12%	12%	12%	0.907
Overall N	689,693	27,523	662,170	

Table S2. Summary of patient residence, based on zip code.

State or Territory	% of Participants
AK	0.2%
AL	2.3%
AR	4.0%
AZ	2.7%
CA	5.0%
CO	2.2%
CT	0.6%
DC	0.0%
DE	0.2%
FL	5.0%
GA	3.4%
HI	0.2%
IA	1.2%
ID	0.9%
IL	3.4%
IN	2.6%
KS	1.9%
KY	2.5%
LA	2.5%
MA	0.7%
MD	0.8%
ME	0.6%
MI	1.7%
MN	1.2%
MO	3.8%
MS	1.6%
MT	0.4%
NC	4.0%
ND	0.0%
NE	0.9%
NH	0.4%
NJ	1.0%
NM	1.4%
NV	1.4%
NY	1.9%
OH	3.0%
OK	3.5%
OR	1.1%
PA	1.8%
RI	0.2%
SC	2.2%
SD	0.4%
TN	3.0%
TX	13.4%
UT	1.5%
VA	2.8%
VT	0.1%
WA	1.5%
WI	2.2%
WV	0.8%
WY	0.3%
Other/Unknown	0.0%

3. Extended Results

This section includes the regression-estimated impact of each of our study's 22 intervention conditions on flu vaccine take-up 1) by October 31, 2020 (Table S3), 2) broken down by patient gender (Table S4), 3) broken down for patients <65 vs. 65+ (Table S5), 4) broken down by patient race (Table S6) and 5) broken down by the racial composition in the patient's county (Table S7).

To confirm whether any of the observed differences across subgroups were meaningful, we ran an additional set of analyses where we interacted the subgroup variable of interest (e.g., male) with each of the 22 indicators for intervention conditions and then tested the joint hypothesis that all interaction terms were 0. None of these F-tests were significant (male vs. female: $F = 1.229$, $p = 0.210$; age < 65 vs. age ≥ 65: $F = 1.217$, $p = 0.22$; white vs. non-white vs. missing: $F = 1.109$, $p = 0.287$; county % white at or above median vs. county % white below median: $F = 1.116$, $p = 0.319$), which suggests that the 22 interventions performed comparably across different subgroups.

Table S3. Regression-estimated impact of each of our study's 22 intervention conditions on flu vaccine uptake by October 31st, 2020

	Beta	SE	p-value	adjusted p-value
Flu shot waiting for you (2 texts: initial text + 3 d later)	0.032	(0.004)	< 0.001	< 0.001
Flu shot waiting for you, encourage others to get flu shot (3 texts: initial text + 1 d later + 3 d later)	0.028	(0.003)	< 0.001	< 0.001
Reminder to get a flu shot (2 texts: initial text + 3 d later)	0.027	(0.003)	< 0.001	< 0.001
Protect others & avoid unnecessary COVID-19 exposure (2 texts: initial text + 3 d later)	0.029	(0.004)	< 0.001	< 0.001
More Americans are getting flu shot than in the past (2 texts: initial text + 3 d later)	0.027	(0.003)	< 0.001	< 0.001
Come back & get your flu shot (1 text)	0.023	(0.004)	< 0.001	< 0.001
Protect yourself & avoid unnecessary COVID-19 exposure (2 texts: initial text + 3 d later)	0.027	(0.004)	< 0.001	< 0.001
Protect yourself by getting a flu shot (2 texts: initial text + 3 d later)	0.026	(0.004)	< 0.001	< 0.001
Get a flu shot to avoid getting the flu or spreading it to others (2 texts: initial text + 3 d later)	0.025	(0.003)	< 0.001	< 0.001
Commit to getting flu shot (2 texts: initial text + 3 d later)	0.023	(0.003)	< 0.001	< 0.001
Protect others by getting a flu shot (2 texts: initial text + 3 d later)	0.021	(0.004)	< 0.001	< 0.001
45% of Americans get the flu shot, more than in the past (2 texts: initial text + 3 d later)	0.023	(0.003)	< 0.001	< 0.001
Receive a joke about the flu (1 text)	0.021	(0.004)	< 0.001	< 0.001
Share a joke about the flu (1 text)	0.019	(0.004)	< 0.001	< 0.001
People who get flu shots are less likely to get the flu (1 text)	0.017	(0.004)	< 0.001	< 0.001
Get a flu shot to avoid getting sick (1 text)	0.015	(0.003)	< 0.001	< 0.001
Get a flu shot to avoid getting sick, reminder of previous sickness (1 text)	0.016	(0.003)	< 0.001	< 0.001
Think about risk of catching the flu (1 text)	0.013	(0.004)	< 0.001	< 0.001
Do yourself a favor by getting flu shot (2 texts: initial text + 2 hr later)	0.014	(0.004)	< 0.001	< 0.001
Do others a favor by getting the flu shot (2 texts: initial text + 2 hr later)	0.012	(0.004)	0.001	0.001
People who get flu shots are healthier, wealthier, more educated (1 text)	0.012	(0.004)	0.001	0.001
Think about risk of catching the flu at specific locations (1 text)	0.009	(0.004)	0.016	0.016
R-Squared		0.0131		
Baseline Vaccination Rate		23.6%		
Observations		689,693		

Note: The above table reports the results of an ordinary least squares regression predicting whether patients in our study received a flu shot at Walmart between September 25, 2020 (when our intervention began) and October 31, 2020 (inclusive) with 22 different indicators for each of our experimental conditions as the primary predictors. The reference group is the business-as-usual control condition. The regression includes the following control variables: (1) patient age, (2) an indicator for whether a patient is male, (3) indicators for patient race/ethnicity (Black non-Hispanic, Hispanic, Asian, other/unknown; white non-Hispanic omitted), and (4) racial composition of the patient's county (percent white, percent Black, percent Hispanic; indicator for missing). Robust standard errors accounting for heteroskedasticity in linear probability models are shown in parentheses. Adjusted p-values accounting for multiple comparisons are calculated using the Benjamini-Hochberg method.

Table S4. Regression-estimated impact of each of our study's 22 intervention conditions on flu vaccine uptake by patient gender (Male vs. Female).

	Male				Female			
	Beta	SE	p-value	adjusted p-value	Beta	SE	p-value	adjusted p-value
Flu shot waiting for you (2 texts: initial text + 3 d later)	0.033	(0.006)	< 0.001	< 0.001	0.027	(0.005)	< 0.001	< 0.001
Flu shot waiting for you, encourage others to get flu shot (3 texts: initial text + 1 d later + 3 d later)	0.025	(0.006)	< 0.001	< 0.001	0.027	(0.005)	< 0.001	< 0.001
Reminder to get a flu shot (2 texts: initial text + 3 d later)	0.027	(0.006)	< 0.001	< 0.001	0.025	(0.005)	< 0.001	< 0.001
Protect others & avoid unnecessary COVID-19 exposure (2 texts: initial text + 3 d later)	0.026	(0.006)	< 0.001	< 0.001	0.025	(0.005)	< 0.001	< 0.001
More Americans are getting flu shot than in the past (2 texts: initial text + 3 d later)	0.035	(0.006)	< 0.001	< 0.001	0.019	(0.005)	< 0.001	< 0.001
Come back & get your flu shot (1 text)	0.028	(0.006)	< 0.001	< 0.001	0.023	(0.005)	< 0.001	< 0.001
Protect yourself & avoid unnecessary COVID-19 exposure (2 texts: initial text + 3 d later)	0.031	(0.006)	< 0.001	< 0.001	0.018	(0.005)	< 0.001	< 0.001
Protect yourself by getting a flu shot (2 texts: initial text + 3 d later)	0.025	(0.006)	< 0.001	< 0.001	0.021	(0.005)	< 0.001	< 0.001
Get a flu shot to avoid getting the flu or spreading it to others (2 texts: initial text + 3 d later)	0.021	(0.006)	< 0.001	< 0.001	0.024	(0.005)	< 0.001	< 0.001
Commit to getting flu shot (2 texts: initial text + 3 d later)	0.021	(0.006)	< 0.001	< 0.001	0.022	(0.005)	< 0.001	< 0.001
Protect others by getting a flu shot (2 texts: initial text + 3 d later)	0.029	(0.006)	< 0.001	< 0.001	0.017	(0.005)	< 0.001	0.001
45% of Americans get the flu shot, more than in the past (2 texts: initial text + 3 d later)	0.021	(0.006)	< 0.001	< 0.001	0.021	(0.005)	< 0.001	< 0.001
Receive a joke about the flu (1 text)	0.028	(0.006)	< 0.001	< 0.001	0.016	(0.005)	< 0.001	0.002
Share a joke about the flu (1 text)	0.025	(0.006)	< 0.001	< 0.001	0.015	(0.005)	0.003	0.004
People who get flu shots are less likely to get the flu (1 text)	0.015	(0.006)	0.018	0.020	0.017	(0.005)	< 0.001	0.001
Get a flu shot to avoid getting sick (1 text)	0.014	(0.006)	0.017	0.020	0.015	(0.005)	0.002	0.002
Get a flu shot to avoid getting sick, reminder of previous sickness (1 text)	0.021	(0.006)	< 0.001	< 0.001	0.010	(0.005)	0.029	0.035
Think about risk of catching the flu (1 text)	0.023	(0.006)	< 0.001	< 0.001	0.008	(0.005)	0.105	0.105
Do yourself a favor by getting flu shot (2 texts: initial text + 2 hr later)	0.017	(0.006)	0.007	0.009	0.012	(0.005)	0.019	0.025
Do others a favor by getting the flu shot (2 texts: initial text + 2 hr later)	0.014	(0.006)	0.026	0.027	0.010	(0.005)	0.035	0.040
People who get flu shots are healthier, wealthier, more educated (1 text)	0.015	(0.006)	0.018	0.020	0.009	(0.005)	0.067	0.071
Think about risk of catching the flu at specific locations (1 text)	0.010	(0.006)	0.119	0.119	0.009	(0.005)	0.060	0.066
R-Squared		0.0106				0.0148		
Baseline Vaccination Rate		29.9%				29.0%		
Observations		265,038				424,655		

Note: The above table reports the results of two ordinary least squares regressions, separately predicting whether male patients (left) and female patients (right) in our study received a flu shot at Walmart between September 25, 2020 (when our intervention began) and December 31, 2020 (inclusive) with 22 different indicators for each of our experimental conditions as the primary predictors. The reference group is the business-as-usual control condition. Each regression includes the following control variables: (1) patient age, (2) indicators for patient race/ethnicity (Black non-Hispanic, Hispanic, Asian, other/unknown; white non-Hispanic omitted), and (3) racial composition of the patient's county (percent white, percent Black, percent Hispanic; indicator for missing). Robust standard errors accounting for heteroskedasticity in linear probability models are shown in parentheses. Adjusted p-values accounting for multiple comparisons are calculated using the Benjamini-Hochberg method.

