Comment to Anzai et al., BMC Infectious Diseases (2022)

Junko Kurita[1], Yasushi Ohkusa[2]

1) Department of Nursing, Faculty of Sports & Health Science, Daitobunka University, Saitama, Japan

2) Infectious Disease Surveillance Center, National Institute of Infectious Diseases, Tokyo, Japan

Corresponding author: Yasushi Ohkusa, ohkusa@nih.go.jp

Keywords: COVID-19, Go To Travel Campaign, policy evaluation, sightseeing tourism, long distance travel

ICMJE Statement

Contributors YO was responsible for the coordination of the study and analyzed the data JK set the data. All authors contributed to the writing of the final manuscript.

Keywords: COVID-19, Go To Travel Campaign, long distance travel, policy evaluation, sightseeing tourism

Abstract

Background: Travel subsidy policy during July 22 through December 27, 2020 in Japan, the Go To Travel Campaign (GTC), was believed to have exacerbated the COVID-19 outbreak. A report by Anzai et al. supported this rumor. However, the study specifically examined only two months with only minor changes in GTC.

Object: This study examined the results of the earlier study with a longer time span including periods before and after GTC to confirm the effects of GTC itself, not minor changes.

Method: Following the methods used for the earlier study, we used data of the number of prefectures in which the weekly number of newly confirmed patients per 100 thousand residents was greater than a certain criterion of the daily time trend. Furthermore, we used interaction of the daily time trend and the total number of GTC users per day in the month instead of one time changing in time trend in the earlier study. Two estimation periods were examined: June, 2020 – January, 2021 and May, 2020 – February, 2021.

Results: For both estimation periods, no interaction of the total number of GTC users and the daily time trend was significant in the cases of 3 and 5 day criteria. It was significant, although its coefficient was negative *t*, for the 7 day criterion.

Discussion and Conclusion: Estimation results indicate that GTC itself or the total number of GTC users might not have worsened COVID-19 outbreak situation. The earlier study had proved that the minor change in GTC in October worsened the outbreak situation temporarily, but those findings might not be appropriate for the entirety of GTC.

Introduction

Policies administered by governments should be evaluated ex post facto as well as ex ante. Nevertheless, such official evaluations are rare in Japan because the government posture is that officials never make mistakes. Countermeasures against the COVID-19 outbreak were never evaluated ex-ante because little knowledge and experience about COVID-19 were available during the pandemic. Ex ante evaluation was too difficult and imprecise. That lack of ex ante evaluation notwithstanding, ex post evaluation has also been rare. For example, long-distance travel for sightseeing was believed to spread outbreaks. In fact, such travel was banned until 2022 except for "Go To Travel Campaign" (GTC) period. At least one study [1] advocated this public stance, but the study was found to include numerous mistakes and was discounted as evidence and as a basis for policy. It was refuted and contradicted completely [2].

A subsequent study [3] found contrasting evidence that the effective reproduction number was significantly lower during the period when long distance travel was promoted. Moreover, another study [4] demonstrated that airport users at a local airport were associated with reduced infectivity. These findings might be strong evidence casting doubt on the legitimacy and rationality of policies banning long-distance travel. However, these studies specifically examined large areas. In fact, the former study examined the entirety of Japan. The latter assessed a prefecture. In general, the study areas were larger, suggesting greater difficulty in identifying people engaged in long-distance tourism. The eventual analyses might therefore be more indirect. Moreover, both studies were conducted during the period when the Wuhan original strain was dominant. The mutated strain was well known to have had higher infectivity than the original strain [5,6]. Indeed, some probability exists that long distance travel affects the infectivity of the mutated strain differently than it affects the infectivity of the original strain. Studies must analyze tourism in much smaller areas and must include a period during which the mutated strain was dominant. The exceptional studies were conducted at a hot spring resort [7] and at a resort island [8,9]. These results were consistent with those of earlier studies [3, 4]. No evidence has shown that long travel or sight-seeing promote infectivity throughout the whole of Japan, with few exceptions [1]. These exceptional findings are not convincing, as this study demonstrates below.

