**Supplemental Material for**

**"Underweighting of rare events in social interactions and its implications to the design of voluntary health applications" (Plonsky, Roth, & Erev, 2021)**

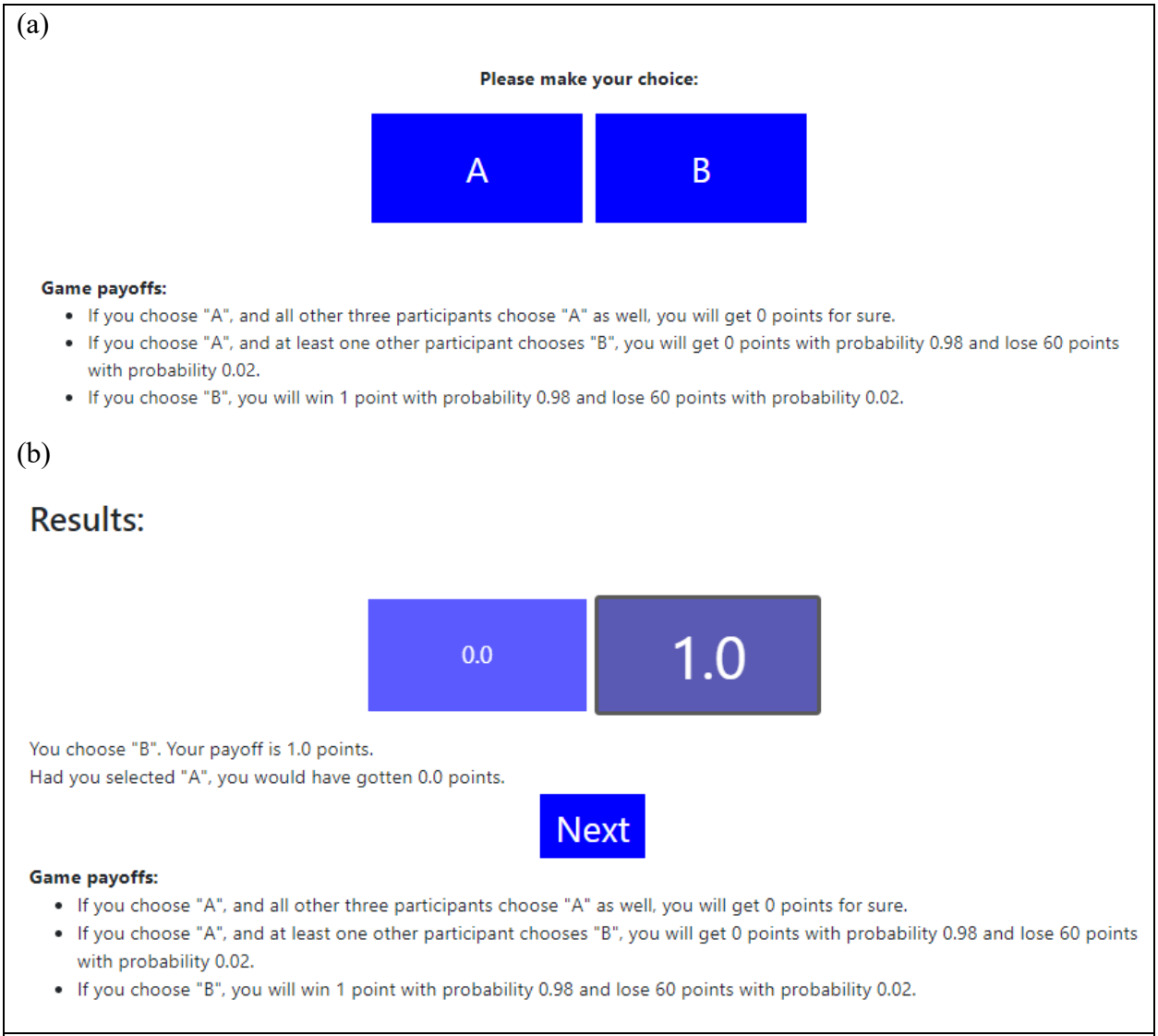