Table S5. Regression-estimated impact of each of our study's 22 intervention conditions on flu vaccine uptake by patient age (Age 18-64 vs. Age ≥ 65).

	< 65				≥65			
	Beta	SE	p-value	adjusted p-value	Beta	SE	p-value	adjusted p-value
Flu shot waiting for you (2 texts: initial text + 3 d later)	0.027	(0.005)	< 0.001	< 0.001	0.030	(0.006)	< 0.001	< 0.001
Flu shot waiting for you, encourage others to get flu shot (3 texts: initial text + 1 d later + 3 d later)	0.021	(0.005)	< 0.001	< 0.001	0.031	(0.005)	< 0.001	< 0.001
Reminder to get a flu shot (2 texts: initial text + 3 d later)	0.028	(0.005)	< 0.001	< 0.001	0.023	(0.005)	< 0.001	< 0.001
Protect others & avoid unnecessary COVID-19 exposure (2 texts: initial text + 3 d later)	0.025	(0.005)	< 0.001	< 0.001	0.026	(0.006)	< 0.001	< 0.001
More Americans are getting flu shot than in the past (2 texts: initial text + 3 d later)	0.023	(0.005)	< 0.001	< 0.001	0.026	(0.005)	< 0.001	< 0.001
Come back & get your flu shot (1 text)	0.026	(0.005)	< 0.001	< 0.001	0.023	(0.006)	< 0.001	< 0.001
Protect yourself & avoid unnecessary COVID-19 exposure (2 texts: initial text + 3 d later)	0.020	(0.005)	< 0.001	< 0.001	0.026	(0.006)	< 0.001	< 0.001
Protect yourself by getting a flu shot (2 texts: initial text + 3 d later)	0.021	(0.005)	< 0.001	< 0.001	0.024	(0.006)	< 0.001	< 0.001
Get a flu shot to avoid getting the flu or spreading it to others (2 texts: initial text + 3 d later)	0.023	(0.005)	< 0.001	< 0.001	0.023	(0.005)	< 0.001	< 0.001
Commit to getting flu shot (2 texts: initial text + 3 d later)	0.019	(0.005)	< 0.001	< 0.001	0.024	(0.005)	< 0.001	< 0.001
Protect others by getting a flu shot (2 texts: initial text + 3 d later)	0.021	(0.005)	< 0.001	< 0.001	0.021	(0.006)	< 0.001	< 0.001
45% of Americans get the flu shot, more than in the past (2 texts: initial text + 3 d later)	0.020	(0.005)	< 0.001	< 0.001	0.022	(0.005)	< 0.001	< 0.001
Receive a joke about the flu (1 text)	0.018	(0.005)	< 0.001	0.001	0.023	(0.006)	< 0.001	< 0.001
Share a joke about the flu (1 text)	0.024	(0.005)	< 0.001	< 0.001	0.013	(0.006)	0.029	0.035
People who get flu shots are less likely to get the flu (1 text)	0.017	(0.005)	0.002	0.002	0.015	(0.006)	0.010	0.014
Get a flu shot to avoid getting sick (1 text)	0.014	(0.005)	0.006	0.007	0.015	(0.005)	0.006	0.010
Get a flu shot to avoid getting sick, reminder of previous sickness (1 text)	0.020	(0.005)	< 0.001	< 0.001	0.008	(0.005)	0.145	0.152
Think about risk of catching the flu (1 text)	0.019	(0.005)	< 0.001	< 0.001	0.007	(0.006)	0.231	0.231
Do yourself a favor by getting flu shot (2 texts: initial text + 2 hr later)	0.012	(0.005)	0.021	0.023	0.015	(0.006)	0.011	0.014
Do others a favor by getting the flu shot (2 texts: initial text + 2 hr later)	0.014	(0.005)	0.009	0.011	0.009	(0.006)	0.120	0.132
People who get flu shots are healthier, wealthier, more educated (1 text)	0.010	(0.005)	0.066	0.069	0.013	(0.006)	0.022	0.029
Think about risk of catching the flu at specific locations (1 text)	0.009	(0.005)	0.075	0.075	0.010	(0.006)	0.086	0.100
R-Squared	0.0085				0.0037			
Baseline Vaccination Rate	26.7%				32.2%			
Observations	357,333				332,360			

Note: The above table reports the results of two ordinary least squares regressions, separately predicting whether patients between 18 and 64 years old (left) and patients 65 years old or older (right) in our study received a flu shot at Walmart between September 25, 2020 (when our intervention began) and December 31, 2020 (inclusive) with 22 different indicators for each of our experimental conditions as the primary predictors. The reference group is the business-as-usual control condition. Each regression includes the following control variables: (1) an indicator for whether a patient is male, (2) indicators for patient race/ethnicity (Black non-Hispanic, Hispanic, Asian, other/unknown; white non-Hispanic omitted), and (3) racial composition of the patient's county (percent white, percent Black, percent Hispanic; indicator for missing). Robust standard errors accounting for heteroskedasticity in linear probability models are shown in parentheses. Adjusted p-values accounting for multiple comparisons are calculated using the Benjamini-Hochberg method.

Table S6. Regression-estimated impact of each of our study's 22 intervention conditions on flu vaccine uptake by patient race (White vs. Non-white vs. Missing data on patient race).

	White				Non-white				Missing			
	Beta	SE	p-value	adjusted p-value	Beta	SE	p-value	adjusted p-value	Beta	SE	p-value	adjusted p-value
Flu shot waiting for you (2 texts: initial text + 3 d later)	0.019	(0.012)	0.113	0.460	0.008	(0.023)	0.717	0.909	0.031	(0.004)	< 0.001	< 0.001
Flu shot waiting for you, encourage others to get flu shot (3 texts: initial text + 1 d later + 3 d later)	0.013	(0.011)	0.237	0.522	0.010	(0.022)	0.650	0.909	0.028	(0.004)	< 0.001	< 0.001
Reminder to get a flu shot (2 texts: initial text + 3 d later)	0.020	(0.011)	0.069	0.460	0.012	(0.022)	0.591	0.909	0.027	(0.004)	< 0.001	< 0.001
Protect others & avoid unnecessary COVID-19 exposure (2 texts: initial text + 3 d later)	0.018	(0.012)	0.129	0.460	0.016	(0.023)	0.487	0.909	0.027	(0.004)	< 0.001	< 0.001
More Americans are getting flu shot than in the past (2 texts: initial text + 3 d later)	0.018	(0.011)	0.103	0.460	0.006	(0.022)	0.791	0.909	0.026	(0.004)	< 0.001	< 0.001
Come back & get your flu shot (1 text)	0.022	(0.012)	0.064	0.460	0.024	(0.023)	0.308	0.909	0.025	(0.004)	< 0.001	< 0.001
Protect yourself & avoid unnecessary COVID-19 exposure (2 texts: initial text + 3 d later)	0.016	(0.012)	0.161	0.460	0.014	(0.023)	0.549	0.909	0.024	(0.004)	< 0.001	< 0.001
Protect yourself by getting a flu shot (2 texts: initial text + 3 d later)	0.012	(0.012)	0.324	0.600	-0.008	(0.023)	0.722	0.909	0.026	(0.004)	< 0.001	< 0.001
Get a flu shot to avoid getting the flu or spreading it to others (2 texts: initial text + 3 d later)	0.023	(0.011)	0.041	0.460	0.012	(0.022)	0.592	0.909	0.023	(0.004)	< 0.001	< 0.001
Commit to getting flu shot (2 texts: initial text + 3 d later)	0.009	(0.011)	0.419	0.602	-0.001	(0.022)	0.962	0.962	0.025	(0.004)	< 0.001	< 0.001
Protect others by getting a flu shot (2 texts: initial text + 3 d later)	0.007	(0.012)	0.520	0.602	0.015	(0.023)	0.514	0.909	0.023	(0.004)	< 0.001	< 0.001
45% of Americans get the flu shot, more than in the past (2 texts: initial text + 3 d later)	0.008	(0.011)	0.491	0.602	0.007	(0.022)	0.729	0.909	0.023	(0.004)	< 0.001	< 0.001
Receive a joke about the flu (1 text)	0.016	(0.012)	0.167	0.460	-0.006	(0.023)	0.794	0.909	0.022	(0.004)	< 0.001	< 0.001
Share a joke about the flu (1 text)	0.008	(0.012)	0.471	0.602	-0.016	(0.023)	0.474	0.909	0.021	(0.004)	< 0.001	< 0.001
People who get flu shots are less likely to get the flu (1 text)	0.012	(0.012)	0.327	0.600	0.005	(0.023)	0.826	0.909	0.017	(0.004)	< 0.001	< 0.001
Get a flu shot to avoid getting sick (1 text)	0.008	(0.011)	0.447	0.602	-0.035	(0.022)	0.107	0.909	0.017	(0.004)	< 0.001	< 0.001
Get a flu shot to avoid getting sick, reminder of previous sickness (1 text)	0.007	(0.011)	0.506	0.602	-0.042	(0.022)	0.055	0.909	0.018	(0.004)	< 0.001	< 0.001
Think about risk of catching the flu (1 text)	0.002	(0.012)	0.836	0.919	-0.016	(0.023)	0.493	0.909	0.017	(0.004)	< 0.001	< 0.001
Do yourself a favor by getting flu shot (2 texts: initial text + 2 hr later)	0.015	(0.012)	0.211	0.515	-0.015	(0.023)	0.500	0.909	0.015	(0.004)	< 0.001	< 0.001
Do others a favor by getting the flu shot (2 texts: initial text + 2 hr later)	0.010	(0.012)	0.379	0.602	0.001	(0.023)	0.949	0.962	0.012	(0.004)	0.003	0.003
People who get flu shots are healthier, wealthier, more educated (1 text)	-0.001	(0.012)	0.910	0.953	-0.008	(0.023)	0.721	0.909	0.014	(0.004)	< 0.001	< 0.001
Think about risk of catching the flu at specific locations (1 text)	0.000	(0.012)	0.971	0.971	0.012	(0.023)	0.616	0.909	0.011	(0.004)	0.011	0.011
R-Squared			0.0012				0.0033				0.0097	
Baseline Vaccination Rate			38.3%				38.9%				27.7%	
Observations			87,578				22,716				579,399	

