Supplementary Material “Adding Nudge-based Reminders to Financial Incentives for Promoting Antibody Testing and Vaccination to Prevent the Spread of Rubella”

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Contents

A Detail Background of Rubella 1

B Antibody Testing and Vaccination Questions 4

C Estimation of the Monetary Value of the Text Message Reminders 5

D Tables 7

A Detail Background of Rubella

Rubella is a highly contagious disease spread through droplet transmission. The most common symptoms are fever and rashes, but the disease is rarely severe. According to the National Institute of Infectious Diseases (NIID), the subclinical transmission of rubella (the state in which a person is infected but has no symptoms) occurs in approximately 15–30% of cases. Fever is observed in approximately 50% of patients. Adults may also experience transient arthritis (5–30%). Rarely, complications such as thrombocytopenic purpura (0.02–0.03%) and acute encephalitis (0.01–0.03%) may require hospitalization.[1]

The most serious problem is that women infected with rubella during early pregnancy may have children with congenital rubella syndrome (CRS), which includes eye and ear defects. Because the spread of rubella tends to increase the CRS incidence, the Japanese government has designated rubella as a disease requiring immunization.

According to Kinoshita and Nishiura (2016), Japan can obtain herd immunity against rubella if the antibody prevalence exceeds 90% in all generations. Some researches show relatively weak conditions to

[1] `https://www.niid.go.jp/niid/ja/kansennohanashi/430-rubella-intro.html`. Japanese. Accessed September 22, 2023.

obtain herd immunity. For example, according to Plans-Rubió (2012), an antibody prevalence of 83–95% achieves herd immunity against rubella. Nishiura et al. (2015) found that the antibody prevalence for herd immunity is 83.6%.

Anyway, owing to low antibody prevalence among men in their 40s and 50s, Japan has not achieved herd immunity to rubella. According to National Institute of Infectious Diseases (2019*a*), the antibody prevalence among men aged 39–56 years (as of 2018) is approximately 81.5%. This value is lower than that of women of the same generation (about 97.9%) who have had at least one dose of the rubella vaccine administered as part of routine immunization. The prevalence rates of antibodies in men and women aged 57 and older are 91.1% and 89.3%, respectively. Despite not having received routine vaccination, men and women aged 57 and older grew up during a time when rubella was common and people are likely to have antibodies from natural infection. The antibody prevalence of men and women aged 38 years and younger is 91.3% and 94.0%, respectively. They have had at least one dose of the rubella vaccine administered as part of routine immunization.

Thus, the influx of viruses of Southeast Asian origin caused rubella epidemics in 2013 and 2018, mainly among men with relatively low antibody prevalence (National Institute of Infectious Diseases, 2019*b*). In the 2018 epidemic, the U.S. Centers for Disease Control and Prevention advised pregnant women not to travel to Japan.[2] As cross-border traffic is increasing, achieving herd immunity against rubella is becoming increasingly important for Japan.

To achieve herd immunity, Japan must raise the antibody prevalence among men in their 40s and 50s from 80% to 90%. To achieve this goal, The Ministry of Health, Labour and Welfare (MHLW) provided the rubella antibody test and vaccination as an additional free routine immunization for men aged 40–57 years (as of 2019) between April 2019 and March 2022. More precisely, eligible men were born between April 2, 1962 and April 1, 1979.

If transmission to pregnant women is the most important issue, one might think that vaccinating pregnant women would be the optimal strategy. However, Japan implemented measures for pregnant women in advance of the 2019 vaccination campaign, as they were already receiving at least one vaccination. In addition, since 2014, pregnant women and women who want to become pregnant as well as their partners have been offered free antibody testing. However, during the 2013 and 2018 epidemics, some infants were affected by CRS. Therefore, to eradicate CRS, interventions for pregnant women alone are insufficient; interventions to achieve hard immunity are needed.