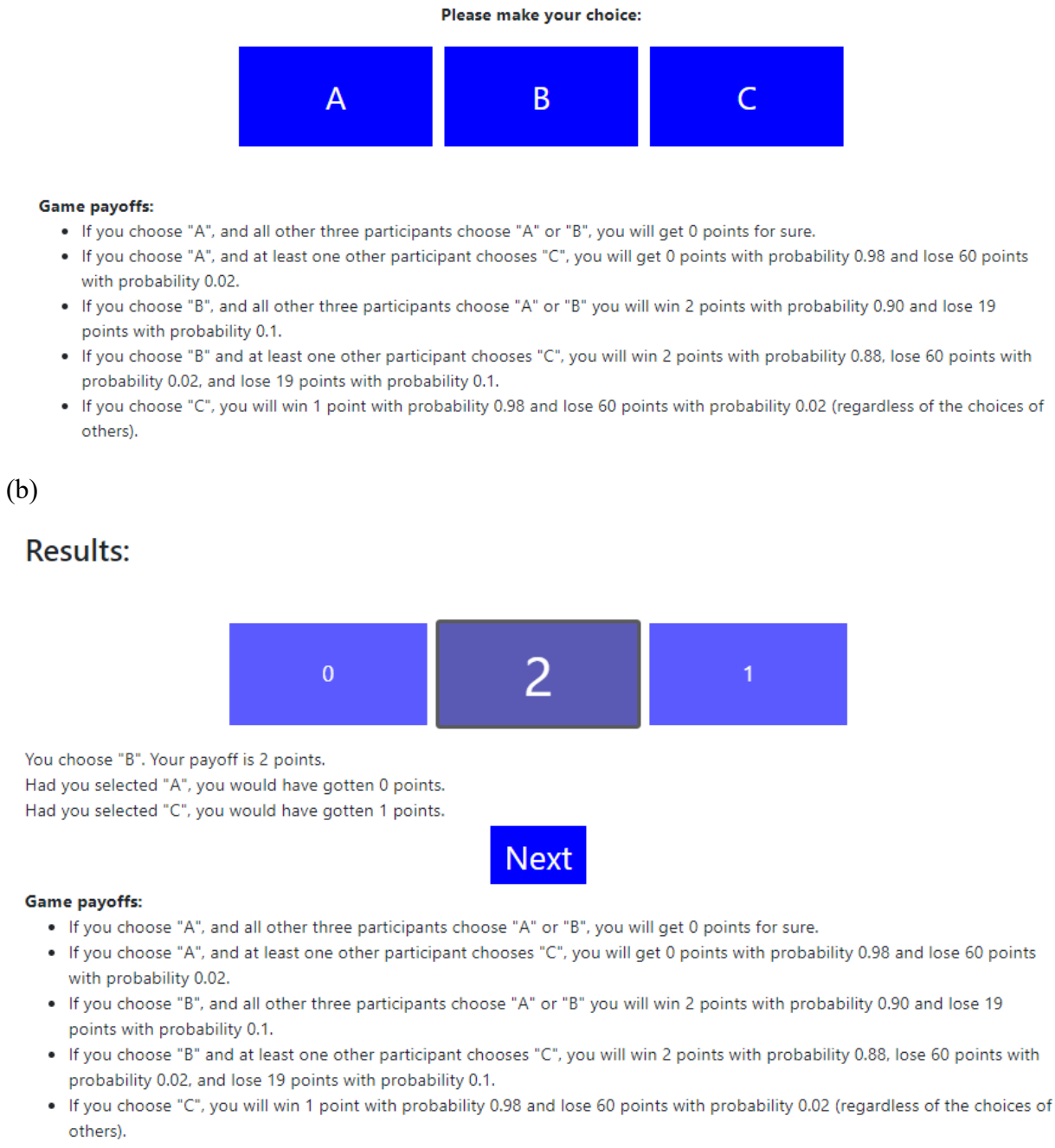



Figure S1. Screenshots of the experimental screen in Condition Without-App in Experiment 1. (a) The pre-choice screen. (b) The post-choice feedback screen. In this round, the participant chose B.

