Suicide and mental health during the COVID-19 pandemic in Japan

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Abstract

Background: The coronavirus disease (COVID-19) pandemic is an unprecedented public health crisis, but its effect on suicide deaths is little understood.

Method: We analyzed data from monthly suicide statistics between January 2017 and August 2020 and online surveys on mental health among the general population during the COVID-19 pandemic in Japan.

Results: Compared to the last three years (2017-2019), the number of suicide deaths was lower during the initial phase of the pandemic but subsequently exceeded the past trend. By August 2020, the total number of suicides was 7.72% higher than the average number of suicides in the same month of the previous three years. The largest increase was found in suicides by young women (less than 40 years of age), with a 63.1% increase in August 2020 compared to the same month in the past three years. The number of suicides among students and housekeepers in summer months was notably larger in 2020. The survey data indicated that the status of mental health among young women was worse than that of women in other age groups. In addition, young female workers were more likely to have experienced a job or income loss in recent months compared to any other groups, suggesting adverse economic conditions surrounding some of these young female workers.

Conclusion: Our results strongly indicate that continuous monitoring of mental health, particularly that of the most vulnerable populations identified in this study, and appropriate suicide prevention efforts are necessary during and in the aftermath of the COVID-19 pandemic.

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Introduction

The coronavirus disease (COVID-19) pandemic is an unprecedented public health crisis that entails both physical and mental health consequences. Emerging evidence suggests that the COVID-19 pandemic severely affects mental health in the general population (e.g. Pierce et al., 2020). These findings correspond with the concerns that deteriorated mental health, in combination with higher unemployment rates during the pandemic, have the potential to increase the incidence of suicide worldwide (Gunnell et al., 2020; Kawohl & Nordt, 2020).

Despite this possibility, to our knowledge, no peer-reviewed study has documented how the current pandemic has affected the prevalence of suicide, due to the lack of reliable fast-reporting data. In response to this, this study examined the suicide deaths and mental health status of the general population during the COVID-19 pandemic in Japan. We focus on Japan for two reasons. First, Japan has one of the highest suicide rates in the OECD countries (OECD, n.d.). Its suicide rate (the number of suicide deaths per 100,000 population) as of 2018 was 16.5, with more than 20,000 people ended their life by suicide in that year alone (Ministry of Health, Labour and Welfare, 2019). Thus, the vulnerable population in Japan may be highly responsive to the crisis, which can result in a rapid increase in suicide deaths. Second, rapid-release monthly suicide statistics, in combination with our own monthly survey data, would allow us to closely monitor the status of mental health since the onset of the pandemic.

Japan had its first encounter with COVID-19 relatively earlier than the rest of the world. The first case was reported on January 16, 2020, followed by outbreaks on a cruise ship at Yokohama Port and in Hokkaido in February 2020. The first wave of COVID-19 cases was observed in April 2020, and a second larger wave of cases started in July 2020. As of August 31, 2020, the total number of confirmed COVID-19 cases was 67,077, and the number of deaths attributed to COVID-19 was 1,278, which translates to 10.15 deaths per one million persons. The number of new COVID-19 cases in Japan is shown in Fig 1 (Ministry of Health, Labour and Welfare, 2020a).

The Japanese government has imposed several measures to stem the tide of the pandemic. School closure started in early March. The Japanese government declared a state of emergency in major metropolitan areas on April 7, 2020, which was extended to the rest of Japan on April 16, 2020. Without introducing lockdown measures or strict domestic movement restrictions during the state of emergency, authorities requested non-essential businesses to close or opt to work remotely. Stores and restaurants were asked to operate for reduced hours. The state of emergency was lifted on May 25, 2020.