Note: The above table reports the results of two ordinary least squares regressions, separately predicting whether white (left), non-white (middle), and patients with missing race information (right) in our study received a flu shot at Walmart between September 25, 2020 (when our intervention began) and December 31, 2020 (inclusive) with 22 different indicators for each of our experimental conditions as the primary predictors. The reference group is the business-as-usual control condition. Each regression includes the following control variables: (1) patient age, (2) an indicator for whether a patient is male, and (3) racial composition of the patient's county (percent white, percent Black, percent Hispanic; indicator for missing). Robust standard errors accounting for heteroskedasticity in linear probability models are shown in parentheses. Adjusted p-values accounting for multiple comparisons are calculated using the Benjamini-Hochberg method.

Table S7. Regression-estimated impact of each of our study's 22 intervention conditions on flu vaccine uptake by racial composition in the patient's county (Below Median % White vs. ≥ Median % White).

	≥ Median % White				< Median % White			
	Beta	SE	p-value	adjusted p-value	Beta	SE	p-value	adjusted p-value
Flu shot waiting for you (2 texts: initial text + 3 d later)	0.033	(0.006)	< 0.001	< 0.001	0.028	(0.006)	< 0.001	< 0.001
Flu shot waiting for you, encourage others to get flu shot (3 texts: initial text + 1 d later + 3 d later)	0.030	(0.005)	< 0.001	< 0.001	0.023	(0.005)	< 0.001	< 0.001
Reminder to get a flu shot (2 texts: initial text + 3 d later)	0.029	(0.005)	< 0.001	< 0.001	0.024	(0.005)	< 0.001	< 0.001
Protect others & avoid unnecessary COVID-19 exposure (2 texts: initial text + 3 d later)	0.025	(0.006)	< 0.001	< 0.001	0.027	(0.006)	< 0.001	< 0.001
More Americans are getting flu shot than in the past (2 texts: initial text + 3 d later)	0.026	(0.005)	< 0.001	< 0.001	0.025	(0.005)	< 0.001	< 0.001
Come back & get your flu shot (1 text)	0.027	(0.006)	< 0.001	< 0.001	0.024	(0.006)	< 0.001	< 0.001
Protect yourself & avoid unnecessary COVID-19 exposure (2 texts: initial text + 3 d later)	0.024	(0.006)	< 0.001	< 0.001	0.024	(0.006)	< 0.001	< 0.001
Protect yourself by getting a flu shot (2 texts: initial text + 3 d later)	0.025	(0.006)	< 0.001	< 0.001	0.021	(0.005)	< 0.001	< 0.001
Get a flu shot to avoid getting the flu or spreading it to others (2 texts: initial text + 3 d later)	0.024	(0.005)	< 0.001	< 0.001	0.022	(0.005)	< 0.001	< 0.001
Commit to getting flu shot (2 texts: initial text + 3 d later)	0.024	(0.005)	< 0.001	< 0.001	0.021	(0.005)	< 0.001	< 0.001
Protect others by getting a flu shot (2 texts: initial text + 3 d later)	0.031	(0.006)	< 0.001	< 0.001	0.014	(0.005)	0.014	0.017
45% of Americans get the flu shot, more than in the past (2 texts: initial text + 3 d later)	0.019	(0.005)	< 0.001	< 0.001	0.023	(0.005)	< 0.001	< 0.001
Receive a joke about the flu (1 text)	0.022	(0.006)	< 0.001	< 0.001	0.021	(0.006)	< 0.001	< 0.001
Share a joke about the flu (1 text)	0.023	(0.006)	< 0.001	< 0.001	0.016	(0.006)	0.003	0.005
People who get flu shots are less likely to get the flu (1 text)	0.013	(0.006)	0.015	0.019	0.021	(0.006)	< 0.001	< 0.001
Get a flu shot to avoid getting sick (1 text)	0.011	(0.005)	0.032	0.035	0.019	(0.005)	< 0.001	< 0.001
Get a flu shot to avoid getting sick, reminder of previous sickness (1 text)	0.018	(0.005)	< 0.001	< 0.001	0.012	(0.005)	0.023	0.027
Think about risk of catching the flu (1 text)	0.013	(0.006)	0.017	0.019	0.016	(0.005)	0.004	0.005
Do yourself a favor by getting flu shot (2 texts: initial text + 2 hr later)	0.017	(0.006)	0.002	0.003	0.012	(0.005)	0.033	0.034
Do others a favor by getting the flu shot (2 texts: initial text + 2 hr later)	0.009	(0.006)	0.109	0.114	0.015	(0.005)	0.005	0.007
People who get flu shots are healthier, wealthier, more educated (1 text)	0.016	(0.006)	0.003	0.004	0.007	(0.005)	0.187	0.187
Think about risk of catching the flu at specific locations (1 text)	0.009	(0.006)	0.116	0.116	0.012	(0.005)	0.030	0.033
R-Squared	0.0130				0.0134			
Baseline Vaccination Rate	29.9%				28.8%			
Observations	340,412				339,432			

Note: The above table reports the results of two ordinary least squares regressions, separately predicting whether patients in counties with populations comprised of fewer white Americans than the median county (left) and populations comprised of equal to or more white Americans than the median county (right) in our study received a flu shot at Walmart between September 25, 2020 (when our intervention began) and December 31, 2020 (inclusive) with 22 different indicators for each of our experimental conditions as the primary predictors. The reference group is the business-as-usual control condition. Each regression includes the following control variables: (1) patient age, (2) an indicator for whether a patient is male, (3) indicators for patient race/ethnicity (Black non-Hispanic, Hispanic, Asian, other/unknown; white non-Hispanic omitted), and (4) non-white racial composition of the patient's county (percent Black, percent Hispanic; indicator for missing). Robust standard errors accounting for heteroskedasticity in linear probability models are shown in parentheses. Adjusted p-values accounting for multiple comparisons are calculated using the Benjamini-Hochberg method.

4. Additional Analyses

To ensure the robustness of our primary results, we re-ran our analysis without any control variables (Table S8). The treatment effect estimates on our 22 intervention indicator variables in a regression without controls are extremely similar to those in our primary analysis ($r = 0.998$; $p < 0.001$).

We ran the following additional tests:

1) We confirmed that the average treatment effect pooled across all 22 intervention conditions was greater than zero and found it was 2.0 percentage points (regression-estimated average effect = 0.020; $SE = 0.003$, $p < 0.001$).
2) We tested the difference between the effect of the top performing intervention and the average effect of the other 21 interventions. The difference was 1.0 percentage points ($\chi^2 = 11.541$, $p < 0.001$). Note that this test was formulated only after the treatment effects were estimated and ranked. Consequently, the true differences are likely smaller than the estimated differences reported here.

Table S8. Regression-estimated impact of each of our study's 22 intervention conditions on flu vaccine uptake overall, without any control variables.