(a)




(b)




Figure S2. Screenshots of the experimental screen in Condition With-App (both experiments). (a) The pre-choice screen. (b) The post-choice feedback screen. In this round, the participant chose B.

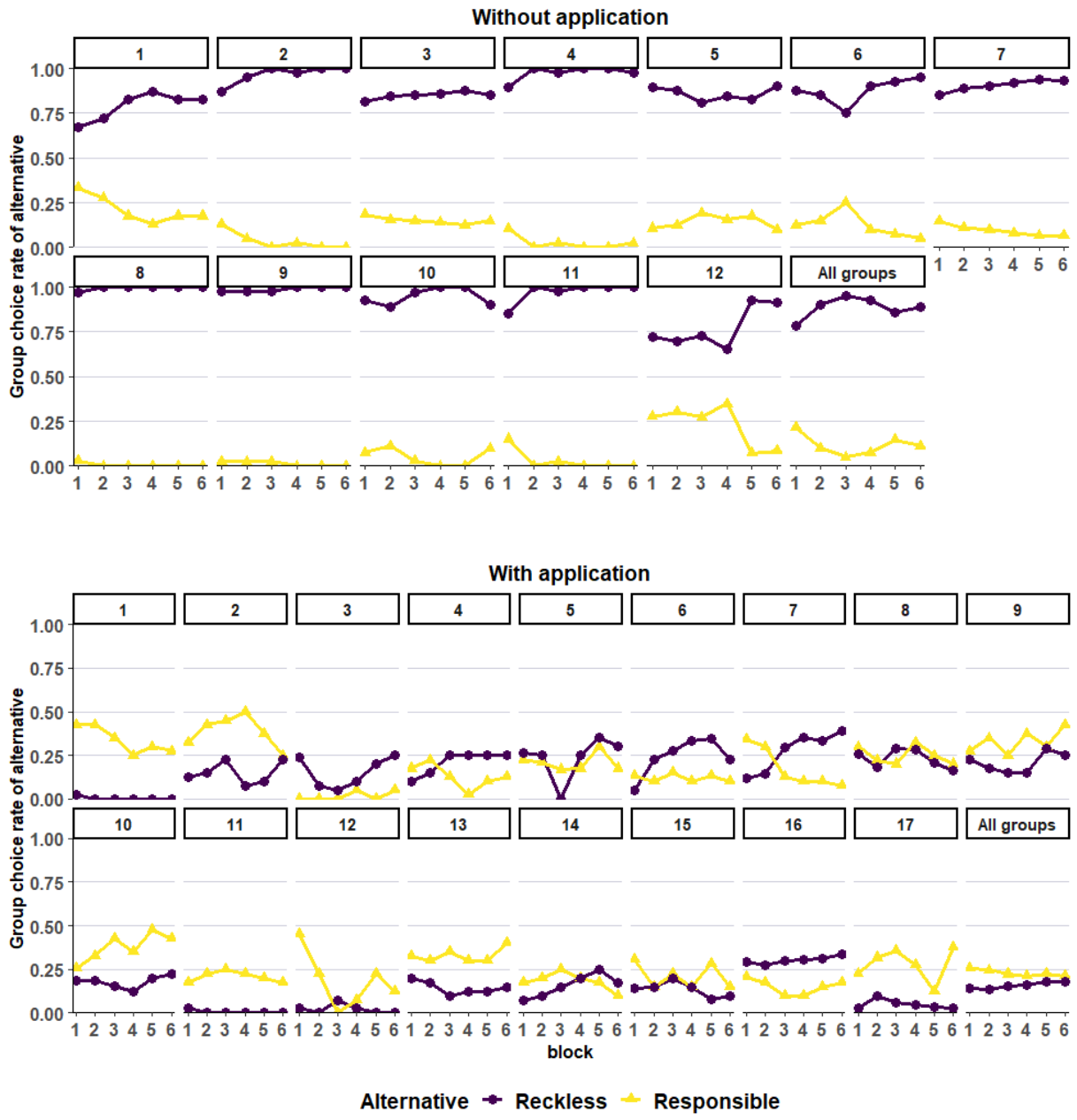



Figure S3. Learning curves in Experiment 1. Reckless and Responsible choices are presented across six blocks of 10 trials each in each condition and each group. Condition Without-App (top) includes only two options (Reckless and Responsible sum to unity). Condition With-App includes in addition option App-Use. The bottom-right plot in each condition shows the average curves in each condition.

