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6 **Does Correcting Myths about the Flu Vaccine Work?**
7 **An experimental evaluation of the effects of corrective information**
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9 Brendan Nyhan, Ph.D. (corresponding author)

10 Dartmouth College

11 HB 6108, Hanover, NH 03755

12 603/646-2894 / nyhan@dartmouth.edu
13

14 Jason Reifler, Ph.D.

15 University of Exeter

16 J.Reifler@exeter.ac.uk
17

18 **Abstract**

19 Seasonal influenza is responsible for thousands of deaths and billions of dollars of medical costs
20 per year in the United States, but influenza vaccination coverage remains substantially below
21 public health targets. One possible obstacle to greater immunization rates is the false belief that it
22 is possible to contract the flu from the flu vaccine. A nationally representative survey experiment
23 was conducted to assess the extent of this flu vaccine misperception. We find that a substantial
24 portion of the public (43%) believes that the flu vaccine can give you the flu. We also evaluate
25 how an intervention designed to address this concern affects belief in the myth, concerns about
26 flu vaccine safety, and future intent to vaccinate. Corrective information adapted from the
27 Centers for Disease Control and Prevention (CDC) website significantly reduced belief in the
28 myth that the flu vaccine can give you the flu as well as concerns about its safety. However, the
29 correction also significantly *reduced* intent to vaccinate among respondents with high levels of
30 concern about vaccine side effects – a response that was not observed among those with low
31 levels of concern. This result, which is consistent with previous research on misperceptions
32 about the MMR vaccine, suggests that correcting myths about vaccines may not be an effective
33 approach to promoting immunization.
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38 **Introduction**

39 In the United States, seasonal influenza is responsible for thousands of deaths and billions of
40 dollars in medical costs and lost earnings annually, but immunization rates remain substantially
41 below the targets in *Healthy People 2020*.¹² In 2011-2012, for instance, only 33% of adults aged
42 18-64 were vaccinated – far short of the *Healthy People 2020* target of 80% for adults.³

43 One possible impediment to higher vaccination rates is the false belief that the influenza vaccine
44 can give people the flu. Health agencies often attempt to correct this false claim, which may
45 contribute to perceptions that the vaccine is unsafe or exacerbate hesitancy about immunization.⁴
46 However, previous research in non-medical contexts suggests that correcting factual
47 misperceptions may be ineffective and can even make false beliefs more prevalent due to
48 people's motivations to defend their prior beliefs.⁵ Similarly, corrective information is also often
49 ineffective at changing opinions.^{6,7,8} Most notably, though debunking the myth that the measles,
50 mumps, and rubella (MMR) vaccine causes autism was found to successfully reduce belief in
51 that false claim, it also *reduced* vaccination intent among parents with the least favorable
52 attitudes towards vaccines.⁹ Similarly, exposure to accurate information about the vaccine for
53 diphtheria-pertussis-tetanus (DPT) was associated with non-vaccinators seeing the vaccine as
54 less dangerous but also making them feel less inclined to vaccinate.¹⁰

55 In this article, we report the results of a nationally representative survey experiment examining
56 the prevalence of the myth that the flu vaccine can give people the flu and test whether
57 correcting this myth reduces belief in the misperception, increases perceptions that the flu
58 vaccine is safe, and increases vaccination intent. We compare the effect of this corrective
59 information and information about the dangers of the flu with a control condition in which
60 respondents were not given any information.

61

62 **Methods**

63 *Data collection*

64 The data for this study were collected as part of the 2012 Cooperative Congressional Election
65 Survey, a multi-investigator online study that primarily focused on questions about politics and
66 government. The survey was fielded in two waves – a pre-election wave in October 2012 and a
67 November 2012 post-election wave for respondents from the first wave (as we discuss below,
68 however, this wave suffered from significant non-random attrition).

69 Respondents were U.S. adults drawn from the YouGov/Polimetrix PollingPoint Panel and the E-
70 Rewards and Western Wats panels. These respondents were matched and weighted to
71 approximate a national probability sample using the YouGov/Polimetrix sample matching
72 methodology,¹¹ which has been shown to perform well in predicting the outcome of U.S.
73 elections and was recently adopted by the *New York Times*.¹² The final sample for the module
74 included 1000 respondents who participated in the first wave of the study (822 of these accepted
75 the invitation to complete wave 2). The response rate for wave 1 was 33.4% of the participants in
76 the panels listed above who were invited to take part in the study (American Association for

77 Public Opinion Research response rate 1).¹³ This study was designated as exempt from human
78 subjects review by the Dartmouth Committee for the Protection of Human Subjects (CPHS
79 #23722). Respondents provided informed consent before participating; no adverse events were
80 reported.

81

82 *Study design*

83 Respondents were randomly assigned to one of three different conditions in our experiment,
84 which allows us to make credible causal inferences about their effects of the messages tested. In
85 each condition, respondents were asked questions about the flu vaccine and whether or not they
86 intended to get vaccinated. In the control condition, respondents received no additional
87 information about the flu or flu vaccines prior to answering these questions. In the other
88 conditions, respondents received either information about the risk of influenza (*Danger*) or
89 information debunking the myth that people can contract flu from the vaccine (*Correction*). Each
90 respondent was assigned to only one condition and saw no other messages about the flu or
91 vaccines.