The MHLW requested local governments to send free vouchers for a rubella antibody test and vaccine to eligible men over a three-year period. More than half of eligible men are 40–46 years old (6.46 million). They received the free vouchers from April 2019 to March 2020. According to interviews conducted by the MHLW, approximately 96% of local governments planned to send the vouchers by October 2019. The cumulative number of antibody tests using vouchers by January 2019 was 1.17 million. We calculate the

[2]The Japan Times, October 24, 2018. `https://www.japantimes.co.jp/news/2018/10/24/national/science-health/u-s-cdc-warns-pregnant-women-traveling-japan-amid-rubella-outbreak/`. Accessed September 22, 2023.

actual uptake of antibody testing by dividing the cumulative number of antibody tests using vouchers to January 2020 (1.17 million) by the population of 40–46-year-old men (6.46 million). Thus, although men aged 40–46 years automatically received the financial incentives, the actual uptake of antibody testing with vouchers remained as low as 18% as of January 2020. When the financial incentives offered are adequate, as in the presented case, non-monetary interventions should be considered to increase antibody testing.

B Antibody Testing and Vaccination Questions

In Wave 2, the participants were asked if they had undertaken antibody testing and been vaccinated since Wave 1. The antibody testing question asked, "Have you undertaken rubella antibody testing since the end of the last survey?" The participants were given the following choices:

- (a) Yes, I have undertaken antibody testing;
- (b) No, I have not undertaken antibody testing;
- (c) I underwent antibody testing before the last survey.

We created a binary variable coded 1 if the respondent chose option (a) and used it as an outcome variable for the actual uptake of antibody testing. Meanwhile, the vaccination question was "Have you been vaccinated against rubella since the end of the last survey?" The respondents were given five options:

- (a) I have been vaccinated;
- (b) I do not need the vaccine due to a positive test or infection experience;
- (c) I have undertaken antibody testing but have not been vaccinated yet;
- (d) I have not undertaken antibody testing or gotten vaccinated;
- (e) I was vaccinated before the last survey.

As stated earlier, to receive the rubella vaccination through routine immunization, eligible men must first undergo antibody testing. However, they may have been vaccinated against rubella at their own expense without having their antibodies tested. To eliminate this possibility, we created a binary variable coded 1 if the participant chose option (a) for both the antibody testing and the vaccination questions. Then, we used it as the outcome variable for vaccination rates. The vaccination rate can be regarded as the proportion of newly acquired antibodies through vaccination. This outcome variable matches the MHLW's policy goal.

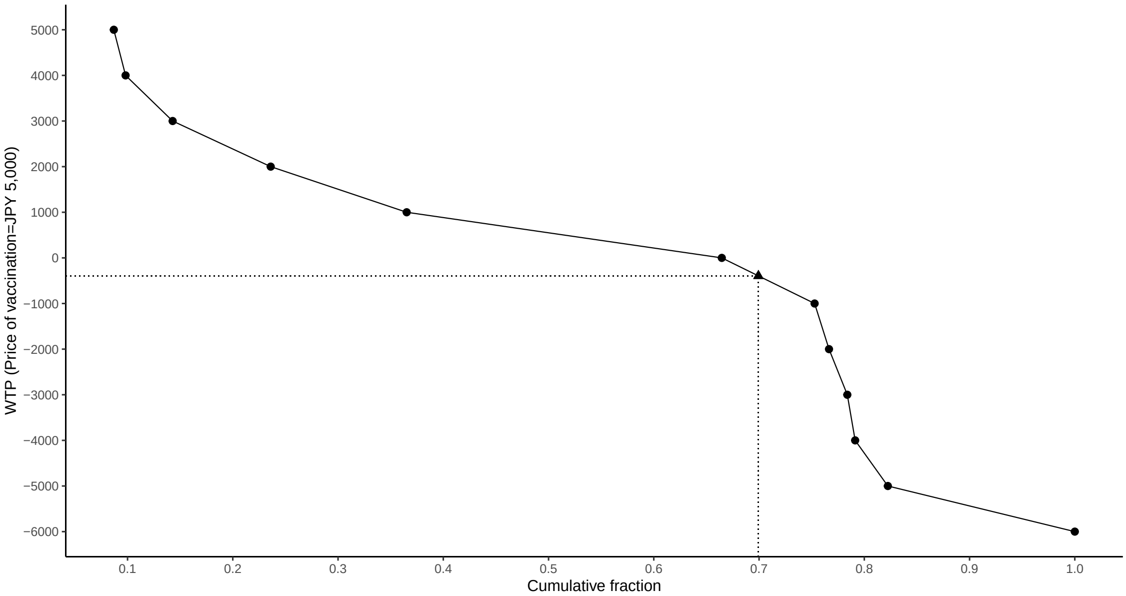

Figure C1: Demand Curve of the Rubella Vaccination for the *Default Incentive* Group. Notes: Black triangles indicate the baseline vaccination rate F_0 and corresponding WTP.

