# Infection control, personal estimations, and the ethics of testing during COVID-19 pandemic

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**Abstract**

On March 16, 2020, the Director-General of the World Health Organization stated, "We have a simple message to all countries—test, test, test." However, what if limiting the number of tests has a positive effect on infection control? Such a case rarely occurs, but it raises an important ethical problem under the COVID-19 pandemic, closely related to a central tension between deontic and consequential approaches to ethics. This paper first argues that the early stage of the COVID-19 pandemic in Japan offers an interesting case, for the death toll has remained low while the number of tests was limited. Second, we examine deontic constraints under the social crisis. We especially consider issues related to the "right to know," which is a central issue in medical ethics in general. We clarify conditions under which such a "right" justifies or requires the policy of "test, test, test."

**Keywords:** personal estimate, individual right to know, libertarianism.

**Conflict of Interests:** None.

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## Introduction

What is the number of people infected with COVID-19? Since the beginning of 2020, this has been a daily question in almost all countries. There is no definite answer to it, especially since most infected people have weak or no symptoms and thus even carriers cannot know that they are infected [1]. Therefore, the laypeople, and even the government, have difficulties in grasping an accurate number. Each citizen has their own estimations, which can be different from the numbers given by governments; these given numbers are deemed not perfectly reliable for citizens.

Notably, "personal estimates" of the number of infected people are crucial for the infection control of the COVID-19 pandemic. The reason is that someone's estimates reflect their own risk perception, which affects their protective behaviors, such as social distancing and mask-wearing. Indeed, risk perception plays a key role in individual behavior associated with health in general. For example, individual smoking behavior is dependent on that individual's expectation of an increase in the possibility of getting lung cancer [2].

On this matter, Japan is a unique example for two reasons. First, the number of daily PCR tests was quite low, particularly in the early stage of the pandemic. Many people could not get tested even if they considered that they might be infected or even had a fever. Given this, each person acknowledged that they should estimate the actual number to choose their own protective behavior. Second, there has been no strong legal punishment [3]. Therefore, people chose their protective behaviors based on their own risk perceptions and expectations. As this study will show, people in Japan tended to estimate high numbers of actual cases amid the pandemic, although variations existed. Moreover, people with high estimates tended to choose high levels of social distancing. Despite its low number of PCR tests, there was no explosive outbreak of infection in Japan compared to European countries. That might partly be a consequence of people's social distancing based on their risk perception.

Thus, one cannot deny the possibility that a high perception of risk, due to the small number of PCR tests, led to a relatively mild spread of infection with small economic costs. However, even if that could be the case, we can ask the following question: Can we accept, ethically speaking, to intentionally reduce the number of PCR tests as a measure to tackle the pandemic, given that it is an effective control policy? It is hard to answer. Notably, in this case, the government would not be lying nor deceiving, and successful infection controls are considered good results. However, if the government intentionally reduces the number of tests, that does not sound "normal." In this study, we consider how such a "low-testing" policy is compatible with our ethical concerns. Although various researchers have argued policies under the pandemic with ethical viewpoints, this paper offers a novel argument concerning the morality of testing [4,5,6].

**The early stage of the COVID-19 pandemic in Japan**

Japan's experiences offer a distinguishable case study in the early stage of the COVID-19 pandemic. First, Japan is one of the earliest countries in which COVID-19 cases were reported outside of China. The first case was confirmed on January 16, 2020 (a male who visited Wuhan, China). At the end of January, the Japanese government decided to use an air charter to offer Japanese citizens in Wuhan a chance to go back to Japan. Beginning with February 2020, passengers on the Diamond Princess, a British-registered cruise ship, started to test positive when it visited Yokohama, Japan. The ship started its quarantine on February 4. While infection spread on Diamond Princess, the number of reported cases had increased on the mainland Japan. However, the spread was stable until the middle of March. Following the explosion of infections in Europe, Japan also experienced a rapid increase in the reported number of infected people, especially at the end of March. The State of Emergency was declared in April.