	Beta	SE	p-value	adjusted p-value
Flu shot waiting for you (2 texts: initial text + 3 d later)	0.029	(0.004)	< 0.001	< 0.001
Flu shot waiting for you, encourage others to get flu shot (3 texts: initial text + 1 d later + 3 d later)	0.026	(0.004)	< 0.001	< 0.001
Reminder to get a flu shot (2 texts: initial text + 3 d later)	0.026	(0.004)	< 0.001	< 0.001
Protect others & avoid unnecessary COVID-19 exposure (2 texts: initial text + 3 d later)	0.026	(0.004)	< 0.001	< 0.001
More Americans are getting flu shot than in the past (2 texts: initial text + 3 d later)	0.025	(0.004)	< 0.001	< 0.001
Come back & get your flu shot (1 text)	0.025	(0.004)	< 0.001	< 0.001
Protect yourself & avoid unnecessary COVID-19 exposure (2 texts: initial text + 3 d later)	0.024	(0.004)	< 0.001	< 0.001
Protect yourself by getting a flu shot (2 texts: initial text + 3 d later)	0.023	(0.004)	< 0.001	< 0.001
Get a flu shot to avoid getting the flu or spreading it to others (2 texts: initial text + 3 d later)	0.023	(0.004)	< 0.001	< 0.001
Commit to getting flu shot (2 texts: initial text + 3 d later)	0.022	(0.004)	< 0.001	< 0.001
Protect others by getting a flu shot (2 texts: initial text + 3 d later)	0.021	(0.004)	< 0.001	< 0.001
45% of Americans get the flu shot, more than in the past (2 texts: initial text + 3 d later)	0.022	(0.004)	< 0.001	< 0.001
Receive a joke about the flu (1 text)	0.021	(0.004)	< 0.001	< 0.001
Share a joke about the flu (1 text)	0.019	(0.004)	< 0.001	< 0.001
People who get flu shots are less likely to get the flu (1 text)	0.016	(0.004)	< 0.001	< 0.001
Get a flu shot to avoid getting sick (1 text)	0.015	(0.004)	< 0.001	< 0.001
Get a flu shot to avoid getting sick, reminder of previous sickness (1 text)	0.015	(0.004)	< 0.001	< 0.001
Think about risk of catching the flu (1 text)	0.013	(0.004)	< 0.001	< 0.001
Do yourself a favor by getting flu shot (2 texts: initial text + 2 hr later)	0.013	(0.004)	< 0.001	< 0.001
Do others a favor by getting the flu shot (2 texts: initial text + 2 hr later)	0.012	(0.004)	0.002	0.002
People who get flu shots are healthier, wealthier, more educated (1 text)	0.012	(0.004)	0.002	0.002
Think about risk of catching the flu at specific locations (1 text)	0.010	(0.004)	0.010	0.010
R-Squared		0.0002		
Baseline Vaccination Rate		29.4%		
Observations		689,693		

Note: The above table reports the results of an ordinary least squares regression predicting whether patients in our study received a flu shot at Walmart between September 25, 2020 (when our intervention began) and December 31, 2020 (inclusive) with 22 different indicators for each of our experimental conditions as the primary predictors. The reference group is the business-as-usual control condition. Robust standard errors accounting for heteroskedasticity in linear probability models are shown in parentheses. Adjusted p-values accounting for multiple comparisons are calculated using the Benjamini-Hochberg method.

5. Attribute Analysis

To explore underlying characteristics predictive of intervention efficacy, we gathered data on the content characteristics of our megastudy's interventions and conducted a series of attribute analyses, similar to those conducted in a previous megastudy examining methods for encouraging flu vaccinations in doctors' offices (Milkman et al., 2021). Our analysis plan was pre-registered at https://aspredicted.org/blind.php?x=29wz2i.

a. Participants

We recruited participants (N = 2,416) from Prolific's online pool to evaluate text messages from our megastudy, in exchange for $0.60. Following best practices for online surveys outlined by Mason & Suri (2012), we included an attention check ("How many words are in this sentence?") after our main survey task but before our demographics questions. We excluded from our pool (a) 119 participants who incorrectly answered our attention check question and (b) 216 participants with duplicate IP addresses. Our subsequent dataset included 2,081 raters (M_{Age} = 34.6; SD = 12.8); 47.8% male; 69.1% White/Caucasian, 14.7% Asian, 7.0% Black, 6.5% Hispanic, 1.8% Other, and less than 1% for each of American Indian / Alaska Native and Native Hawaiian / Other Pacific Islander.

b. Method

Subjective Ratings of Interventions. We asked participants to complete a survey gathering their "opinions about a short series of text messages" and provided them with the megastudy's general context (see complete study stimuli in *Web Appendix Attribute Analysis Survey Stimuli:* https://osf.io/qs4p7/?view_only=546ed2d8473f4978b95948a52712a3c5).

On the next screen, participants saw one text message intervention that was randomly selected from the set of 22 tested in our megastudy. Participants were asked to imagine they had received this text message and to rate their agreement with five statements using a 5-point scale (1 = "strongly disagree"; 5 = "strongly agree"). These statements were: "Receiving this set of text messages would put me in a positive mood." (*positive mood*); "Receiving this set of text messages would put me in a negative mood." (*negative mood*); "This set of text messages seems to assume that I already intend to get my flu shot. The messages are just a reminder." (*reminder*); "This set of text messages has a casual, informal tone." (*casualness*); and "I would be surprised to get these sorts of text messages from Walmart pharmacy." (*surprise factor*). We presented these statements in randomized order and asked participants to rate only one text message intervention.

On the next screen, participants completed our attention check. Next, they reported whether they received a flu shot during the a) 2019-2020 flu season and b) 2020-2021 flu season. Finally, they self-reported their demographic information (age, gender, race, ethnicity, highest level of education achieved, and country of residence).

Coding of Objective Attributes. Three research assistants who were blind to our study's hypotheses classified ten objective attributes of our text message interventions independently and then came to consensus in case of any disagreements. Three attributes represented the readability of the first text message in a given intervention, which we asked coders to validate by using the editor function in Microsoft Word to capture *word count*, *Flesch-Kincaid grade level*, and *Flesch-Kincaid reading ease*. A fourth attribute indicated whether a given text message intervention had been designed to serve as a control condition in a smaller sub-study within the megastudy, of which there were eight (*control condition*). Finally, six additional attributes of all text messages in a given intervention[*] were coded: whether an exclamation mark was used (*exclamation mark*); whether the messages explicitly mentioned a flu shot was "waiting for you" (*waiting for you*); the number of discrete text messages sent by Walmart pharmacy (*message count)*; the number of verbs in the imperative tense (excluding standard opt-out instructions; e.g., "remember to…," *imperative)*; the number of verbs in the interrogative tense (e.g., "did you…," *interrogative)*; and whether the message asked the recipient to take an action such as texting back, excluding standard opt-out instructions (*interactive).*

Coding of Message Delivery. To evaluate message delivery, we counted the number of discrete days across which messages were sent (*multiple days of messages*)[†].

Our full set of intervention attributes can be found in Table S9.

[*] Here we looked at the message flow as if a patient did not ignore any text messages and, if requested, texted back.

[†] As with six of the objective content attributes, we counted message days for a conversational flow as if a patient did not ignore any text messages and, if requested, texted back. These were either one or two, so we treat it as a binary variable of "multiple days of messages."

Table S9. Each of our 22 interventions and their corresponding ratings across our fifteen attributes.

	Objective attributes										Subjective attributes				
	Control condition	Word count	Reading level	Reading ease	Message count	Imperative	Interrogative	Exclamation marks	Interactive	Waiting for you	Positive mood	Negative mood	Reminder	Casualness	Surprise factor
Get a flu shot to avoid getting the flu or spreading it to others (2 texts: initial text + 3 d later)	1	59	2.2	96.4	3	1	0	1	1	0	2.94	2.05	3.26	3.90	2.78
Commit to getting flu shot (2 texts: initial text + 3 d later)	0	72	2.5	95.3	3	1	0	1	1	0	2.97	2.45	3.28	3.52	2.94
Get a flu shot to avoid getting sick, reminder of previous sickness (1 text)	0	58	3.2	89.0	2	3	2	1	1	0	2.26	3.36	2.78	3.67	3.64
Get a flu shot to avoid getting sick (1 text)	1	35	2.3	90.9	1	1	0	1	0	0	2.88	2.36	2.84	3.92	2.86
45% of Americans get the flu shot, more than in the past (2 texts: initial text + 3 d later)	0	52	4.5	77.6	2	0	0	1	0	0	2.89	2.52	3.26	3.63	2.63
More Americans are getting flu shot than in the past (2 texts: initial text + 3 d later)	0	43	4.2	80.0	2	0	0	1	0	0	2.93	2.64	3.44	3.65	2.91
Reminder to get a flu shot (2 texts: initial text + 3 d later)	1	31	3.4	84.3	2	0	0	1	0	0	2.71	2.26	3.91	3.73	2.57
Flu shot waiting for you, encourage others to get flu shot (3 texts: initial text + 1 d later + 3 d later)	0	55	3.9	80.4	3	2	1	2	1	1	3.00	2.40	4.01	3.90	2.87
Flu shot waiting for you (2 texts: initial text + 3 d later)	1	38	3.8	81.1	2	1	0	1	0	1	2.78	2.39	3.69	3.73	2.70
Protect others by getting a flu shot (2 texts: initial text + 3 d later)	0	65	4.6	81.3	3	2	0	2	1	0	3.07	2.30	3.39	3.60	2.73
Protect yourself by getting a flu shot (2 texts: initial text + 3 d later)	0	63	4.4	82.0	3	2	0	2	1	0	2.91	2.46	3.56	3.70	2.89
Protect others & avoid unnecessary COVID-19 exposure (2 texts: initial text + 3 d later)	0	71	4.1	83.3	3	2	0	2	1	0	2.94	2.31	3.16	3.57	2.89
Protect yourself & avoid unnecessary COVID-19 exposure (2 texts: initial text + 3 d later)	0	69	4.7	81.1	3	2	0	2	1	0	2.97	2.51	3.34	3.70	2.60
People who get flu shots are healthier, wealthier, more educated (1 text)	0	58	4.2	81.7	2	1	1	1	1	0	2.68	2.76	2.68	3.38	3.36
People who get flu shots are less likely to get the flu (1 text)	1	59	3.0	90.7	2	1	1	1	1	0	2.74	2.27	2.55	3.59	3.03
Do others a favor by getting the flu shot (2 texts: initial text + 2 hr later)	0	43	2.8	87.4	2	4	1	2	1	0	2.79	2.83	3.19	3.77	3.20
Do yourself a favor by getting flu shot (2 texts: initial text + 2 hr later)	1	26	1.8	90.9	2	3	1	2	1	0	2.59	2.98	3.31	3.86	2.90
Think about risk of catching the flu at specific locations (1 text)	0	74	4.8	82.2	2	2	1	1	1	0	2.61	2.73	3.03	3.78	3.39
Think about risk of catching the flu (1 text)	1	45	2.0	93.9	2	2	0	1	1	0	2.95	2.32	3.12	3.71	2.73
Share a joke about the flu (1 text)	0	92	4.1	85.7	1	2	2	2	1	0	3.32	2.17	3.63	4.27	3.82
Receive a joke about the flu (1 text)	0	63	4.4	82.0	1	1	1	1	0	0	3.42	2.01	3.67	4.32	3.47
Come back & get your flu shot (1 text)	1	30	5.0	72.3	1	1	0	1	0	0	3.17	2.19	3.65	3.84	2.60