C Estimation of the Monetary Value of the Text Message Reminders

To determine the extent to which the text message reminders increase the monetary value of the rubella vaccination, we use the WTP for the vaccination. Let WTP_i be an individual's WTP that follows a cumulative distribution F. Then, for a given cost C, men will be vaccinated if $WTP_i \geq C$. The vaccination rate is $F_0 = 1 - F(C)$. Suppose that our treated text message reminders change the WTP by β. An individual who receives a treated text message reminder will be vaccinated if $WTP_i \geq C - \beta$. The vaccination rate of the treated group is $F_1 = 1 - F(C - \beta)$. Thus, the treatment effect is $\tau = F_1 - F_0 = F(C) - F(C - \beta)$. From the perspective of government subsidies, the subsidy equal to the effect of the text message reminder τ is β. We want to estimate β.

Once F, C, and τ are determined, we obtain β. We first discuss the estimation of F (demand function). We elicit the WTP for the vaccination in Wave 1 before the participants read their message. If the vaccination costs JPY 5,000, we ask the respondents if they would be vaccinated if the local government pays s_j. The subsidy amounts are $s_j \in \{0, 1000, 2000, \ldots, 10000\}$. Let $s_i^{\min}$ be the lowest subsidy at which the respondents indicate that they would be vaccinated. Let $s_i^{\max}$ be the highest subsidy that the respondents indicate they would not be vaccinated. We can identify the WTP for the vaccination within the range $[5000 - s_i^{\max}, 5000 - s_i^{\min})$. Thus, without additional assumptions, the demand curve is step-wise, and we estimate the monetary value of the effect of the text message reminders with bounds. If the respondents indicate that they would not be vaccinated at all the subsidy amounts, then $s_i^{\max} = 10000$. However, we cannot define $s_i^{\min}$ in the data. Therefore, we assume $s_i^{\min} = 11000$. This assumption does not affect the monetary value of the text message reminders. To obtain a point estimate, we assume that the true WTP is uniformly distributed within the range $[5000 - s_i^{\max}, 5000 - s_i^{\min})$. The vaccination demand curve can then be linearly interpolated (see Figure C1).

In the *default incentive* group, eligible men receive a free vaccination. Therefore, the natural setting is $C = 0$. In addition, we use the effect on the actual uptake of antibody testing as the effect of the text message reminders τ. The person taking the antibody test wants to obtain the antibody against rubella. However, the effect of the text message reminder on vaccination rates differs from the effect on the (true) intention to be vaccinated because people with a positive antibody test result cannot be vaccinated. Therefore, τ is the effect on antibody testing rather than on vaccination rates.

In our framework, $F_0 = 1 - F(0)$, but one potential concern remains. The effect of the text message reminders τ is estimated as the difference from the MHLW (Control) group. Assuming that everyone who did not participate in our survey did not take the antibody test after the survey, the actual uptake of antibody testing of MHLW (Control) can be considered as an effect of providing the message in the survey. To remove this effect, we instead use $F_0 = (1 - F(0)) + (F(0) - F(-\alpha))$. The second term is the antibody testing rate of the control group (3.5%) under no vaccination cost. The demand function is estimated to be $F_0 = 0.7$ and $\alpha = 394$. Finally, we find β holding that $\tau = F(-\alpha) - F(-\beta)$.

