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# The association of public trust with the utilization of digital contact tracing for COVID-19 in Japan

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ABSTRACT

*Objectives:* To examine whether public trust was associated with the utilization of COVID-19 Contact Confirming Application (COCOA) in those who self-reported a history of COVID-19.
*Study design:* Cross-sectional study.
*Methods:* Data were obtained from the Japan Society and New Tobacco Internet Survey, a nationwide online survey conducted from February to March 2021, which also assessed items related to COVID-19 and public trust. We included 453 participants with a history of COVID-19. Participants' reports of their general trust in the national government and the related policies, attitudes toward COVID-19 vaccination, and the adherence to the preventive measures against SARS-CoV-2 spread were compared between COCOA users and non-users controlling for age, sex, and socioeconomic statuses by analysis of covariance. Mediation analysis was conducted to examine whether public trust mediates the associations of certain participants' characteristics with COCOA utilization.
*Results:* Seventy-six percent (344/453) reported the COCOA utilization. Compared to non-users, the users were younger, more likely to be men and had a tendency to have higher education. They were more willing to get COVID-19 vaccination, adherent to public health measures against the spread of the SARS-Cov-2, and more likely to express trust in government in general and policies related to COVID-19 independent of age, sex, and the socioeconomic status. Trust in government did not mediate the associations of age and education with COCOA utilization.
*Conclusions:* The utilization of digital contact tracing technology for the health of public during pandemic was related to the degree of trust in the government in Japan.

## 1. Background

The avoidance of close contact with COVID-19 infected individuals remains the best strategy for preventing the spread of virus, in spite of rapid progress of medical treatments and vaccines. The traditional form of contact tracing requires human rescores and time [1], which makes it difficult during a large-scale pandemic. In the current era of widespread use of information, communication and technology (ICT), where almost everyone possesses a smartphone, contact tracing applications that utilize smartphones have been used in several countries. Most of the apps let the users know whether they have had a close contact with an infected person. In theory, the users should take immediate actions including testing and self-quarantining or seeking appropriate medical consultation if symptomatic. Japan also launched a smartphone-based digital contact tracing tool – COVID-19 Contact-Confirming Application (COCOA) in June 2020. COCOA notifies the users if they had a close contact with individuals who tested positive for SARS-CoV-2. It is expected that the app could shorten the time for testing at the Public Health Center or for seeking medical care. However, the utilization of the app has reportedly been low since its launch, and some has questioned privacy issues and the effectiveness [2].

We investigated the proportion of population that installed COCOA

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in Japan. Since individuals with the infection are usually recommended by the Public Health Center to install the app and inform the system about their having infection, we focused our analyses on those with a history of COVID-19 and compared the characteristics of the app users and non-users.

## 2. Methods

### 2.1. COVID-19 Contact-Confirming Application (COCOA)

COCOA is a contact tracing app created and launched by the Japanese Ministry of Health, Labour and Welfare, and has been available through Google Play and App Store since June 19, 2020. COCOA uses Bluetooth signal to detect close contacts with the SARS-CoV-2 positive users in the past 14 days. Namely, a confirmed infected person is expected to enter the "case number" issued by Public Health Center. The users who had been a close contact defined as proximity within 1 meter, longer than 15 minutes will be notified by the app. The users who were notified are expected to self-quarantine, get testing and seek medical consultation depending on the symptoms. COCOA does not collect any personally identifiable information such as phone number, email and GPS. Since the app is designed to be anonymous, the Public Health Center will not know whether the infected person enters the number into the app or not.

### 2.2. Data source and study design

We used self-reported data about the utilization of COCOA and other necessary variables obtained in the Japan Society and New Tobacco Internet Survey (JASTIS) conducted from February to March 2021 [3]. The JASTIS is a longitudinal study started in 2015, which originally aimed to collect information about tobacco products use and other related variables. Participants were recruited from a large survey panel managed by a major, nationwide internet research agency, Rakuten Insight (Rakuten Insight, Inc., https://insight.rakuten.co.jp/), which maintains a pool of 2.3 million panelists covering all social categories defined by the census in Japan. The JASTIS 2021 also collected information on the history of COVID-19, adherence to public health measures, attitudes toward the vaccine, general and COVID-19-related trust in the government, as well as a number of socio-economic variables. Details of the sampling procedure were described previously [3].

We targeted individuals who had self-reportedly been infected with SARS-CoV-2 (n = 453, 1.9% of the 23516 JASTIS 2021 respondents) in the current study. The prevalence is close to the level reported nationally as of the end of March 2021 (0.38%) [4].

### 2.3. Statistical analysis

Means and standard deviations (SDs) were presented for continuous variables. Categorical variables were presented as proportions. Differences across the utilization of COCOA utilization were tested using analysis of covariance (ANCOVA).

Considering age, gender and socioeconomic status (younger age, male gender, and higher education) might lie in the causal pathway connecting trust and utilization of COCOA as well as other attitudes such as willingness to get COVID-19 vaccination or adherence to general public health measures against the spread of the SARS-CoV-2, we have performed mediation analyses to more clearly characterize relationships among these variables (results are shown in the supplementary files).