Note: This table includes the means and frequencies of content-based attributes of our 22 text message interventions. The subjective attributes are the mean rating given by our Prolific raters.

c. Results

Summary Statistics. An average of 94.6 raters evaluated each intervention (min = 87, median = 94, max = 101). To assess coding reliability across interventions, we calculated the intraclass correlation coefficients for each of our subjective attribute measures, and these are shown in Table S10. Notably, all intraclass correlation coefficients are 0.8 or higher, indicative of good reliability in this context (DeVellis, 2016; Koo & Li, 2016).

Table S10. Intraclass Correlation Coefficients for Subjective Attributes of Text Message Interventions

Rating	ICC(1,R)[1]
Positive mood	0.85
Negative mood	0.86
Reminder	0.91
Casualness	0.80
Surprise Factor	0.86

Note. One-way random-effect ICC based on all raters for each condition. The number of raters ranged from 87 to 101 across conditions.

Correlational Analysis. We calculated bivariate correlations between the fifteen intervention attributes described above as well as their correlation with intervention efficacy (see Table S11 for correlations). To measure efficacy, we used the coefficient estimating the impact of a given intervention on flu shot uptake at Walmart between September 25, 2020 and December 31, 2020 (from Table 1).

Table S11. Paired correlations between the ratings of intervention attributes as well as their correlations with our estimates of intervention efficacy (regression-estimated treatment effects from Table 1), across our 22 text messaging interventions.

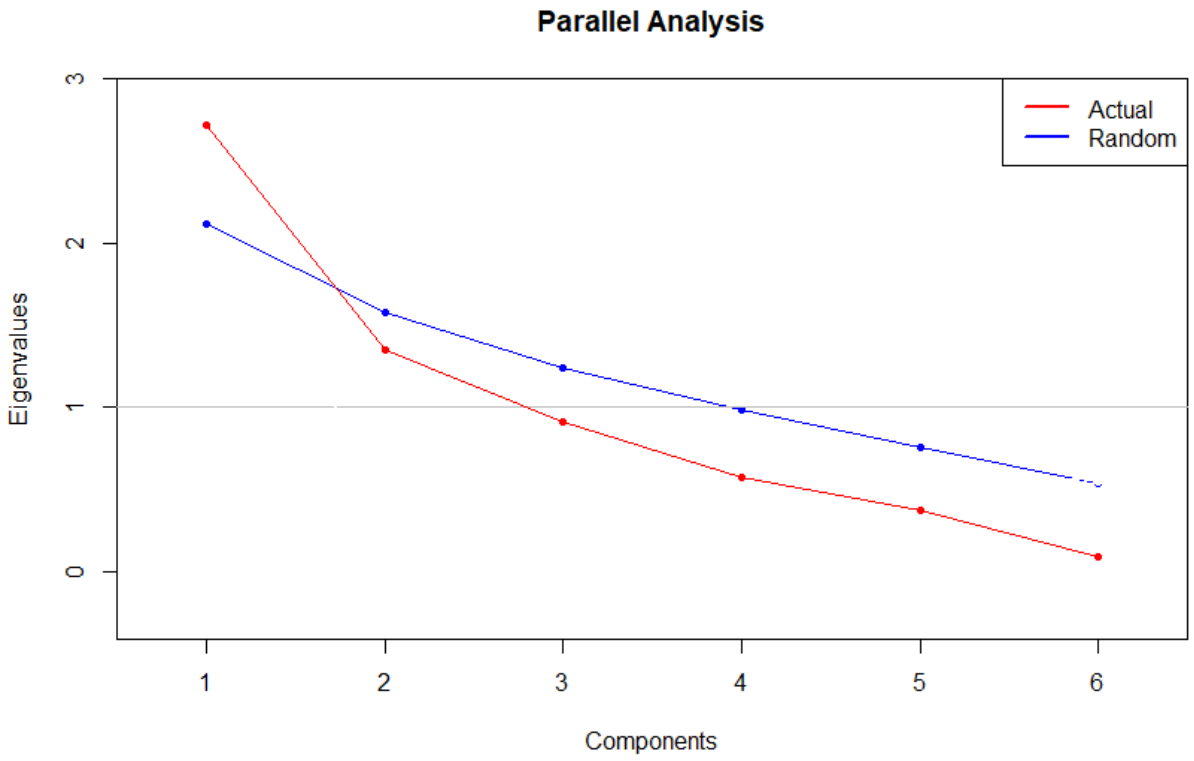
	Intervention Efficacy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Subjective attributes																
1. Reminder	0.714***	-														
2. Surprise factor	-0.523*	-0.281	-													
3. Negative mood	-0.504*	-0.411†	0.312	-												
4. Positive mood	0.416†	0.514*	-0.069	-0.801***	-											
5. Casualness	0.064	0.455*	0.360	-0.387†	0.542**	-										
Objective attributes																
6. Interrogative	-0.513*	-0.206	0.879***	0.426*	-0.221	0.365†	-									
7. Imperative	-0.458*	-0.161	0.367†	0.501*	-0.254	0.100	0.490*	-								
8. Waiting for you	0.442*	0.461*	-0.175	-0.073	0.002	0.084	0.000	-0.015	-							
9. Interactive	-0.410†	-0.343	0.312	0.286	-0.226	-0.226	0.371†	0.674***	-0.123	-						
10. Flesch-Kincaid reading ease	-0.374†	-0.422†	0.147	0.067	-0.258	-0.002	0.115	0.233	-0.224	0.435*	-					
11. Flesch-Kincaid grade level	0.319	0.304	0.052	-0.140	0.325	0.003	-0.032	-0.221	0.071	-0.218	-0.896***	-				
12. Message count	0.293	0.052	-0.375†	0.075	-0.172	-0.537**	-0.349	0.157	0.166	0.556**	0.153	-0.020	-			
13. Exclamation mark	0.088	0.287	0.019	0.070	0.193	0.128	0.144	0.635**	0.090	0.516*	-0.122	0.131	0.396†	-		
14. Word count	-0.059	-0.112	0.523*	-0.150	0.292	0.097	0.328	0.141	-0.157	0.538**	0.059	0.348	0.282	0.273	-	
15. Control Condition	0.054	-0.032	-0.451*	-0.282	-0.133	0.085	-0.288	-0.226	0.090	-0.295	0.327	-0.539**	-0.285	-0.375†	-0.658***	-

***p <0.001, ** p < 0.01, * p < 0.05, † p < 0.10

Principal Component Analysis. Because intervention attributes were not linearly independent (see correlations in Table S11), we used principal component analysis to extract dimensions of correlated attributes. Given limited degrees of freedom, we restricted our analysis to attributes with statistically significant ($p < 0.05$) associations with efficacy in Table S11: *reminder, surprise factor, negative mood, positive mood, interrogative, imperative, and waiting for you.*

Figure S1 shows our scree plot and parallel analysis (i.e., the scree plot of simulated data from 10,000 reshufflings of the same data). Together these indicated a two-component solution: the scree plot slope levels off after two dimensions, and the crossover point is near two dimensions. The first component explained 42% of the variance and the second component explained 25%, ignoring other components.

Figure S1. Parallel analysis of components identified from six selected attributes. The red line represents the actual data; the blue line represents simulated data from 10,000 reshufflings.



We identified our two-component solution by running a principal component analysis with an oblique promax rotation on our six attributes. The loadings are shown in Table S12. We interpreted Component 1 as messages that were incongruent with typical Walmart Pharmacy communications (i.e., surprising, asking questions, telling patients what to do), and Component 2 as messages reminding customers a flu shot was "waiting" for them at Walmart Pharmacy.

Table S12. Loadings from our Principal Component Analysis

	Component 1 "Incongruence"	Component 2 "Reserved Reminder"
Interrogative	**0.95**	0.12
Surprise factor	**0.82**	-0.05
Imperative	**0.75**	0.09
Negative mood	**0.61**	-0.21
Waiting for you	0.20	**0.90**
Reminder	-0.12	**0.82**

Note: Component loadings ≥ 0.60 are shown in bold.

As expected and as shown in Table S13, these two components were largely independent. Also as expected, bivariate associations with intervention efficacy were substantial for Component 1 ("*incongruence*") (r = - 0.64, p = 0.0015) and Component 2 ("*reserved reminder*") (r = 0.69, p < 0.001).

