Preregistration plan for:

Stimulating Uptake of a COVID-19 Contact Tracing App Using Monetary Incentives

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Study Information

1. Title

Stimulating Uptake of a COVID-19 Contact Tracing App Using Monetary Incentives

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3. Description

We extend a previous study of uptake of Germany's official COVID-19 contact tracing app (see https://osf.io/6jstp/). Using a randomized intervention, we identify the effects of varying monetary incentives on people's willingness to install and use the app on their mobile device and other relevant outcomes.

4. Hypotheses

Hypothesis on incentivization acceptance

H1: Subjects offered higher monetary incentives will **be more likely to be willing to install the app** than subjects assigned to lower monetary incentives.

Hypotheses on app usage

H2a: Subjects in any of the incentivization groups will **be more likely to be observed to install the app** than subjects assigned to the control group.

H2b: The differences between incentivized subjects and the control group referred to in H2a will be larger for subjects offered higher monetary incentives.

H3a: Subjects in any of the incentivization groups will **be more likely to report using the app** than subjects assigned to the control group.

H3b: The differences between incentivized subjects and the control group referred to in H3a will be larger for subjects offered higher monetary incentives.

Hypotheses on downstream effects of app usage

H4: Subjects in any of the incentivization groups will **show higher levels of knowledge about the app** than subjects assigned to the control group.

H5: Subjects in any of the incentivization groups will **report more positive attitudes towards the app** than subjects assigned to the control group.

H6: Subjects in any of the incentivization groups will **be more likely to intend to share a message about the app** than subjects assigned to the control group.

Design Plan

5. Study type

We devise an incentivization experiment embedded in an online panel survey fielded in Germany. For a subsample of the respondents, the data are linked to passive tracking data of app usage on mobile devices.

6. Blinding

No blinding is involved in this study.

7. Study design

We implement the design in a follow up survey (wave 2) of a previous study registered at https://osf.io/6jstp/. Thereby, we use data from an opt-in online panel provided by respondi AG, a German market and social science research panel provider. All respondents who participated in Wave 1 (2,047) will be invited to participate in Wave 2, serving as the basis for our experiment. Participants will complete a 10-minute survey about sociodemographic, attitudinal, and behavioral characteristics. As part of this survey, participants are randomly assigned to one of three treatment conditions or the control condition with equal probability, 1/4.

About three weeks after the survey, participants are re-invited to yet another follow-up survey in which key measures of attitudes and behaviors are repeated.

8. Randomization

Randomization into one of the three treatment conditions will be done with equal probability, ¼.

Sampling Plan

9. Existing data

The tracking data covering the period prior to launching the survey has been existing before, but we haven't had access to it.

10. Data collection procedures

Participants were recruited from online access panels administered by the Respondi company. No incentives other than the participation incentives provided by Respondi will be given. For recruitment for the original wave, participants had to be at least 18 years old and reside in Germany. To attain a representative sample, panelists were selected according to their gender (targets: 51% female, 49% male), age (18% 18-29 years, 16% 30-39 years, 17% 40-49 years, 21% 50-59 years, 28% 60-75 years) and education (33% primary/lower secondary[Haupt-, Volks-, Grundschulabschluss; no qualification (yet)], 32% secondary [Realschulabschluss, Mittlere Reife, Oberschule], 35% higher secondary [Abitur, (Fach-)Hochschulreife mit oder ohne Studium]) to approximate marginal distributions of the 2019 best4planning study. Quotas in the tracking panel were expected to be slightly off due to the limited overall panel size.

11. Sample size

We study the respondents who completed both Waves 1 and 2 of the original survey, and who potentially participate in Wave 3.

12. Sample size rationale

The survey-only sample size is constrained by the research budget. The survey-plus-tracking as well as the tracking-only sample is constrained by the overall size of the passive tracking panel operated by the provider.

