Supplemental Material

Default Clinic Appointments Promote Influenza Vaccination Uptake
Without a Displacement Effect

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Supplemental Text

Abstract

Objective. Influenza vaccination protects against infection and prevents morbidity, yet many individuals do not receive an annual flu shot. A field study assessed the influence of a default effect intervention on outpatient clinic vaccination rates and examined whether the intervention increased net vaccination rates or merely displaced vaccinations from off-site to on-site.

Method. Medical clinic outpatients were randomized to three conditions. In the opt-out condition (*n* = 295), patients received a letter informing them that they had been scheduled for a flu clinic appointment, with instructions for how to cancel or change it. Those in the opt-in condition (*n* = 296) received a letter informing them that flu shots were available, with instructions for how to schedule a flu clinic appointment. Those in the no-letter condition (*n* = 295) received no letter. Clinic influenza vaccination records were tracked for all participants as the primary outcome measure. Off-site (e.g., workplace or pharmacy) influenza vaccination records were obtained from 298 participants who completed a follow-up questionnaire.

Results. Vaccination rates at the flu shot clinic were higher in the opt-out condition (16%) than in the opt-in (5%) or no-letter (2%) conditions. Vaccination at doctor's office visits and self-reports on the questionnaire of off-site vaccination indicated that the opt-out condition did not significantly displace vaccination relative to the other two conditions.

Conclusion. Default interventions increase influenza vaccination rates rather than displacing off-site vaccination. The effect is localized to the venue of the prescheduled vaccination appointments, however, and comes at the cost of a high no-show rate (71%).

Keywords: influenza vaccination, default effect, opt out, field study

Summary

The supplemental materials consist of supplementary text describing past research on using the default effect in vaccination; a method section; and a data, results, and analysis section with regard to the current study. It also includes supplementary tables.

Introduction

In this section, we briefly review past research on behavioral interventions to increase vaccination. Chapman, Li, Colby, and Yoon[1] tested the effect of a default manipulation in the context of seasonal flu shots offered by a workplace clinic. Some employees were automatically scheduled for a flu shot appointment that they could cancel, while others were invited to make an appointment if they wished. Thus, the default for the former group was having an appointment, from which they could opt out, while the default for the latter group was not having an appointment, although they could opt in. Vaccination rates were 45% in the opt-out group, compared to 33% in the opt-in group, a 36% relative increase in vaccination rates in the opt-out condition.

Lehmann and colleagues[2] also used a default intervention to increase flu shot acceptance—in this case, among 122 health care workers. The vaccination rate was 28% in the opt-out condition versus 16% in the opt-in condition, a difference that was not statistically significant but was nevertheless similar in effect size to that observed by Chapman et al. Like the Chapman study, the Lehmann study showed a significant mediation by appointment status.

Default interventions are not the only manipulations that affect vaccination rates. A number of other studies have demonstrated other interventions that increase seasonal flu shot uptake. [3] For example, reminders increase vaccination rates—individuals who were sent reminder letters with an action plan for receiving a flu shot were more likely to vaccinate than were those receiving no letter.[4] This finding is similar to those from previous studies showing the importance of action plans for increasing vaccination rates.[5] In addition, Bronchetti and colleagues found that offering a $30 financial incentive doubled flu shot uptake among college students.[6] Milkman and colleagues[7] also found that forming specific implementation intentions increased flu shot rates among workplace employees.

The Bronchetti et al. and Milkman et al. studies were noteworthy because each examined displacement. Bronchetti et al.[6] surveyed a sample of the participants about off-site vaccination, revealing that the incentive effect was reduced by half after accounting for displacement. In the Milkman et al. study,[7] for some of the employees, the researchers had access to health insurance claims showing influenza vaccinations received at any site, not simply at the workplace. Consequently, the researchers were able to document that the intervention increased the net vaccination rate rather than displacing vaccinations from off-site venues to the on-site workplace vaccination clinic.

In the current study, we test the default effect in vaccination behavior in a large clinical sample for which we are able to capture off-site vaccination. This allows us to address a key question: Does a default intervention increase net vaccination among the population instead of displacing vaccination from other venues to the study site?