GTC might have expanded the outbreak. It commenced on July 22, 2020. The GTC program, which was aimed at supporting tourism businesses, subsidized 50% of travel expenses with coupons issued for shopping at tourist destinations. The GTC continued through December, by which time the third wave had been reached. In fact, the third wave was larger than either of the prior two waves in December. Therefore, GTC was inferred as the main reason for the third wave [10].

Anzai and colleagues analyzed GTC, however, only for two months: September and October, 2020 [11]. They specifically examined minor changes in GTC in October 2020 to include Tokyo residents and travelers to Tokyo. For that reason, they did not examine GTC itself. Nevertheless, they concluded in the study that GTC itself worsened the outbreak situation without any evidence other than results obtained for two months. Therefore, we examined evaluation of some effects of GTC itself or how GTC users affect situations during a longer period than in the earlier study, which included periods before and after GTC. As one might expect, to evaluate the entirety of GTC, a study must include a non-GTC period. At least, one must include data obtained before the GTC period, even if we examined it during the GTC ongoing period.

Methods

Similarly to an earlier study [11], the outbreak situation was measured by the time trend of the number of prefectures exceeding a criterion. The criterion they used was the number of newly confirmed patients: 3, 5 or 7 cases per week.

Although they considered one instance of a change in the time trend, we must model continuous change in the time trend. Therefore, we arranged the original estimation equation in the earlier study as

$$N_t=\alpha+\Sigma_i\beta_i D^i_t+\gamma T_t+\eta G_t T_t\ ,$$

where N_t denotes the number of prefectures in which the number of newly confirmed patients was higher than the criterion in days t, D^i_t is the dummy variable for months, T_t denotes the daily time trend from the beginning of estimation period, and G_t represents the total number of GTC users per day during the month.

According to the earlier study, a month was defined as a 9 day delay considering the incubation period, time to visit a doctor, and the time to report test results. Consequently, April was defined as April 10 to May 9. The total numbers of GTC users per day in each month were 234, 435, 476, 712, 855, and 381 thousand, respectively, during July–December, 2020 [12]. In July and December, GTC started and ceased during the month. It started on July 22 and ceased on December 27. Therefore, the total number of GTC users per day on July 1–30 was zero; it was 234 thousand as applied on July 31 and August 1–8. Similarly, it was 381 thousand in the period from December 10, 2020 to January 7, 2021; zero was applied from January 8. The daily numbers of newly confirmed patients by prefecture were referred from the government home page [13].

We used two estimation periods: June, 2020 – January, 2021, and May, 2020 – February, 2021. To evaluate the effects of GTC itself and the entirety of GTC, we must include non-GTC periods. During the two estimation periods, the period of May 10 – July 30 was before the GTC period; January 7, 2021 and thereafter was after the GTC period.

We estimated the equation above using Poisson regression, similarly to the earlier study. We adopted 5% as significance level. All statistical analyses were conducted using software (STAT SE 17.0; Stata Corp.).

Ethical considerations

Information about patients examined for this study was collected under the Law of Infection Control of Japan. It was published on the homepage as open data [12]. Data about GTC users by month were also available from the home page [13]. Therefore, no ethical issue is posed by this report or the work it describes.

Results

Figure 1 shows the numbers of prefectures for which the weekly number of newly confirmed patients per 100 residents were higher than the criteria of three types, 3, 5 and 7 cases each day. Lines of dots of three types are almost parallel, although different patterns for only two months were presented in the earlier study.

Table 1 presents the estimation result obtained when the estimation period was June–January. No estimated coefficient of interaction terms among the time trend and GTC users was significant in a case where the criterion was three or five cases. The coefficient was significant but negative if the criterion was seven.

Table 2 presents estimation results obtained when the estimation period was May–February. However, estimation results found for interaction terms between the time trend and GTC users were similar to those shown in Table 1.

