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Effects of a fourth postal reminder in the SOM-surveys

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ABSTRACT

Using several postal reminders in surveys is a widespread method to improve response rates and mitigate the risk of non-response bias. This note presents the results from an experiment measuring the effects of a fourth postal reminder in a regional SOM-survey targeting residents in the western part of Sweden in 2019. The results of the experiment showed that in a context of relatively high response rates, sending four postal reminders statistically significantly increased the overall response rate by 1.1 percentage points compared to sending only three postal reminders. Moreover, excluding the individuals who had already submitted the questionnaire before the day of the administration of the experiment, the additional reminder statistically significantly increased the number of submitted questionnaire by 2 percentage points. In addition, individuals who were sent a fourth postal reminder were marginally significantly more likely to resemble the general population in terms of gender and geographic representation. The results support previous survey research that additional reminders positively affect response rates. Furthermore, adding to the still conflicted scholarly debate on whether additional reminders increase or decrease non-response bias, the results support that adding one additional reminder was causally related with less non-response bias.

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INTRODUCTION

Overall, the most prominent issues in surveys today are the declining response rates and the risk that non-response bias reduces the validity of data estimates. Although surveys in Sweden, in comparison to international surveys, have had a history of very high response rates, response rates have been decreasing in Sweden in the past couple of decades. A particular issue for the SOM Institute's annual mixed-mode surveys is that the declining response rates differ in terms of socio-demographic factors and consequently risk that respondents are not representative of the population targeted.

A common method to minimize declining response rates and enhance the generalizability of survey data has been to provide multiple postal reminders to non-respondents (Dillman 2007). Previous research has found that the first, second, and third reminders improve response rates in surveys (Smith et al 2019; Christensen et al 2014). However, studies evaluating the effects of more than three postal reminders are rarer. In addition, "the continuum of resistance" model states that the higher number of reminders needed to yield a response, the more similar respondents are to the targeted population (Lin IF & Schaeffer 1995). On the other hand, previous findings have shown mixed results in terms of reminder effects on representativeness. Christensen et al. (2014) find that more than one postal reminder did not yield a reduction of any socio-demographic discrepancies between respondents and non-respondents, whereas Smith et al (2019) provide results that indicate that a higher number of reminders leads to respondents more similar to the general population.

As a practice, the annual SOM-surveys have sent out four mailed postal reminders and four SMS reminders over a field period of around 100 days over the last years (Falk et al. 2020). Although the response rate continues to increase after every reminder, even though at a slow pace by the end of the field period, it has been unclear whether the fourth and last postal reminder actually significantly improves the response rate and representability. There is a risk that questionnaires sent in after the fourth reminder is a lagging effect of earlier reminders. At the same time, there is a tradeoff in how many times it is ethically defendable to remind an individual to respond to a survey versus the advantage of achieving a high response rate and reducing non-response bias.

This note presents the results from an experiment that assesses the effect that adding a fourth postal reminder may have on response rates and non-response bias. The experiment was administered in a large-scale mixed-mode survey of the

Swedish population conducted by the SOM Institute in 2019. The sample was randomized to be sent either three or four postal reminders (each reminder included a reminder letter and a questionnaire copy).

HYPOTHESIS

Two hypotheses will be investigated:

RESPONSE RATES

H1: Individuals who are sent a fourth postal reminder may be more likely to submit the questionnaire than individuals who are sent three postal reminders.

NON-RESPONSE BIAS

H2: Individuals who are responding after a fourth postal reminder may be more likely to be similar to the general population in terms of demographics than individuals who are sent three postal reminders.

SAMPLE

This study examines the effects of sending a fourth postal reminder to randomly selected individuals registered by the Swedish Tax Authority as residing in Sweden on August 27, 2019. The experiment was part of a regional survey targeting residents in West Sweden, conducted by the SOM-Institute at the University of Gothenburg. The total sample size was 6 000 invited participants 16-85 years old. The total number of survey questions was 73.

