Are COVID-19 proximity tracing apps working under real-world conditions? Indicator development and assessment of drivers for app (non-)use

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Abstract

Digital proximity tracing (DPT) apps have been released to mitigate SARS-CoV-2 transmission, but it remains unclear how their effectiveness should be monitored. The aim of this study was to formalize indicators for measuring the fulfillment of assumptions for appropriate proximity tracing app functioning.

Six indicators were developed to monitor the SwissCovid app functioning and effectiveness in the Swiss population. Using official statistics and survey data, we calculated indicator values and examined socio-demographic factors associated with the SwissCovid app utilization. Indicators show that 1 in 3 adults in Switzerland have downloaded the app. However, only 15% of new cases also triggered DPT-app notifications, and indicators also reveal ignored app notifications. In the full survey sample (n=2'098), higher monthly household income or being a non-smoker were associated with higher SwissCovid app uptake; older age or having a non-Swiss nationality with a lower uptake. In a subsample including more detailed information (n=701), high trust in health authorities was associated with higher SwissCovid app uptake.

The indicators help to monitor key drivers of DPT-apps effectiveness and hint to non-compliance issues. Streamlining procedures, removing technical hurdles, and communicating the usefulness of DPT-apps are crucial to promote uptake, compliance, and ultimately effectiveness of DPT-apps for pandemic mitigation.
Background

Since safe and effective vaccines against SARS-CoV-2 are currently unavailable, global and national health authorities still rely on surveillance response measures in their fight against the ongoing SARS-CoV-2 pandemic. Cornerstones of pandemic mitigation measures include testing, tracing, isolation, and quarantine (TTIQ).(2) Digital proximity tracing apps are expected to further enhance conventional TTIQ measures, in particular classic, interview-based contact tracing. Digital proximity tracing apps are a novel, still largely untested health technology, which record a person's proximity contacts, that is, other app users who were within a pre-specified radius for a certain amount of time.(3) In case the app user tests positive for SARS-CoV-2, she/he can notify these proximity contacts in an anonymous manner through the app. Detailed explanations of apps following the decentralized, privacy-preserving proximity tracing (DP-3T) design can be found in Box 1 and elsewhere (3, 4).

The rationale for using digital contact tracing as pandemic mitigation tools are based on a modelling study which found that - in principle - digital contact tracing alone has the ability to stop the pandemic spread of SARS-CoV-2.(5) Classic contact tracing is labor- and time-consuming, and exposed contacts can sometimes only be reached and notified with substantial time lags.(6) By comparison, digital contact tracing can lead to faster notification and earlier self-quarantine of exposed contacts.(4, 5) In addition, digital proximity tracing has a wider reach than classic contact tracing by also including exposed contacts not known by name to an index case, such as chance encounters in a public space. However, the modelling study further suggests that these expected effects of digital contact tracing depend on several assumptions. Specifically, a large proportion of the population must use the app (e.g., 60% and more if no other mitigation measures are implemented), turnaround time of test results and digital notification of exposed contacts must be within 1-2 days, and notified contacts should enter self-quarantine immediately.(5, 7)

Digital proximity tracing has been developed and implemented with very limited real-life testing. (2, 8) It currently remains unclear whether and to what extent assumptions stated by the modelling analysis are achievable under real world conditions and whether digital proximity tracing technologies can ultimately have a significant impact on pandemic mitigation.(8, 9) Therefore, the present study intended to formalize indicators for measuring the fulfillment of assumptions for appropriate proximity tracing app functioning.

In a first step, we aimed to develop a framework of “necessary conditions” for stopping transmission chains by digital proximity tracing apps. This framework gives rise to indicators for measuring the extent of assumption fulfillment set out by the theoretical models.(5, 7) In a second step, we analyzed the proposed indicators for Switzerland using data from two longitudinal SARS-CoV-2 population surveys. Among the proposed indicators, those pertaining to app uptake are analyzed in greater detail in order to gain a deeper understanding of characteristics associated with and reasons for not using the Swiss proximity tracing app (SwissCovid app).

Combined, these analyses establish a baseline for continued indicator monitoring and reveal room for improvement with respect to uptake and use of digital proximity tracing apps, as well as reasons for non-use of apps. The methods and analyses are further intended show a way forward for countries relying on DP-3T-based technologies on how to evaluate aspects influencing the effectiveness digital proximity tracing apps.
Methods

Analytic framework

As described in Box 1 and along the lines proposed by (5), the prevention of secondary transmission by proximity tracing apps depends on a number of steps, namely app download, app utilization, notification of exposed contacts, and self-quarantine of exposed contacts. The completion of these steps depends on several conditions:

1. Both the index case and the exposed person have downloaded the app.
2. Both the index case and the exposed person have activated the app (that is, proximity tracing by Bluetooth is active when exposures/contacts take place).
3. The index case got tested for SARS-CoV-2 and received an activation code (CovidCode) to initiate the notification.
4. The index case uploaded the activation code, which triggered a notification of exposed persons.
5. The exposed persons entered self-quarantine.
Without the fulfillment of all these conditions, the preventive effect of proximity tracing apps will not be realized. Thus, they are necessary conditions. Based on the five necessary conditions, several expectations (“optimal” scenarios) and corresponding possible indicators can be derived (Table 1). While in principle generic, these indicators may require country-specific adaptations, for example to reflect procedural (e.g., recommended actions upon notification) or data-related differences.

Analysis flow

Figure 1 outlines the different analysis steps for the investigations into reasons for app (non-)use and for the calculation of indicators. First, we utilized survey data from two studies to explore reasons for app uptake. This question was addressed in three steps. In step 1, a basic regression model was developed using Social Monitor study data, including only variables that are available in both surveys. In step 2, the robustness of regression model estimates was explored by inclusion of the Corona Immunitas data in a pooled analysis. For step 3, more detailed examination of factors associated with app use were performed by extending the regression model with additional variables that were only available in a split-sample of the Social Monitor study. Step 4 explored reasons for non-use of proximity tracing apps by using all available information. Finally, in step 5 the proposed indicators in table 1 were calculated using both information from both surveys and official data.

Data Sources

The SwissCovid app for digital proximity tracing was publicly released on 25.06.2020.(10) The observation period spanned from 10.07.2020 to 23.07.2020, i.e. approx. 3-4 weeks after app release, for which data from two ongoing survey studies and from the Federal Office of Public Health (FOPH) as part of the official SARS-CoV-2 monitoring were available.