92 Each of these messages was taken nearly verbatim from the CDC website. In the *Danger*
93 condition, which uses text from the CDC web page “Key Facts about Influenza (Flu) and Flu
94 Vaccine,”¹⁴ respondents were informed that flu is a contagious illness, provided with a list of its
95 signs and symptoms, and told about the serious risks it poses. In the *Correction* condition, which
96 is adapted from the CDC web page “Misconceptions about Seasonal Flu and Flu Vaccines,”⁴
97 respondents were told that people cannot contract flu from the the flu shot or live virus nasal
98 spray. (The text of each intervention is provided in Online Appendix A.)

99 Responses to information about vaccines may vary depending on pre-existing attitudes toward
100 vaccines. It was not possible to accurately measure prior vaccine receipt in this study due to
101 concerns about error in self-reports of past behavior. In addition, prior receipt may also not
102 accurately reflect an individual’s current beliefs and attitudes. We instead measured participants’
103 general concerns about vaccine safety and possible side effects, which may contribute to beliefs
104 in specific vaccine myths (and rejection of corrective information about them) as well as vaccine
105 hesitancy.⁹ Specifically, we asked, “In general, how concerned are you about serious side effects
106 from vaccines?” prior to administering the interventions. Respondents answered on a five-point
107 scale ranging from “not at all concerned” to “extremely concerned.” We expected responses to
108 this question to moderate the treatment effect of interest because the corrective information in
109 our study concerns a perceived side effect of vaccines. Specifically, our expectation is that
110 respondents who are most concerned about side effects are most likely to resist corrective
111 information intended to alleviate those concerns.

112 Approximately a quarter of the sample (24%) answered that they were either “extremely
113 concerned” (11%) or “very concerned” (13%) about side effects from vaccines. In the analyses
114 that follow, this group, which is the most concerned about vaccine side effects, is referred to as
115 the high concern group. The remaining respondents are classified as low concern.

116

117 *Outcome measures*

118 After the experimental intervention, we assessed the effects of *Correction* and *Danger* on
119 respondents' misperceptions about the flu vaccine, beliefs about flu vaccine safety, and intention
120 to get vaccinated using three outcome measures. Misperceptions about the flu vaccine were
121 measured by asking respondents whether the statement "You can get the flu from the seasonal
122 flu vaccine" is accurate. Respondents' general beliefs about the safety of flu vaccines were
123 measured by asking "Just based on what you know, how safe do you believe the seasonal flu
124 vaccine, meaning the flu vaccine available every year, is generally for most people to take?"
125 Responses to both questions were measured on a four-point scale. We also asked respondents
126 "How likely is it that you will get a flu vaccine for the seasonal flu during the upcoming flu
127 season (fall 2012-spring 2013)?" and measured their reported intention to vaccinate on a six-
128 point scale. (The full text of each measure is provided in Online Appendix A.)

129

130 *Waves*

131 The *Danger* and *Correction* messages were administered only in Wave 1 of the survey. All
132 outcome measures and the side effects concern question were asked in Wave 1 and Wave 2. We
133 asked these outcome measures in both waves in the hopes of assessing whether the treatments
134 had both immediate and lasting effects. As we discuss below, however, wave 2 suffered from
135 significant non-random attrition, especially among respondents with high vaccine side effects
136 concern. As a result, it cannot yield valid inferences about the effect of the treatments given the
137 role of side effects concern as a moderator, though we present these data for completeness in
138 Online Appendix B (we discuss these results further below).

139

140 *Statistical analysis*

141 The results from the study were analyzed using ordered probit in Stata 13 (Stata Corp, College
142 Station, TX) and incorporate probability weights provided by YouGov to approximate a
143 nationally representative sample. We estimate the effects of assignment to the *Correction* and
144 *Danger* conditions on misperceptions about the flu vaccine (an "intent to treat" effect). In our
145 analysis below, we consider the possibility that responses to messages about vaccine safety or
146 the dangers of communicable disease may differ depending on respondents' prior attitudes
147 toward vaccines, which has been documented in previous research.⁹ Specifically, we test for
148 differences in responses to the *Correction* and *Danger* treatments between respondents with low
149 and high concerns about vaccine side effects. (This attitude was measured using the vaccine side
150 effects concern question described above, which was the only pre-intervention measure of
151 vaccine attitudes administered to respondents; full text in Online Appendix A). We report
152 separate statistical models for respondents with low and high levels of concern about side effects
153 for ease of interpretation. (Online Appendix B reports the results of full statistical models with
154 interactions between high concern over side effects and the experimental interventions; the

155 substantive conclusions are identical.) Predicted probabilities were estimated using SPost.¹⁵

156

157 **Results**

158 Table 1 summarizes the characteristics of respondents in our sample, which should reflect the
159 demographics of the national adult population in the U.S.

160

161 [Table 1]

162

163 The results indicate that our randomization was successful. In each case, we cannot reject the
164 null hypothesis of no association between the characteristic and assignment to condition.

165

166 Figure 1 summarizes the weighted distribution of responses to the three outcome variables of
167 interest across all conditions of our study (the control condition, *Correction*, and *Danger*): the
168 misperception that the flu vaccine can give you the flu, perceptions of flu vaccine safety, and
169 self-reported likelihood of vaccinating during the approaching flu season (fall 2012-spring 2013
170 at the time of the survey was administered).