Methods

We analyzed the publicly available monthly suicide statistics tabulated by the National Police Agency (NPA) and published by the NPA and the Ministry of Health, Labour and Welfare of the Japanese government (Ministry of Health, Labour and Welfare, 2020b; National Police Agency, 2020). The NPA suicide statistics are based on police investigations of suicide cases. In Japan, the police investigate all suspected cases of suicide, and the agency records all deaths that are determined to be suicide in its suicide statistics data. We used its monthly tabulation between

January 2017 and the most recent available data, August 2020. There are two types of NPA data: the data tabulated based on the date that the deceased had been found and the data tabulated by the date of death. We used the former, as this is the most frequently updated data.

The NPA suicide data constitute one of the two official data sources on suicide deaths in Japan (Ministry of Health, Labour and Welfare, 2019). Another data source is the Vital Statistics of Japan that are drawn from the death certificates issued by physicians. The number of suicide deaths reported in these two data sets are closely related; For example, the number of suicides in 2018 according to the Vital Statistics was 20,465, and that according to the NPA data was 20,840 (Ministry of Health, Labour and Welfare, 2019). This study analyzed the NPA data because the monthly tabulation of the Vital Statistics data for early 2020 would not be released to the public until late 2020.

We examined the total number of deaths by suicide, the number of suicides by sex, age groups (less than 40 years old, 40-59 years old, and 60 years and older), and major occupation groups. We calculated monthly averages between 2017 and 2019 and compared them with the number of suicide deaths in the corresponding months in 2020 by calculating the percentage changes between the two periods. This part of the analysis used publicly available data, thus no ethics approval was necessary.

In addition, we assessed the status of mental health among the general Japanese population by using data from a series of monthly online surveys that we had been conducting since April 2020. We surveyed the general public each month, and the final sample in each round of the survey consisted of 1,000 respondents. We selected the respondents so that they were representative of the Japanese population in terms of their sex, age groups, and area of residence. A more detailed description of the survey is provided in Supplementary File 1. For the purposes of this study, we used the surveys taken between April and August 2020 (N=5,000).

As measures of mental health, we analyzed the prevalence of depressive and anxiety symptoms, measured by the Patient Health Questionnaire nine-item scale (Spitzer et al., 1999) and the seven-item General Anxiety Disorder scale (GAD-7) (Spitzer et al., 2006), respectively. We also examined the self-reported change in employment status of the respondents in the labor market to understand whether they had recently experienced major job-related changes during the COVID-19 pandemic. We only asked about the changes in employment status since June, and we used the data from June, July, and August 2020 when we analyzed the job-related changes of the respondents (N=3,000). We calculated the presence of depressive symptoms (PHQ-9 $\geq$ 10), anxiety symptoms (GAD-7 $\geq$ 10), as well as the percentages of those in the labor force who had lost their job, taken a leave or laid off from work, or experienced significant reduction in working hours in the last three months, and stratified them by sex and age groups.

The survey was approved by the Ethics Review Committee on Human Research of Waseda University (approval #: 2020-050) and Osaka School of International Public Policy, Osaka University. We used Python (version 3.7.3) to conduct all tabulations and to make figures and used R (version 4.0.2) to create Fig 1.

Results

The top panel of Fig 2 shows the percentage changes in the number of suicide deaths in Japan overall and by sex. The baseline period is the mean of 2017-2019 for each month. The number of suicide deaths in the two time periods is provided in Supp. Fig 1. The shaded area in the figure indicates the period of the state of emergency. During this period (April and May 2020), Japan experienced approximately a 20% decrease in suicide deaths. However, the declining trend observed in the spring reversed its course in July. By August, the total number of suicides in 2020 was 7.72% higher than the average number of suicides in the same month of the previous three years. The source of the increase was mainly female suicides; the number of suicides by women in August increased from 531.66 (the mean in 2017-2019) to 651 (in 2020), which corresponded to a 22.44% increase.