Materials and Method

Participants. The study was conducted in a suburban academic general internal medicine practice that has a single location in central New Jersey. The participants were 900 outpatients selected from the rolls of the practice. Sample size was determined prior to initiation of the study. Inclusion criteria included the requirement that patients be over 18 years of age and have had a clinic visit in the 18 months prior to the start of the study. In addition, patients were selected such that half were women and one-third were over the age of 60 years, thus enabling us to examine whether the default effect was moderated by age. Fourteen patients were excluded from data analyses after a debriefing letter was mailed at the end of the study because they responded to the letter by requesting that their data be removed (n = 2) or because the debriefing letter did not reach them because of a bad address (n = 12). Participant age ranged from 19 to 95 years, with a median of 55 years. Age did not differ across the three conditions (Ms = 53 years, 55 years, and 55 years, for the opt-out, opt-in, and no-letter conditions, respectively, p = .16). No other demographic information was available for the entire sample.

Procedures. Before our study period, the standard practice of this clinic was to schedule early morning “flu shot clinic” hours in the general internal medicine suite during the fall. Patients wishing to receive a flu shot could schedule a 5-min appointment with a nurse during these hours.

Patients were randomly assigned to one of three conditions: opt out (n = 295, condition 1), opt in (n = 296, condition 2), and no letter (n = 295, condition 3). A HIPAA-certified research assistant who was permitted to work with the list of patient names performed the randomization using the random number generator in Excel so as to assign equal numbers of participants to each condition, stratified by gender and age over or under 60 years. Participants in the opt-out condition received a letter informing them that they had been scheduled for a flu clinic appointment, with instructions for how to cancel or change the appointment. Those in the opt-in condition received a letter informing them that flu shots were available, with instructions for how to schedule a flu clinic appointment. Those in the no-letter condition received no letter. Letters were mailed on September 9, 2011, immediately after the clinic received its supply of influenza vaccines.

All appointments were scheduled for 5-min time slots and occurred during the early morning flu shot clinic hours from Monday, September 19, through Thursday, October 20, 2011. Those with appointments received an automatic reminder phone call the day before.

The primary outcome measure was vaccination status, which was tracked by examining the consent forms that patients signed when they receive a shot at the flu clinic.

Outside of the flu clinic appointments, the same medical practice also offered flu shots during regular office visits scheduled for other reasons (for example, annual checkup or blood pressure check). We also obtained consent form records for flu shots received at these regular office visits.

Thus, for all 886 patients in the study, data were available on whether they received an on-site (flu shot clinic) shot or a flu shot in the same practice (regular doctor's office visit). These consent forms were tracked between September 1, 2011, and March 19, 2012. The flu vaccinations recorded for the study occurred between September 16, 2011, and March 1, 2012.

Questionnaire. Between November 17 and 21, 2011, all participants were mailed a questionnaire with an invitation to complete it and consent to a medical chart review in exchange for a gift card. Three hundred patients completed the questionnaire (of the respondents, 68% were female and 73% were White) and 278 of them consented to the medical chart review. The questionnaire contained items on whether participants had received a flu shot by then, where they received it, their perceptions of the flu shot, and demographics. Self-reported vaccination status from the questionnaire responses served as the secondary outcome measure.

The medical chart review extracted information on patient comorbidities and flu shot receipt anywhere during the current and previous years. Because the chart review data did not contain information on where the patient received the vaccine and only patients who saw the doctor during the study period could report their flu vaccination for inclusion in the chart, these data were not used as a key outcome measure. Instead, chart data were used to assess the influence of patient comorbidities on flu vaccination.

Debriefing. In spring 2012, all participants received a debriefing letter informing them that their flu vaccination status at the clinic was being tracked as part of a research study and offering them the option to withdraw their data from the study. Prior to initiation of the study, all study procedures received human subjects' approval, including a waiver of informed consent for the default manipulation letters and tracking of vaccination status. The researchers received only de-identified data.

Data, Analyses, and Results

Clinical vaccination records. Vaccination status was examined using clinic vaccination consent forms collected during the flu shot clinic hours as well as at doctor's office visits in the same practice. The data included all participants who received the debriefing letter and did not object to being included in the study (regardless of whether they completed the questionnaire or consented to the chart review).