171

172 [Figure 1]

173

174 Our results indicate that more than four in ten Americans believe the misperception that the flu
175 vaccine can give you the flu is “somewhat accurate” (31%) or “very accurate” (12%). However,
176 fewer hold the belief that the vaccine is unsafe (12% say “not very safe,” 4% “not at all safe”).
177 The distribution of self-reported likelihood of receiving a flu shot are highly bimodal: 34% say
178 they are very unlikely to get a flu shot and 37% say they are very likely while the remaining 29%
179 of respondents were less certain.

180

181 *Experimental results: Flu vaccine beliefs*

182 Table 2 reports ordered probit models of the effects of our interventions on respondent beliefs
183 that the flu vaccine can you give the flu and that it is unsafe. These models estimate the effect of
184 the *Danger* and *Correction* interventions by comparing responses among individuals assigned to
185 those conditions with those from individuals assigned to the control group. We estimate these
186 effects both for our total sample and separately for respondents with low or high concern about
187 vaccine side effects. Finally, both outcome variables are coded so that higher values represent
188 more negative views of the flu vaccine (i.e., beliefs that the flu vaccine can give you the flu or is
189 unsafe). Negative coefficients thus indicate that an intervention reduced false beliefs.

190

191

[Table 2]

192

193 The results of our models suggest that *Correction* was generally successful in reducing false
194 beliefs about the flu vaccine. Telling respondents that the vaccine cannot give you the flu
195 significantly reduced beliefs in that false claim in the full sample as well as respondents with
196 both low and high side effects concern. *Correction* also significantly reduced beliefs that the flu
197 vaccine is unsafe for the full sample, though the effect was only statistically significant for the
198 low side effects concern group. (We cannot reject the null hypothesis of no difference in the
199 effects of *Correction* between groups when we estimate a pooled model with interaction terms,
200 however – see Online Appendix B.) By contrast, we find no evidence that *Danger* affected
201 misperceptions about the flu vaccine for the full sample or either side effects concern group.
202 (Note: These findings, and those reported below, are robust to estimating the models with binary
203 dependent variables instead of ordered scales or using OLS instead of ordered probit – all results
204 available upon request.)

205 To illustrate the substantive effects of our findings, we calculate predicted probabilities from the
206 statistical models in Table 2 that respondents in each vaccine side effects concern group will
207 endorse the myth that the flu vaccine can give you the flu (i.e., that the claim is “somewhat” or
208 “very accurate”) or say that the vaccine is not safe (“not very safe” or “not at all safe”).

209

210

[Figure 2]

211

212 As the figure illustrates, the probability of believing that the flu vaccine can give you the flu
213 declines across the two side effects concern groups. Respondents with high side effects concern
214 are much more likely to believe in the claim than those with low concern, but endorsement of the
215 false belief declined significantly in both groups (39% to 27% for low concern; 70% to 51% for
216 high concern). For beliefs that the vaccine is unsafe, the marginal effect is only significant in the
217 low side effects concern group (beliefs that the flu vaccine is unsafe declined from 9% to 5%).

218

219 *Experimental results: Intention to get flu vaccine*

220 Table 3 reports ordered probit models of the effect of our interventions on respondents’ self-
221 reported likelihood of getting a flu vaccine during the 2012-2013 flu season.

222

223

[Table 3]

224

225 As in the previous analysis, we estimate separate models for the entire sample as well as for the
226 low and high vaccine side effects concern groups. The results indicate that neither intervention
227 had a significant effect on intent to vaccinate on the sample as a whole or the low side effects
228 concern subgroup. However, among the high concern group, we see something strikingly
229 different. While *Danger* again has no significant effect, *Correction* actually *decreases* the
230 reported likelihood of receiving the vaccine. Among those most concerned about vaccine side
231 effects, being told that the flu vaccine does not cause the flu *reduces* one's reported likelihood of
232 getting vaccinated. (The difference in effects between the low and high concern groups is
233 statistically significant in a pooled model with interaction terms; see Online Appendix B.) These
234 results suggest that our findings are not the result of social desirability bias, an account that
235 would not explain why vaccination intent would *decrease* in response to corrective information.

236 Figure 3 illustrates the negative effect of *Correction* on vaccination intent using predicted
237 probabilities estimated from the statistical models in Table 3 that respondents will answer they
238 are "slightly likely," "somewhat likely," or "very likely" to get a flu vaccine.

239

240 [Figure 3]

241

242 Corrective information about the flu shot not causing the flu has no significant effect on the
243 reported likelihood of vaccinating among respondents with low side effects concern. However,
244 being told that the flu vaccine cannot give you the flu significantly *decreases* vaccination intent
245 among respondents with high side effects concern, reducing the predicted probability of saying
246 they are likely to get the vaccine from 46% to 27%.

247

248 **Discussion**

249 Corrective information was found to be generally effective at reducing misperceptions that the
250 flu vaccine causes the flu as well as concerns about its safety. Moreover, neither response varied
251 significantly based on respondents' concern about vaccine side effects. However, the effects of
252 corrective information on intent to vaccinate did vary significantly depending on side effect
253 concerns. While corrective information about the flu vaccine had no effect on vaccination
254 intention among respondents with low side effects concern, it significantly *decreased* the self-
255 reported likelihood of receiving a flu vaccine among respondents with high side effects concern.
256 By contrast, information about the dangers of the flu had no significant effect on beliefs about
257 the vaccine or intent to vaccinate.