According to the bottom panels of Fig 2, which report the percentage increases in suicide by sex and age groups, suicide deaths by all demographic groups followed the same trajectories with an initial decline during the state of emergency, followed by an increase in July and August. We observed the largest increase in the summer months among young individuals (less than 40 years old) for both sexes. In particular, the incidence of suicide among young women was 63.1% higher in August 2020 (N = 193) than in the previous three years' average in the same month (mean = 118.33).

Fig 3 reports the percentage changes in the number of suicides between the previous three-year averages and the 2020 figures, by major occupation categories. There were no suicides by male housekeepers in our study period. Similarly, there was a monthly average of less than ten suicides by job-seeking women, thus it is not shown in the figure. The trend in suicide deaths by occupation is shown in Supp. Fig 2.

Fig 3 indicates that students and housekeepers experienced the largest increase after the initial decline during the state of emergency. For example, student suicides declined by nearly 25% during the school closure period (early March – May or June, depending on the area), then subsequently increased during the summer break. Student suicides in August averaged 62.66 during the past three years but increased to 114 in August 2020. Among them, 42 were university students, whose number of suicides in August was 28.5 in recent years (47.37% increase, not shown in the figure). The incidence of student suicides was higher among female students. Over the past three years, the average number of suicides by female students in August was 18.66, whereas the number of suicides by female students was 49 in August 2020, which translates into a 162.5% increase. The incidence of suicide among housekeepers also increased in July and August, with a 32.6% increase in August 2020 (N = 107) compared to the average figure (Mean = 80.66) over the past three years.

Among the employed, we also observed a larger increase in July and August among females than among males. As reported in the bottom-right panel in Fig 3, the number of suicides by employed women increased by 33.86% (105.33 to 141) and 19.81% (107.67 to 129) in July and August 2020, respectively, compared to the same months over the last three years.

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Fig 4 reports the percentages of those who were categorized as having depressive symptoms or anxiety disorders according to sex and age groups. The top panel shows the prevalence of depression based on their PHQ-9 score, and the bottom panel shows the percentages of those who were considered to have anxiety disorders based on their GAD-7 score. Overall, relatively young individuals who were less than 40 years old were more likely to have depressive and anxiety symptoms than other age groups. The June data reported the worst status of mental health for these young individuals, which was right after the state of emergency was lifted. The percentage of those with depressive and anxiety symptoms had either decreased or remained the same in July and August 2020 for all demographic groups.

Finally, Table 1 shows the percentages of the survey respondents in the labor force who reported that they had lost their job, took a leave/laid off from work, or experienced a drastic decrease in working hours over the past three months, stratified by sex and age groups. Overall, female respondents were more likely to have reported changes in their employment status and working hours, with 25.05% of female workers reporting as such, compared to 17.99% among male workers. Among the female workers, 30.56% of young individuals (less than 40 years old) reported drastic changes in employment and working conditions, whereas the corresponding number for middle-aged (age 40-59 years) women was lower at 23.97%.

Discussion

This study compared the monthly trajectories of suicide deaths in Japan during the COVID-19 pandemic to those in recent years. We found that the number of suicide deaths was lower during the initial phase of the pandemic than during the last three years. However, it subsequently exceeded the previous trend approximately two months after the state of emergency was lifted in Japan, coinciding with the second wave of infection. Notably, across all age and occupation groups, the largest increase was found among relatively young women. Women who were less than 40 years old died by suicide at a rate considerably higher in July and August 2020 than the past figures of the same months. We also found that the prevalence of suicide among students and housekeepers in summer months was notably higher in 2020 than the previous average.