D Tables

Table D1: List of the Covariates

	Description	Mean	Std.Dev.
age	(Wave1) Age as of April 2019 based on year of birth and month of birth.	48.66	5.69
married	(Wave1) Dummy variable taking one if a respondent is married.	0.58	0.49
education	(Wave1) Years of education.	14.75	2.31
income	(Wave1) Household income. For those who did not respond with household income, the overall average was used.	684.90	375.74
noinfo_income	(Wave1) Dummy variable taking one if a respondent did not answer household income.	0.15	0.36
exercise_w1	(Wave1) Dummy variable taking one if a respondent exercises or plays sports more than once a week.	0.22	0.42
health_check	(Wave1) Dummy variable taking one if a respondent has had a medical examination in their city or place of employment in the past year from the time of Wave 1.	0.68	0.46
flushot	(Wave1) Dummy variable taking one if a respondent is vaccinated against influenza every year.	0.27	0.45
norm_waiting_line	(Wave1) Five-point Likert scale for the question ”I never interrupt someone in line.”	4.07	0.96
selfish_anonymous	(Wave1) Five-point Likert scale for the question ”If I can never find it, I can do bad things (littering, parking tickets, etc.).”	2.33	0.98
handwash	(Wave2) Five-point Likert scale for the question ”I washed my hands and gargled frequently from the end of the previous survey to today.”	3.91	1.04
temp_check	(Wave2) Five-point Likert scale for the question ”I took my temperature frequently from the end of the previous survey to today.”	2.26	1.22
avoid_out	(Wave2) Five-point Likert scale for the question ”I refrained from going out from the end of the previous survey to today.”	2.96	1.20
avoid_crowd	(Wave2) Five-point Likert scale for the question ”I avoided crowded places when I went out from the end of the previous survey to today.”	3.38	1.10
wear_mask	(Wave2) Five-point Likert scale for the question ”I always wore a medical mask when I went out or met people from the end of the previous survey to today.”	3.14	1.38

Table D2: Balance Tests for the *Default Incentive* Group (Sample for Estimating the Effect on Intention)

	MHLW (Control)	MHLW (Age)	Altruistic	Selfish	Social Comparison	Deadline	Convenient	F-test, p-value
age	42.862	43.046	43.135	43.045	42.909	42.906	42.866	0.874
married	0.408	0.458	0.412	0.417	0.455	0.478	0.480	0.785
education	14.654	14.473	14.595	14.205	14.099	14.348	14.575	0.446
income	557.562	645.556	613.156	623.542	569.530	590.422	633.487	0.149
noinfo_income	0.162	0.168	0.203	0.197	0.157	0.130	0.181	0.706
exercise_w1	0.246	0.176	0.277	0.189	0.165	0.217	0.213	0.285
health_check	0.654	0.626	0.696	0.538	0.603	0.674	0.614	0.150
flushot	0.238	0.260	0.203	0.144	0.140	0.239	0.236	0.055
norm_waiting_line	4.100	3.908	3.892	3.970	4.050	3.906	4.024	0.447
selfish_anonymous	2.377	2.435	2.331	2.371	2.446	2.355	2.425	0.945

Notes: Table D1 describes the variables. Columns (2)–(8) show the sample averages for each experimental arm. Column (9) shows the p-value of the joint null hypothesis (F-test).

Table D3: Balance Tests for the *Opt-In Incentive* Group (Sample for Estimating the Effect on Intention)

	MHLW (Control)	MHLW (Age)	Altruistic	Selfish	Social Comparison	Deadline	Convenient	F-test, p-value
age	51.632	51.408	51.226	51.657	51.582	51.545	51.502	0.712
married	0.600	0.588	0.628	0.657	0.602	0.549	0.619	0.334
education	14.572	14.655	14.530	14.830	14.566	14.634	14.393	0.578
income	712.622	707.190	687.764	677.141	656.419	707.708	710.713	0.540
noinfo_income	0.184	0.164	0.145	0.117	0.155	0.163	0.205	0.211
exercise_w1	0.156	0.193	0.239	0.230	0.183	0.203	0.218	0.252
health_check	0.632	0.664	0.701	0.683	0.653	0.659	0.644	0.742
flushot	0.228	0.244	0.197	0.270	0.275	0.228	0.251	0.433
norm_waiting_line	4.136	4.134	4.137	4.078	4.004	4.028	4.063	0.590
selfish_anonymous	2.416	2.231	2.325	2.374	2.223	2.337	2.368	0.201

Notes: Table D1 describes the variables. Columns (2)–(8) show the sample averages for each experimental arm. Column (9) shows the p-value of the joint null hypothesis (F-test).