Notably, the legal basis for the State of Emergency is substantially weak in Japan. This is assumed to be mainly because the Constitution does not include any emergency clause. Consequently, lockdown or related measures have been very soft. Indeed, there were (and still are) no sanctions for their violation. Although the Japanese government and local authorities asked for various types of social distancing and other procreative behaviors, these have been technically just recommendations or suggestions. Even if someone tested positive and they went out for dinner, there was no punishment at all.

In addition to the soft lockdown approach, another notable issue was present in the early stage of the pandemic in Japan: the number of PCR tests was quite small, with 187.8 per 10 million people. It was substantially smaller than the number in South Korea, 1198, while in most European countries, it was over 2000; for example, 3043.5 in Germany and 2224.2 in Spain. This is also a matter of the spread of the disease. However, testing was not easy, and the capacity of the maximum number of tests was small in Japan compared to other countries. It violated the slogan "test, test, test," which was raised by the head of the WHO on March 16, 2020. However, the country had surprisingly low mortality rates.

**PCR tests and personal estimates in Japan**

At the early stage of the pandemic, the process of testing included complicated steps. A procedure for PCR tests was initiated to track infections among travellers from overseas. Thus, even if someone had a serious symptom, it was not easy to get tested unless that person had contact with someone else who tested positive. If someone was specified as a "close contact of an infected person,"[3] they were immediately tested in public health centers.

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[3] A "close contact" is a person who (i) meets someone infected with COVID-19 at a close distance or (ii) touches the person directly; relevant information is available at
https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/kenkou_iryou/dengue_fever_qa_00014.html#Q

If a person had some symptoms but was not a "close contact," they (or the confirming doctor) had to contact a call center for public health as a first step. This call center decided if the symptomatic person should be tested in designated medical facilities, by issuing referrals. Alternatively, doctors could ask the facilities to test their patients even if the call center decided not to refer them. Given the decisions in designated medical facilities, the patients took PCR tests in a public health center.

Information about this testing process was open to the public; however, common Japanese people did not necessarily understand it. They only knew the government guideline, which suggested that a person who had been febrile for several days should contact public health call centers. Notably, it had been widely known that it was difficult to be tested even if one had some symptoms. Then, the Japanese people concluded that the true number of infected people was not reported and that they had to estimate the number. This testing procedure gradually became more flexible but was extremely rigid in the early stage of the pandemic.

Before offering our theoretical arguments, we provide our empirical observations. We conducted original online surveys in the early stage of the pandemic. We recruited respondents through Rakuten Insight, one of the largest survey companies in Japan. The survey was conducted on March 25th–27th 2020 among residents in Japan in their 30s and 40s (N = 2104). It applied quota sampling with regard to gender, age group, and location of residence. Note that at the end of March, Japan was in the early stage of the pandemic, and thus, the reported number of cases per day was gradually increasing. Figure 1 shows a distribution of personal estimates at the end of March. The accumulated reported numbers were 1,268 on the 25th, 1,364 on the 26th, and 1,468 on the 27th. Each day, the officially reported numbers were less than 100. Thus, people who relied on the reported numbers amounted for less than 15%, and most people's estimates were substantially higher than the numbers reported by the government. Almost half of the population considered that more than 5000 people were infected. This suggests that people expected a tremendous number of uncaught cases. Because risk perception is crucial for social distancing [7], this also implies that a low number of PCR tests may stimulate protective behaviors by making the expected risk higher. Notably, because people tend to avoid ambiguous risks, this can trigger high degrees of social distancing [8]. The actual social distance tends to be lower than the hypothetically optimal one that is enough for infection control [9], and thus, an increase in social distance caused by the higher estimates can have a positive impact on infection control.

By conducting interval regression, we have two additional observations, which may be of interest. First, the personal estimates of college graduates tended to be higher than those of high school graduates at the early stage of the pandemic, but the significant difference between these two groups disappeared in the later stage. Second, there was a difference between female and

male respondents, with the former tending to have lower estimates of infected people. These are reported in the Online Appendix.