The survey studies utilized here were the Swiss Covid-19 Social Monitor (https://csm.netlify.app/about/) and the Zurich sub-study of the national Corona Immunitas Project (www.corona-immunitas.ch) conducted under the umbrella of the Swiss School of Public Health. Both studies collect, among others, information on sociodemographic features, comorbidities, and implementation of preventive measures related to Covid-19. In addition, three standardized questions were introduced into the questionnaires of both studies to gather information about the usage of the Swiss digital proximity tracing app (Supplementary Table 1). The questions were jointly developed by experts from the two studies, epidemiologists, and infectious disease experts.

The Social Monitor is a cohort of randomly selected participants of an existing online panel population (a stratified sampling on age, gender and language region), who receive an invitation every 2-4 weeks to complete a survey on Covid-19 related topics. A weighted sample from the panel was used in order to make the Social Monitor population representative to the Swiss population. So far, 8 study waves with an average response of 1500 to 1700 persons from across Switzerland have been completed. Participants are well described with respect to demographics, attitudes towards Covid-19, health status, and the application of preventive measures for Covid-19. In wave 8, which included the standardized questions related to the use of the SwissCovid app and ran from 13.07.2020 to 20.07.2020, 1508 responses were collected. These data were used for model development, as well as in the pooled analysis (Figure 1, Steps 1 and 2). A randomly selected subsample was presented with additional questions about internet and media usage, as well as trust in
media, the Swiss government and science. This data was used for the split sample analysis (Figure 1, Step 3), which allowed more detailed analyses into factors driving app utilization.

Furthermore, we used data from the regular digital follow-up of the multi-centric, nationwide Corona Immunitas study (International Standard Randomised Controlled Trial Number ISRCTN18181860). Corona Immunitas aims to measure seroprevalence of SARS-CoV-2 in Switzerland by recruiting approximately 25’000 persons according to a standardized protocol, including a unified SARS-CoV-2 antibody test. In addition to responding to a baseline questionnaire and receiving antibody testing, participants can choose to contribute to a digital follow-up study, which includes a brief weekly assessment of symptom status and risk exposures and a more extensive monthly survey with, among others, questions on personal prevention measures and use of the SwissCovid app (Supplementary Table 1).

For our analysis, we extracted data from the first monthly digital follow-up survey in Zurich, which ran from 10.07.2020 to 16.07.2020. Data from other Corona Immunitas sites were not available as they had not yet started. The analyzed study population includes a random sample from the general population, as well as a group of persons who experienced symptoms suggestive of COVID-19 in spring 2020 but could not be tested for the virus due to shortage of tests and, accordingly, restrictive eligibility criteria for testing issued by the FOPH at that time. Data from both Corona Immunitas study populations were used in the pooled analysis (Figure 2, Step 2), and comment field data was used for exploratory investigations into the reasons for not using the SwissCovid app (Figure 2, Step 4).

Last, public data on positive SARS-CoV-2 PCR test results, app downloads, and the number of entered CovidCodes between 06.07.2020 and 22.07.2020 were extracted from official sources.

Figure 1: Flowchart

Ethics statement

The Corona Immunitas Zurich study was approved by the Ethics Committee of the Canton Zurich (BASEC-Nr. 2020-01247), and informed consent was obtained from all participants. For the Covid-19 Social Monitor, the Ethics Committee of the Canton Zurich confirmed that it does not fall under the Swiss Human Research Law (BASEC-Nr. Req-2020-00323). Therefore, informed consent was not needed.
Statistical analysis

Investigating factors associated with app uptake (steps 1-3)

To study uptake of app use, users and non-users were compared for each survey separately by age (in 10-year categories), sex, presence of self-reported comorbidities (respiratory diseases, cardiovascular diseases, stroke, hypertension, diabetes, cancer), application of preventive measures (wearing masks, social distancing), education status, household income, citizenship, smoking status, and recruitment mode (randomly selected or selected population, Corona Immunitas). Persons who use the app permanently or who turn it off occasionally were considered app users. Those who are not using the app (with or without intention to do so later) were considered non-users. Descriptive analyses were performed by summarizing continuous data as medians [interquartile ranges] and categorical data as percentages.

Multivariable logistic regression models were constructed with app use as outcome variable and the characteristics mentioned above as of interest. Age, sex, and comorbidity status were included as a-priori fixed potential confounder variables in all models; the remaining variables, including an a priori defined interaction term for age and sex, were added incrementally and kept if the Akaike Information Coefficient (AIC) decreased by 2 points or more upon variable addition.(14, 15) Logistic regression analyses were performed on the full Social Monitor data (including the overlapping variables from the other samples, Step 1), the Social Monitor split sample (a random subsample including more detailed information on media usage and government trust, Step 3), as well as a pooled analysis including all available samples (Step 2). For the latter, a logistic regression model with survey sample-specific random intercepts was estimated.

Descriptive analyses into reasons for app non-use (step 4)

Next, reasons for non-use were further explored descriptively (N, %) on the basis of comment field answers describing reasons, which were grouped according to pre-specified categories, which were refined based on the content of the comments. Only one reason per person was allowed (with reasons falling into the existing categories given precedence). Sociodemographic and other characteristics as listed above were compared descriptively across the three most frequent reasons for non-use, as well as a fourth group subsuming all other reasons.

Calculation of indicators (step 5)

Indicators were calculated using the three different data sources as outlined in table 1. Specifically, indicators 1, 2a, 3, and 4 are directly available from official sources. (12, 13). Indicator 1 was additionally estimated by use of the Social Monitor data for persons aged 18 to 79 years by multiplication of each record with its corresponding sampling weight and subsequent overall aggregation. Thereby, the sampling weights reflect how many other persons with the same age and canton of residence are represented by an individual in the sample.

Indicator 2b, the observed percentages of app users per age and language region strata, was calculated from the Social Monitor and compared against the age- and sex distribution.
of new SARS-CoV-2 cases reported by the FOPH between 06.07.2020 (7 days before wave 8 of the Social Monitor and 4 days before the first monthly digital follow-up of Corona Immunitas) and 22.07.2020 (2 days after wave 8 of the Social Monitor and 6 days after the first monthly follow-up of Corona Immunitas). Indicator 5 was not estimable with adequate precision due to small sample size, but preliminary results from the two surveys are provided.

All analyses were performed using Stata version 13 (Stata Corp., College Station TX, USA). Two-sided tests of statistical significance were calculated. The level of statistical significance was set at p<0.05. No adjustments for multiple testing were performed.