Variables

13. Manipulated variables and outcome measures

Incentivization conditions

The control group will receive no incentivization and no encouragement to install the app. Those who report to not having installed the app are assigned to the following incentivization condition (with varying incentivization level):

> Sie haben angegeben, dass Sie die Corona-Warn-App derzeit nicht installiert haben.
>
> Wir würden Ihnen 100[200,500] Mingle-Punkte gutschreiben, wenn Sie die Corona-Warn-App auf Ihrem eigenen Smartphone installieren.
>
> Die Punkte würde Ihnen dann nach Ihrer Einwilligung in den nächsten Tagen gutgeschrieben werden.
>
> Sie gehen dafür keinerlei Verpflichtung ein. Wir würden Sie lediglich bitten, die App zu installieren.
>
> Sind Sie bereit, die App in den nächsten Tagen auf Ihrem Smartphone zu installieren?

Mingle points are the platform-specific currency used by the survey provider (100 Mingle points = 1 EUR).

Respondents are requested to select one of three answers:

> 1. Ja, ich bin bereit und werde die Corona-Warn-App in den nächsten Tagen auf meinem Smartphone installieren.
> 2. Nein, ich bin nicht bereit, die Corona-Warn-App zu installieren.
> 3. Ich habe die Corona-Warn-App bereits installiert.

When response (1) is selected, the respondent qualifies for the monetary payoff, which is taken care of by the survey provider. The payoff is not conditional on further compliance measures.

Outcome measures

The survey will include several attitudinal and quasi-behavioral outcomes. In addition, the passive tracking data will provide a behavioral measure of tracing app uptake in the tracking samples. These measures will be taken both pre- and post-treatment.

1. **App usage yes/no (tracking measure)**
   Variable will be coded as 1 if app usage is identified in the tracking data, otherwise 0.

2. **App installment intention yes/no (tracking measure)**
   Coded 1 if respondent clicks on any of the app store link buttons or selects the option to show QR codes to install the app directly after agreeing to install the app in response to the promised incentive.

3. **App usage yes/no (survey measure)**
   Using the following item, two measures are derived:
   - app_usage_initial will be coded as 1 if respondent answers (1) or (3), otherwise 0
   - app_usage_current will be coded as 1 if respondent answers (1), otherwise 0

> Zuletzt haben wir noch ein paar Fragen an Sie zur Corona-Warn-App, die das Robert-Koch-Institut (RKI) seit kurzem zur Verfügung stellt. Manche Leute installieren die Corona-Warn-App, während andere Leute die App nicht installieren können oder möchten.

Wie ist es bei Ihnen? Haben Sie oder hat jemand für Sie die offizielle Corona-Warn-App auf Ihrem Smartphone installiert oder nicht installiert?

o App installiert (1)
o App nicht installiert (2)
o App installiert, aber seitdem wieder deinstalliert (3)

4. **Attitudes about app**

We will measure respondents' attitudes about the app by conducting a principal components analysis (PCA) of their responses to a set of statements documented in the following item. The item "Ich habe bereits viel Werbung für die App gesehen" will be excluded. We will run PCA in the set of responses in Wave 1 to derive an app opinion index by taking the first principal component, and then predict the app opinion index in Wave 2 (outcome variable) by using the same set of weights computed in Wave 1.

Inwiefern stimmen Sie den folgenden Aussagen zur Corona-Warn-App zu? [Stimme überhaupt nicht zu, Stimme eher nicht zu, Weder/noch, Stimme eher zu, Stimme voll und ganz zu]

- Ich glaube nicht, dass die App für die Bekämpfung der Pandemie etwas nützt.
- Ich finde es sinnvoll, dass die App als Zusatzinstrument zur Nachverfolgung von Infektionen genutzt wird.
- Ich fühle mich nicht gut genug über die App informiert.
- Ich sorge mich um den Datenschutz der App.
- Ich habe bereits viel Werbung für die App gesehen.