**Figure 1: Personal estimates**
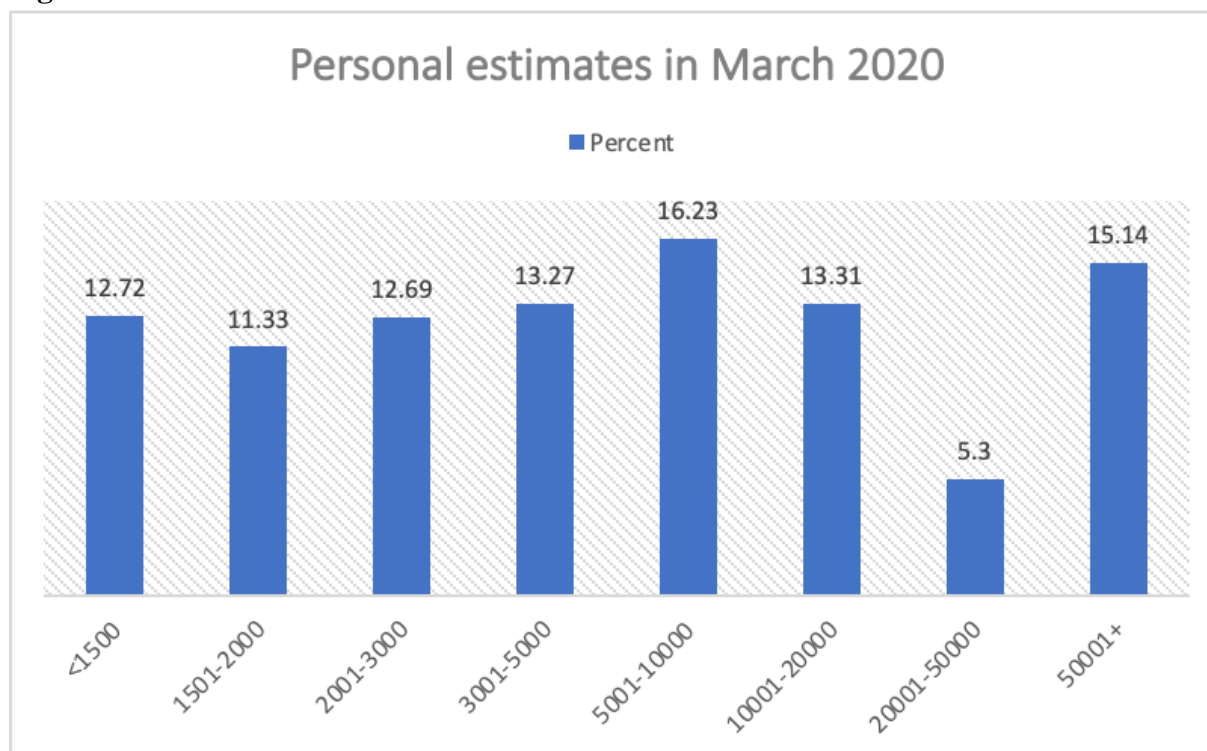


Note: This figure shows the distribution of personal estimates of the number of infected people. The associated question was: "How many people do you think have been actually infected with COVID-19 in Japan?"

**Ethical considerations**

Our ethical question is regarding the moral permissibility of limiting the number of PCR tests. Before addressing the question, we make several counterfactual assumptions, for argument's sake. First, we assume that there are sufficient resources to carry out any medical test whenever necessary. We acknowledge that it is an unrealistic view of the situation in Japan at the early stage of the COVID-19 pandemic; however, such an idealized scenario helps us understand the point of ethical questions. Our second assumption is that mass PCR testing is the most reliable way of seeing the nationwide conditions regarding COVID-19. Third, we take it for granted that the shortage of PCR tests contributes to laypeople's protective behaviors, which in turn leads to the avoidance of an explosive outbreak of COVID-19.