Discussion

All policies must be checked for rationality and their cost-effectiveness, ideally ex ante or in real time, but at the very least they should be examined ex post. Their rationality can be confirmed based on significant results of the policies themselves. Moreover, the policy rationality must be re-examined. The study described in this manuscript investigated the credibility of the earlier study asserting the irrationality of GTC.

Estimation results indicated that GTC decreased the outbreak trend or exerted no significant effect. The findings suggest that the conclusions obtained for only two months in the earlier study [11] might be a hasty judgment. If the authors of that study had been adequately cautious, they would have revised their study to be similar to this study, incorporating data after December, 2020, and would thereby have reached a completely opposite conclusion from the one which they reported. In other words, their study was valid for data through November, 2020, but it might be false for data obtained after December. Moreover, one earlier study [1] was more biased against GTC, ignoring their unfavorable results obtained for August 2020, when the outbreak decreased in intensity during GTC, as shown in [2], although this report specifically addresses one report of a study [11] and not another [1]. In this sense, misunderstandings in the first report [11] might be interpreted as careless mistakes or misapprehensions. Even if so, the report was published two years later on October 31, 2022. Surely the authors would have recognized their misunderstanding before submission or publication. Moreover, they have responsibility for their publication even after it has been published. If they never recognized their misunderstanding, then they were too careless to be investigating the matter in the first place. Therefore, one can reasonably infer that they recognized their mistake, but they did not fulfill their responsibility to report it.

Actually, we can confirm their result using data of only two months in our estimation model: September and October, 2020. We also confirmed that the number of GTC users increased the time trend during the GTC period. Therefore, a minor change in the GTC system to promote travelling increased the time trend even in our estimation model. However, that was just an evaluation for minor change in GTC, not for GTC itself or for the entirety of GTC. To evaluate the GTC effects, comparison of the GTC period to the non-GTC period is necessary. We examined that point in this study and found that GTC itself had not increased the time trend at all. This is expected to be the answer to the question about the effects of GTC.

For this study, we limited the time frame for the estimation period to February, 2021 and did not include March or after March, 2021. Because the Alpha variant strain was dominant from March, 2021 [14] and because it probably had higher infectivity [15–17], we did not include this period in our estimation and limited analysis to the original Wuhan strain. Alternatively, even if data in April, 2020 are added, the results remain unaffected. Therefore, our obtained result was robust for the setting of before the GTC period.

What did they understand of the phenomena during the two months? Figure 2 shows the number of newly confirmed cases from May to the following April for the four seasons of May 2020 – April 2024, as measured by the percentage in each season. Because the notification report had been discontinued and changed to sentinel surveillance on May 8, 2023, we adjusted the weekly total number of patients from sentinel surveillance by multiplication by 8/7. If data before and after the day were almost comparable, then the adjusting factor itself does not matter so much in the following discussion. The two peaks in summer and winter in the four seasons are apparent, even though there were somewhat earlier or later in each season. October was merely a trough between the summer peak and winter peak. Every season experienced a turn to an increasing trend from a declining trend in October or around that period. Especially, even in October 2023, when aggressive countermeasures had not been initiated, the number of patients increased again. It certainly was not any effect of a countermeasure for COVID-19. It was merely a seasonal pattern of COVID-19. Therefore, the authors of the earlier report might have misinterpreted this seasonal pattern as some effect of GTC. Because October 2020 was the first October during the pandemic, they could not help misunderstanding the data in their interpretation. However, they were able to revise it up to the point of submission and publication in October 2022.

Their belief that GTC worsened the outbreak might bias their consideration and affect policy decisions without any evidence. In this sense, they might discount the earlier study.

The present study has some limitations. First, regression analysis such as that used for this study does not mean causality. Although we interpreted the number of GTC users as reflecting a better outbreak situation, a better outbreak situation might have caused the increase of GTC users. The important finding in the results of this study is that the number of GTC users was not associated with a worse outbreak situation. One must interpret the results carefully.