5. **Knowledge about app**

We use the following item post-treatment (Wave 1) to measure factual knowledge on the app. To avoid learning effects, these questions were not asked pre-treatment. The outcome variable will be calculated by total number of correct answers divided by total number of items. In addition, the items "Je mehr Menschen die App nutzen, desto besser sind besonders gefährdete Menschen geschützt" and "Wenn viele Menschen die App nutzen, könnte man bald wieder zu einem Alltag fast ohne Einschränkungen übergehen" will be used as standalone alternative outcomes to check whether treatment condition-specific knowledge was picked up at different levels in the different treatment groups.

Welche dieser Aussagen über die Corona-Warn-App halten Sie für richtig und

welche für falsch?

- Über die App gesammelte Daten werden zentral beim Robert-Koch-Institut gespeichert.
- Je mehr Menschen die App nutzen, desto besser sind besonders gefährdete Menschen geschützt.
- Trotz Anonymität kann die App mir helfen, schneller zu wissen, dass ich möglicherweise infiziert wurde.
- Bis heute wurde die App etwa 10 Millionen mal installiert.
- Wenn viele Menschen die App nutzen, könnte man bald wieder zu einem Alltag fast ohne Einschränkungen übergehen.

[Richtig, Falsch, Weiß nicht]

6. **Sharing behavior: FB, Twitter, WhatsApp, Email**
   Coded 1 if respondent clicks on any of the share buttons on the final information screen, otherwise 0.

14. Additionally measured variables

See enclosed questionnaire.

Analysis Plan

15. Statistical models to analyze effects of incentivization experiment

For all experimental analyses, we will report both unadjusted and covariate-adjusted differences in means (Intent-to-Treat, ITT estimates). We will provide separate estimates of the effects comparing the different incentivization groups with the control group separately, comparing all incentivization groups pooled together with the control group, and comparing the incentivization groups among each other.

Additionally, when testing any of the Hypotheses 2a to 6 on app usage and downstream effects of app usage, we will report Complier Average Causal Effect (CACE) estimates. For the CACE estimates, we use an IV framework. We define as “treated” any respondent who installed the app after agreeing to do so. To measure app uptake in the different samples, we proceed as follows:

- In the survey-only sample, reported app usage in Wave 3 is used
- In the tracking-only sample, the tracking-based measure is used and the status set to treated "treated" when the app is installed after the survey was taken
- In the survey-plus-tracking sample, we rely on the tracking-based measure unless there is a mismatch between behavioral and reported app usage. In this case, we code:
    - behavioral measure "App installed", reported measure "App not installed" → "App installed"
    - behavioral "App not installed", reported "App installed":
        - if no smartphone tracking data available but respondent has smartphone → "App installed"
        - if smartphone tracking data is available → "App not installed"

In general, if the share of compliers is very low or very high, we may relegate all CACE estimates to an appendix.

We will use HC2 robust standard errors in all analyses and report p-values from two-tailed t-tests.

For covariate-adjusted models, we will select covariates for inclusion using lasso with default options in glmnet. We will run this separately for each analysis specified in this document. Our list of pre-treatment covariates for possible inclusion will be defined by the list of predictors of app usage (see previous analysis plan), the pre-treatment measure of the outcome variable (if available), and a sample indicator (if different samples are pooled).

16. Transformations

See previous section.

17. Inference criteria

We will rely on classical frequentist statistical inference and the conventional $p<.05$ cut off for statistical significance. All tests will be two-tailed and we will not correct the p-values for multiple hypotheses.

18. Data exclusion

We will use the full samples (as defined by the setup of the experiment) and will not exclude any observations from the analysis.

19. Missing data

We will rely on model specific listwise deletion of observations with missing variable values.

“Don’t know” responses will be considered missing data for our outcome measures. Missing covariates will be treated as missing, unless inclusion of covariates per our pre-specified models results in dropping 20% or more of observations. In such cases, we will use multiple imputation.

20. Exploratory analysis