Results:

Sample characteristics

In total, 2098 participants from the two studies provided information about the relevant outcomes. As illustrated in Table 2, the three subgroups (Social Monitor, Corona Immunitas random sample, Corona Immunitas selected sample) differed markedly in several characteristics such as age, gender, education, and income. In the Social Monitor, the median age was 47 years, 49% of participants were female, and 46% have completed a tertiary education. The random sample of the Corona Immunitas study also included 49% females, but the median age was higher (59 years), and a greater proportion had completed a tertiary education (52%). By contrast, the selected sample of the Corona Immunitas study had a median age of 42 years, included 58% females and 71% of persons with a higher education.

Regarding the uptake of the SwissCovid app, 44% (Social Monitor) to 70% (Corona Immunitas selected sample) of the population reported to have installed the app and to use it permanently or to only turn it off occasionally.

Factors associated with app uptake

Multivariable logistic regression analyses revealed that several factors were associated with app uptake. Descriptive analyses are shown in Supplementary Table 1, multivariable regression results are displayed in Table 3. Results are reported as the range of observed odds ratios (OR-range) across the three analyses. As a general pattern, gender (OR-range 0.73-0.97) and presence of comorbidities (OR-range 0.74-0.97) were not statistically significant factors in the models, whereas older age (OR-range 0.90-1.01) was associated with a lower uptake in two (Steps 1 & 2) of three models.

With respect to the variables available in all samples, monthly household income higher than CHF 6'000 (OR-range CHF 6'000-10'000: 0.80-1.53; OR-range >CHF 10'000:1.68-2.34; 1 CHF equals 0.93 EUR or 1.10 US$, as of 18.08.2020), and being a non-smoker (OR-range 1.26-1.55) were almost always associated with higher app uptake in the three samples (Steps 1 - 3). Not having a Swiss nationality was associated with a lower uptake (OR-range Swiss and other citizenship: 0.57-0.74; OR-range no Swiss citizenship: 0.62-0.69), which did not reach statistical significance in the Step 3 model. Education level did not reach the predefined statistical significance threshold but improved the AIC model fit and nominally
suggested a higher uptake with higher education levels (OR-range high education: 1.14-1.42). Furthermore, the implementation of preventive measures against Covid-19 was also associated with app use: those who reported to wear a mask always or most of the time were more likely to also use the app (OR-range sometimes wearing masks: 0.56-0.79; not or rarely wearing masks: 0.21-0.45). Staying at home except for essential tasks was included as a confounding variable in the models because we hypothesized that persons staying at home most of the time would be less likely to use the app. But the results suggest the opposite relationship: persons who were not concerned about leaving the house were also less likely to use the app (OR-range rarely or never staying at home: 0.74-0.78; not included in step 3 because of inferior AIC model fit).

A subsample of the Social Monitor population was surveyed on further questions of relevance, shown in Table 3 (Step 3). In this sample, infrequent daily internet use was associated with a lower (OR weekly use: 0.64; less than weekly use: 0.30) and having a partner (OR living with partner: 1.56; not living in same household: 1.27) with a greater likelihood for using the app. Negative associations with app use were observed for persons living in the French- (OR 0.68) or Italian-speaking part of Switzerland (OR 0.77).

Furthermore, this subsample of the Social Monitor population answered questions on trust in the government or health authorities, as well as trust in science (Step 3). High trust in the government and health authorities was associated with a comparatively higher probability for app-uptake (OR for high trust category: 2.25), whereas trust in science was not clearly associated with app-uptake but improved the AIC model fit.

Reasons for non-use of app

The responses of persons who reported not to use the app were analyzed further with respect to reasons for non-use (Table 4). This group included both persons who stated that they are planning to use the app and those who do not want to use it. Overall, the most important reasons for not installing the app were not having a suitable smartphone or operating system (28%), followed by a perceived lack of usefulness of the app (26%) and concerns about privacy (24%). Several additional reasons were mentioned less frequently, such as concerns about battery usage, general doubts about the severity of the Covid-19 epidemic, general mistrust in science or government, or doubts about the maturity of the app. Of note, reasons differed between persons who are planning to use the app and those who do not want to use it. Among the former, “inertia” (i.e., not having had the time or just not having undertaken the effort yet) or currently being abroad were cited as important reasons for not yet having downloaded the app.

The descriptive comparison of socio-demographic and other characteristics across the three major reasons for app non-use (and a fourth category subsuming all other reasons, Table 5) suggests that some reasons may be more prevalent in specific subgroups. The subpopulation stating problems with installing the app (“not the right phone”) was the oldest (median age 56 years), had the highest burden of chronic co-morbidities (40.6%), but tended to have high trust in government (highest category 84.2%) and science (highest category 70.3%) compared with the other subgroups. By contrast, those reporting privacy concerns for non-use were younger (median age 42 years), more often did not have a Swiss citizenship (16.8%), and generally had less trust in the government (highest category: 56.8%) or science (highest category: 46.3%). Demographics of subpopulations reporting the remaining two reasons (“not useful”, “other reasons”) did not reveal specific patterns.
Indicator results

Based on the available data, the following indicator values were calculated as per 22.07.2020.

1) **Number of app downloads:** For 22.07.2020, the Federal Office of Statistics reported 2'040'568 downloads of the SwissCovid app. The projection including the sampling weights from the Social Monitor yielded a projection of 1'988'058 users who stated to be using the app permanently, which corresponds to 31.0% of the adult Swiss population aged 18 to 79 as a lower bound. When also counting those, who reported to occasionally turn off the app, the upper bound was estimated at 2'350'361 users, or 36.6%.

2a) **% active app users as a fraction of downloaded apps:** 1'150'000 estimated app users out of 2'040'568 recorded downloads yields a fraction of 56.4%.

2b) **% app users in the population, stratified by key demographics:** The incidence data suggest that new cases were most frequent among younger age groups (i.e., from 18 to 29 years and from 30 to 39 years). App uptake was also higher in those age groups compared with persons of older age. But the youngest age group with the highest incidence during the observed period (18 to 29 years) was not the group with the highest app uptake (Figure 2).

3) **Number of issued activation codes as a fraction of all reported positive tests:** In the period between 16.07.2020 and 22.07.2020, 484 persons were newly tested positive for SARS-CoV-2. In comparison, 71 CovidCodes were entered in the SwissCovid app upon positive test (14.7% of all positive tests).

4) **Number of entered activation codes as a fraction of all issued activation codes:** Although there are no officially published statistics, the FOPH confirmed to the media that, between 25.06.2020 and 08.08.2020, a total of 752 notification codes were generated, but only 487 (64.7%) were uploaded by positively tested persons to trigger the alert.