Second, even though this study followed the methods of the earlier study, the number of prefectures for which cases are greater than some criterion might not be an appropriate measure of the outbreak situation. The number of newly confirmed cases or effective reproduction number is expected to be more appropriate for measurement of the outbreak situation.

Conclusion

Estimation results indicated that GTC itself or the total number of GTC users might not have worsened the COVID-19 outbreak situation. Even though an earlier study proved that a minor change in GTC in October worsened the outbreak situation temporarily, that finding might not be appropriate for application to the entirety of GTC. It was true for November, 2020, but it might be false after February 2021, including today. The authors were able to revise the manuscript and study findings after November, 2020 when they submitted and revised their work, but they did not do so. Therefore, the conclusion of the earlier study, that “the enhanced movement resulting from GTC facilitated spatial spread of COVID-19,” is misleading today. It should be discounted because the authors might be deliberately or negligently affecting discussions of policy evaluation.

Ethical considerations

All information about patient data used for this study was collected under the Law of Infection Control, Japan and published on their homepage [10]. The number of GTC users by month was referred from the homepage [9]. Therefore, no ethical issue is posed by this study.

References

1. Anzai A, Nishiura H. “Go To Travel” Campaign and Travel-Associated Coronavirus Disease 2019 Cases: A Descriptive Analysis, July–August 2020. J Clin Med. 2021;10:398. https://doi.org/10.3390/jcm10030398
2. Kurita J, Sugawara T, Ohkusa Y. Estimating Event Ban Effects on COVID-19 Outbreak in Japan. Journal of Health Science and Development 2021;4. https://www.innovationinfo.org/articles/JHSD/JHSD-137.pdf
3. Kurita J, Sugawara T, Ohkusa Y. Infectivity of omicron BA.5 comparison with

original strain and other mutated strain of SARS-Cov-2 in Japan. Journal of Disaster Research 2023;18:4-10.
4. Kurita J, Iwasaki Y. Did Visitors for Sightseeing Actually Spread COVID-19 Outbreak dominated the original strain in Japan? Ex Post Evaluation for Banning of Long Distance Travel, https://jxiv.jst.go.jp/index.php/jxiv/preprint/view/226
5. European Centre for Disease Prevention and Control. Epidemiological update: SARS-CoV-2 Omicron sub-lineages BA.4 and BA.5. https://www.ecdc.europa.eu/en/news-events/epidemiological-update-sars-cov-2-omicron-sub-lineages-ba4-and-ba5 [accessed on August 22, 2022]
6. National Institute of Infectious Diseases. Updated Situation of COVID-19 Outbreak (July 13, 2022) https://www.niid.go.jp/niid/ja/2019-ncov/11309-covid19-ab90th.html (in Japanese) [accessed on August 20, 2022]
7. Kurita J, Ohkusa Y, Iwasaki Y. Association of Sightseeing Tourists and COVID-19 Outbreak: A Case Study of a Hot Spring Resort. J Health Sci Dev 2023;6.
8. Kurita J, Iwasaki Y. Did visitors for sightseeing actually spread COVID-19 outbreak dominated the omicron variant strain in Japan ? A case study at resort island. https://jxiv.jst.go.jp/index.php/jxiv/preprint/view/232
9. Kurita J, Iwasaki Y. Association of sightseeing tourists and COVID-19 outbreak: A case study of a resort island. https://jxiv.jst.go.jp/index.php/jxiv/preprint/view/318
10. Japan Times. Politics — not public health — drove Suga U-turn on Go To Travel. https://www.japantimes.co.jp/news/2020/12/15/national/politics-diplomacy/suga-go-to-travel-public-support-coronavirus/ [accessed on May 12,2023]
11. Anzai A, Jung SM, Nishiura H. Go To Travel campaign and the geographic spread of COVID-19 in Japan. BMC Infect Dis 2022;22:808. doi: 10.1186/s12879-022-07799-0.
12. Ministry of Labour, Health and Welfare. Open data about COVID-19. https://www.mhlw.go.jp/stf/covid-19/open-data.html (in Japanese) [accessed on July 18, 2024]
13. Tourism agency, Number of nights using Go To Travel Campaign since July 22 to checked out on December 28. https://www.mlit.go.jp/kankocho/content/001386426.pdf (in Japanese) [accessed on July 18, 2024]
14. Japan Ministry of Health, Labour and Welfare. Countermeasure for variant strain of COVID-19 reported at the 32nd Advisory board for infection control to COVID-19. https://www.mhlw.go.jp/content/10900000/000774322.pdf (in Japanese) [accessed on May 19, 2021]