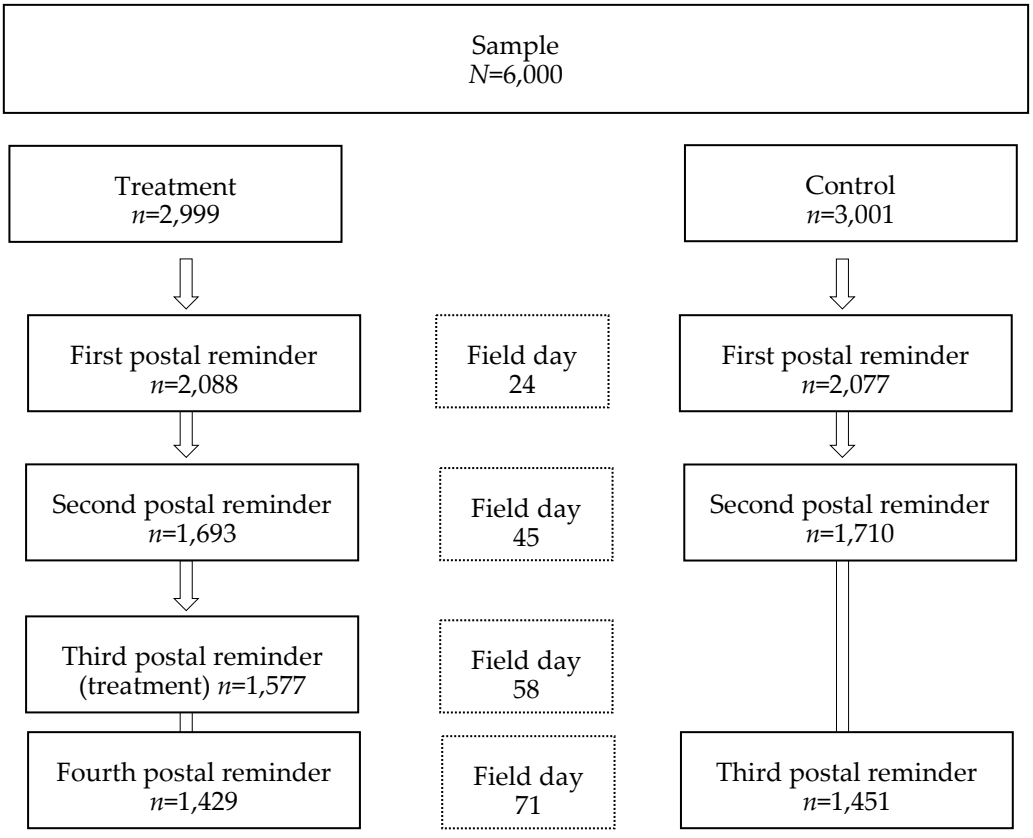
PROCEDURE

Prior to being invited to complete the questionnaire, each respondent in the sample was randomly assigned into one treatment group (n=2 999) and one control group (n=3 001) (see appendix 1 for descriptive statistics on the randomized samples). The field period started on September 16, 2019, when a postal invitation to complete the questionnaire through a self-administrated paper- and pencil questionnaire or an online self-administrated questionnaire was sent to all individuals in the two experimental groups. All respondents were also sent a pre-notification postcard a week prior to the postal invitation (September 9) and a postcard thanking them for participating/reminding them to participate on field day 9 (September 25). Individuals in both groups who had not yet responded or

refused[1] were sent up to three postal reminders[2] (sent out on field days 24, 45, and 71 respectively) and up to four reminders as text messages to their mobile telephones[3] (sent out on field day 17, 36, 52, 64). The content in the first, second, and third postal reminders and the four text messages was identical for both groups. The field period ended on January 3, 2020, the day the final survey was received.

The experimental design, focusing on the postal reminders, is described in Figure 1. The full field period is described in appendix 2. Individuals in the treatment group who had not yet responded and had not contacted the SOM-Institute to refuse their participation were sent an extra postal reminder on field day 58 (November 13) (n=1, 577). Since responses, in theory, can be completed and sent in online the same day postal reminders are sent out, field day 57 is counted as the start day for the experiment.

Figure 1. *Experimental design and samples*



[1] Individuals who refused to respond either informed the SOM-institute this by email or telephone, or by replying NO to text message two, three or four.

[2] The postal reminders included the survey, an information letter and a return envelope.

[3] The first text messages were sent out to 33 % of the sample.

ANALYSIS PLAN

RESPONSE RATES

To compare response rates between the groups, Response Rate 6 (RR6) was estimated following the guidelines of the American Association for Public Opinion Research (AAPOR, 2016). A t-test evaluating the difference in difference in RR6 between the treatment and control group will be estimated to assess the effect of the additional fourth reminder.

NON-RESPONSE BIAS

The parameters of four OLS-regressions equations will be estimated and predict the RR6 with the treatment variable, the independent variables of interest, and the interactions between them. The statistical significance of the interactions will determine if the treatment group would mitigate the non-response bias. The variables of interest available in the sample data were the individuals' sex, age, immigrant status (born in Sweden, born outside Sweden), and type of municipality in the West Sweden region (Gothenburg municipality, surrounding municipality to Gothenburg, other Gothenburg regional municipality, or other West regional municipality). Males, younger cohorts, people born outside of Sweden, and residents in Gothenburg municipality are less representative among respondents (Falk et al. 2019). Hence, increasing the response rate in these groups will reduce non-response bias.