258 These results are consistent with previous research showing that factual corrections about
259 controversial issues may have unexpected or counterproductive results.⁵⁻⁸ Most notably,
260 corrective information about the flu vaccine decreased vaccination intent among the high side
261 effects concern group despite reducing misperceptions. This result is highly consistent with the
262 prior finding that corrective information reduced beliefs that the MMR vaccine causes autism but

263 still decreases intent to vaccinate among parents with the least favorable vaccine attitudes.⁹ We
264 infer that respondents with high concerns about vaccine side effects brought other concerns to
265 mind in an attempt to maintain their prior attitude when presented with corrective information,
266 causing them to become *less* likely to intend to vaccinate.

267 Unlike the correction treatment, no difference in responses was observed between the low and
268 high side effects concern groups for the message about the dangers of influenza, which had no
269 significant effect on misperceptions or vaccination intentions among either group. We interpret
270 this finding as the result of the flu danger information being less challenging to respondents'
271 prior beliefs. The risks posed by the flu are widely accepted, whereas the myth that the flu
272 vaccine gives you the flu is prevalent, especially among respondents with high concern about
273 vaccine side effects.

274 These findings of course have limitations. We were not able to directly measure whether
275 respondents actually received a flu vaccine due to logistical and privacy issues. For simplicity,
276 we did not identify or manipulate the source of the intervention messages. In addition, though we
277 tested actual CDC messages, it is possible that other messages could have different effects.
278 Finally, space constraints in our survey limited us to a single pre-intervention measure of side
279 effects concern rather than a more general vaccine attitudes scale.⁹ Because our study focused on
280 a false belief about a supposed side effect of the flu vaccine, we believe this question is the most
281 appropriate. However, future research should also consider whether these responses vary by
282 participants' general attitudes toward vaccines.

283 Despite these limitations, these results suggest the need to experimentally evaluate the effects of
284 health messages, including those about controversial subjects like vaccines. Randomized
285 controlled trials are as necessary for evaluating the efficacy of public health messaging as for
286 medical treatments. Going forward, researchers should further investigate the process that
287 generated the negative response to corrective information about respondents with high side
288 effects concern. While we cannot directly observe respondents' mental state and any causal
289 mediation analyses require demanding assumptions,¹⁶ we should seek to understand more about
290 why corrective information makes high concern respondents less likely to intend to vaccinate.
291 Further studies of the effects of other pro-vaccine messages would also be valuable.

292 More generally, future research should continue to explore the causal relationship between
293 vaccine misperceptions and vaccine hesitancy. If misperceptions cause vaccine hesitancy, then
294 debunking those myths should increase willingness to vaccinate. But if misperceptions are the
295 expression of a more generalized antipathy towards vaccines, then addressing these myths
296 piecemeal is unlikely to be effective. A more comprehensive strategy is likely to be required.

297

298 **Conclusions**

299 A national survey experiment found that corrective information explaining that the flu vaccine
300 does not give you the flu significantly reduced belief in this myth as well as beliefs that the
301 vaccine is unsafe. However, responses differed significantly depending on respondent concerns

302 about vaccine side effects. In particular, respondents with high levels of concern about side
303 effects were *less likely* to report that they would be immunized after seeing this information. No
304 significant changes in beliefs or likelihood of vaccination were found among respondents
305 exposed to a message about the dangers of influenza. These results suggest that correcting
306 vaccine myths may not be an effective approach to promoting vaccination.

307

308 *Acknowledgements*

309

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311 2012 Cooperative Congressional Election Study.

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Table 1

	Control	Danger	Correction	Total
<i>Age</i>				
18-29	22%	24%	18%	21%
30-44	27%	18%	29%	24%
45-59	26%	29%	29%	28%
60+	25%	29%	24%	26%
<i>Sex</i>				
Male	45%	50%	49%	48%
Female	55%	50%	51%	52%
<i>Education</i>				
High school or less	38%	42%	39%	40%
Some college	34%	36%	32%	34%
College grad	18%	16%	18%	17%
Post-grad	11%	6%	10%	9%
<i>Race/ethnicity</i>				
White	67%	71%	76%	71%
Black	15%	13%	9%	12%
Hispanic	11%	12%	8%	10%
Other	8%	4%	7%	6%
<i>Concerned about flu vaccine side effects</i>				
Extremely concerned	13%	12%	9%	11%
Very concerned	12%	15%	11%	13%
Somewhat concerned	30%	32%	34%	32%
Not too concerned	31%	28%	33%	31%
Not at all concerned	14%	13%	13%	14%
Number of observations	321	338	341	1000

Sample statistics are computed using weights calculated by YouGov.¹⁰ Due to rounding, some percentages may not add to 100%. Pearson's chi-square is non-significant for differences across intervention groups for each variable listed.