There is arguably *some* reason to think that a low-testing policy—the policy of limiting the number of PCR tests—is morally preferable. For instance, it may be morally permissible or even required from a purely consequentialist perspective [10] in that it (*ex hypothesi*) contributes to

avoiding the explosive outbreak of COVID-19. We even admit the possibility that it is morally permissible *all things considered*. However, that does not mean that there is nothing morally problematic about such a policy. Consider the following situation: suppose government officials intentionally deceive people to avoid the outbreak of COVID-19, which proves to be successful. Even if such a policy of public deception would be morally permissible all things considered, most of us find it at least *pro tanto* morally wrong due to the government-led deception of people. In the same vein, the low-testing policy at issue may involve morally problematic features, whether or not it is morally permissible all things considered.

An argument for the low-testing policy (i.e., limiting the number of PCR tests) goes as follows:

1. Government officials are morally required to reduce the risk of an explosive outbreak of COVID-19.
2. If φ-ing is a feasible and effective measure to reduce the risk of an explosive outbreak of COVID-19 and φ-ing does not violate any deontological constraints, then government officials are morally required to φ.
3. Limiting the number of PCR tests is a feasible and effective measure to reduce the risk of an explosive outbreak of COVID-19.
4. Limiting the number of PCR tests does not violate any deontological constraints.
5. Therefore, government officials are morally required to limit the number of PCR tests.

Premise 1 is a normative premise that is almost indisputable. It seems plausible, irrespective of whether a suitable strategy against COVID-19 is complete "elimination" or moderate "suppression" [11,12]. Premise 2 is also a normative premise, which we take as a natural corollary of the first one. Premise 3 is an empirical premise, which we have assumed at the outset of this section. However, at its face value, it sounds counterintuitive that government officials are morally required to limit the number of PCR tests. In order to argue against this conclusion, then, one must deny Premise 4. What kind of deontological constraints, if anything, are violated by the low-testing policy?

One might find the low-testing policy sufficiently similar to problematic classes of actions such as lying, deceiving, and misleading. Hence, some might argue that low-testing is inherently morally problematic in the same way as lying-related actions are [13].

This route of objection faces at least two problems. First, as a well-cited philosophical argument goes, lying can be justifiable when telling the truth has a significant consequence [14]. That is, lying is not morally prohibited as a deontological constraint. If low-testing is sufficiently similar to lying, it is reasonable to see that low-testing is not morally prohibited as a deontological constraint. Second, it is questionable that limiting the number of PCR tests constitutes a class of actions to be morally prohibited in the first place [15]. It amounts to nothing more than (say) *not*

*gathering sufficient information*, which is quite distinct from lying. Hence, it is unlikely that the low-testing policy violates any negative duty not to commit prohibited actions.

Thus, the low-testing policy can infringe deontological constraints only if it violates some positive duty. What kind of positive duty does it violate? One might argue that it violates people's epistemic rights [16,17], such as the "right to know" the public health conditions of their country [18]. Given that the information about the spread of COVID-19—for example, whether an outbreak is an imminent danger or just a theoretical possibility—is of reasonable concern among people, they seem to have a moral claim to access to the information concerning such a contagious disease [19,20].

We should be careful about what kind of information is at issue. It is one thing that you have a right to know whether *you* are afflicted with COVID-19 (which we visit later), and it is another that you have a right to know the exact conditions of *your country* regarding COVID-19. The latter kind of "rights" may be compromised by significant social concerns. As an illuminating case, consider the 1918 influenza pandemic. It has been called the "Spanish flu," but the earliest reported cases are in the US and other European countries. In these countries, the information about the influenza pandemic was not made public because of wartime censorship [21]. If such a policy is morally justified at all, it is justifiable to restrict people's "right" to know the public health conditions of their country. We do not claim that the situation of COVID-19 is analogical to the situation of the 1918 pandemic during World War I. Instead, the point is that the "right" to know public health conditions does not count as a deontological constraint in general.

Perhaps people may have a "right" to know whether *they* are afflicted with COVID-19. Two questions are in order. Does it constitute a deontological constraint? If it does, is it violated by the low-testing policy? Their answers can be affirmative if we assume that there is a purely epistemic kind of absolute "right" in its own right. Although such an epistemic "right" might be plausible, it must be argued for, rather than assumed. Alternatively, we may see such a "right" as a derivative of other rights, such as one's right to health and physical integrity. It is not unreasonable to see that one's right to health and physical integrity constitutes a deontological constraint. However, it is disputable that the low-testing policy infringes such a right. *Ex hypothesi*, low-testing is intended to, and successfully does, respect people's right to health and physical integrity (by avoiding an explosive outbreak of COVID-19 in its early stage).