Table D4: Difference-in-means Test of Intention

	Antibody testing			Vaccination		
		P-values			P-values	
Treatment	Effect	T-test	Exact test	Effect	T-test	Exact test
A. Default incentive group						
MHLW (Age)	2.132	0.678	0.775	1.973	0.748	0.825
Altruistic	14.366	0.007	0.005	2.380	0.690	0.720
Selfish	7.261	0.172	0.210	3.916	0.524	0.540
Social Comparison	4.024	0.450	0.485	1.437	0.819	0.920
Deadline	3.144	0.538	0.545	-0.959	0.874	0.890
Convenient	5.215	0.325	0.425	1.769	0.775	0.800
B. Opt-in incentive group						
MHLW (Age)	-2.390	0.550	0.605	-6.582	0.147	0.145
Altruistic	5.306	0.205	0.190	-2.800	0.539	0.570
Selfish	4.139	0.323	0.380	-2.800	0.541	0.585
Social Comparison	-3.696	0.345	0.400	-8.178	0.067	0.085
Deadline	2.888	0.480	0.430	-2.800	0.534	0.560
Convenient	6.291	0.133	0.180	-3.009	0.507	0.510

Notes: The unit of effect is a percentage point. Fisher's exact p-values test sharp null hypotheses. To calculate p-values, we create 200 simulated assignment vector keeping the number of treated and contrl units fixed.

Table D5: Balance Tests for the *Default Incentive* group (Sample for Estimating the Effect on Behavior)

	MHLW (Control)	MHLW (Age)	Altruistic	Selfish	Social Comparison	Deadline	Convenient	F-test, p-value
age	42.861	43.059	43.102	43.036	42.893	42.898	42.964	0.953
married	0.391	0.454	0.391	0.360	0.437	0.466	0.477	0.467
education	14.496	14.471	14.547	14.126	14.010	14.407	14.595	0.474
income	548.244	649.778	614.512	599.124	555.083	591.597	637.056	0.102
noinfo_income	0.174	0.126	0.203	0.207	0.146	0.136	0.171	0.522
exercise_w1	0.252	0.185	0.266	0.171	0.165	0.195	0.225	0.375
health_check	0.643	0.639	0.680	0.532	0.631	0.661	0.640	0.391
flushot	0.235	0.261	0.227	0.135	0.146	0.246	0.207	0.082
norm_waiting_line	4.174	3.933	3.922	4.036	4.078	3.898	4.063	0.219
selfish_anonymous	2.339	2.412	2.367	2.333	2.447	2.373	2.414	0.977
handwash	3.861	3.916	3.797	3.757	3.767	3.915	3.829	0.835
temp_check	2.139	2.235	2.414	2.126	2.204	2.203	2.117	0.535
avoid_out	3.096	3.034	3.047	2.793	2.932	3.025	2.928	0.544
avoid_crowd	3.296	3.336	3.273	3.234	3.350	3.305	3.324	0.990
wear_mask	2.930	3.076	3.109	3.009	3.010	3.144	3.207	0.794

Notes: Table D1 describes the variables. Columns (2)–(8) show the sample averages for each experimental arm. Column (9) shows the p-value of the joint null hypothesis (F-test).

Table D6: Balance Tests for the *Opt-in Incentive* Group (Sample for Estimating the Effect on Behavior)

	MHLW (Control)	MHLW (Age)	Altruistic	Selfish	Social Comparison	Deadline	Convenient	F-test, p-value
age	51.695	51.394	51.179	51.662	51.421	51.605	51.512	0.564
married	0.591	0.560	0.611	0.652	0.598	0.547	0.596	0.407
education	14.505	14.620	14.553	14.876	14.593	14.610	14.345	0.472
income	712.165	707.809	686.355	671.407	644.798	699.289	718.575	0.370
noinfo_income	0.173	0.157	0.137	0.114	0.159	0.166	0.222	0.142
exercise_w1	0.159	0.194	0.232	0.229	0.173	0.211	0.202	0.432
health_check	0.632	0.667	0.684	0.677	0.645	0.673	0.631	0.849
flushot	0.223	0.245	0.189	0.264	0.280	0.215	0.241	0.376
norm_waiting_line	4.159	4.162	4.126	4.065	3.991	4.063	4.030	0.431
selfish_anonymous	2.436	2.227	2.311	2.343	2.234	2.300	2.379	0.240
handwash	3.823	3.889	3.926	3.751	3.836	3.861	3.867	0.769
temp_check	2.095	2.204	2.221	2.100	2.136	2.085	2.182	0.841
avoid_out	2.886	2.889	2.932	2.866	2.855	2.964	2.941	0.960
avoid_crowd	3.295	3.361	3.447	3.239	3.313	3.309	3.433	0.437
wear_mask	3.082	3.176	3.116	3.144	2.977	2.942	3.010	0.533