RESULTS

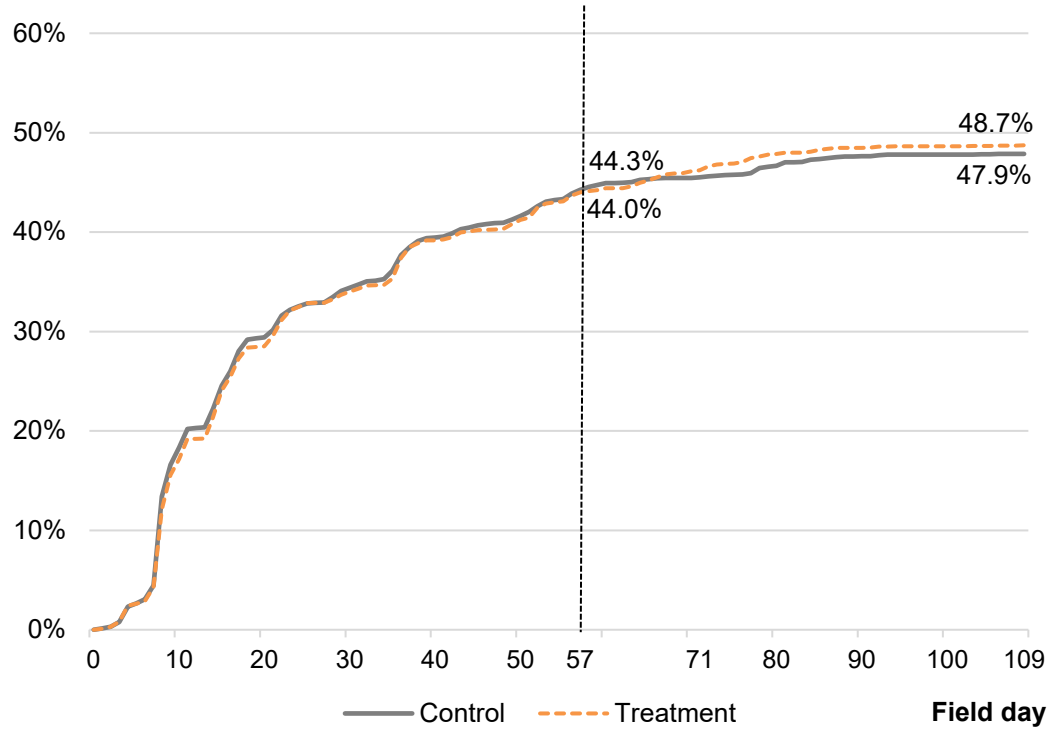
RESPONSE RATES

A difference-in-difference t-test revealed that respondents who were sent an additional reminder were statistically significantly more likely to submit the questionnaire (difference in RR5 = 4.7%, SD = 0.39) than the respondents who only got three reminders (difference in RR5 = 3.6%, SD = 0.34, difference-in-difference = 1.1%-points, t = 5.99, p = 0.027). In addition, a t-test, excluding individuals who had already submitted the questionnaire before the day of the administration of the experiment, showed that the extra reminder statistically significantly increased the number of submitted questionnaires by 2 percentage points ($M_{extra\ reminder}$ = 8.46%, SD = 0.68, $M_{no\ extra\ reminder}$ = 6.46%, SD = 0.60, t = 3,35, p = 0.027).

Figure 2 shows the response rates for the treatment and the control group over each field day. The figure illustrates that the difference between the two experimental groups happened after the extra reminder was sent out. That is, the

response rate increased more in the treatment group compared to the control group after the additional reminder was sent out to the treatment group. After the last postal reminder was sent out to both groups on field day 71, the difference between the two groups was reduced slightly, but the group that was sent four reminders was still statistically significantly more likely to submit the questionnaire.

Figure 2. *Response rates (RR6) over field day (percent)*



Note. The black dotted line represents the day before the extra reminder was sent to the treatment group (field day 57).

The benefit to use the difference in difference method is made clear in that the response rate at the start day of the experiment was 44,0 percent compared to 44,3 percent in the control group (AAPOR RR6) and the overall average difference in response rate up until the start day was 0,4 percentage points, in favor of the control group. The response advantage in the control group, therefore, needs to be taken into account when evaluating the difference in response rates between the groups. Table 1 demonstrates the response rates by a two-sided t-test and a difference in difference estimation predicting the difference in response rate between the groups before the extra postal reminder was sent out compared to the difference in response rate between the groups by the end of the experiment. The results show that the difference in difference effect is 1.1 percentage point (see Table 1, $p = 0.027$). H1 can therefore not be rejected. Individuals in the treatment

group were more likely to submit the questionnaire than individuals in the control group. The effect is statistically significant at the 95 percent confidence level.