Table S13. Bivariate correlations between our two components and intervention efficacy

	Intervention Efficacy	1	2
1. Incongruence	-0.635**	-	-0.280
2. Reserved Reminder	0.690***	-0.280	-

***p<0.001, ** p<0.01

i. Predicting intervention effectiveness

Per our pre-registered analysis plan, we predicted intervention effectiveness between September 25, 2020 and October 31, 2020 and between September 25, 2020 and December 31, 2020 (predicting the 22 coefficient estimates from Table 1 and Table S3, respectively). Our predictors were our two components (*reserved reminder* and *incongruence*) as well as a binary indicator for whether an intervention sent patients messages on more than one day (*multiple days of messages*), and we used heteroskedasticity-robust standard errors. This echoes the analysis method taken in a prior megastudy of messaging interventions (Milkman et al., 2021).

As shown in Table S14 below, *reserved reminder* (B = 0.002, p = 0.006) and *multiple days of messages* (B = 0.008, p = 0.002) were each significant positive predictors of flu shot uptake between September 25, 2020 and October 31, 2020. *Incongruence* was a negative and insignificant predictor of intervention efficacy (B = -0.001, p = 0.374).

Table S15 shows the same analysis for the September 25, 2020 and December 31, 2020 time period. Again, *reserved reminder* (B = 0.002, p = 0.002) and *multiple days of messages* (B =

0.005, $p = 0.035$) were significant positive predictors of flu shot uptake. *Incongruence* was not a significant predictor ($B = -0.001$, $p = 0.197$).

Table S14. Regression-estimated effect of principal components 1 (*incongruence*) and 2 (*reserved reminder*) as well as *multiple days of messages* on regression-estimated intervention effectiveness between September 25 and October 31, 2020 measured via regression coefficient estimates in Table S3.

	Beta	SE	p-value
Incongruence	-0.001	(0.001)	0.374
Reserved Reminder	0.002	(0.001)	0.006
Multiple Days of Messages	0.008	(0.002)	0.002
R-Squared		0.7685	
Observations		22	

Note: The above table reports the results of the ordinary least squares regression predicting one-month intervention efficacy with our two components — Incongruence and Reserved Reminders — and Multiple Days of Messaging as the predictors. Each intervention was given a component loading based on our prior PCA. Intervention efficacy was measured using coefficient estimates from Table S3. Robust standard errors are shown in parentheses.

Table S15. Regression-estimated effect of principal components 1 (*incongruence*) and 2 (*reserved reminder*) as well as *multiple days of messages* on regression-estimated intervention effectiveness between September 25 and December 31, 2020 measured via regression coefficient estimates in by Table 1.

	Beta	SE	p-value
Incongruence	-0.001	(0.001)	0.197
Reserved Reminder	0.002	(0.001)	0.002
Multiple Days of Messages	0.005	(0.002)	0.035
R-Squared		0.7534	
Observations		22	

Note: The above table reports the results of the ordinary least squares regression predicting three-month intervention efficacy with our two components — Incongruence and Reserved Reminders — and Multiple Days of Messaging as the predictors. Each intervention was given a component loading based on our prior PCA. Intervention efficacy was measured using coefficient estimates from Table 1. Robust standard errors are shown in parentheses.

As a robustness test, we re-ran the above regression models replacing our second component (*reserved reminder)* with a binary indicator of whether a text message intervention included the phrase "waiting for you." *Multiple days of messages* remains a significant positive predictor of intervention efficacy for both time periods (October: $p = 0.002$ and December: $p = 0.032$) and *incongruence* an insignificant negative predictor (both p's > 0.10). The indicator of "waiting for you" — which loaded heavily on our component *reserved reminder* and was present in our top interventions — unsurprisingly is a positive predictor (October: $p = 0.003$ and December: $p < 0.001$).

ii. Predicting vaccination

For robustness, we also ran an OLS regression model to predict our study's primary dependent variable (flu vaccination at Walmart between September 25, 2020 and December 31, 2020) across all observations[‡]. Again, our main predictors were the two components that emerged from our attribute principal component analysis (*reserved reminder* and *incongruence*) as well as a binary indicator for whether an intervention sent patients messages on more than one day (*multiple days of messages*). We also included a binary indicator for whether a participant was in the control condition, adding our standard controls (as described in the note of Table 1) and using heteroskedasticity-robust standard errors.

As shown in Table S16, *reserved reminder* and *multiple days of messages* were each significant positive predictors of flu shot uptake ($p < 0.001$ and $p = 0.001$ respectively). The other component - *incongruence* - was a negative and marginally significant predictor of vaccination ($p = 0.058$).

Table S16. Regression-estimated effect of components 1 (*incongruence*) and 2 (*reserved reminder*) as well as *multiple days of messages* on flu vaccination between September 25 and December 31, 2020, controlling for gender, age, and race[§].

	Beta	SE	p-value
Incongruence	-0.001	(0.001)	0.058
Reserved Reminder	0.002	(0.001)	< 0.001
Multiple Days of Messages	0.005	(0.002)	0.001
R-Squared		0.0133	
Observations		689,693	

Note: The above table reports the results of an ordinary least squares regression predicting whether patients in our study received a flu shot at Walmart between September 25, 2020 (when our intervention began) and December 31, 2020 (inclusive) with the two components identified above — Incongruence & Reserved Reminder — as the primary predictors. The regression includes the following control variables: (1) patient age, (2) an indicator for whether a patient is male, (3) indicators for patient race/ethnicity (Black non-Hispanic, Hispanic, Asian, other/unknown; white non-Hispanic omitted), and (4) racial composition of the patient's county (percent white, percent Black, percent Hispanic; indicator for missing). Robust standard errors accounting for heteroskedasticity in linear probability models are shown in parentheses.

We also ran this OLS regression model focusing on our megastudy's secondary dependent variable (vaccinations at Walmart received within one-month of our intervention's launch: between September 25, 2020 and October 31, 2020). Our results with this alternative outcome are extremely similar to the results presented above, as shown in Table S17. *Reserved reminder*

[‡] Unlike the prior set of regressions on intervention efficacy, this set of regressions on vaccination decisions definitionally include the business-as-usual control (no message) in their analyses.

[§] In both OLS regression models predicting vaccination at the individual level, we include individuals who received the business-as-usual control, which was no message. For those individuals, the value of both components is 0 and of multiple days of messages is 0.

and *multiple days of messages* remain significant positive predictors of flu shot uptake (both *p*'s < 0.001), but *incongruence* was an insignificant predictor ($p = 0.206$).

iii. Heterogeneity analysis

Heterogeneity analyses did not show significant variation in our attribute analysis results across different demographic groups (male vs. female, under 65 vs. 65+, white vs. nonwhite vs. unknown, county % white at or above median vs. county % white below median) and full results are available upon request.

Table S17. Regression-estimated effect of components 1 (*incongruence*) and 2 (*reserved reminder*) as well as *multiple days of messages* on flu vaccination between September 25 and October 31, 2020, controlling for gender, age, and race.

	Beta	SE	p-value
Incongruence	-0.001	(0.001)	0.206
Reserved Reminder	0.002	(0.001)	< 0.001
Multiple Days of Messages	0.008	(0.001)	< 0.001
R-Squared		0.0131	
Observations		689,693	

Note: The above table reports the results of an ordinary least squares regression predicting whether patients in our study received a flu shot at Walmart between September 25, 2020 (when our intervention began) and October 31, 2020 (inclusive) with the two components identified above — Incongruence & Reserved Reminder — as the primary predictors. The regression includes the following control variables: (1) patient age, (2) an indicator for whether a patient is male, (3) indicators for patient race/ethnicity (Black non-Hispanic, Hispanic, Asian, other/unknown; white non-Hispanic omitted), and (4) racial composition of the patient's county (percent white, percent Black, percent Hispanic; indicator for missing). Robust standard errors accounting for heteroskedasticity in linear probability models are shown in parentheses.

Finally, we re-ran both of the above regression models replacing component 2 (*reserved reminder*) with a binary indicator for whether the text message included the phrase "waiting for you." In these analyses, *waiting for you* and *multiple days of messages* were significant positive predictors ($p = 0.018$ and $p = 0.014$, respectively) and *incongruence* was a significant negative predictor ($p < 0.001$) when predicting vaccination decisions between September 25 and December 31st, 2020. However, when predicting only the first month of decisions, i.e., through October 31st, 2020, *waiting for you* and *multiple days of messages* remained significant positive predictors ($p = 0.007$, $p < 0.001$, respectively) while *incongruence* was no longer a significant negative predictor ($p = 0.073$).

6. Prediction Analysis

To understand the ex ante predictability of our megastudy results, we conducted the following prediction analysis, focusing on predictions of results in the first one-month after our intervention. Participants in these prediction studies were provided with an overview of our megastudy and historical vaccination rates in the United States (Centers for Disease Control and Prevention, https://www.cdc.gov/flu/fluvaxview/coverage-1920estimates.htm). They then predicted the vaccination rates of individuals in different megastudy conditions.

a. Participants

Study 1: Scientists. In October 2020, well before Walmart flu shot data were available for analysis, we invited the scientists who designed the interventions in our megastudy to participate in a prediction survey. Twenty-four of 27 scientists participated (89%). Ninety-six percent reported getting a flu vaccine in 2019-2020 and, likewise, 96% reported getting a flu vaccine in 2020-2021.