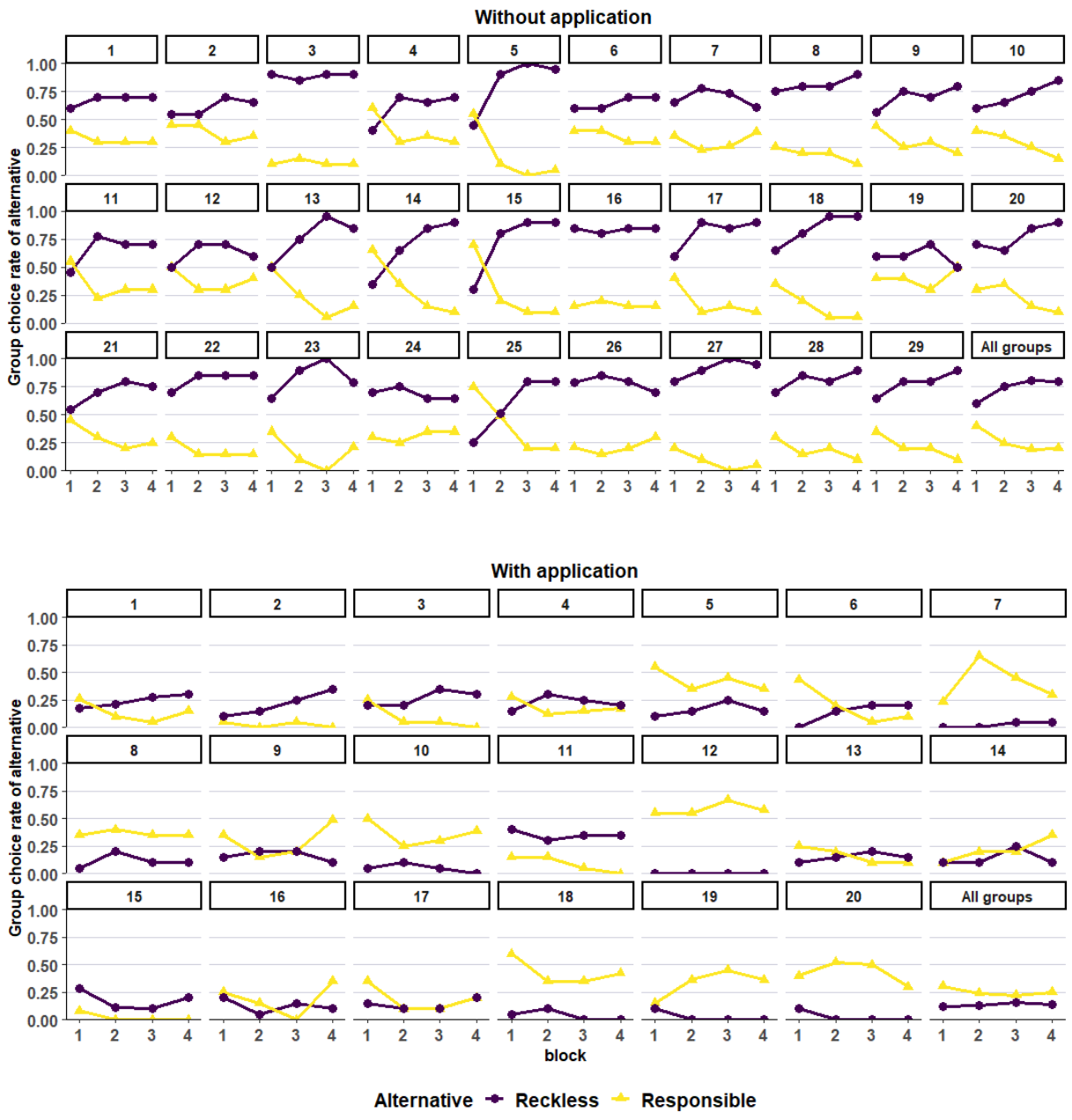



Figure S4. Learning curves in Experiment 2. Reckless and Responsible choices are presented across four blocks of 5 trials each in each condition and each group. In Condition Without-App (top), there were two identical Responsible options for groups 1-12 and two identical Reckless options for groups 13-29 (rates are pooled over identical options). Condition With-App includes in addition option App-Use. The bottom-right plot in each condition shows the average curves in each condition.

**Simple model of reliance on small samples**

To demonstrate how reliance on small samples predicts choice of the option that frequently provides the better outcome, we simulated the games using the naïve sampler model (Barron & Erev, 2003; Erev & Roth, 2014) as the model of behavior for all four agents. The model assumes random choice in the first trial and sampling-based decisions thereafter. Specifically, the model assumes the agent randomly selects κ previous experiences (with replacement) and chooses the option with the highest sample mean. Following Erev and Roth (2014) we assumed κ=5. Note that the model is indifferent to the existence of other interacting agents.

In Condition Without-App, this model predicts 91% Reckless-rate (Roth et al., 2020), whereas in Condition Without-App it predicts 37% Reckless-rate and 59% App-Use rate. Hence, this very simple model predicts the qualitative pattern well, but assumes the addition of App-Use will be less effective in reduction of Reckless-rates than it truly is.

In Condition With-App, decreasing the frequent payoff from App-Use from +2 to +1.1 or increasing it to +4 does not change the predictions of the naïve sampler model at all. Yet, decreasing this payoff to +0.9 such that it is slightly lower than the frequent payoff from Reckless changes the predictions to 91% Reckless rate, and 6% App-Use rate (compared to 37% and 59% respectively). Similarly, the predictions of the model hardly move if we change the probability for infection (i.e. the probability to get -60 if someone is reckless) from .02 to .04 or to .01. Yet, changing the probability of the additional rare penalty of App-Use (i.e. the probability to get -19 when choosing App-Use) from 0.1 to 0.2 (so it is no longer rare) increases the prediction for Reckless rate from 37% to 59% (and reduces the predictions for the App-Use rate from 59% to 37%). This analysis suggests that as long as the structure of the environment is