Table 1. *Response rates (RR6) and the difference in difference effect (percent).*

	Before (Field day 57)	After (Field day 109)	Difference
Treatment group	44.0 (0.91)	48.7 (0.91)	+4.7 (0.39)
Control group	44.3 (0.91)	47.9 (0.91)	+3.6 (0.36)
Difference	-0.3	+0.8	+1.1*

Note. Standard errors in parenthesis. The difference in difference estimation is based on a two-sided t-test that estimates difference within the treatment group (.0473) against the difference within the control group (.0359) (.0473-.0359=.011). The p-value for the difference in difference effect is 0.0277.

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Another way to look at the data is to drop individuals in the treatment and control group that had already responded before the additional reminder was sent out. Then only individuals who are yet to react or not to react to the treatment would be considered in the sample (n=3 352). Table 2 presents the response rate in each group for these individuals. The accumulated response rate was 8.46 percent for the treatment group and 6.46 percent for the control group, a statistically significant difference of 2 percentage points. In other words, this additional test confirms the validity of the difference in difference test of the overall response rates, and reveals that the actual effect of the additional reminder was larger than first anticipated.

Table 2. *Response rates from field day 57 to field day 109 (percent).*

Treatment	Control	Δ	t	*p*	*n*
8.46 (0.68)	6.46 (0.60)	2.00 (0.91)	-2.207	0.027	3 352

Note. Standard errors in parenthesis. The results are based on a two-sided t-test that estimates the difference in mean between the treatment group and the control group.

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

NON-RESPONSE BIAS

Adding a fourth reminder made the treatment group marginally statistically significantly more representative in terms of sex ($\beta_{female*treatment} = -0.02$, $SE = 0.01$, $p < 0.1$) and municipality ($\beta_{municipality*treatment} = 0.05$, $SE = 0.02$, $p < 0.05$).

Table 3 presents the OLS regression estimates of the interactions between the treatment and control group with the separate independent variables. The estimations for the two-way interactions with age and immigrant status were not statistically significant. However, the interaction between the treatment group and the dummy variable *other municipalities in the Gothenburg region* was statistically significant ($p<0.05$), and the interaction coefficient of the treatment group and *other municipalities in the West region* was marginally statistically significant ($p<0.1$). This means that individuals living in Gothenburg municipality who were sent a fourth postal reminder were 2 percentage points more likely to submit the questionnaire than individuals living in other municipalities in the Gothenburg region, and 1 percentage point marginally significantly more likely to submit the questionnaire than individuals living in other municipalities in the West region (see Table 3, model 5). Furthermore, the interaction between treatment group and sex was marginally statistically significant ($p<0.1$). Hence, male individuals who received a fourth postal reminder were 2 percentage points marginally more likely to submit the questionnaire compared to women (see Table 3, model 2). Since males and residents living in Gothenburg (metropolitan city) were less representative among respondents, H2 can therefore not be rejected. In other words, individuals who responded after a fourth postal reminder were more likely to be similar to the general population in terms of demographics than individuals who were not sent a fourth postal reminder.

Table 3. *Difference in response rate between the treatment and control group*

	Response rate: Treatment versus.Control				
	Baseline	Sex-interaction	Age-interaction	Immigrant-interaction	Municipality-interaction
	Model 1	Model 2	Model 3	Model 4	Model 5
Treatment (reference: control)	0.01* (0.01)	0.02** (0.01)	0.02* (0.01)	0.01+ (0.01)	0.02** (0.01)
Treatment * Female (reference: male)		-0.02+ (0.01)			
Treatment * Age: 30-49 (reference: 16-29)			-0.01 (0.01)		
Treatment * Age: 50-64 (reference: 16-29)			-0.02 (0.01)		
Treatment * Age: 65-85 (reference: 16-29)			-0.01 (0.02)		
Treatment * Born outside Sweden (reference: born in Sweden)				0.01 (0.01)	
Treatment * Surrounding municipalities (reference: Gothenburg)					-0.01 (0.02)
Treatment * Other municipalities in Gothenburg region (reference: Gothenburg)					-0.05* (0.02)
Treatment * Other municipalities in the West region (reference: Gothenburg)					-0.02+ (0.01)
Constant	0.07 (0.00)	0.06*** (0.01)	0.06*** (0.01)	0.07*** (0.01)	0.07*** (0.01)
Observations	6,000	5,996	6,000	6,000	5,718
R^2	0.85	0.85	0.85	0.85	0.85

Note. Unstandardized OLS regression coefficients with standard errors in parentheses. The main effects of the response variable, the control dummy for the day the experiment started, and the treatment dummies were included in the regression but were dropped from the Table for readability.