While it is challenging to determine what lies behind the large increase in female suicides observed in July and August 2020, it should be noted that the job losses during the current pandemic were concentrated in the industries that are mainly served by women, such as the service, retail and travel industries (Statistics Bureau of Japan, 2020). The deterioration of the economy caused by the pandemic also hit economically vulnerable individuals who are more likely to be women. According to the latest labor statistics as of August 2020, the number of employed individuals in a non-permanent position, such as part-time or contract workers decreased for the six consecutive months since the onset of the pandemic. In August alone, the number of these precarious workers decreased by 1.2 million compared to the same month last year, out of which 0.84 million were women (Statistics Bureau of Japan, 2020). In contrast, the number of permanent employees has increased in recent months compared to 2019. Women of a precarious employment status, thus, largely felt the economic impact of the current pandemic. This may explain some of the increases observed in this study. It should also be noted that the occupation categories reported in the NPA data are based on the occupation at the time of death, and some women may have been categorized as housekeepers if they had lost their jobs prior to their death.

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The results of our survey also revealed the unfavorable psychological and economic conditions of young women. We found that the status of mental health among relatively young women (less than 40 years of age) was worse than that of women in other age groups, which may underlie their relatively high suicide rate in 2020. Relatively worse mental health conditions among young and economically vulnerable individuals was also reported in another study, in which other attributes of the respondents were explicitly controlled for (Michiko Ueda et al., 2020). In addition, as reported in Table 1, young female workers were more likely to have experienced a job or income loss in recent months compared to any other groups, suggesting adverse economic conditions surrounding some of these young female workers.

Another factor worth considering is the potential effect of school closure on the prevalence of suicides among students and relatively young women who tend to have school-age children. The former Prime Minister Shinzo Abe abruptly announced a request for school closure on February 27, 2020, and almost all schools and childcare facilities complied with the request on March 2, 2020. This unexpected school closure caused a major disruption for working parents, as most businesses had not yet arranged for remote work in early March. While the connection between school closure and the departure from work by women, as described above, or suicides by young women remains unclear, the burden of school closure was most likely be borne by women as they spend more time on child-rearing than men do in Japan (Cabinet Office, 2019).

The increase in student suicides during the summer break identified in this study was notable because the summer is typically characterized by a decline in suicide deaths among students (Matsubayashi et al., 2016). Our surveys did not contain many student respondents, but the results indicate that their mental health condition was worse than most of the other occupation categories (Supplementary Table 1). For example, 28.85% of the surveyed students (N = 107) were classified as depressed during the study period. Similarly, a survey conducted between June and July (after school reopening) by the National Center for Child Health and Development reported that 72% of surveyed students (age 7-17 years) reported symptoms that indicated some form of stress reactions (National Center for Child Health and Development 2020). Returning to school after a summer break is known to be difficult for some students even in normal years, and student suicides have previously peaked on the first day of school after the summer break, specifically on September 1st (Matsubayashi et al., 2016). Many schools reopened in August this year because of the shortened school days in the spring, and thus the peak may have shifted earlier.

At the same time, however, it is also important to note that suicide among university students experienced a similarly large increase in August. Most universities in Japan switched to online teaching when the new academic year started in April, and many continued to do so even after the state of emergency was lifted in late May (Ministry of Education, Culture, Sports, Science and Technology, 2020). Since university students did not return to school in August, the school calendar cannot explain the high incidence of suicide in that month. Instead, it is possible that some university students were under distress as online and solitary learning without on-campus activities largely continued until late September. This is in sharp contrast to students in elementary to high schools who returned to school by June. More work is necessary to understand the association between school closure and student suicide.

Another important factor that we need to consider is the potential effect of media reporting on celebrity suicide. Several well-known individuals died by suicide during the pandemic, and two notable instances were a death of a male actor who died at the age of 30 on July 18th, 2020 and another suicide death of a 40-year-old actress on September 27th, 2020. Both of them were at the height of their career and their deaths were regarded as unexpected. According to a study in Japan, the number of suicides tends to increase at least five percent instantly following the media reporting on celebrity suicide, and such an increase can last up to 10 days after the initial report on their death (Ueda et al., 2014). The subsequent increase in actual suicides is estimated to be particularly large when their deaths are widely discussed on SNS or when they are regarded as a "surprise" (Fahey et al., 2018; Ueda et al., 2017). Given that the abovementioned prominent cases satisfy these two conditions, their deaths and associated media reporting may have affected the number of subsequent suicide deaths by the public.