5) **% of notified persons who ignored notification as fraction of all notified:** Using the survey data, of 1027 persons who use the app, 1025 reported to have never received a notification, 1 person (0.1%) was notified and called the infoline, and 1 (0.1%) was notified but ignored the alert.
Discussion

By analyzing information on the use of the SwissCovid app from two large population studies, consisting of two random population samples and a selected sample (total N=2098), we analyzed factors influencing the use of the digital proximity tracing app in Switzerland.

In our study, we deduced a number of population characteristics that may influence the uptake of the app. For example, younger age, higher income, or being a non-smoker were associated with greater app uptake. By contrast, having foreign (non-Swiss) nationality, or living in the French- or Italian-speaking parts of Switzerland were associated with lower uptake. Furthermore, app uptake was influenced by the level of trust in the government and in health authorities. Moreover, following recommended preventive measures and wearing masks in particular were also associated with a higher likelihood to use the app, which could signal higher levels of awareness or worry related to the Covid-19 epidemic or health consciousness.

We further investigated stated reasons for non-use of the app, which were dominated by technical aspects (i.e., not having a suitable smartphone or operating system), privacy concerns, and perceived lack of usefulness. However, it also seemed that the vast majority of respondents were informed about the app, as only around 4% reported did not know about the app. Privacy concerns as a reason was associated with a lack of trust in the government and health authorities, as well as with a migration background. By contrast, the group hindered from app use by technical aspects seemed to be more trustful in the government
but tended to be older. Therefore, streamlining installation processes and establishing compatibility with older phones may be worthwhile in order to increase uptake in this subgroup. By contrast, the prevalent privacy concerns and trust issues are harder to tackle. Although the SwissCovid app implements privacy by design, the fact that the app relies on application programming interfaces (APIs) provided by Google and Apple is sometimes criticized. These concerns should be addressed by communication efforts, which, for example, could also focus on personal experiences of app users and tell success stories. The latter may also increase motivations for app use among the substantial fraction (26% of non-users) citing as main reason for their non-use lack of personal or general benefits of proximity tracing app usage.

Finally, the indicators suggest that, three to four weeks after app release, around 1 in 3 persons aged 18 to 79 years had downloaded the app. A recent modelling study suggests that this uptake proportion may in fact be sufficient to reduce the number of new infections to “manageable levels”.(17) But our data also suggest a substantial room for improvement in app uptake, particularly among younger persons aged between 18 and 29 years, which at present show the highest SARS-CoV-2 incidence level of all age groups.

We also noted a discrepancy between number of downloads and number of active users. This gap may partly be explained by the fact that these numbers are assessed by different methods. A further explanation is that the surveys fell into the summer holiday period, with many residents going abroad for vacation (thus reducing the number of detected active app users). Other notable discrepancies are the relatively low number of triggered notifications given the incidence numbers (indicator 4), as well as the substantially lower number of triggered notifications compared to the number of activation codes provided to patients tested positive. Both discrepancies clearly warrant closer inspection because they may relate to missing incentives, but critically impact the effectiveness of digital proximity tracing.(17)

To our knowledge, this is the first study to systematically investigate digital proximity tracing app uptake and the reasons for app non-use in Switzerland. One survey has been conducted in Switzerland since the app release in late June 2020 among 1’000 Swiss individuals.(18) This study, whose data have not been published in detail, yielded that 43% of the Swiss population are using or considering to use the Swiss proximity tracing app, with higher percentages among younger respondents. Our study results show similar proportions of app users, but also shed further light on motivations or barriers for app use. Furthermore, a key strength of our study was the availability of data from different surveys, which allowed us to verify the robustness of our findings. Furthermore, our largest sample of 1500 persons is based on random sampling and is therefore likely to be quite representative in various regards for the Swiss population, which is also reflected by the close match of our projected number of app users with official numbers. However, we cannot fully exclude potential biases such as over-reporting or social desirability bias regarding app use. In addition, the fact that the Social Monitor sample was drawn from an online panel population might lead to an over-estimation of the app usage of the general population.

To summarize, our study formalized assessments of conditions affecting the real-world effectiveness of digital proximity tracing apps and should be easily adaptable to other settings. Furthermore, our study yielded a clearer understanding of motivations, barriers and other factors associated with the uptake of digital proximity tracing apps. Our data point to complex interactions between motivations, trust, and incentives. Therefore, communication efforts to promote the app use should convey messages for different subgroups and should particularly focus on successes and positive personal experiences with the app. Moreover, an emphasis on younger age groups is pertinent because, at present, they seem to be important drivers of the Covid-19 epidemic in Switzerland.
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Conflicts of Interest

The authors have no competing interests to report.

Author Contributions

VWW conceived and designed the work, conducted the statistical analysis, and drafted the manuscript. C.S., M.S.B., D.M., T.B., M.H., A.M. & M.K. provided input on the analytic strategy. C.S. performed parts of the statistical analysis. M.H., A.M., and M.A.P. designed the Covid-19 Social Monitor and collected the data. M.H. and A.M. prepared the Social Monitor datasets. A.F. & M.A.P. designed the Corona Immunitas program. A.F., T.B. & M.K. contributed to the collection of the Corona Immunitas data. M.K. prepared the Corona Immunitas datasets.

All authors contributed to the interpretation of the data and critically revised the manuscript. All the authors gave final approval of the completed manuscript version and are accountable for all aspects of the work.

Data availability

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.
**Table 1:** Derived hypotheses from proposed framework for necessary conditions for proximity tracing app effectiveness.

| Necessary Condition                                                                 | Expectation                                                                 | Key indicator                                                                 | Data Source                                                                 |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 1 Both the index case and the exposed person have downloaded the app             | The number of app downloads should be steadily increasing and plateau at a high population percentage. | 1) Number of app downloads                                                  | App downloads (13) Projection based on sampling weights of COVID19 Social Monitor |
| 2 Both the index case and the exposed person have activated the app (that is, proximity tracing by Bluetooth is active when exposures/contacts take place) | All persons who have downloaded the app should actively use it (that is, no de-activation or de-installation) | 2a) % active app users as a fraction of downloaded apps               | (13), includes information on calculation of active app users |
|                                                                                  | The demographics of app users should closely match the population groups with the highest burden of new infections. Imbalances may point to a lack of uptake. | 2b) % app users in the population, stratified by key demographics            | Information from COVID-19 Social Monitor Official incidence data (12)       |
| 3 The index case got tested for SARS-CoV-2 and received an activation code to trigger notifications | The number of issued activation codes should ideally equal the number of persons with a positive PCR-test result. | 3) Number of issued activation codes as a fraction of all reported positive tests | CovidCodes (13) Official incidence data (12) |
| 4 The index case uploaded the activation code, which triggered a notification of the exposed person. | All activation codes are entered into the app, which triggers notifications of close contacts | 4) Number of entered activation codes as a fraction of all issued activation codes | Activation codes entered into the app (13) |
| 5 The exposed person entered quarantine.                                         | All notified exposed persons follow the recommendations, call the infoline, and enter quarantine. | 5) % of notified persons who ignored notification as fraction of all notified notified | Information from COVID-19 Social Monitor and from the Corona Immunitas Zurich substudy |
**Table 2: Sample descriptions**