Notes: Table D1 describes the variables. Columns (2)–(8) show the sample averages for each experimental arm. Column (9) shows the p-value of the joint null hypothesis (F-test).

Table D7: Difference-in-means Test of Behavior

	Antibody testing			Vaccination		
		P-values			P-values	
Treatment	Effect	T-test	Exact test	Effect	T-test	Exact test
A. Default incentive group						
MHLW (Age)	3.244	0.260	0.385	0.811	0.581	1.000
Altruistic	7.459	0.023	0.030	3.818	0.066	0.115
Selfish	5.531	0.088	0.115	1.833	0.303	0.420
Social Comparison	5.260	0.111	0.170	3.985	0.085	0.135
Deadline	0.759	0.765	1.000	-0.022	0.985	1.000
Convenient	3.729	0.216	0.295	1.833	0.303	0.380
B. Opt-in incentive group						
MHLW (Age)	0.471	0.554	0.615	0.463	0.318	0.530
Altruistic	1.651	0.148	0.200	0.526	0.319	0.460
Selfish	1.038	0.286	0.390	0.498	0.319	0.475
Social Comparison	2.349	0.055	0.080	0.000		1.000
Deadline	0.891	0.321	0.695	0.448	0.318	1.000
Convenient	0.531	0.523	0.640	0.000		1.000

Notes: The unit of effect is a percentage point. Fisher's exact p-values test sharp null hypotheses. To calculate p-values, we create 200 simulated assignment vector keeping the number of treated and contrl units fixed.

Table D8: Effect of the Message Content on Intention Compared with MHLW (Age)

	Testing		Vaccination	
	(1)	(2)	(3)	(4)
Altruistic	0.122 (0.054)	0.124 (0.051)	0.004 (0.060)	−0.001 (0.057)
	[0.023]	[0.016]	[0.946]	[0.990]
Selfish	0.051 (0.054)	0.077 (0.051)	0.019 (0.061)	0.041 (0.058)
	[0.340]	[0.133]	[0.752]	[0.475]
Social Comparison	0.019 (0.054)	0.037 (0.052)	−0.005 (0.063)	0.004 (0.059)
	[0.725]	[0.469]	[0.932]	[0.947]
Deadline	0.010 (0.052)	0.003 (0.049)	−0.029 (0.060)	−0.041 (0.058)
	[0.845]	[0.955]	[0.627]	[0.478]
Convenient	0.031 (0.054)	0.022 (0.051)	−0.002 (0.062)	−0.015 (0.058)
	[0.565]	[0.664]	[0.974]	[0.793]
Opt-in	0.023 (0.046)	0.019 (0.052)	0.027 (0.054)	−0.038 (0.060)
	[0.619]	[0.710]	[0.617]	[0.523]
Altruistic × Opt-in	−0.045 (0.068)	−0.044 (0.065)	0.034 (0.075)	0.040 (0.071)
	[0.506]	[0.496]	[0.655]	[0.574]
Selfish × Opt-in	0.014 (0.068)	−0.022 (0.064)	0.018 (0.077)	−0.012 (0.072)
	[0.837]	[0.734]	[0.811]	[0.864]
Social Comparison × Opt-in	−0.032 (0.067)	−0.046 (0.063)	−0.011 (0.077)	−0.011 (0.072)
	[0.631]	[0.467]	[0.891]	[0.875]
Deadline × Opt-in	0.043 (0.066)	0.066 (0.063)	0.067 (0.076)	0.100 (0.071)
	[0.518]	[0.295]	[0.375]	[0.163]
Convenient × Opt-in	0.056 (0.068)	0.077 (0.065)	0.038 (0.077)	0.069 (0.072)
	[0.410]	[0.234]	[0.624]	[0.336]
Linear combination test: Treatment + Opt-in × Treatment				
Altruistic (Opt-in incentive)	0.077 (0.042)	0.080 (0.040)	0.038 (0.046)	0.040 (0.043)
	[0.066]	[0.045]	[0.412]	[0.357]
Selfish (Opt-in incentive)	0.065 (0.042)	0.055 (0.039)	0.038 (0.046)	0.029 (0.043)
	[0.118]	[0.154]	[0.414]	[0.501]
Social Comparison (Opt-in incentive)	−0.013 (0.039)	−0.008 (0.036)	−0.016 (0.045)	−0.007 (0.042)
	[0.738]	[0.815]	[0.724]	[0.858]
Deadline (Opt-in incentive)	0.053 (0.041)	0.068 (0.038)	0.038 (0.046)	0.059 (0.042)
	[0.196]	[0.074]	[0.406]	[0.164]
Convenient (Opt-in incentive)	0.087 (0.042)	0.099 (0.039)	0.036 (0.046)	0.054 (0.042)
	[0.037]	[0.011]	[0.436]	[0.205]
Covariates		X		X
Num.Obs.	2235	2235	2235	2235
R2	0.008	0.105	0.004	0.121