Although the number of suicides increased starting in July 2020, Japan experienced a large drop in suicide deaths at the initial phase of the pandemic when the state of emergency was in place. There could be multiple reasons for the decline, but it is possible that remote work and associated reduced commuting during the period contributed to some of the decline. During the state of emergency, many non-essential businesses switched to remote work, which is a rare practice in Japan, and consequently, many workers were spared from commuting to work. In the first week after the declaration of the state of emergency, the number of commuters at major stations in Tokyo during the peak commuting time on weekdays declined to 30% of the pre-COVID levels (Ministry of Land, Infrastructure, Transport and Tourism, 2020). Remote work may have eased the physical and psychological burdens of a long commute and possibly long working hours.

It may also be possible to attribute the observed reduction in suicide to enhanced social connectedness during times of crisis. For instance, the level of social connectedness and altruism is known to increase in the aftermath of natural disasters (Matsubayashi et al., 2013), and if natural disasters and the current pandemic share certain similarities, enhanced connectedness may have worked as a protective factor with regard to suicide risks.

There are several limitations of this study that should be noted. First, we based our analysis of suicide deaths on provisional data, which can be corrected upward in subsequent months. However, the data used in this study were tabulated by the dates that the deceased was found, and thus the subsequent correction should be minimal. We also checked if our main results hold if we use the data tabulated by the date of death and confirmed the same trend. We used the data tabulated by the date that the deceased was found because NPA uses this data for its official announcement, and thus it is the most frequently updated data. Second, our data on suicide deaths are aggregate in nature, thus we could not control for the effects of confounders in our analysis. Researchers have no access to individual NPA data, and more refined analysis should wait until the release of individual data from the Vital Statistics. However, the Vital Statistics data do not contain detailed occupation data of the deceased and analyzing the NPA data has certain advantages. Third, online surveys were the basis of our survey data concerning mental health status as well as job-related conditions. While our respondents were not a convenience sample, it is possible that our sampling scheme did not capture certain segments of the population, including those with no access to the internet.

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Despite these limitations, the present study makes an important contribution to the literature by reporting the trajectories of suicide deaths during the COVID-19 pandemic and by highlighting the most vulnerable populations during this unprecedented public health crisis. The experience in Japan may provide valuable implications for other countries. Given that the most affected industries were those mainly served by women in many other countries, it is likely that women constitute one of the highest risk groups for suicide in those countries as well. Similarly, future study should investigate the impact of school closure on schoolchildren and university students in Japan and in other countries, because many countries also introduced school closure during the peak period of the pandemic. The results of our study strongly indicate that continuous monitoring of mental health and appropriate suicide prevention efforts are necessary during and in the aftermath of the COVID-19 pandemic.

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Table 1: The reported experience of major change in employment status or working hours by sex and age groups: June - August 2020

	All	Experienced major change in employment status or working hours	
	N	N	%
Total	2291	486	21.21
Female, Age <40	373	114	30.56
Female, Age 40-59	438	105	23.97
Female, Age 60-	235	43	18.30
Female (all ages)	1046	262	25.05
Male, Age <40	440	82	18.64
Male, Age 40-59	519	83	15.99
Male, Age 60-	286	59	20.63
Male (all ages)	1245	224	17.99

Note: The data represent respondents from the three original surveys taken between June and August 2020. Only respondents in the labor force (N=2291) were included in the tabulation. The exact question asked in the survey was "During the past three months, have you experienced a job loss, a layoff/temporary leave of absence, or significant reduction in working hours?"