such that App-Use is frequently the best option, the predictions of the model are similar, but they change when that is no longer the case.

**Experimental Instructions in Experiment 1**

The instructions for the two games follow. Differences between conditions are in brackets and color coded (grey – Condition Without-App, blue – Condition With-App):

In this experiment, you are part of a four-participant group.

In each trial, you and the other three participants have to decide between strategies "A" [and "B" / , "B", and "C"].

Your goal in this experiment is to maximize the accumulated number of points you earn.

The higher the number of points you earn, the higher your chance to earn an additional $1 bonus.

The number of points you receive in each trial depends on your choice, the choices of others, and luck. Specifically:

- If you choose "A", and all other three participants choose "A" [as well / or "B"], you will get 0 points for sure.
- If you choose "A", and at least one other participant chooses ["B" / "C"], you will get 0 points with probability 0.98 and lose 60 points with probability 0.02.
- If you choose "B", [you will win 1 point with probability 0.98 and lose 60 with probability 0.02 / and all three other participants choose "A" or "B", you will win 2 points with probability 0.90 and lose 19 points with probability 0.10.]
- If you choose "B" and at least one other participant chooses "C", you will win 2 points with probability 0.88, lose 60 points with probability 0.02, and lose 19 points with probability 0.10.
- If you choose "C", you will win 1 point with probability 0.98 and lose 60 points with probability 0.02 (regardless of the choices of others).

The game payoffs would remain on-screen for the entire experiment.

To clarify, “will win 1 point with probability 0.98 and lose 60 points with probability 0.02” means that roughly in 98 out of 100 times, the outcome will be “win 1 point” and roughly 2 in 100 times, the outcome will be “lose 60 points”.