15. Leung K, Shum MHH, Leung GM, Lam TTY, Wu JT. Early transmissibility assessment of the N501Y mutant strains of SARS-CoV-2 in the United Kingdom, October to November 2020. Euro Surveill 2021;26:2002106. doi: 10.2807/1560-7917.ES.2020.26.1.2002106.
16. Graham MS, Sudre CH, May A, Antonelli M, Murray B, Varsavsky T, Klaser K, Canas LS, Molteni E, Modat M, Drew DA, Nguyen LH, Polidori L, Selvachandran S, Hu C, Capdevila J; COVID-19 Genomics UK (COG-UK) Consortium, Hammers A, Chan AT, Wolf J, Spector TD, Steves CJ, Ourselin S. Changes in symptomatology, reinfection, and transmissibility associated with the SARS-CoV-2 variant B.1.1.7: an ecological study. Lancet Public Health 2021;6:e335–e345.
17. Davies NG, Abbott S, Barnard RC, Jarvis CI, Kucharski AJ, Munday JD, Pearson CAB, Russell TW, Tully DC, Washburne AD, Wenseleers T, Gimma A, Waites W, Wong KLM, van Zandvoort K, Silverman JD; CMMID COVID-19 Working Group; COVID-19 Genomics UK (COG-UK) Consortium, Diaz-Ordaz K, Keogh R, Eggo RM, Funk S, Jit M, Atkins KE, Edmunds WJ. Estimated transmissibility and impact of SARS-CoV-2 lineage B.1.1.7 in England. Science 2021;372(6538):eabg3055. doi: 10.1126/science.abg3055.

Table 1: Estimation results of Poisson regression for time trend interaction with the number of GTC users during June 2020 – January, 2021

Criterion	3 cases		5 cases		7 cases	
Explanatory variable	Estimated coefficient	*p* value	Estimated coefficient	*p* value	Estimated coefficient	*p* value
July	2.776331	0	2.758803	0	3.704971	0
August	2.750788	0	2.454689	0	3.815997	0
September	1.657086	0	0.983414	0.008	2.626592	0
October	2.024901	0	1.555576	0	3.527013	0
November	2.714561	0	2.634879	0	5.070077	0
December	2.973935	0	2.953389	0	5.383803	0
January	2.87198	0	2.795366	0	5.221149	0
trend	0.005479	0.001	0.007476	0	0.00204	0.363
GTC*trend	1.21E-05	0.183	1.11E-05	0.263	-2.2E-05	0.039
constant	-0.71067	0.003	-1.33328	0	-2.41594	0
Pseudo R^2	0.6549		0.6861		0.7091	