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Robust standard errors are in parentheses. We exclude from the sample those assigned to MHLW (Control). The reference group is MHLW (Age). Covariates are age, years of education, annual income, usual health behavior (exercise, medical checkup, and annual influenza vaccination), and psychological factors potentially associated with the experimenter demand effect and social desirability bias (following social norms, accepting bad behavior in anonymous conditions). Effect of the text message reminders in the *opt-in incentive* group is estimated by summing the main term of the treatment dummy and the cross-term between the treatment dummy and opt-in dummy.

Table D9: Heterogeneous Effects of the Altruistic Message Content

	Intention to undertake antibody testing	
	(1)	(2)
Altruistic	0.199 (0.068)	−0.104 (0.112)
	[0.004]	[0.356]
Altruistic × Handicap	−0.126 (0.082)	
	[0.125]	
Altruistic × Generosity		0.075 (0.035)
		[0.033]
Other nudges	0.038 (0.039)	0.033 (0.040)
	[0.329]	[0.413]
Linear combination test		
Altruistic + Altruistic × Handicap	0.073 (0.063)	
	[0.248]	
Altruistic + Altruistic × Most generous		0.270 (0.089)
		[0.003]
Covariates	X	X
Num.Obs.	797	797
R2	0.128	0.148

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Robust standard errors are in parentheses. We exclude from the sample those assigned to MHLW (Control). The reference group is MHLW (Age). The covariate "Other nudges" is a dummy indicating the respondent is assigned to the Selfish, Social Comparison, Deadline, and Convenient message groups. the covariate "Handicap" is a dummy indicating that the respondent knows that infants born to infected pregnant women may have disabilities. The covariate "Generosity" indicates on a 5-point scale the degree to which the respondent feels pleasure in taking actions for others. Those respondents who give a score of 5 to this are the most generous. Covariates are age, years of education, annual income, usual health behavior (exercise, medical checkup, and annual influenza vaccination), and psychological factors potentially associated with the experimenter demand effect and social desirability bias (following social norms, accepting bad behavior in anonymous conditions).

Table D10: Effect of the Message Content on Behavior Compared with MHLW (Age)