First, to test for the default effect, we examined vaccinations at the special flu shot clinic only. As shown in Figure 1 in the main text and Table S1, 16% (47 out of 295) of those in the opt-out condition received a flu shot, compared with 5% (15 out of 296) in the opt-in condition and 2% (7 out of 295) in the no-letter condition (see dark gray portion of the bars in Figure 1 in the main text), $\chi^2(2, N = 886) = 34.71$, $p < .0001$, indicating that default appointments at the flu clinic substantially increased vaccination rate.

Next, to test for a displacement effect, we examined vaccination at regular doctor's office visits. Here, the vaccination rate was lower in the opt-out condition compared with the other conditions, but the difference was not statistically significant. Vaccination rates were 11% (33 out of 295), 13% (37 out of 296), and 15% (44 out of 295) in the opt-out, opt-in, and no-letter conditions, respectively (see Figure 1 in the main text), $\chi^2(2, N = 886) = 1.87$, $p = .39$. These results suggest a slight displacement effect that was not close to statistical significance. The sample size of 886 provided power of 0.95 to detect a displacement effect equal to or stronger than (numerically equal to or smaller than) an odds ratio of 0.68 (G*Power 3.1.9.2), whereas the actual nonsignificant displacement effect observed had an odds ratio of 0.79, a weaker effect that would not be detected. Thus, we have no reliable evidence that default appointments at the special flu clinic drew patients away from getting vaccinated at doctor's office visits within the practice.

Table S1. Number (percentage) of participants who had appointments or were vaccinated at flu clinic appointments and at office visits in each condition

Dependent variable	Experimental condition			Contrast *OR* [95% CI]	*p*
	Opt out (*n* = 295)	Opt in (*n* = 296)	No letter (*n* = 295)		

Appointment	164 (56%)	15 (5%)	7 (2%)	34.81 [20.91, 57.97]	.0001
Vaccination at flu clinic	47 (16%)	15 (5%)	7 (2%)	1.93 [1.14, 5.47]	.001
Vaccination at office visit	33 (11%)	37 (13%)	44 (15%)	0.79 [0.52, 1.22]	.30
Total vaccination at practice	80 (27%)	52 (18%)	51 (17%)	1.77 [1.23, 2.46]	.0009

Note. Contrast odds ratio (*OR*) compares the opt-out condition with the opt-in and no letter conditions pooled. CI = confidence interval.

A logistic regression with vaccination received at the flu shot clinic as the dependent variable and experimental condition as a class variable showed a significant effect of condition, $\chi^2(2, N=886) = 15.26$, $p = .0005$. A contrast showed that the vaccination rate for the opt-out condition was higher than for the opt-in and no-letter control conditions pooled, $\chi^2(1) = 15.26$, $B = 1.67$, $OR = 5.32$, 95% CI [2.30, 12.32], $p < .0001$ (see Table S1).

When patient age was added as a continuous, centered variable to the model along with default condition and their interaction, there was a main effect of age, $\chi^2(1) = 7.81$, $B = 0.029$, $OR = 1.03$, 95% CI [1.01, 1.05], $p < .0001$, indicating that older participants were more likely than younger ones to get vaccinated. The main effect of default condition remained, $\chi^2(2) = 34.44$, $p < .0001$, including a significant contrast comparing the opt-out condition with the opt-in and no-letter conditions pooled, $B = 1.85$, $OR = 6.35$, 95% CI [3.42, 11.81], $p < .0001$. However, there was no interaction between this contrast and age, $B = 0.03$, $OR = 1.03$, 95% CI [0.99, 1.06], $p = .14$, indicating that the default effect is just as large for older adults as for younger adults. Previous flu shot receipt and the presence of comorbidities also predicted vaccination but did not moderate the default effect (see “Chart Review” section below).