In sum, it is not easy to see what positive duty the low-testing policy infringes. An obvious candidate is the people's "right to know." However, such an understanding faces a dilemma. On the one hand, if it denotes a right to know the public health situation concerning COVID-19, it does not constitute a deontic constraint. On the other hand, if it denotes a person's right to know whether he or she is afflicted with COVID-19, then it may constitute a deontic constraint, which

is not violated by the low-testing policy. Hence, appealing to one's "right to know" cannot reject Premise 4. If we accept Premises 1–3, then, the conclusion holds.

Of course, defending the right-to-know version of Premise 4 can be just a partial argument for Premise 4 itself. However, appealing to the "right to know" is one of the most plausible deontological arguments against low-testing. If such an appeal is successfully rejected, that means that the low-testing policy is likely to be immune to major deontological challenges worthy of concern.

Alternatively, it could be possible to reject (one of) Premises 1–3. In particular, one might deny Premise 2. That is, one might hold that government officials are not necessarily morally required to φ even if φ-ing is an effective measure to avoid an explosive outbreak and φ-ing does not violate any deontic constraint. For instance, it may be morally relevant from a utilitarian viewpoint how people feel fear and uneasiness if the number of PCR tests is limited. (Indeed, this is essentially why the low-testing policy works as a tool for infection control.) Thus, it may cause mental problems [22,23]. Similarly, a libertarian may focus on how such a policy coerces people to "overreact" to COVID-19. Moreover, the low-testing policy can enhance inequality in people's lives during the pandemic because some can be tested while others cannot. Indeed, it has been pointed out that the COVID-19 pandemic can cause or worsen inequality [24]. Examining that policy in detail from these ethical perspectives remains for future research. The discussion in this paper helps understand the moral characteristics of the low-testing policy itself, which proved not as eccentric as it appears.

**Concluding remarks**

This paper examined ethical concerns related to the number of PCR tests, which may affect the personal estimation of the number of infected people. Our question is: if limiting the number of PCR tests is an efficient tool for infection control, is it morally permissible or even required for the government to conduct fewer tests? As we observed from Japan's experience, this is not a trivial concern. It is associated with why we should accept the slogan "test, test, test" raised by the head of the WHO at the beginning of the pandemic. If this slogan is backed by some deontological constraint, the low-testing policy that violates it is morally problematic. However, our investigation revealed that this route is not very promising. This implies that purely deontic approaches may accept the low-testing policy as long as it works as an infection control measure.

Is the low-testing policy morally acceptable from non-deontic perspectives, such as libertarian and utilitarian ones? Detailed ethical examination on this topic remains for future research. Indeed, ethicists and other academics were less concerned with moral questions regarding test strategies under the COVID-19 pandemic than with questions concerning lockdowns, allocations

of essential resources, or the priority of vaccination [25,26]. By articulating the nature and morality of "low-testing" as a seemingly eccentric policy, this paper makes the first step towards a moral inquiry into various test strategies.

## Reference List

1   Day, M. (2020). Covid-19: four fifths of cases are asymptomatic, China figures indicate. *BMJ Clinical research*, *369*, m1375. https://doi.org/10.1136/bmj.m1375

2   Lundborg, P., & Andersson, H. (2008). Gender, risk perceptions, and smoking behavior. *Journal of Health Economics*, *27*(5), 1299–1311. https://doi.org/10.1016/j.jhealeco.2008.03.003

3   Kodama, S., Campbell, M., Tanaka, M., & Inoue, Y. (2022). Understanding Japan's response to the COVID-19 pandemic. *Journal of Medical Ethics*, *48*, 173. https://doi.org/10.1136/medethics-2022-108189

4   Herron, T. L., & Manuel, T. (2022). Ethics of US government policy responses to the COVID-19 pandemic: A utilitarianism perspective. *Business and Society Review*, *127*(51). https://doi.org/10.1111/basr.12259