## 3. Findings

The percentage of individuals who reported that they were using COCOA was 75.9% (344/453) in those who self-reported a history of SARS-CoV-2 infection. This percentage is much higher than that of those who did not report the infection (17.0%, 3921/23063).

The users were more likely to report they had trust in government in general (56.9% vs 34.3%, Table 1) as well as in the policies related to COVID-19 (55.1% vs 30.7%) independent of age, sex, education, job and income. Also, the users were significantly younger than non-users (median age: 29-year-old vs 35-year-old).

Although the differences were not statistically significant, the users were more likely to be men than the non-users (73.6% vs 68.7%). The users were more willing to get COVID-19 vaccination (86.5% vs 80.3%), and more likely to be cooperative with government instructions for public health such as avoidance of traveling, staying home, or refraining from crowded places (86.4% vs 79.5%). The users and non-users had similar socioeconomic characteristics such as education, employment status, and income.

Even though trust in government was significantly associated with COCOA utilization, it was not a mediator of the association of age and education with the utilization of COCOA.

## 4. Discussion

The expected percentage of digital contact tracing app that may work for the suppression of epidemic was reported as 60% [5]. Our study found that the overall COCOA usage rate in the JASTIS was 18.1%, while the rate reported by the Japanese government was much lower [6]. In this study, we found that higher trust in government was significantly associated with the more utilization of digital contact tracing app for COVID-19 in Japan. We also found that trust in government did not mediate the associations of age and education with COCOA utilization. We considered the following possible explanations for the association.

Privacy concerns might primarily influence the perception of contact tracing app. In the UK, it was reported that individuals distrust their government to store and analyze the data collected by such kind of app [7]. Another controversy was reported in Singapore because the data of TraceTogether (the COVID-19 contact tracing app in Singapore) was accessed by the police for criminal investigations. Moreover, users may be concerned about personal information protection since the infected persons were possibly discriminated by the public once the infection

**Table 1**
Characteristics of participants by users and non-users.

| | Users (N = 344) | | Non-users (N = 109) | | *p*-value |
|---|---|---|---|---|---|
| | N | % | N | % | |
| Age, year [a] | 29 | | 35 | | 0.002 |
| Sex [b] | | | | | |
| Men | 252 | 73.6 | 76 | 68.7 | 0.33 |
| Had a Job [c] | | | | | |
| Yes | 256 | 75.1 | 86 | 76.9 | 0.69 |
| Household income, JPY [c] | | | | | |
| 10 million and above | 43 | 12.9 | 18 | 15.3 | 0.52 |
| Education [c] | | | | | |
| Graduate School or above | 19 | 5.5 | 9 | 8.3 | 0.29 |
| Are the government's policies towards COVID-19 convincible? | | | | | |
| Yes | 189 | 55.1 | 34 | 30.8 | <0.001 |
| Is the government reliable? | | | | | |
| Yes | 196 | 56.9 | 37 | 34.3 | <0.001 |
| Compliance with the precautious measures toward COVID-19 for the past month | | | | | |
| Environmental | 299 | 86.6 | 93 | 86.5 | 0.98 |
| Self-protective | 261 | 75.7 | 80 | 73.8 | 0.69 |
| Changing behavior for public health | 344 | 100 | 109 | 100 | – |
| Cooperation to government guidance for public health | 298 | 86.4 | 86 | 79.5 | 0.08 |
| Willingness to COVID-19 vaccine | | | | | |
| Yes | 297 | 86.5 | 88 | 80.3 | 0.12 |

Percentages and *p*-values are adjusted for age, sex, education, job, and income, except for specified notes.
[a] Variables are presented as median, *p*-value is adjusted for sex.
[b] Results are adjusted for age.
[c] Results are adjusted for age and sex.

history leaked [8]. The public trust determines whether a new technique introduced by the government could be widely accepted or not.

The extremely higher smartphone penetration among younger generation (91%, 2021 in Japan) [9] might explain the reason that COCOA users were younger than non-users. We also assumed that public trust might explain the association between higher education and less willingness to get COVID-19 vaccination since a previous study had reported that the declining trust towards public facilities among the better-educated [10].

Digital contact tracing programs in countries can be divided into two categories. One is based on the real-name system and GPS/base station positioning. This kind of program is somewhat controversial due to the sense of compulsion, and possibility of abuse by public power for other purposes. The other type is anonymous, which is fully considering personal privacy protection and only records the experience of having close contacts. However, such effortful consideration to secure anonymity might not have been well appreciated by the public, and the role of these apps gradually fade away as the breakthrough in medication and vaccines.

The strength of this study, as far as our knowledge, is the first study based on nationwide sampling dataset. However, our study has several limitations. First, this study did not involve a detailed qualitative design about users' experiences. Individuals' specific opinions on both government and contract tracing app could not be expressed. Second, the causation should be explained cautiously due to the cross-sectional design.

## 5. Conclusion

In conclusion, the present findings indicate the importance of public trust in the government for public health. The government should work systemically to maintain and increase its credibility. Moreover, it is also important to pay more attention to how to attract individuals with different beliefs and attitudes.

## Ethical approval

The study was reviewed and approved by the Research Ethics Committee of the Osaka International Cancer Institute (no. 1611079163-2) and the National Institute of Public Health (NIPH-IBRA#12112).

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## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.puhip.2022.100279.

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