To test the net effect of default manipulation on vaccination rates, we combined vaccinations recorded at the early morning special flu clinic and at doctor’s office visits. Here, we found 27% of those in the opt-out condition were vaccinated, compared with only 18% in the opt-in condition and 17% in the no-letter condition (see Table S1), $\chi^2(2, N=886) = 11.28$, $p = .0035$, indicating a sizable increase in net vaccination rate. Note that this represents a 54% relative increase and a 10% absolute increase, an effect size comparable to that seen in Chapman et al..[1]

We also examined the timing of vaccinations received at either the flu clinic or doctor's office visits. Vaccinated participants in the opt-out group did not receive vaccines any earlier than did vaccinated participants in the opt-in or no-letter groups, $F(1, 180) = 1.89$, $\eta^2 = .01$, $p = .17$, despite the fact that opt-out patients received more vaccines at the flu clinic appointments and these appointments were only available until October 20, 2011, whereas doctor's office vaccinations were given until March 2012.

Appointments. Appointment data were retrieved from records kept by staff at the flu clinic. A minority of opt-out patients (131 out of 295) cancelled their prescheduled appointments. The rest either rescheduled appointments to another day or time ($n = 10$) or did nothing ($n = 154$), meaning that they still had an appointment scheduled. In contrast, very few of the opt-in ($n = 15$) and no-letter ($n = 7$) patients scheduled flu clinic appointments. Consequently, the percentage of patients with a flu shot clinic appointment varied significantly across conditions, $\chi^2(2, N = 886) = 192.95$, $p < .0001$. More patients in the opt-out condition had appointments compared with patients in the opt-in and no-letter conditions pooled, $\chi^2(1, N = 886) = 186$, $B = 3.55$, $OR = 34.81$, 95% CI [20.91, 57.97], $p < .0001$ (see Table S1).

Although participants in the opt-out condition were likely to retain their appointments, 71% did not show up. That compared with no-show rates of 0% in the opt-in and no-letter conditions and among opt-out patients who rescheduled their appointments ($n = 10$).

Follow-up survey. We next examined self-reports of vaccination from the 300 participants who completed the follow-up questionnaire. These completers were older (M age = 56 years) than those who did not complete the questionnaire (M age = 54 years), $t(884) = 2.12$, $p = .03$, but did not differ in vaccination rate, as assessed via clinical vaccination records (at either the flu clinic or doctor's office visits in the practice): 23% of those who completed the questionnaire got vaccinated and 19% of those who did not complete the questionnaire did, $\chi^2(1, N = 886) = 1.99$, $p = .16$.

Participants self-reported on the questionnaire whether they had received a flu shot that fall, and 25% reported receiving a flu shot on site at the medical practice (at either the flu clinic or a doctor's visit), while another 43% reported receiving a flu shot elsewhere (for example, at a workplace, in a pharmacy, or at other offsite location). Two participants did not answer this question, so analyses were based on 298 observations. Self-reports of vaccination at the medical practice corresponded very closely to objective clinical vaccination records (data not shown) and demonstrated a default effect.

The questionnaire responses indicating vaccinations were received at the medical practice did not distinguish between vaccinations received at the flu clinic versus during doctor's visits. To distinguish between these two, we matched self-report questionnaire responses (see Table S2) to clinic vaccination records (see Table S1). Self-reports of vaccinations that matched clinic records of a vaccination received during the flu clinic hours were considered to be self-reports of flu clinic vaccination. All other self-reports of vaccination were considered to be self-reports of non–flu clinic vaccinations (either at a doctor's office or outside of the medical practice).

First, we found a default effect based on such self-reports: self-reports of vaccination at the flu clinic were higher in the opt-out condition than in the opt-in and no-letter conditions pooled, $B = 1.67$, $OR = 5.32$, 95% CI [2.30, 12.32], $p = .0001$ (see Table S2).

Then, to assess any displacement effect, we examined whether receiving a default appointment for the flu clinic was inversely related to vaccinations elsewhere. If default appointments displaced vaccinations from off-site to on-site rather than increasing vaccination overall, one would expect that self-reports of vaccination outside of the flu clinic would be inversely affected by default appointments. A logistic regression showed that participants in the opt-out condition had self-reported non–flu clinic vaccination rates similar to those in the opt-in and no-letter conditions pooled, $B = -0.29$, $OR = 0.75$, 95% CI [0.46, 1.22], $p = .23$. Thus, this analysis revealed no evidence of displacement (see Table S2). Although the effect is in the direction of displacement ($B = -0.29$, $OR = 0.75$), the confidence interval includes 1. With 298 participants, we had power of .95 to detect a displacement effect equal to or stronger than an odds ratio of 0.64 (G*Power 3.1.9.2), whereas the actual odds ratio observed was 0.75, a weaker effect than we could detect. Thus, the weight of the evidence from the current study suggests no displacement, although we cannot rule out a modest displacement effect.