|                          | Social Monitor (N=1508) | Corona Immunitas Random sample (N=366) | Corona Immunitas Selected population (N=224) |
|--------------------------|-------------------------|----------------------------------------|---------------------------------------------|
| Age, median [IQR]        | 47 [34; 58]             | 59 [43; 69]                            | 42 [34; 51]                                |
| Female gender            | 739 (49.0%)             | 180 (49.2%)                            | 130 (58.0%)                                |
| Partnership status       |                         |                                        |                                             |
| No partner               | 437 (29.0%)             |                                        |                                             |
| Living with partner      | 943 (62.5%)             |                                        |                                             |
| Not living with partner  | 128 (8.5%)              |                                        |                                             |
| Has children             | 156 (10.3%)             | 83 (22.7%)                             | 81 (36.2%)                                 |
| Citizenship              |                         |                                        |                                             |
| Swiss                    | 1203 (79.8%)            | 266 (72.7%)                            | 162 (72.3%)                                |
| Swiss and other          | 138 (9.2%)              | 46 (12.6%)                             | 26 (11.6%)                                 |
| Non-Swiss                | 167 (11.1%)             | 54 (14.8%)                             | 36 (16.1%)                                 |
| Language region          |                         |                                        |                                             |
| German                   | 964 (63.9%)             | 366 (100.0%)                           | 224 (100.0%)                               |
| French                   | 334 (22.1%)             |                                        |                                             |
| Italian                  | 210 (13.9%)             |                                        |                                             |
| Education                |                         |                                        |                                             |
| Only mandatory schooling | 91 (6.0%)               | 9 (2.5%)                               | 3 (1.3%)                                   |
| Completed professional education | 727 (48.2%)    | 167 (45.6%)                            | 62 (27.7%)                                 |
| University, university of applied sciences | 690 (45.8%)    | 190 (51.9%)                            | 159 (71.0%)                                |
| Currently working        | 1063 (70.5%)            | 198 (54.1%)                            | 190 (84.8%)                                |
| Monthly household income |                         |                                        |                                             |
| ≤CHF 6'000               | 408 (27.1%)             | 115 (31.4%)                            | 64 (28.6%)                                 |
| CHF 6'000 - CHF 10'000   | 488 (32.4%)             | 151 (41.3%)                            | 82 (36.6%)                                 |
| >CHF 10'000              | 339 (22.5%)             | 78 (21.3%)                             | 68 (30.4%)                                 |
| No answer                | 273 (18.1%)             | 22 (6.0%)                              | 10 (4.5%)                                  |
| Smoker                   | 312 (20.7%)             | 62 (16.9%)                             | 41 (18.3%)                                 |
| Self-reported chronic illness** | 350 (23.2%) | 124 (33.9%)                            | 42 (18.8%)                                 |
| Use of protective masks  |                         |                                        |                                             |
| Always or most of the time | 614 (40.7%)           | 177 (48.4%)                            | 123 (54.9%)                                |
| Sometimes                | 700 (46.4%)             | 121 (33.1%)                            | 65 (29.0%)                                 |
| Rarely or never          | 194 (12.9%)             | 68 (18.6%)                             | 36 (16.1%)                                 |
| Staying at home except for essential tasks |                        |                                        |                                             |
| Always or most of the time | 432 (28.6%)           | 140 (38.3%)                            | 70 (31.3%)                                 |
| Sometimes                | 668 (44.3%)             | 112 (30.6%)                            | 69 (30.8%)                                 |
| Rarely or never          | 408 (27.1%)             | 114 (31.1%)                            | 85 (37.9%)                                 |
| Frequency of internet use|                         |                                        |                                             |
| Once daily or several times a day | 1313 (87.1%)   |                                        |                                             |
| Once weekly or several days per week | 153 (10.1%)        |                                        |                                             |
| Never or less than once weekly | 42 (2.8%)            |                                        |                                             |
| Trust in government      |                         |                                        |                                             |
| Little                   | 46/701 (6.6%)           |                                        |                                             |
| Somewhat                 | 116/701 (16.5%)         |                                        |                                             |
| Large                    | 539/701 (76.9%)         |                                        |                                             |
| Trust in science         |                         |                                        |                                             |
| Little                   | 61/701 (8.7%)           |                                        |                                             |
### Questions related to SwissCovid app

|                                | Somewhat | Large  |
|--------------------------------|----------|--------|
| Has app installed              | 174/701 (24.8%) | 466/701 (66.5%) |
| App user                       | 662 (43.9%)   | 207 (56.6%)   |
| Planning to use the app        | 142 (9.4%)    | 22 (6.0%)    |
| Not using the app              | 704 (46.7%)   | 137 (37.4%)  |

** Presence of chronic illnesses was defined based on self-report of at least one of the following conditions: asthma, chronic obstructive pulmonary disease (COPD), diabetes, hypertension, cardiovascular disease, stroke, cancer.
Table 3: Multivariable logistic regression models for SwissCovid app use as outcome, OR presented