Study 2: Lay Predictors. In January 2021, we recruited 406 lay people from Prolific's online panel of participants to "make predictions about how text messages might nudge people to get a flu vaccine" in exchange for $1.95. We also informed participants that the six most accurate individuals would receive a bonus of $50. Participants had the following demographic characteristics: mean age = 32.3 (*SD* = 11.9); 52% female; mean years of work experience = 10.9 (*SD* = 9.8); degree level: high school or less = 11.1%, some college = 26.9%, associate's degree = 8.6%, bachelor's degree = 38.2%, master's, doctoral, or professional degree = 14.8%; 11% indicated that their job was in academia, 8% worked in healthcare, and 6.4% worked in psychology; 48% reported getting a flu vaccine in 2019-2020 and 45% reported getting a flu vaccine in 2020-2021.

b. Methods

Study 1: Scientists: Scientists predicted (in order) the vaccination rates of (1) individuals in the business-as-usual control condition, (2) individuals who received the text message interventions they designed, and (3) individuals who received the text message interventions designed by other researchers (the latter were displayed in randomized order). Twenty-four scientists made a total of 552 predictions. More details on the study procedures appear below.

Study 2: Lay Predictors: Participants predicted the vaccination rates of individuals in the business-as-usual control, as well as for six randomly selected text message interventions from the 22 in our megastudy. 406 participants produced a total of 406 predictions about the vaccination rate in the business-as-usual control condition and 2,436 text message intervention

predictions for an average of 111 predictions per text message intervention. More details on the study procedures appear below.

Study 1 & 2 Procedures: As displayed in *Stimuli for Prediction Accuracy Surveys* (https://osf.io/v5gyd/?view_only=ed57b91de433428a8e4cc7ad923934f5), participants in Study 1 & 2 were first shown an overall description of the Walmart megastudy, followed by a chart of flu vaccination rate trends in the United States over the last ten years as reported by the Centers for Disease Control and Prevention (CDC). Participants were then asked to estimate the vaccination rate of Walmart pharmacy customers in the business-as-usual control condition of our megastudy. On the next screen, Study 2 participants were asked to make the same estimate (an estimate of Walmart customers' vaccination rates) for customers from six randomly-selected conditions from the mega-study. Specifically, they were asked: "For individuals who received the above text messages and received a flu vaccine last flu season at Walmart -- what percentage of them do you think got the flu vaccine at Walmart between September 25 and October 31, 2020? Please write your percentage as a whole number between 0 and 100, inclusive." Study 1 participants were asked to make the same estimate, first for the interventions they designed (minimum of two, maximum of four) and then for the interventions designed by other scientists, in randomized order.

Each intervention condition from the megastudy that participants were asked to rate was presented in isolation (that is, one at a time) with a realistic rendering of what the text message conversation between Walmart pharmacy and a given customer might look like, including multiple potential paths the conversation could take depending on customer responses (see example stimuli in *Stimuli for Prediction Accuracy Surveys* (https://osf.io/v5gyd/?view_only=ed57b91de433428a8e4cc7ad923934f5)).

Finally, after evaluating all provided text message interventions (22 for scientists, 6 for lay predictors), participants were asked to rate the knowability (or "epistemicness") of this prediction domain (EARS, Ülkümen, Fox, & Malle, 2016).

c. Analysis and Results

For both the scientists and lay predictors from Prolific, our key dependent variable was the predicted vaccination rate in a given condition at the one-month mark, which we compared to the actual vaccination rate at that point in time. Our analysis evaluated each cohort's ability to predict i) relative intervention efficacy, ii) the average effect size across interventions.

i. Ability to predict relative intervention efficacy

The average predictions of intervention efficacy by the crowd of scientists (measured by averaging their predictions of the fraction of patients in an intervention condition who would get

vaccinated) did not correlate with observed vaccination rates at the one-month mark ($N = 23$, $r = 0.03$, $p = 0.880$) while those of lay predictors did ($N = 23$, $r = 0.60$, $p = 0.003$). Following Diedenhofen & Musch (2015), we ran three two-sided tests comparing these correlations and found that the difference was significant at the 4-6% level — Dunn & Clark's z-test: $p = 0.048$; Steiger's z-test: $p = 0.051$; Meng et al.'s z-test: $p = 0.055$ (Dunn & Clark, 1969; Steiger, 1980; Meng, Rosenthal, & Rubin, 1992). Running the same set of analyses with only text message interventions (excluding predictions about the control condition), we found similar results (scientists: $N = 22$, $r = -0.14$, $p = 0.535$; lay predictors: $N = 22$, $r = 0.62$, $p = 0.002$) and the difference between the two cohorts was statistically significant across all three of the aforementioned tests ($p = 0.0108$, $p = 0.0135$, and $p = 0.0158$ respectively).

Figure S2 below presents this data side-by-side, and Figure S3 shows participants' 95% confidence interval predictions along with their actual predictions.

Figure S2. Side-by-side scatterplots of the average scientist prediction (left side, green) and average lay predictor prediction (right side, blue) vs. actual vaccination rates for the 23 megastudy conditions.

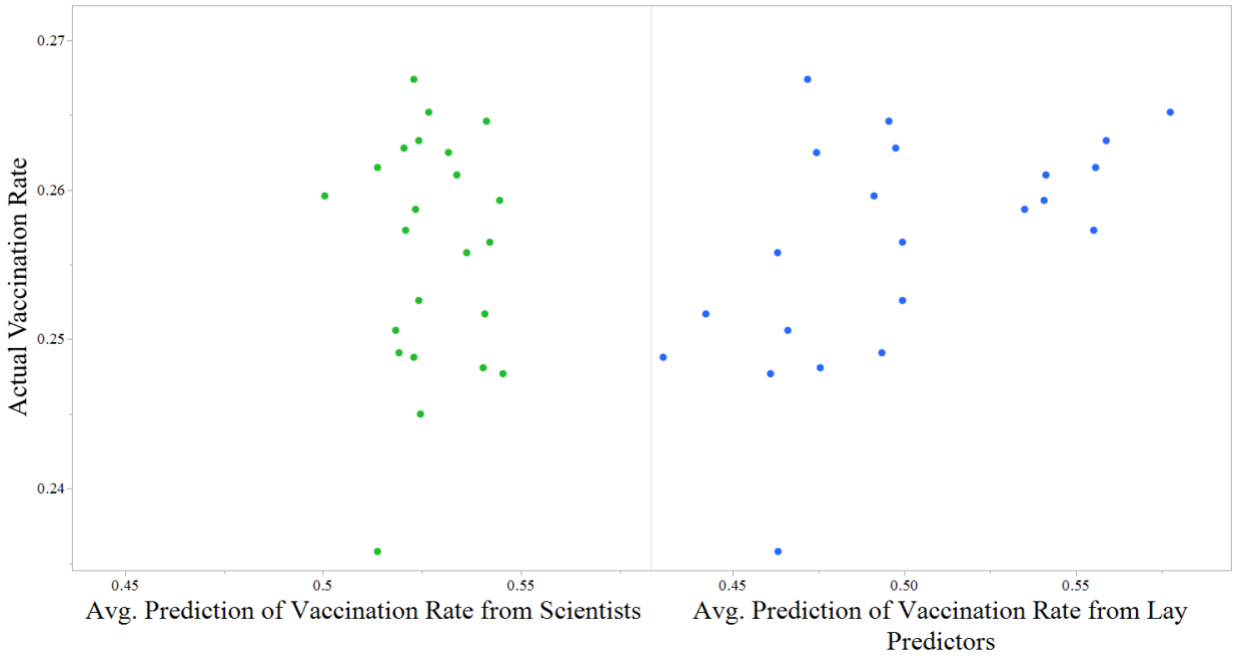
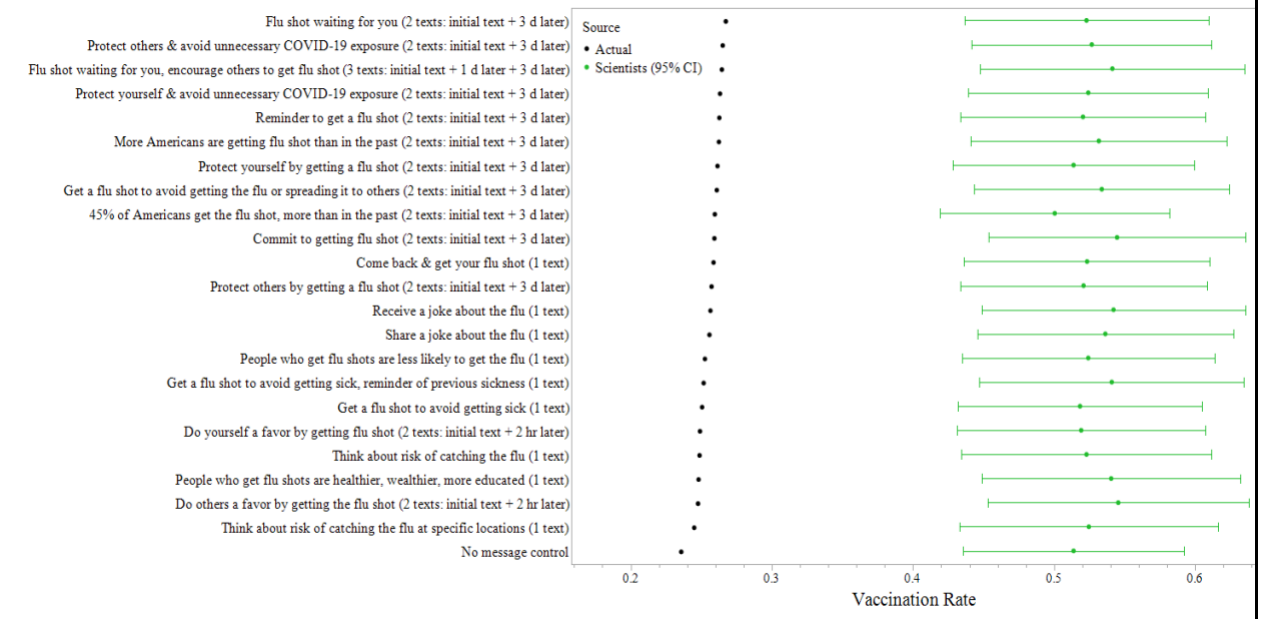
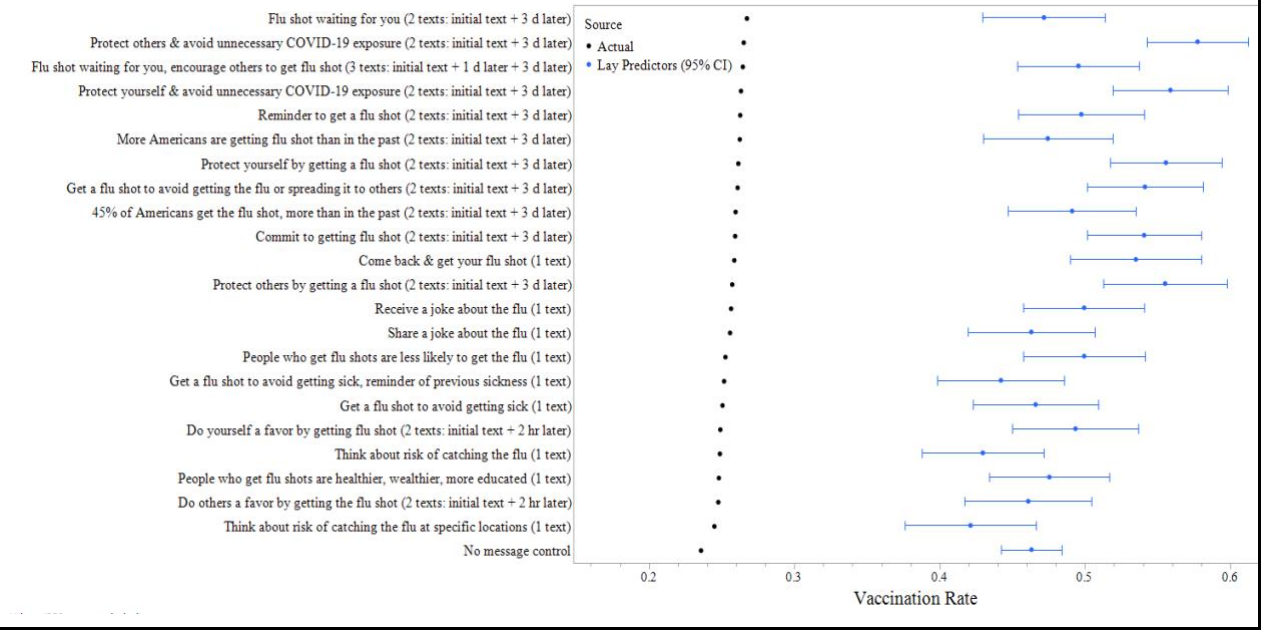