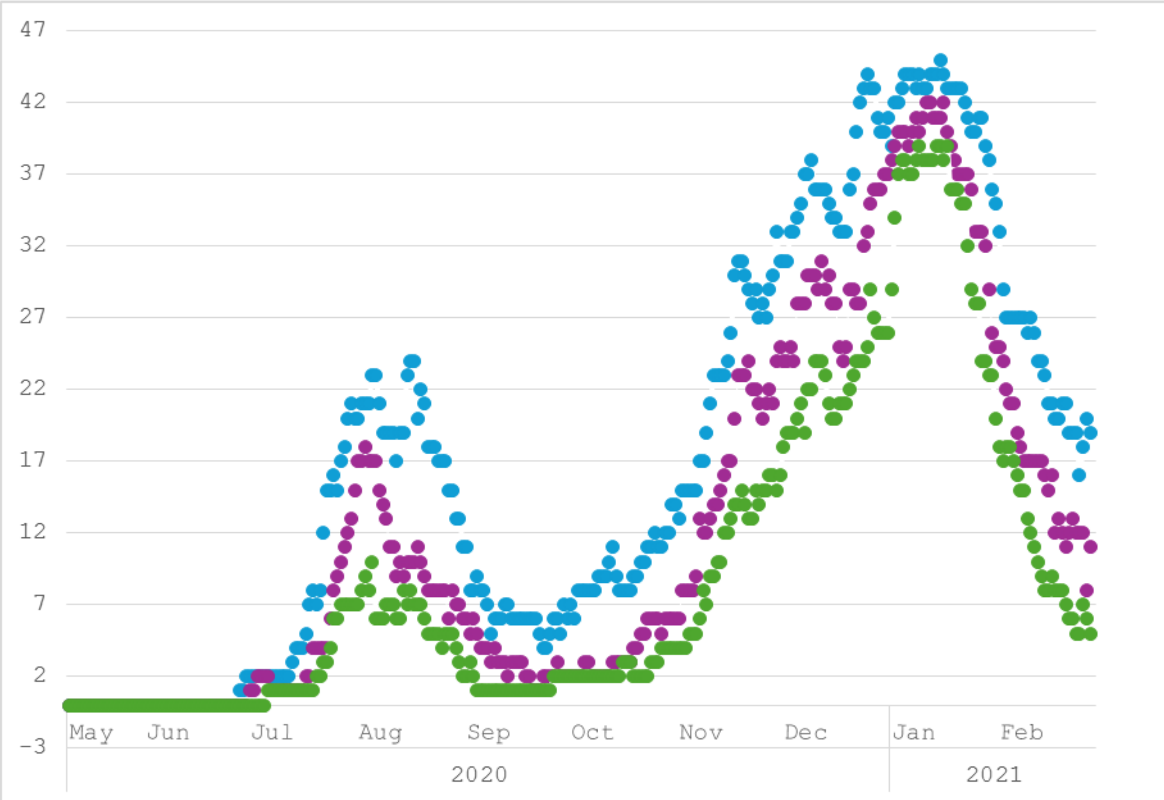
Note: Dependent variables were the number of prefectures with a higher weekly number of newly confirmed patients with COVID-19 per 100 thousand residents than a certain criterion of 3, 5 and 7. "Trend" is the daily time trend from May 11, 2020. "GTC" indicates the total number of GTC users per day, which were 234, 435, 476, 712, 855, and 381 thousand, respectively, in July–December, 2020.

Table 2: Estimation results of Poisson regression for time trend interaction with the number of GTC users during May 2020 – February, 2021

Criterion	3 cases		5 cases		7 cases	
Explanatory variable	Estimated coefficient	*p* value	Estimated coefficient	*p* value	Estimated coefficient	*p* value
June	16.05041	0.982	16.76416	0.99	13.93246	0.982
July	18.85393	0.979	19.55758	0.989	17.67173	0.977
August	18.85655	0.979	19.29084	0.989	17.82156	0.977
September	17.79011	0.98	17.85495	0.99	16.66781	0.978
October	18.186	0.98	18.46487	0.989	17.60761	0.977
November	18.90359	0.979	19.58151	0.989	19.18959	0.975
December	19.18764	0.979	19.92796	0.988	19.52731	0.974
January	19.11154	0.979	19.80009	0.988	19.39091	0.975
February	18.41228	0.98	18.77574	0.989	18.08435	0.976
Trend	0.004597	0.005	0.006353	0.001	0.000934	0.674
GTC*Trend	1.18E-05	0.192	1.05E-05	0.292	-2.3E-05	0.031
constant	-16.7119	0.982	-18.0344	0.989	-16.2869	0.979
Pseudo R^2	0.7167		0.7233		0.7354	