Table 2

	Vaccines can give flu			Flu vaccine unsafe		
	All responses	Low concern	High concern	All responses	Low concern	High concern
<i>Danger</i>	0.06	0.07	-0.01	-0.14	-0.11	-0.35
treatment	[-0.17, 0.29]	[-0.20, 0.33]	[-0.47, 0.45]	[-0.40, 0.12]	[-0.43, 0.21]	[-0.85, 0.14]
<i>Correction</i>	-0.39**	-0.34**	-0.49*	-0.31**	-0.33**	-0.14
treatment	[-0.65, -0.12]	[-0.64, -0.04]	[-1.02, 0.05]	[-0.57, -0.05]	[-0.65, -0.02]	[-0.62, 0.34]
N	995	769	226	997	772	225

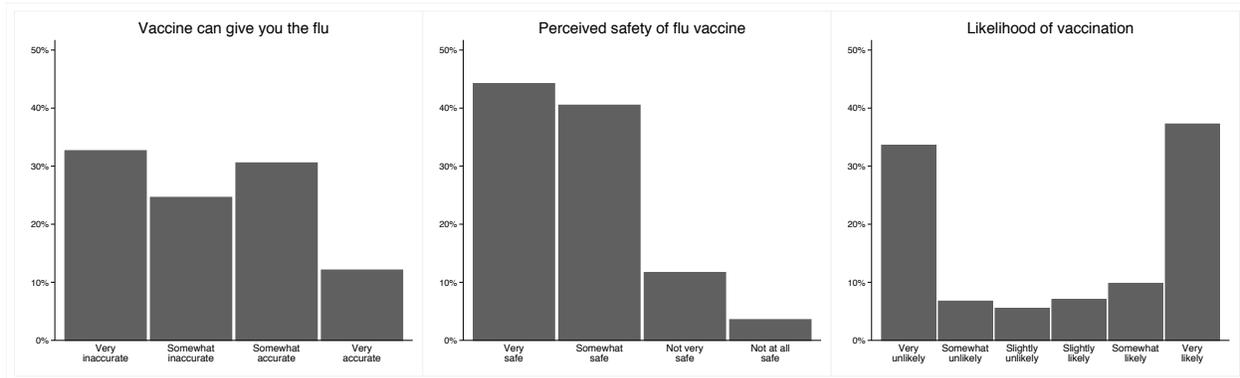
Ordered probit models estimated using weights calculated by YouGov¹⁰ with 95% confidence intervals in brackets (cutpoints omitted; ** $p < .05$, * $p < .10$). Respondents with low side effects concern answered “Not too concerned” or “Not at all concerned” to the question “In general, how concerned are you about serious side effects from vaccines?”, while those with high side effects concern answered “Somewhat concerned,” “Very concerned,” or “Extremely concerned.” “Vaccine can give flu” measures belief on a four-point scale from “Very inaccurate” (1) to “Very accurate” (4) in the statement “Just based on what you know, is the following statement accurate or inaccurate? You can get the flu from the seasonal flu vaccine.” “Flu vaccine unsafe” measures responses on a four-point scale from “Very safe” (1) to “Not at all safe” (4) to the question “Just based on what you know, how safe do you believe the seasonal flu vaccine, meaning the flu vaccine available every year, is generally for most people to take?” The experimental interventions are provided in Online Appendix A. Table 1 provides the number of respondents who were randomly assigned to each experimental condition.

Table 3

<u>Likelihood of getting flu vaccine</u>			
	All	Low side effects concern	High side effects concern
<i>Danger</i> treatment	0.10 [-0.14, 0.35]	0.14 [-0.14, 0.42]	0.01 [-0.50, 0.52]
<i>Correction</i> treatment	0.03 [-0.22, 0.28]	0.13 [-0.17, 0.42]	-0.49** [-0.97, -0.01]
N	998	772	226

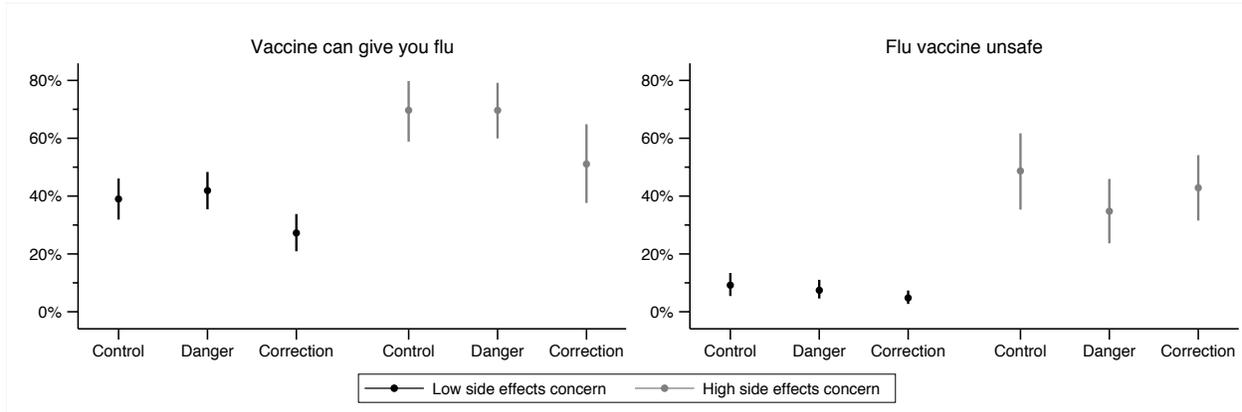
Ordered probit models estimated using weights calculated by YouGov¹⁰ with 95% confidence intervals in brackets (cutpoints omitted; ** $p < .05$, * $p < .10$). “Likelihood of getting flu vaccine” measures belief on a six-point scale from “Very unlikely” (1) to “Very likely” (6) in the statement “How likely is it that you will get a vaccine for the seasonal flu during this flu season (fall 2012-spring 2013)?” The experimental interventions are provided in Online Appendix A. Table 1 provides the number of respondents who were randomly assigned to each experimental condition.