|                         | Social Monitor (Step 1; N=1508) | Pooled (Step 2; N=2098) | Social Monitor Split Sample (Step 3; N=701) |
|-------------------------|---------------------------------|-------------------------|---------------------------------------------|
| Age (10-year bands)     | 0.92 [0.86; 0.99]               | 0.90 [0.84; 0.95]       | 1.01 [0.90; 1.13]                           |
| Female Gender (vs. male)| 0.97 [0.78; 1.21]               | 0.97 [0.81; 1.17]       | 0.73 [0.52; 1.03]                           |
| **Education**           |                                 |                         |                                             |
| Only mandatory schooling| Ref.                            | Ref.                    | Ref.                                        |
| Completed professional  | 1.06 [0.66; 1.68]               | 0.90 [0.59; 1.38]       | 1.11 [0.51; 2.39]                           |
| University, university  | 1.37 [0.85; 2.20]               | 1.14 [0.74; 1.76]       | 1.42 [0.65; 3.09]                           |
| of applied sciences     |                                 |                         |                                             |
| **Monthly household income** |                                 |                         |                                             |
| ≤ CHF 6’000             |                                 |                         |                                             |
| CHF 6’000 - CHF 10’000  | 1.50 [1.13; 1.99]               | 1.53 [1.21; 1.93]       | 0.83 [0.53; 1.29]                           |
| >CHF 10’000             | 2.34 [1.70; 3.21]               | 2.27 [1.73; 2.97]       | 1.68 [1.00; 2.81]                           |
| No answer               | 1.45 [1.04; 2.00]               | 1.28 [0.95; 1.72]       | 1.09 [0.66; 1.80]                           |
| **Citizenship**         |                                 |                         |                                             |
| Swiss                   | Ref.                            | Ref.                    | Ref.                                        |
| Swiss and other         | 0.57 [0.39; 0.84]               | 0.59 [0.43; 0.80]       | 0.74 [0.40; 1.39]                           |
| Non-Swiss               | 0.63 [0.44; 0.89]               | 0.69 [0.52; 0.91]       | 0.62 [0.35; 1.09]                           |
| **Being non-smoker (vs. smoker)** | 1.40 [1.07; 1.83] | 1.26 [1.00; 1.59] | 1.55 [1.03; 2.35] |
| Self-reported chronic illness** (vs. none) | 0.97 [0.75; 1.25] | 1.06 [0.85; 1.32] | 0.74 [0.50; 1.09] |
| **Staying at home except for essential tasks** |                                 |                         |                                             |
| Always or most of the time | Ref.                  | Ref.                    | not included*                              |
| Sometimes               | 1.02 [0.79; 1.31]               | 1.00 [0.81; 1.25]       | not included*                              |
| Rarely or never         | 0.78 [0.58; 1.04]               | 0.74 [0.58; 0.94]       | not included*                              |
| **Use of protective masks** |                                 |                         |                                             |
| Always or most of the time | Ref.                  | Ref.                    | Ref.                                        |
| Sometimes               | 0.75 [0.60; 0.94]               | 0.79 [0.65; 0.97]       | 0.56 [0.39; 0.80]                           |
| Rarely or never         | 0.33 [0.23; 0.47]               | 0.45 [0.34; 0.60]       | 0.21 [0.12; 0.38]                           |
| **Frequency of internet use** |                                 |                         |                                             |
| Once daily or several times a day | Ref.                  |                         |                                             |
| Once weekly or several days per week | 0.64 [0.37; 1.12] |                          |                                             |
| Never or less than once weekly | 0.30 [0.09; 0.98]                  |                          |                                             |
| **Partnership status** |                                  |                         |                                             |
| No partner              | Ref.                            |                         |                                             |
| Living with partner     | 1.56 [1.04; 2.33]               |                         |                                             |
| Not living with partner | 1.27 [0.66; 2.44]               |                         |                                             |
| **Language region**     |                                 |                         |                                             |
| German                  | Ref.                            |                         |                                             |
| French                  | 0.68 [0.45; 1.02]               |                         |                                             |
| Italian                 | 0.77 [0.46; 1.30]               |                         |                                             |
| **Trust in Government / Health Authorities** |                                 |                         |                                             |
| Little                  | Ref.                            |                         |                                             |
| Somewhat                | 1.29 [0.54; 3.12]               |                         |                                             |
| Large                   | 2.25 [1.01; 5.02]               |                         |                                             |
| **Trust in Science**    |                                 |                         |                                             |
| Little     | Somewhat | Large   |
|------------|----------|---------|
| 0.51 [0.25; 1.02] | 0.89 [0.46; 1.70] |

* not included because of inferior AIC mode fit.

** Presence of chronic illnesses was defined based on self-report of at least one of the following conditions: asthma, chronic obstructive pulmonary disease (COPD), diabetes, hypertension, cardiovascular disease, stroke, cancer.
Table 4: Reasons for non-use of the SwissCovid app

| Reason                                                                 | Planning to use the app | Not using the app |
|-----------------------------------------------------------------------|-------------------------|-------------------|
|                                                                       | Corona Immunitas        | Corona Immunitas   | Social Monitor   | Corona Immunitas | Corona Immunitas   | Social Monitor   | Overall     |
|                                                                       | selected population (n=18) | random sample (n=22) | random sample (n=142) | selected population (n=48) | random sample (n=137) | random sample (n=704) | (n=1071)     |
| Not the right phone                                                   | 6 (33.3%)                | 10 (45.5%)            | 48 (33.8%)         | 13 (27.1%)            | 48 (35%)               | 173 (24.6%)            | 298 (27.8%)   |
| Perceived not useful                                                  | 4 (22.2%)                | 3 (13.6%)              | 17 (12%)            | 11 (22.9%)            | 32 (23.4%)             | 211 (30%)              | 278 (26%)     |
| Concerned about privacy                                              | 1 (5.6%)                 | 1 (4.5%)               | 22 (15.5%)          | 14 (29.2%)            | 38 (27.7%)             | 180 (25.6%)            | 256 (23.9%)   |
| Don't know the app                                                   | 1 (5.6%)                 | 3 (13.6%)              | 11 (7.7%)           | 2 (4.2%)              | 2 (1.5%)               | 28 (4%)                | 47 (4.4%)     |
| Inertia, not had the time yet                                        | 3 (16.7%)                | 1 (4.5%)               | 23 (16.2%)          | 1 (2.1%)              | 1 (7%)                 | 12 (1.7%)              | 41 (3.8%)     |
| Concerned about battery usage                                        | 2 (11.1%)                | 1 (4.5%)               | 2 (1.4%)            | 2 (4.2%)              | 0                     | 15 (2.1%)              | 22 (2.1%)     |
| Technical doubts about reliability, maturity                          | 0                       | 0                     | 2 (1.4%)            | 1 (2.1%)              | 2 (1.5%)               | 16 (2.3%)              | 21 (2%)       |
| Don't want Bluetooth permanently on                                  | 0                       | 1 (4.5%)               | 3 (2.1%)            | 1 (2.1%)              | 0                     | 10 (1.4%)              | 15 (1.4%)     |
| Currently abroad                                                     | 1 (5.6%)                 | 0                     | 6 (4.2%)            | 1 (2.1%)              | 3 (2.2%)               | 3 (4%)                 | 14 (1.3%)     |
| Already protecting themselves, rarely leave the house                 | 0                       | 1 (4.5%)               | 4 (2.8%)            | 0                     | 1 (7%)                 | 7 (1%)                 | 13 (1.2%)     |
| Principally opposed, no specific reason                               | 0                       | 0                     | 0                   | 2 (4.2%)              | 2 (1.5%)               | 8 (1.1%)               | 12 (1.1%)     |
| Worried about consequences/quarantine                                | 0                       | 0                     | 0                   | 1 (2.1%)              | 0                     | 7 (1%)                 | 8 (7%)        |
| Would have to turn off app at work                                    | 0                       | 0                     | 4 (2.8%)            | 0                     | 0                     | 3 (4%)                 | 7 (7%)        |
| Don't believe in seriousness of Corona; no trust in government        | 0                       | 0                     | 0                   | 0                     | 2 (1.5%)               | 5 (7%)                 | 7 (7%)        |
| Would feel stressed/scared by app use                                 | 0                       | 0                     | 0                   | 0                     | 2 (1.5%)               | 2 (3%)                 | 4 (4%)        |
Table 5: Sociodemographic characteristics of persons not using the app, stratified by reason for non-use (three most frequent and other)