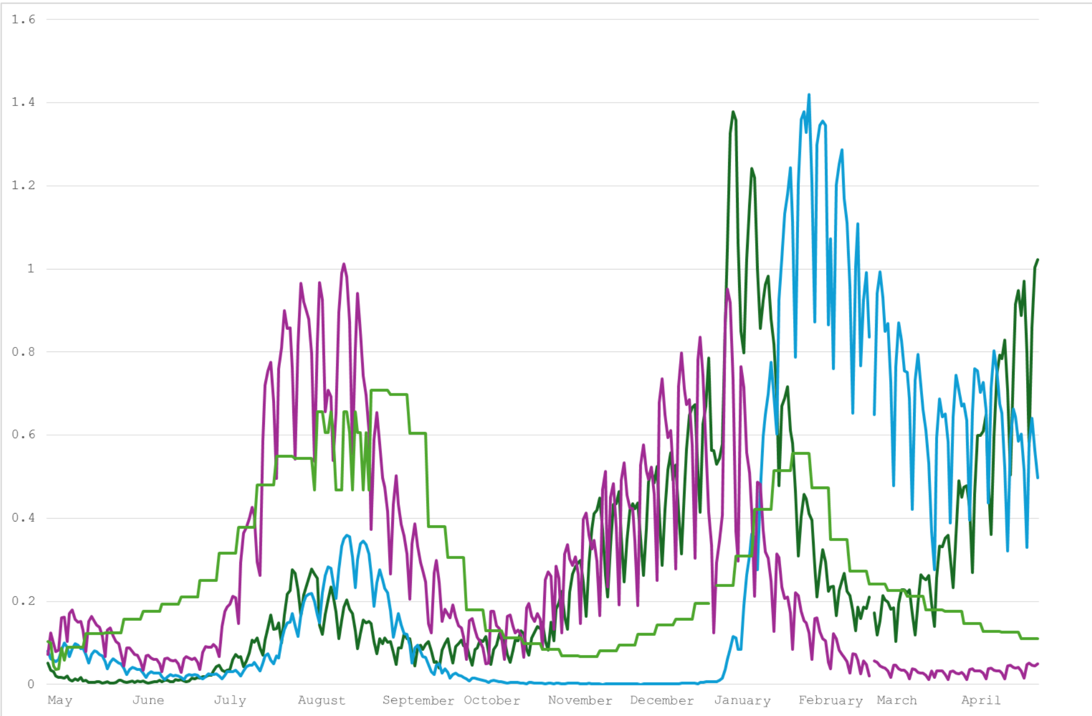
Note: Dependent variables were number of prefectures with higher weekly number of newly confirmed patients with COVID-19 per 100 thousands residents than a certain criterion, 3, 5 and 7. “Trend” is the daily time trend from May 11, 2020. “GTC” indicates the total number of GTC users per day, which were 234, 435, 476, 712, 855, and 381 thousand respectively in July–December, 2020.

Figure 1: Numbers of prefectures for which the weekly number of newly confirmed patients were higher than the criterion.



Note: Blue dots denote the number of prefectures when the criterion was three cases per 100 thousand residents, purple dots denote those when the criterion was five cases, and green dots denote those for seven cases.

Figure 2: Seasonal pattern of COVID-19 in Japan from May to the following April in the four seasons (%).



Note: Season for COVID-19 in this figure was defined to May 1 to the following April 30. Each line shows the percentage of number of patients in each day over the sum of patients in the season. Because the notification report had been discontinued and changed to sentinel surveillance on May 8, 2023, we adjusted the weekly total number of patients from sentinel surveillance multiply by 8/7 as number of patients in each day of the week for 2023 season. Therefore, it was a stepwise curve. The dark green line represents the 2020 season. The blue line represents the 2021season. The purple line represents the 2022 season. The light green line represents the 2023 season.