5   Jain, S. S., Jain, S. P., & Li, Y. J. (2022). Sustaining livelihoods or saving lives? Economic system justification in the time of COVID-19. *Journal of Business Ethics*, 1–34. https://doi.org/10.1007/s10551-022-05091-4

6   Lee, K., & Eyal, N. (2021). COVID-19 controlled human infection studies: worries about local community impact and demands for local engagement. *Journal of Medical Ethics*, *47*(8), 539–542. http://dx.doi.org/10.1136/medethics-2021-107229

7   Shoji, M., Cato, S., Iida, T., Ishida, K., Ito, A., & McElwain, K. M. (2021). Variations in early-stage responses to pandemics: survey evidence from the COVID-19 pandemic in Japan. *Economics of Disasters and Climate Change*, 1–24. https://doi.org/10.1007/s41885-021-00103-5

8   Cato, S., Iida, T., Ishida, K., Ito, A., Katsumata, H., McElwain, K. M., & Shoji, M. (2021). Social media infodemics and social distancing under the COVID-19 pandemic: public good provisions under uncertainty. *Global Health Action*, *14*(1), 1995958. https://doi.org/10.1080/16549716.2021.1995958

9   Cato, S., Iida, T., Ishida, K., Ito, A., McElwain, K. M., & Shoji, M. (2020). Social distancing as a public good under the COVID-19 pandemic. *Public Health*, *188*, 51–53. https://doi.org/10.1016/j.puhe.2020.08.005

10  Savulescu, J., Persson, I., & Wilkinson, D. (2020). Utilitarianism and the pandemic. *Bioethics*, *34*(6), 620–632. https://doi.org/10.1111/bioe.12771

11  Baker, M. G., Wilson, N., & Blakely, T. (2020). Elimination could be the optimal response strategy for COVID-19 and other emerging pandemic diseases. *BMJ Clinical Research*, *371*, 1–4. https://doi.org/10.1136/bmj.m4907

12  Jecker, N. S., Au, D. K. S. (2022). Does zero-COVID neglect health disparities? *Journal of Medical Ethics*, *48*, 169–172. https://doi.org/10.1136/medethics-2021-107763

13  Kant, I. (1996). Metaphysics of morals. In M. J. Gregor (Ed.), *Practical philosophy*. Cambridge University Press.

14  Kagan, S., (1998). *Normative ethics*. Westview Press.

15  Saul, J. M., (2012). *Lying, misleading, and what is said: an exploration in philosophy of language and in ethics*. Oxford University Press.

16  Hadden, S. G. (1989). *A citizen's right to know: risk communication and public policy*. Routledge.

17  Watson, L. (2021). *The right to know: epistemic rights and why we need them*. Routledge.

18  Sarmiento, P. J. D., Yap, J. F. C., Espinosa, K. A. G., Ignacio, R. P., & Caro, C. A. (2021). The truth must prevail: citizens' rights to know the truth during the era of COVID-19. *Journal of Public Health*, *43*(2), e275–e276. https://doi.org/10.1093/pubmed/fdaa240

19  Winston, M. E. (1988). AIDS, confidentiality, and the right to know. *Public Affairs Quarterly*, *2*(2), 91–104.

20  Allen, A. (2021)., Privacy and medicine. In Edward N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy*. https://plato.stanford.edu/archives/spr2021/entries/privacy-medicine/

21  Trilla, A., Trilla, G., and Daer, C. (2008). The 1918 "Spanish flu" in Spain. *Clinical Infectious Diseases*, *47*(5), 668–673. https://doi.org/10.1086/590567

22  Fetzer, T., Hensel, L., Hermle, J., & Roth, C. (2021). Coronavirus perceptions and economic anxiety. *Review of Economics and Statistics*, *103*(5), 968–978. https://doi.org/10.1162/rest_a_00946

23  Kavoor, A. R. (2020). COVID-19 in people with mental illness: challenges and vulnerabilities. *Asian Journal of Psychiatry*, *51*, 102051. https://doi.org/10.1016/j.ajp.2020.102051