Figure 1



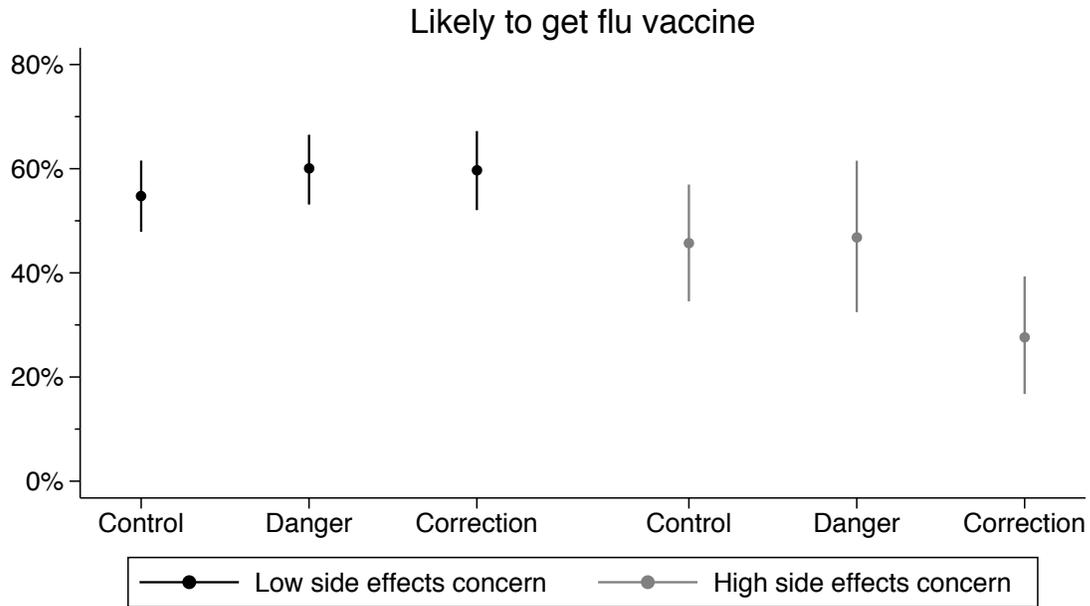
Predicted probabilities computed using weights calculated by YouGov; figure includes responses from respondents in each experimental condition.¹⁰ The left panel presents the distribution of responses to the question “Just based on what you know, is the following statement accurate or inaccurate? You can get the flu from the seasonal flu vaccine.” The center panel presents the distribution of responses to the question “Just based on what you know, how safe do you believe the seasonal flu vaccine, meaning the flu vaccine available every year, is generally for most people to take?” The right panel presents the distribution of responses to the question “How likely is it that you will get a vaccine for the seasonal flu during this flu season (fall 2012-spring 2013)?”

Figure 2



Predicted intervention effects for flu vaccine misperceptions for adults with low and high concern about side effects. The left panel presents the predicted probabilities that participants would respond “Very accurate” or “Somewhat accurate” to the question “Just based on what you know, is the following statement accurate or inaccurate? You can get the flu from the seasonal flu vaccine.” The correction significantly reduced belief that the flu vaccine can give you the flu among both groups of people. The right panel presents the predicted probabilities that respondents would say “Not very safe” or “Not at all safe” to the question “Just based on what you know, how safe do you believe the seasonal flu vaccine, meaning the flu vaccine available every year, is generally for most people to take?” The correction significantly reduced beliefs that the vaccine is unsafe among people with low concern but not high concern, though the difference in effects between groups is not statistically significant. The predicted probabilities and bootstrapped 95% confidence intervals were estimated from the ordered probit models in Table 2 using SPost in Stata 13.¹³ The experimental interventions are provided in Online Appendix A.

Figure 3



Predicted intervention effects for adults with low and high concern about side effects on the probability that respondents would answer “Slightly likely,” “Somewhat likely,” or “Very likely” to the question “How likely is it that you will get a vaccine for the seasonal flu during this flu season (fall 2012-spring 2013)?” The predicted probabilities and bootstrapped 95% confidence intervals were estimated from the ordered probit models in Table 3 using SPost in Stata 13.¹³ The effects of the correction differed by concern about side effects – it reduced intention to vaccinate among people with high concern about side effects but not those with low concern. The experimental interventions are provided in Online Appendix A.

Online Appendix A: Stimulus materials

[Wave 1]

[vaccine concern – pre-intervention]

First, we'd like to ask you a question about medical vaccines.

In general, how concerned are you about serious side effects from vaccines?

- Extremely concerned [5]
- Very concerned [4]
- Somewhat concerned [3]
- Not too concerned [2]
- Not at all concerned [1]

[randomization after delay – control group receives no message]

[danger intervention]

Please examine the following information about seasonal influenza (“the flu”) carefully.

What is influenza (also called flu)?