	Testing		Vaccination	
	(1)	(2)	(3)	(4)
Altruistic	0.042 (0.036)	0.045 (0.036)	0.030 (0.022)	0.032 (0.022)
	[0.242]	[0.212]	[0.175]	[0.154]
Selfish	0.023 (0.036)	0.032 (0.035)	0.010 (0.019)	0.014 (0.019)
	[0.522]	[0.361]	[0.599]	[0.484]
Social Comparison	0.020 (0.036)	0.028 (0.036)	0.032 (0.024)	0.035 (0.025)
	[0.578]	[0.438]	[0.192]	[0.158]
Deadline	−0.025 (0.030)	−0.024 (0.029)	−0.008 (0.015)	−0.007 (0.014)
	[0.401]	[0.420]	[0.567]	[0.626]
Convenient	0.005 (0.034)	0.010 (0.034)	0.010 (0.019)	0.013 (0.020)
	[0.886]	[0.775]	[0.599]	[0.514]
Opt-in	−0.058 (0.024)	−0.045 (0.027)	−0.012 (0.013)	−0.001 (0.015)
	[0.016]	[0.088]	[0.338]	[0.923]
Altruistic $\times$ Opt-in	−0.030 (0.038)	−0.032 (0.038)	−0.029 (0.023)	−0.031 (0.024)
	[0.425]	[0.405]	[0.205]	[0.185]
Selfish $\times$ Opt-in	−0.017 (0.037)	−0.028 (0.037)	−0.010 (0.021)	−0.012 (0.021)
	[0.645]	[0.448]	[0.632]	[0.557]
Social Comparison $\times$ Opt-in	−0.001 (0.038)	−0.009 (0.039)	−0.036 (0.025)	−0.039 (0.025)
	[0.972]	[0.807]	[0.142]	[0.124]
Deadline $\times$ Opt-in	0.029 (0.031)	0.030 (0.031)	0.008 (0.016)	0.008 (0.016)
	[0.353]	[0.344]	[0.607]	[0.630]
Convenient $\times$ Opt-in	−0.004 (0.035)	−0.005 (0.035)	−0.015 (0.020)	−0.017 (0.020)
	[0.903]	[0.877]	[0.458]	[0.387]
Linear combination test: Treatment + Opt-in $\times$ Treatment				
Altruistic (Opt-in incentive)	0.012 (0.012)	0.013 (0.013)	0.001 (0.007)	0.001 (0.007)
	[0.339]	[0.288]	[0.928]	[0.941]
Selfish (Opt-in incentive)	0.006 (0.011)	0.004 (0.011)	0.000 (0.007)	0.001 (0.007)
	[0.599]	[0.715]	[0.959]	[0.851]
Social Comparison (Opt-in incentive)	0.019 (0.013)	0.019 (0.013)	−0.005 (0.005)	−0.004 (0.005)
	[0.151]	[0.167]	[0.318]	[0.412]
Deadline (Opt-in incentive)	0.004 (0.010)	0.006 (0.010)	0.000 (0.006)	0.001 (0.007)
	[0.679]	[0.570]	[0.982]	[0.917]
Convenient (Opt-in incentive)	0.001 (0.010)	0.004 (0.010)	−0.005 (0.005)	−0.005 (0.005)
	[0.950]	[0.684]	[0.318]	[0.339]
Covariates		X		X
Num.Obs.	1937	1937	1937	1937
R2	0.029	0.047	0.019	0.031

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Robust standard errors are in parentheses. We exclude from the sample those assigned to MHLW (Control). The reference group is MHLW (Age). Covariates are age, years of education, annual income, usual health behavior (exercise, medical checkup, and annual influenza vaccination), and psychological factors potentially associated with the experimenter demand effect and social desirability bias (following social norms, accepting bad behavior in anonymous conditions). Effect of the text message reminders in the *opt-in incentive* group is estimated by summing the main term of the treatment dummy and the cross-term between the treatment dummy and opt-in dummy.

Table D11: Number of Antibody Testing, Negative Tests, and Vaccinations in the *Default Incentive* group

Text message	Sample size	Antibody testing		Negative tests			Vaccination		
		N	% of sample	N	% of test	% of sample	N	% of negatives	% of sample
MHLW (Control)	115	4	3.5	1	25.0	0.9	1	100.0	0.9
MHLW (Age)	119	8	6.7	2	25.0	1.7	2	100.0	1.7
Altruistic	128	14	10.9	7	50.0	5.5	6	85.7	4.7
Selfish	111	10	9.0	3	30.0	2.7	3	100.0	2.7
Social Comparison	103	9	8.7	5	55.6	4.9	5	100.0	4.9
Deadline	118	5	4.2	1	20.0	0.8	1	100.0	0.8
Convenient	111	8	7.2	5	62.5	4.5	3	60.0	2.7

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