In the first 3 rounds, you will have 20 seconds to make your choice and click on the “Next” button.

In each round after the first 3 rounds, you will have 10 seconds to make your choice and click on “Next” button.

If you do not make your choice and click “Next” by that time, the computer will make a choice for you, and you will lose 2 points (in addition to this round’s payoff).

## Replication of Condition Without-App from Experiment 1

The main analysis in Experiment 1 compares Condition With-App that we ran for the current study with Condition Without-App using data collected in a different study. For robustness, we replicated Condition With-App of Experiment 1 in August 2020.

### *Method*

***Participants.*** We analyze the behavior of 44 MTurk workers (11 groups, , 10 female, 24 male, $M_{age}$ = 32.6) who participated in the experiment for monetary compensation. Three additional groups were excluded because the auto-submission rate in their group was over 20% or because they mistakenly included a participant who also participated in the other condition.

***Procedure.*** The procedure was identical to that explained in the main text.

### *Results*

Main results were all replicated. First, the mean Reckless rate in this replication was 76.6% (SD = 12.7%). The difference in Reckless rates between this replication and Condition With-App ($M_{diff}$ = 60.7%, 95% CI [51.3, 70.1]) is significant: $t(16.9) = -13.62$, $p < .001$, $d = -5.63$, 95% CI [3.89, 7.38]. The difference between the conditions is also significant if considering the difference from random choice: $M_{diff}$ = 44.0%, 95% CI [34.6, 53.4], $t(16.9) = -9.88$, $p < .001$, $d = -4.09$, 95% CI [2.71, 5.46]. Second, the median disaster rate in this replication was 2.16% (IQR = [1.40, 2.52]), significantly more than in Condition With-App, $p < .001$, effect size r = 0.63, one sided Wilcoxon Rank Sum test.

In this replication, we did not replicate the unexpected result that in Condition With-App the Responsible rate was higher than in Condition Without-App. The Responsible rate was 23.4% (SD = 12.7%) and the difference from Condition With-App was not significant ($p = 0.8$). However, if considering the difference of these rates from random choice, the difference is again

significant between conditions: $M_{diff}$ = 18.6%, 95% CI [6.5, 25.7], $t(17.9) = 3.53$, $p = .002$, $d = 1.44$, 95% CI [0.55, 2.33].

**Additional details on field demonstration**

In September 2020, amid the COVID-19 pandemic, some of the authors of this paper were asked by the management of a large nursing home in Israel for advice on how to get employees to use contact tracing applications. The nursing home accommodates approximately 600 residents and employs approximately 300 people. We were told that despite the management's significant efforts to endorse and promote the use of "HaMagen" (Israel's voluntary contact tracing application) among employees, only a small minority of them installed the application and used it regularly. The management considered instead to endorse and promote a commercial contact tracing application, Tamara. We advised the management to make the use of the new application frequently better than not using it, for example, by demanding all employees who wish to enter the nursing home to either show that the app is turned on when they enter or to go through an inquiry with respect to their health status.

The management initially attempted to promote the new application Tamara via marketing and communication efforts. After several weeks in which these attempts did not lead to increased traction, employees were notified that, as of November 15th, 2020, to enter to the nursing home, employees will be required to present the security guard at the entrance either a smartphone with an operating app or a filled health and contact history questionnaire that takes a few minutes to fill in. The use of the application also served for the mandatory temperature check at the entrance. On November 25th, the demands for employees not using the app were somewhat eased, although they still had to go through a short procedure that app users were exempt from.

We obtained data concerning the number of users of the new app that were active from within the nursing home starting October 11th and through December 12th. At the time of writing, we could not obtain daily data on the number of employees entering the nursing home in each of these days, hence we report the absolute number of active users. As per the management, on average, around 175 employees work on weekdays and around 100 employees work Fridays and Saturdays.

We also obtained an hourly summary of the number of users from within the nursing home for several days. The analysis shows that while the number of users peaks between 6-7am (time of arrival of the largest work-shift), it only gradually decreases thereafter, suggesting that the large majority of users of the application do not just use it to enter the nursing home and then turn it off.