Table S2. Number (percentage) of questionnaire respondents in each condition who self-reported vaccination at flu clinic hours or elsewhere (doctor's office visit or off-site)

Dependent variable	Experimental condition			Contrast *OR* [95% CI]	*p*
	Opt out (*n* = 94)	Opt in (*n* = 103)	No letter (*n* = 101)		
Vaccination at flu clinic	20 (21%)	8 (8%)	3 (3%)	5.32 [2.30, 12.32]	.0001
Vaccination at office visit or off site	50 (53%)	59 (57%)	64 (63%)	0.75 [0.46, 1.22]	.23
Vaccination anywhere	70 (74%)	67 (65%)	67 (66%)	1.52 [0.88, 2.64]	.13

Note. Contrast odds ratio (*OR*) compares the opt-out condition with the opt-in and no letter conditions pooled.

Finally, we assessed the effect of default appointments on net vaccination, with self-reported vaccination in all locations as the dependent measure. Here, the opt-out condition showed a trend of higher vaccination rate compared with the other two conditions pooled, but the contrast is no longer significant, $B = 0.42$, $OR = 1.52$, 95% CI [0.88, 2.64], $p = .13$.

We then included age (centered) and self-report of influenza vaccination the previous year (at any location) as predictors in the three logistic regressions reported above, with vaccination at the flu clinic, vaccination at the doctor's office or offsite, and vaccination anywhere as the dependent variables, respectively (see Table S3). We included age and previous vaccination status because previous research identifies them as predictive of influenza vaccination. We again computed the contrast that compared the opt-out condition with the opt-in and no-letter conditions combined. This contrast revealed a significant default effect for self-report of flu clinic vaccination, $\chi^2(1) = 17.35$, $B = 1.85$, $OR = 6.39$, 95% CI [2.67, 15.28], $p = .001$, and also a significant default effect for self-report of vaccination at any location, $\chi^2(1) = 4.22$, $B = 0.78$, $OR = 2.19$, 95% CI [1.04, 4.63], $p = .04$. Thus, this analysis shows an effect of default appointments on net vaccination. There was no significant inverse effect of default appointments on vaccination at doctor's office visits or off-site, $\chi^2(1, N=298) = 2.08$, $B = -0.45$, $OR = 0.64$, 95% CI [0.35, 1.17], $p = .15$. Thus, this analysis revealed no significant displacement effect, although we cannot rule out the possibility of partial displacement.

Table S3. Odds ratio [95% CI] from logistic regression of self-reported vaccination, with vaccination at the clinic, off-site, and anywhere as the outcome measures ($N = 298$)

Predictor	Vaccinated at flu clinic	Vaccinated at office visit or off-site	Vaccinated anywhere
Age (centered)	1.04 [1.01, 1.07]	1.01 [0.99, 1.03]	1.04 [1.02, 1.06]
Vaccination last year	1.13 [0.71, 1.80]	4.39 [3.11, 6.20]	5.14 [3.64, 7.27]
Opt out vs. (opt in + no letter)	6.39 [2.67, 15.28]	0.64 [0.35, 1.17]	2.19 [1.04, 4.63]

Chart review. Chart review data were available from the 278 patients who consented to such a review. These participants were, on average, older than those who declined (*M* age = 56.52 years vs. 53.35 years), $t(884) = 2.74$, $p = .006$, but equally likely to have received an on-site flu shot (23% vaccination rate for consenters vs. 20% for decliners), $\chi^2(1, N = 886) = 1.38$, $p = .23$.