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

CONCLUSION

This note presented results from an experiment evaluating the effect of a fourth postal reminder. The SOM-Institute has for a long time used four postal reminders (including the questionnaire and a reminder letter in each mailed reminder) in addition to four SMS reminders, as a means to maintain a high level of response rates and to minimize the risk for non-response bias. In 2019, an experiment in a regional SOM-survey was conducted in order to evaluate the effect of a fourth postal reminder on response rate and the likelihood of respondents being similar to the targeted population.

The findings from the experiment indicate that the use of a fourth postal reminder statistically significantly improved the overall survey response rate by 1.1 percentage points. In addition, excluding the individuals who had already responded before the day of the administration of the experiment, the additional reminder statistically significantly increased the number of submitted questionnaire by 2 percentage points. The treatment group achieved a final response rate of 48.7 percent. Furthermore, the results of the experiment showed weak support for an enhanced level of representativeness among respondents. The findings indicate that there was a marginal effect that males and residents in the large city of Gothenburg were more likely to respond after getting a fourth postal reminder than females and residents of smaller municipalities. However, there was no significant effect that representativeness improved in terms of age and immigrant status. The results are in line with previous research that multiple postal reminders increase response rates, albeit the effects of 1.1 percentage points should perhaps be considered small. On the other hand, to stem the negative tide of ever-declining response rates in the Swedish survey environment, a fourth postal reminder may still be a valuable intervention to use.

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APPENDIX 1. SAMPLE COMPOSITION

	Treatment group	Control group
Female	50,1%	49,6%
Male	49,7%	50,5%
16-19 years	5,7%	6,1%
20-29 years	16,7%	16,9%
30-39 years	17,0%	15,7%
40-49 years	15,6%	16,0%
50-59 years	15,4%	15,9%
60-69 years	14,0%	14,3%
70-79 years	11,4%	11,5%
80-85 years	4,2%	3,6%
Born in Sweden	79,7%	79,7%
Born outside Sweden	20,3%	20,3%
Resident in Gothenburg	34,4%	34,6%
Resident in surrounding municipalities to Gothenburg	15,5%	15,6%
Resident in other municipalities in Gothenburg region	5,7%	5,8%
Resident in other municipalities in the West region	44,3%	44,0%

APPENDIX 2. FIELD PERIOD

W		FD	West region SOM-survey 2019
37			**Pre-notification**
			(pre-notification received)
38		0	**Invitation** (letter, questionnaire, folder, pen)
		1	
		2	
		3	*Invitation received*
		4	
		5	
		6	
39		7	
		8	
		9	**Reminder card**
		10	
		11	
		12	
		13	
40	**Sept**	14	
	Okt	15	*Reminder card recieved*
		16	
		17	**SMS 1**
		18	
		19	
		20	
41		21	
		22	
		23	
		24	**First postal reminder (letter, questionnaire)**
		25	
		26	
		27	
42		28	
		29	*First postal reminder received*
		30	
		31	
		32	
		33	
		34	
43		35	
		36	**SMS 2**
		37	
		38	
		39	
		40	
		41	
44		42	
		43	
		44	
	Oct	45	**Second postal reminder (letter, questionnaire)**
	Nov	46	
		47	
		48	
45		49	
		50	Second postal reminder recieved
		51	
		52	**SMS 3**
		53	
		54	
		55	
46		56	
		57	
		58	**Third postal reminder (letter, questionnaire) = TREATMENT**
		59	
		60	
		61	Third postal reminder recieved
		62	
47		63	
		64	**SMS 4**
		65	
		66	
		67	
		68	
		69	
48		70	
		71	**Fourth postal reminder (letter, questionnaire)**
		72	

The SOM Institute is an academic organization located at the University of Gothenburg, Sweden. Since 1986 the SOM Institute conduct annual cross-sectional surveys among the Swedish population with a focus on Society, Opinion and Media, as well as administering the web panel called the Swedish Citizen Panel. The annual surveys and the web panel both function as infrastructures, enabling researchers and public organizations to effectively collect research and opinion data in collaboration with researchers at the SOM Institute.

In order to strengthen contemporary research on Swedish society, as well as to contribute to international methodological development, the SOM Institute frequently publish notes on methodological research. These are made available for scholars and the public alike at https://www.gu.se/en/som-institute/publications/research-on-survey-methodology

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