|                          | Not right phone (n=101) | Privacy concerns (n=95) | Not useful (n=110) | Other reason (n=92) | p-value |
|--------------------------|-------------------------|-------------------------|--------------------|---------------------|---------|
| Age, median [IQR]        | 55 (54.5%)              | 49 (51.6%)              | 51 (46.4%)         | 45 (48.9%)          | 0.680   |
| Female gender            | 56 [45; 66]             | 42 [32; 54]             | 48 [29; 57]        | 46.5 [36; 58]       | 0.000   |
| Has a partner            |                         |                         |                    |                     | 0.752   |
| No partner               | 28 (27.7%)              | 36 (37.9%)              | 36 (32.7%)         | 30 (32.6%)          |         |
| Living with partner      | 65 (64.4%)              | 51 (53.7%)              | 62 (56.4%)         | 55 (59.8%)          |         |
| Not living with partner  | 8 (7.9%)                | 8 (8.4%)                | 12 (10.9%)         | 7 (7.6%)            |         |
| Has children             | 7 (6.9%)                | 13 (13.7%)              | 9 (8.2%)           | 12 (13.0%)          | 0.296   |
| Citizenship              |                         |                         |                    |                     | 0.034   |
| Swiss                    | 92 (91.1%)              | 70 (73.7%)              | 89 (80.9%)         | 68 (73.9%)          |         |
| Swiss and other          | 5 (5.0%)                | 9 (9.5%)                | 10 (9.1%)          | 11 (12.0%)          |         |
| Non-Swiss                | 4 (4.0%)                | 16 (16.8%)              | 11 (10.0%)         | 13 (14.1%)          |         |
| Language region          |                         |                         |                    |                     | 0.631   |
| German                   | 62 (61.4%)              | 59 (62.1%)              | 75 (68.2%)         | 60 (65.2%)          |         |
| French                   | 28 (27.7%)              | 24 (25.3%)              | 24 (21.8%)         | 17 (18.5%)          |         |
| Ticino                   | 11 (10.9%)              | 12 (12.6%)              | 11 (10.0%)         | 15 (16.3%)          |         |
| Education                |                         |                         |                    |                     | 0.571   |
| Only mandatory schooling | 5 (5.0%)                | 7 (7.4%)                | 7 (6.4%)           | 7 (7.6%)            |         |
| Completed professional education | 61 (60.4%) | 43 (45.3%) | 57 (51.8%) | 47 (51.1%) |         |
| University, university of applied sciences | 35 (34.7%) | 45 (47.4%) | 46 (41.8%) | 38 (41.3%) |         |
| Currently working        | 56 (55.4%)              | 76 (80.0%)              | 82 (74.5%)         | 67 (72.8%)          | 0.001   |
| Monthly household income |                         |                         |                    |                     | 0.205   |
| ≤CHF 6000                | 37 (36.6%)              | 33 (34.7%)              | 27 (24.5%)         | 22 (23.9%)          |         |
| CHF 6000 - CHF 10000     | 34 (33.7%)              | 29 (30.5%)              | 41 (37.3%)         | 35 (38.0%)          |         |
| >CHF 10000               | 14 (13.9%)              | 12 (12.6%)              | 26 (23.6%)         | 16 (17.4%)          |         |
|                                | 1 (1.0%) | 16 (16.8%) | 10 (9.1%) | 8 (8.7%) |
|--------------------------------|----------|------------|-----------|---------|
| Little                         | 15 (14.9%) | 25 (26.3%) | 23 (20.9%) | 21 (22.8%) |
| Somewhat                       | 85 (84.2%) | 54 (56.8%) | 77 (70.0%) | 63 (68.5%) |
| Large                          | 3 (3.0%)   | 13 (13.7%) | 15 (13.6%) | 8 (8.7%)   |
| Somewhat                       | 27 (26.7%) | 38 (40.0%) | 26 (23.6%) | 33 (35.9%) |
| Large                          | 71 (70.3%) | 44 (48.3%) | 69 (62.7%) | 51 (55.4%) |
## Supplementary Table 1: Standardized questions on SwissCovid app use in the Social Monitor and Corona Immunitas studies

The SwissCovid App has been launched by the Swiss Federal Office of Public Health to warn smartphone users in case of possible exposure risks. The app records, if a contact has been in close proximity of 1.5m or less for longer than 15 minutes. If an app user tested positive for the Coronavirus, she or he can anonymously notify other app users, who were in close proximity during the infectious period.

| Are you using the SwissCovid App? |
|-----------------------------------|
| • Yes, permanently                 |
| • Yes, but sometimes I turn off Bluetooth to pause the SwissCovid App |
| • No, but I am planning to use it  |
| • No                               |

**Filter If No or No, but..:**

| Why are you currently not using the SwissCovid App? |
|---------------------------------------------------|
| • I have not heard about the app                   |
| • I don’t think the app is useful for me           |
| • I can’t install the app (e.g., owing to technical difficulties or because I do not own an Android or iOS smartphone) |
| • I fear for my privacy and protection of my data  |
| • Other reasons, comment field                     |