The flu is a contagious respiratory illness caused by influenza viruses that infect the nose, throat, and lungs. It can cause mild to severe illness, and at times can lead to death.

Signs and symptoms of flu

People who have the flu often feel some or all of these signs and symptoms:

- Fever or feeling feverish/chills
- Cough
- Sore throat
- Runny or stuffy nose
- Muscle or body aches
- Headaches
- Fatigue (very tired)
- Some people may have vomiting and diarrhea, though this is more common in children than adults.

How serious is the flu?

Flu is unpredictable and how severe it is can vary widely from one season to the next depending on many things, including:

- what flu viruses are spreading,
- how much flu vaccine is available
- when vaccine is available
- how many people get vaccinated, and

-how well the flu vaccine is matched to flu viruses that are causing illness.

Certain people are at greater risk for serious complications if they get the flu. This includes older people, young children, pregnant women and people with certain health conditions (such as asthma, diabetes, or heart disease), and persons who live in facilities like nursing homes.

Flu seasons are unpredictable and can be severe. Over a period of 30 years, between 1976 and 2006, estimates of flu-associated deaths in the United States range from a low of about 3,000 to a high of about 49,000 people.

[correction intervention]

Please examine the following information about seasonal influenza (“the flu”) carefully.

Can the flu shot give me the flu?

No, a flu shot cannot cause flu illness. The viruses contained in flu shots are inactivated (killed), which means they cannot cause infection. Flu vaccine manufacturers kill the viruses used in the flu shot during the process of making vaccine, and batches of flu vaccine are tested to make sure they are safe. In randomized, blinded studies, where some people got flu shots and others got saltwater shots, the only differences in symptoms was increased soreness in the arm and redness at the injection site among people who got the flu shot. There were no differences in terms of body aches, fever, cough, runny nose or sore throat.

More information about these studies is available at:

Carolyn Bridges et al. (2000). Effectiveness and cost-benefit of influenza vaccination of healthy working adults: A randomized controlled trial. *JAMA*. 284(13):1655-1663.

Kristin Nichol et al. (1995). The effectiveness of vaccination against influenza in healthy working adults. *New England Journal of Medicine*. 333(14): 889-893.

Can the nasal spray flu vaccine give you the flu?

Unlike the flu shot, the nasal spray flu vaccine does contain live viruses. However, the viruses are attenuated (weakened) and cannot cause flu illness. Some children and young adults 2-17 years of age have reported experiencing mild reactions after receiving nasal spray flu vaccine, including runny nose, nasal congestion or cough, chills, tiredness/weakness, sore throat and headache. Some adults 18-49 years of age have reported runny nose or nasal congestion, cough, chills, tiredness/weakness, sore throat and headache. These side effects are mild and short-lasting, especially when compared to symptoms of influenza infection.

[dependent variables]

We would like to ask you some questions about the seasonal flu vaccine (a flu shot or nasal flu spray).

How likely is it that you will get a flu vaccine for the seasonal flu during the upcoming flu season (fall 2012-spring 2013)?

- Very likely [6]
- Somewhat likely [5]
- Slightly likely [4]
- Slightly unlikely [3]
- Somewhat unlikely [2]
- Very unlikely [1]

Just based on what you know, how safe do you believe the seasonal flu vaccine, meaning the flu vaccine available every year, is generally for most people to take?

- Very safe [1]
- Somewhat safe [2]
- Not very safe [3]
- Not at all safe [4]

Just based on what you know, is the following statement accurate or inaccurate?

You can get the flu from the seasonal flu vaccine.

- Very accurate [4]
- Somewhat accurate [3]
- Somewhat inaccurate [2]
- Very inaccurate [1]

[Wave 2]

We would like to ask you some questions about the seasonal flu vaccine (a flu shot or nasal flu spray).

How likely is it that you will get a vaccine for the seasonal flu during this flu season (fall 2012-spring 2013)?

- Very likely [6]
- Somewhat likely [5]
- Slightly likely [4]
- Slightly unlikely [3]
- Somewhat unlikely [2]
- Very unlikely [1]

Just based on what you know, how safe do you believe the seasonal flu vaccine, meaning the flu vaccine available every year, is generally for most people to take?

- Very safe [1]
- Somewhat safe [2]
- Not very safe [3]
- Not at all safe [4]

Just based on what you know, is the following statement accurate or inaccurate?

You can get the flu from the seasonal flu vaccine.

-Very accurate [4]

-Somewhat accurate [3]

-Somewhat inaccurate [2]

-Very inaccurate [1]