Figure S3. By condition, the actual vaccination rate versus the 95% confidence interval predictions by scientists (24 scientists making a total of 552 predictions, Panel A) and lay predictors (406 individuals making a total of 2,842 predictions, Panel B).

Panel A: Scientists



Panel B: Lay Predictors



We also evaluated forecasters' relative ranking of text message interventions, using Spearman's rank-rank correlation test. Again, the crowd of scientists' predictions did not correlate with the actual ordering of interventions' impact on vaccination rates (N = 23, r = -0.01, p = 0.955) while that of lay predictors did (N = 23, r = 0.63, p = 0.001). The difference between these two cohorts' predictive ability of interventions' relative performance was statistically significant (Dunn & Clark's z-test: p = 0.022; Steiger's z-test: p = 0.025; Meng et al.'s z-test: p = 0.028), indicating that in this context, predictions by lay predictors are more accurate than of scientists. As before, these results held when examining only text message interventions excluding our study's business-as-usual control group (scientists: N = 22, r = -0.13, p = 0.558; lay predictors: N = 22, r = 0.60, p = 0.003), and the differences between scientists' and lay predictors' performance were again statistically significant across the aforementioned tests (p = 0.012, p = 0.015, p = 0.018 respectively).

As shown in Table S18, neither scientists nor lay predictors correctly identified the top-performing intervention: scientists placed it 15th out of 22 and lay predictors placed it 16th out of 22.

Table S18. Rankings of each of our 22 interventions by their actual efficacy as a means of encouraging vaccination, by scientists' prediction of their efficacy, and by lay predictors' predictions of their efficacy.

Intervention condition	Actual Rank	Avg. Rank By Scientists	Avg. Rank By Lay Raters
Flu shot waiting for you (2 texts: initial text + 3 d later)	1	15	16
Protect others & avoid unnecessary COVID-19 exposure (2 texts: initial text + 3 d later)	2	10	1
Flu shot waiting for you, encourage others to get flu shot (3 texts: initial text + 1 d later + 3 d later)	3	4	11
Protect yourself & avoid unnecessary COVID-19 exposure (2 texts: initial text + 3 d later)	4	12	2
Reminder to get a flu shot (2 texts: initial text + 3 d later)	5	18	10
More Americans are getting flu shot than in the past (2 texts: initial text + 3 d later)	6	9	15
Protect yourself by getting a flu shot (2 texts: initial text + 3 d later)	7	22	3
Get a flu shot to avoid getting the flu or spreading it to others (2 texts: initial text + 3 d later)	8	8	5
45% of Americans get the flu shot, more than in the past (2 texts: initial text + 3 d later)	9	23	13
Commit to getting flu shot (2 texts: initial text + 3 d later)	10	2	6
Come back & get your flu shot (1 text)	11	14	7
Protect others by getting a flu shot (2 texts: initial text + 3 d later)	12	17	4
Receive a joke about the flu (1 text)	13	3	8
Share a joke about the flu (1 text)	14	7	19
People who get flu shots are less likely to get the flu (1 text)	15	13	9
Get a flu shot to avoid getting sick, reminder of previous sickness (1 text)	16	5	21
Get a flu shot to avoid getting sick (1 text)	17	20	17
Do yourself a favor by getting flu shot (2 texts: initial text + 2 hr later)	18	19	12
Think about risk of catching the flu (1 text)	19	16	22
People who get flu shots are healthier, wealthier, more educated (1 text)	20	6	14
Do others a favor by getting the flu shot (2 texts: initial text + 2 hr later)	21	1	20
Think about risk of catching the flu at specific locations (1 text)	22	11	23
No message control	23	21	18

ii. Ability to predict average intervention effect size

Next, we sought to estimate how well forecasters could predict the magnitudes of different interventions' impacts while adjusting for the issue that we showed participants CDC data on flu shot rates that were considerably higher than rates of vaccination by Walmart customers at Walmart (because we did not have other data available). To do this, we calculated the imputed percent increase in vaccination rate forecasted for each intervention condition.

Specifically, we took the difference between the average predicted vaccination rate for a text message intervention and the average predicted vaccination rate for the business-as-usual control, and we divided this difference by the latter quantity. Evaluating averages, scientists estimated the average lift size to be 5.7% while lay predictors estimated it at 25.9% (a difference that was significant, $p < 0.001$, Welch's test). The actual lift was 8.9%. To account for outliers in our lay predictor cohort, we also looked at medians. Taking each cohort's median prediction, scientists estimated the average lift size was 6.2%, while lay predictors provided an estimate of 8.3%.

7. References for the Supplement

DeVellis, R. F. (2016). Scale Development: Theory and Applications (Vol. 26). SAGE Publications.

Diebold, F.X. & Mariano, R.S. (1995). Comparing predictive accuracy. *Journal of Business and Economic Statistics, 13*(3), 253-263.

Diedenhofen, B. & Musch, J. (2015). cocor: A Comprehensive Solution for the Statistical Comparison of Correlations. *PLOS ONE, 10*(4).

Dunn, O. J., & Clark, V. (1969). Correlation coefficients measured on the same individuals. *Journal of the American Statistical Association, 64*(325), 366-377.

Gomila, R. (2020). Logistic or linear? Estimating causal effects of treatments on binary outcomes using regression analysis. *Journal of Experimental Psychology: General*. Advance online publication. https://doi.org/10.1037/xge0000920

Koo, T. K., & Li, M. Y. (2016). A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *Journal of Chiropractic Medicine, 15*(2), 155-163.

Meng, X. L., Rosenthal, R., & Rubin, D. B. (1992). Comparing correlated correlation coefficients. *Psychological Bulletin, 111*(1), 172-175.

Mason, W., & Suri, S. (2012). Conducting behavioral research on Amazon's Mechanical Turk. *Behavior Research Methods, 44*, 1-23.

Milkman, K. L., Patel, M. S., Gandhi, L., Graci, H. N., Gromet, D. M., Ho, H., … Duckworth, A. L. (2021). A megastudy of text-based nudges encouraging patients to get vaccinated at an upcoming doctor's appointment. *Proceedings of the National Academy of Sciences, 118*(20).

Steiger, J. H. (1980). Tests for comparing elements of a correlation matrix. *Psychological Bulletin, 87*(2), 245-251.

Ülkümen, G., Fox, C. R., & Malle, B. F. (2016). Two dimensions of subjective uncertainty: Clues from natural language. *Journal of Experimental Psychology: General, 145*(10), 1280-1297.

Welch, B. L. (1951). On the Comparison of Several Mean Values: An Alternative Approach. *Biometrika, 38*, 330-336.