**Filter if yes or yes, but:**

| Were you ever notified by the SwissCovid App that you have been in close proximity to a Corona-positive person? |
|----------------------------------------------------------------------------------------------------------------|
| • No, I have never received a notification                                                              |
| • Yes, I called the recommended Infoline SwissCovid                                                        |
| • Yes, I undertook other steps; comment field: which?                                                      |
| • Yes, but I did not undertake any steps                                                                  |
**Supplementary Table 2**: Sample descriptions stratified by app non-users (no) and app users (yes)

|                                | Social Monitor (N=1508) | Corona Immunitas Random Sample (N=366) | Corona Immunitas Selected population (N=224) |
|--------------------------------|-------------------------|----------------------------------------|-----------------------------------------------|
|                                | No          | Yes         | No        | Yes         | No        | Yes         |
| N                              | 846         | 662         | 159       | 207         | 66        | 158         |
| Age, median [IQR]              | 49 [35; 58] | 44 [33; 58] | 64 [47; 71]| 56 [41; 68] | 42 [34; 52]| 42 [33; 51] |
| Female gender                  | 417 (49.3%) | 322 (48.6%) | 77 (48.4%) | 103 (49.8%) | 42 (63.6%)| 88 (55.7%)  |
| Has a partner                  |             |             |           |             |           |             |
| No partner                     | 260 (30.7%) | 177 (26.7%) |           |             |           |             |
| Living with partner            | 505 (59.7%) | 438 (66.2%) |           |             |           |             |
| Not living with partner        | 81 (9.6%)   | 47 (7.1%)   |           |             |           |             |
| Has children                   | 79 (9.3%)   | 77 (11.6%)  | 27 (17.0%)| 56 (27.1%)  | 25 (37.9%)| 56 (35.4%)  |
| Citizenship                    |             |             |           |             |           |             |
| Swiss                          | 653 (77.2%) | 550 (83.1%) | 118 (74.2%)| 148 (71.5%) | 43 (65.2%)| 119 (75.3%) |
| Swiss and other                | 89 (10.5%)  | 49 (7.4%)   | 19 (11.9%) | 27 (13.0%)  | 12 (18.2%)| 14 (8.9%)   |
| Non-Swiss                      | 104 (12.3%) | 63 (9.5%)   | 22 (13.8%) | 32 (15.5%)  | 11 (16.7%)| 25 (15.8%)  |
| Language region                |             |             |           |             |           |             |
| German                         | 524 (61.9%) | 440 (66.5%) | 159       | 207         | 66        | 158         |
| French                         | 196 (23.2%) | 138 (20.8%) |           |             |           |             |
| Ticino                         | 126 (14.9%) | 84 (12.7%)  |           |             |           |             |
| Education                      |             |             |           |             |           |             |
| Only mandatory schooling       | 57 (6.7%)   | 34 (5.1%)   | 2 (1.3%)  | 7 (3.4%)    | 0 (0.0%)  | 3 (1.9%)    |
| Completed professional education| 435 (51.4%)| 292 (44.1%) | 78 (49.1%)| 89 (43.0%)  | 25 (37.9%)| 37 (23.4%)  |
| University, university of applied sciences | 354 (41.8%) | 336 (50.8%) | 79 (49.7%)| 111 (53.6%)| 41 (62.1%)| 118 (74.7%) |
| Currently working              | 582 (68.8%) | 481 (72.7%) | 79 (49.7%)| 119 (57.5%)| 57 (86.4%)| 133 (84.2%) |
| Monthly household income       |             |             |           |             |           |             |
| ≤CHF 6000                      | 271 (32.0%) | 137 (20.7%) | 62 (39.0%)| 53 (25.6%)  | 20 (30.3%)| 44 (27.8%)  |
| CHF 6000 - CHF 10000           | 271 (32.0%) | 217 (32.8%) | 58 (36.5%)| 93 (44.9%)  | 25 (37.9%)| 57 (36.1%)  |
| >CHF 10000                     | 152 (18.0%) | 187 (28.2%) | 24 (15.1%)| 54 (26.1%)  | 17 (25.8%)| 51 (32.3%)  |
| No answer                      | 152 (18.0%) | 121 (18.3%) | 15 (9.4%) | 7 (3.4%) | 4 (6.1%) | 6 (3.8%) |
| Smoker                         | 199 (23.5%) | 113 (17.1%) | 23 (14.5%) | 39 (18.8%) | 14 (21.2%) | 27 (17.1%) |
| Self-reported chronic illness**| 205 (24.2%) | 145 (21.9%) | 51 (32.1%) | 73 (35.3%) | 12 (18.2%) | 30 (19.0%) |
| Use of protective masks        |              |              |            |          |          |          |
| Always or most of the time     | 313 (37.0%) | 301 (45.5%) | 73 (45.9%) | 104 (50.2%) | 36 (54.5%) | 87 (55.1%) |
| Sometimes                      | 390 (46.1%) | 310 (46.8%) | 51 (32.1%) | 70 (33.8%) | 22 (33.3%) | 43 (27.2%) |
| Rarely or never                | 143 (16.9%) | 51 (7.7%) | 35 (22.0%) | 33 (15.9%) | 8 (12.1%) | 28 (17.7%) |
| Staying at home except for essential tasks |              |              |            |          |          |          |
| Always or most of the time     | 246 (29.1%) | 186 (28.1%) | 60 (37.7%) | 80 (38.6%) | 16 (24.2%) | 54 (34.2%) |
| Sometimes                      | 357 (42.2%) | 311 (47.0%) | 43 (27.0%) | 69 (33.3%) | 20 (30.3%) | 49 (31.0%) |
| Rarely or never                | 243 (28.7%) | 165 (24.9%) | 56 (35.2%) | 58 (28.0%) | 30 (45.5%) | 55 (34.8%) |
| Frequency of internet use      |              |              |            |          |          |          |
| Once daily or several times a day | 708 (83.7%) | 605 (91.4%) |          |          |          |          |
| Once weekly or several days per week | 103 (12.2%) | 50 (7.6%) |          |          |          |          |
| Never or less than once weekly | 35 (4.1%) | 7 (1.1%) |          |          |          |          |
| Trust in government *          |              |              |            |          |          |          |
| Little                         | 35/398 (8.8%) | 11/303 (3.6%) |          |          |          |          |
| Somewhat                       | 84/398 (21.1%) | 32/303 (10.6%) |          |          |          |          |
| Large                          | 279/398 (70.1%) | 260/303 (85.8%) |          |          |          |          |
| Trust in science *             |              |              |            |          |          |          |
| Little                         | 39/398 (9.8%) | 22/303 (7.3%) |          |          |          |          |
| Somewhat                       | 124/398 (31.2%) | 50/303 (16.5%) |          |          |          |          |
| Large                          | 235/398 (59.0%) | 231/303 (76.2%) |          |          |          |          |