The chart review indicated vaccination occurred for a larger proportion of patients than did the flu vaccination consent forms used in the main analyses, because the charts also indicate vaccination for patients who were vaccinated outside of the medical practice (in the workplace, at the pharmacy, etc.) and who reported this to the doctor. However, it does not include information on where the flu shot was received.

We examined whether there was a default effect in these 278 people. Using the flu shot consent form as the dependent measure (the same measure used in the main analyses, as shown in Table S1, which records flu vaccinations received at the flu shot clinic and at regular doctor's visits), there is a net effect of default appointments, despite the reduced power: vaccination rates of 36%, 16%, and 18% in the opt-out, opt-in, and no-letter conditions, respectively, $\chi^2(2) = 11.43$, $p = .003$. However, if we use as the dependent measure chart review records (which record flu vaccination received anywhere, as long as it is noted in the chart), there is no default effect: vaccination rates of 46%, 46%, and 41% in the opt-out, opt-in, and no-letter conditions, respectively, $\chi^2(2) = 0.56$, $p = .75$. This result indicates that many patients in the opt-in and no-letter conditions received flu shots off-site and that the effect of default appointments was diluted by flu shots received off-site or may even have resulted in displacement of vaccinations from off-site to on-site rather than increasing vaccination rates overall. It is difficult to draw firm conclusions, however, as chart review data were available for only one-third of participants, and the charts only show the vaccinations for patients who saw the doctor after vaccination but before we conducted the chart review and reported their vaccination. Thus, the vaccinations indicated in the chart may reflect some self-selection in terms of which patients saw their doctor during the approximately 6-month-long period after receiving a flu shot and in terms of who reported the vaccination to their doctor.

The chart data provided additional variables that may moderate the effect of default appointments. Specifically, the chart review revealed flu shots received in the previous year and current comorbidities, including asthma, chronic obstructive pulmonary disease, diabetes, heart disease, hypertension, kidney disease, and immune disorders. Of 278 participants, 25% received a flu shot in the previous year and 54% had one or more comorbidities. Both receipt of a previous flu shot and comorbidities were individually associated with higher vaccination rates, as measured by flu shot consent forms. Vaccination rates from this record were 30% versus 16% for those with and without one or more comorbidities, respectively, and 43% versus 8% for those with and without a previous flu shot, respectively. Vaccination rates measured from patient charts were 60% versus 27% for those with and without one or more comorbidities, respectively, and 71% versus 36% for those with and without previous flu shot, respectively (all *p*s < .006). Vaccination history and presence of comorbidities were also correlated with one another, $\varphi = 0.22$, $p < .0002$. Neither presence of comorbidities nor previous flu shot receipt moderated the effect of default appointments, however (see Table S4).

Thus, although vaccination history and presence of comorbidities both predicted current vaccination, neither influenced the effectiveness of making default appointments for patients.

Table S4. Odds ratio [95% confidence interval] from logistic regression of flu clinic vaccination status with predictors from chart review

Predictor	Vaccinated on-site
Any comorbidity	1.23 [0.70, 2.16]
Vaccination last year	2.11 [1.21, 3.66]
Default: opt out vs. (opt in + no letter)	5.33 [2.00, 14.22]
Comorbidity × Default	1.13 [0.43, 2.95]
Vaccination Last Year × Default	0.96 [0.37, 2.49]

Strengths and Limitations of the Study

The current study has a number of strengths, including random assignment to conditions, with only 14 of 900 participants excluded from the primary outcome measure. In addition, the field study design ensured that participants were unaware that they were part of a research study, avoiding demand effects. Finally, the primary outcome measure was an objective assessment of vaccination behavior. The study also had several notable weaknesses. We did not obtain objective records for vaccinations received off-site. We captured off-site vaccinations through questionnaire responses, but those data have the limitations of self-report, reduced sample size, and potential self-selection in terms of which participants elected to complete the questionnaire. The study was conducted at a suburban academic medical center with a largely middle-class patient base, and it is possible that the results would not generalize to other patient populations.

Conclusions

The current study found strong evidence for an effect of default opt-out appointments on vaccination behavior and no reliable evidence for displacement. The effect of the default appointments was limited to the early morning flu clinic appointments, which were the target of the intervention letters, and did not reduce rates of vaccination at other sites.

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