Online Appendix B: Additional results

	Wave 1				Wave 2				Attrition rate
	Control	Danger	Correction	Total	Control	Danger	Correction	Total	
<i>Age</i>									
18-29	22%	24%	18%	21%	18%	24%	15%	19%	22%
30-44	27%	18%	29%	24%	29%	16%	29%	25%	13%
45-59	26%	29%	29%	28%	27%	29%	29%	28%	14%
60+	25%	29%	24%	26%	26%	30%	27%	28%	9%
<i>Sex</i>									
Male	45%	50%	49%	48%	47%	51%	48%	49%	13%
Female	55%	50%	51%	52%	53%	49%	52%	51%	15%
<i>Education</i>									
High school or less	38%	42%	39%	40%	35%	41%	37%	38%	19%
Some college	34%	36%	32%	34%	34%	35%	32%	34%	16%
College grad	18%	16%	18%	17%	19%	18%	19%	19%	8%
Post-grad	11%	6%	10%	9%	12%	6%	12%	10%	5%
<i>Race/ethnicity</i>									
White	67%	71%	76%	71%	74%	79%	79%	78%	7%
Black	15%	13%	9%	12%	9%	9%	7%	8%	42%
Hispanic	11%	12%	8%	10%	7%	7%	6%	7%	42%
Other	8%	4%	7%	6%	9%	5%	8%	7%	3%
<i>Concerned about vaccine side effects</i>									
Extremely concerned	13%	12%	9%	11%	10%	13%	7%	10%	24%
Very concerned	12%	15%	11%	13%	12%	15%	11%	13%	14%
Somewhat concerned	30%	32%	34%	32%	28%	27%	32%	29%	22%
Not too concerned	31%	28%	33%	31%	34%	32%	35%	34%	7%
Not at all concerned	14%	13%	13%	14%	16%	13%	15%	15%	8%
Number of observations	321	338	341	1000	258	278	286	822	

Sample statistics are computed using weights calculated by YouGov.¹⁰ Due to rounding, some percentages may not add to 100%. Pearson's chi-square is non-significant for differences across intervention groups for each demographic variable listed.

	Vaccine can give flu	Flu vaccine unsafe	Likely to get flu vaccine
<i>Danger treatment</i>	0.06 [-0.20,0.33]	-0.11 [-0.43,0.21]	0.14 [-0.14,0.43]
<i>Correction treatment</i>	-0.34** [-0.64,-0.04]	-0.34** [-0.65,-0.02]	0.13 [-0.17,0.43]
<i>High concern</i>	0.73** [0.34,1.12]	1.16** [0.69,1.63]	-0.26 [-0.63,0.10]
<i>Danger * high concern</i>	-0.07 [-0.59,0.44]	-0.24 [-0.83,0.35]	-0.14 [-0.70,0.42]
<i>Correction * high concern</i>	-0.14 [-0.73,0.45]	0.2 [-0.37,0.77]	-0.62** [-1.17,-0.07]
N	995	997	998

Ordered probit models estimated using weights calculated by YouGov¹⁰ with 95% confidence intervals in brackets (cutpoints omitted; ** p<.05, * p<.10). Respondents with low side effects concern answered “Not too concerned” or “Not at all concerned” to the question “In general, how concerned are you about serious side effects from vaccines?”, while those with high side effects concern answered “Somewhat concerned,” “Very concerned,” or “Extremely concerned.” “Vaccine can give flu” measures belief on a four-point scale from “Very inaccurate” (1) to “Very accurate” (4) in the statement “Just based on what you know, is the following statement accurate or inaccurate? You can get the flu from the seasonal flu vaccine.” “Flu vaccine unsafe” measures responses on a four-point scale from “Very safe” (1) to “Not at all safe” (4) to the question “Just based on what you know, how safe do you believe the seasonal flu vaccine, meaning the flu vaccine available every year, is generally for most people to take?” “Likely to get flu vaccine” measures belief on a six-point scale from “Very unlikely” (1) to “Very likely” (6) in the statement “How likely is it that you will get a vaccine for the seasonal flu during this flu season (fall 2012-spring 2013)?” The experimental interventions are provided in Online Appendix A.

	Wave 2 respondents only					
	<u>Vaccine can give flu</u>		<u>Flu vaccine unsafe</u>		<u>Likely to get flu vaccine</u>	
	Low concern	High concern	Low concern	High concern	Low concern	High concern
<i>Danger treatment</i>	0.08 [-0.21,0.36]	0.01 [-0.56,0.58]	-0.05 [-0.39,0.28]	0.26 [-0.27,0.79]	0.18 [-0.15,0.50]	0.28 [-0.31,0.87]
<i>Correction treatment</i>	-0.13 [-0.44,0.19]	-0.45 [-1.05,0.15]	-0.07 [-0.41,0.28]	0.44* [-0.05,0.93]	0.04 [-0.27,0.35]	-0.1 [-0.70,0.50]
N	650	170	650	171	649	172

Ordered probit models estimated using weights calculated by YouGov¹⁰ with 95% confidence intervals in brackets (cutpoints omitted; ** p<.05, * p<.10). Respondents with low side effects concern answered “Not too concerned” or “Not at all concerned” to the question “In general, how concerned are you about serious side effects from vaccines?”, while those with high side effects concern answered “Somewhat concerned,” “Very concerned,” or “Extremely concerned.” “Vaccine can give flu” measures belief on a four-point scale from “Very inaccurate” (1) to “Very accurate” (4) in the statement “Just based on what you know, is the following statement accurate or inaccurate? You can get the flu from the seasonal flu vaccine.” “Flu vaccine unsafe” measures responses on a four-point scale from “Very safe” (1) to “Not at all safe” (4) to the question “Just based on what you know, how safe do you believe the seasonal flu vaccine, meaning the flu vaccine available every year, is generally for most people to take?” “Likely to get flu vaccine” measures belief on a six-point scale from “Very unlikely” (1) to “Very likely” (6) in the statement “How likely is it that you will get a vaccine for the seasonal flu during this flu season (fall 2012-spring 2013)?” The experimental interventions are provided in Online Appendix A.