24  Ahmed, F., Ahmed, N. E., Pissarides, C., & Stiglitz, J. (2020). Why inequality could spread COVID-19. *The Lancet Public Health*, *5*(5), e240. https://doi.org/10.1016/S2468-2667(20)30085-2

25  Brown, R. C. H., Savulescu, J., Williams, B. & Wilkinson, D. Passport to freedom? Immunity passports for COVID-19. *Journal of Medical Ethics*, *46*(10), 652–659. https://doi.org/10.1136/medethics-2020-106365

26  Cato, S., & Inoue, A. (2022). Libertarian approaches to the COVID‑19 pandemic. *Bioethics*, *36*(4), 445–452. https://doi.org/10.1111/bioe.13007

**Online appendix**

This section briefly offers an empirical observation from our online survey, which was conducted on March 25–27, 2020. We used an online platform, Qualtrics, and respondents were recruited by Rakuten Insight, one of the largest survey companies in Japan, with 2.2 million registrations. We used a quota sampling regarding gender (two categories), age (four 5-year categories), and residential location (10 categories); the distribution of these characteristics is comparable to that of the entire Japanese population. We restricted respondents to be in their 30s–40s.

In this survey, we asked a question associated with the personal estimate of the number of infected people: *How many people do you think have been actually infected with the new coronavirus in Japan?* The answer options included (1) no more than 1500, (2) 1501–2000, (3) 2001–3000, (4) 3001–5000, (5) 5001–10000, (6) 10001–20000, (7) 20001–50000, (7) more than 50000, and (8) I do not want to answer. Demographic variables were: gender, education, age, and household income. Additionally, there was a question on whether a respondent lived with their child. Table A1 shows the summary statistics. Here, "real corona low" corresponds to the lowest value in each interval (e.g., 1501 for the "1501–2000" interval), while "real corona high" corresponds to the highest value in each interval (e.g., 2000 for the "1501–2000" interval).

Table A2 presents the results of the Interval Regression model to regress the change in personal estimates of the number of infected people on the socio-demographic characteristics of respondents. For robustness, we conducted four different models, but all results show the same pattern. All specifications control for the prefecture fixed effects. Overall, (i) university graduates, (ii) males, and (iii) people with higher income tended to have higher estimates.

**Table A1. Summary Statistics**

|  | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| real corona low | 2,104 | 3.724572 | 3.224014 | 0 | 10 |
| real corona high | 2,104 | 7.219344 | 6.454144 | 1.5 | 20 |
| university | 2,104 | 0.506654 | 0.5000746 | 0 | 1 |
| income (1000 yen) | 2,104 | 5458.413 | 3745.761 | 0 | 17500 |
| female | 2,104 | 0.5156844 | 0.4998727 | 0 | 1 |
| live with child | 2,104 | 0.4990494 | 0.500118 | 0 | 1 |
| age | 2,104 | 40.5461 | 5.755501 | 30 | 50 |

**Table A2. Results on Interval Regression**

| VARIABLES | model 1 | model 2 | model 3 | model 4 |
|---|---|---|---|---|
| university | 0.723*** | 0.644*** | 0.679*** | 0.677*** |
|  | (0.176) | (0.180) | (0.182) | (0.182) |
| female | -0.723*** | -0.681*** | -0.676*** | -0.655*** |
|  | (0.175) | (0.176) | (0.176) | (0.177) |
| income (1000 yen) |  | 5.16e-05** | 5.12e-05** | 5.59e-05** |
|  |  | (2.41e-05) | (2.41e-05) | (2.44e-05) |
| age |  |  | 0.0211 | 0.0213 |
|  |  |  | (0.0151) | (0.0151) |
| live with child |  |  |  | -0.191 |
|  |  |  |  | (0.176) |
| constant | 5.626*** | 5.391*** | 4.507*** | 4.558*** |
|  | (0.388) | (0.402) | (0.749) | (0.750) |
| Observations | 2,104 | 2,104 | 2,104 | 2,104 |

Standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

All the specifications control for the prefecture fixed effects.