Fig 1. The number of new COVID-19 cases in Japan
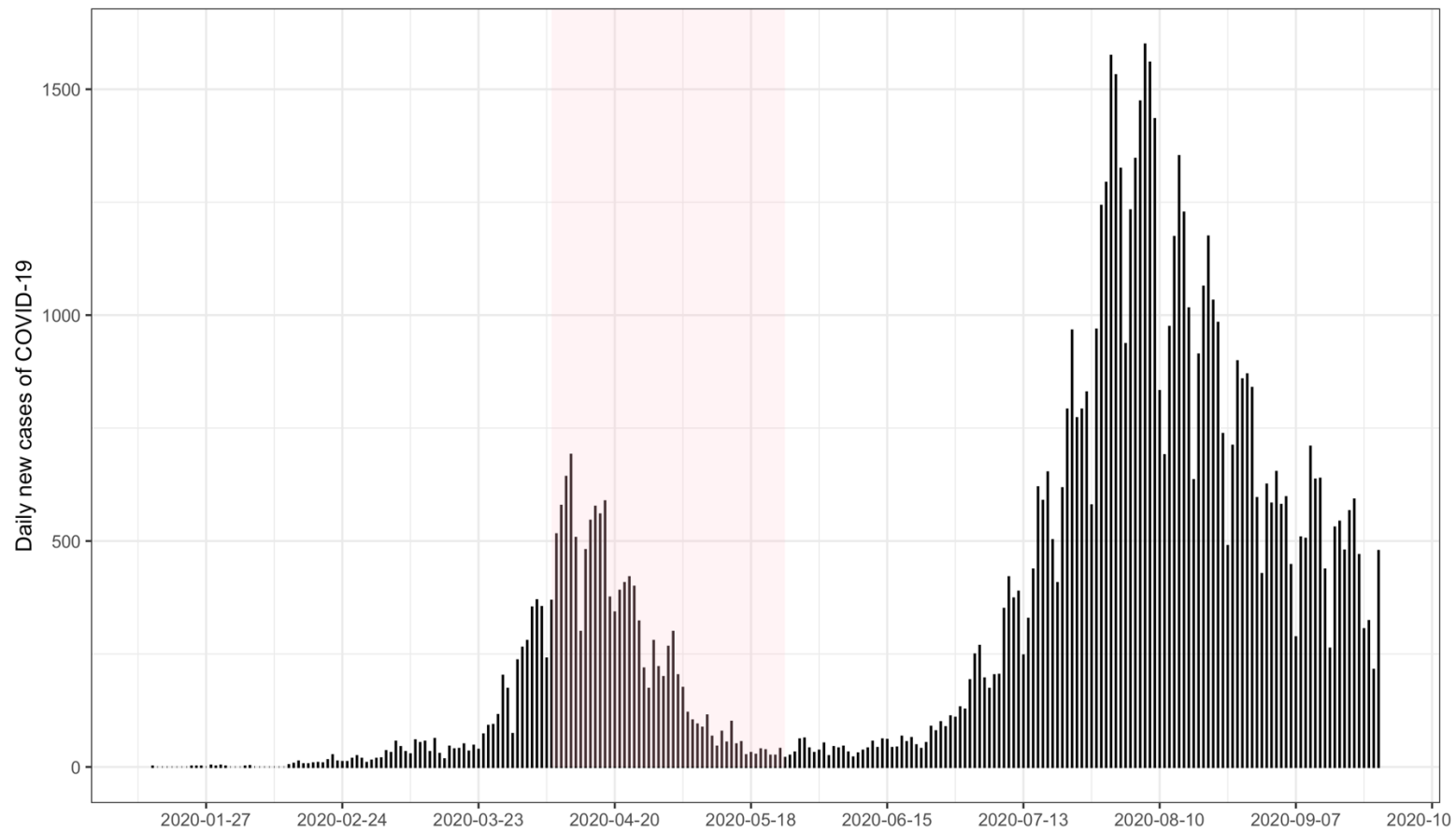
Note: The shaded area indicates the period of the state of emergency (April 7- May 25).

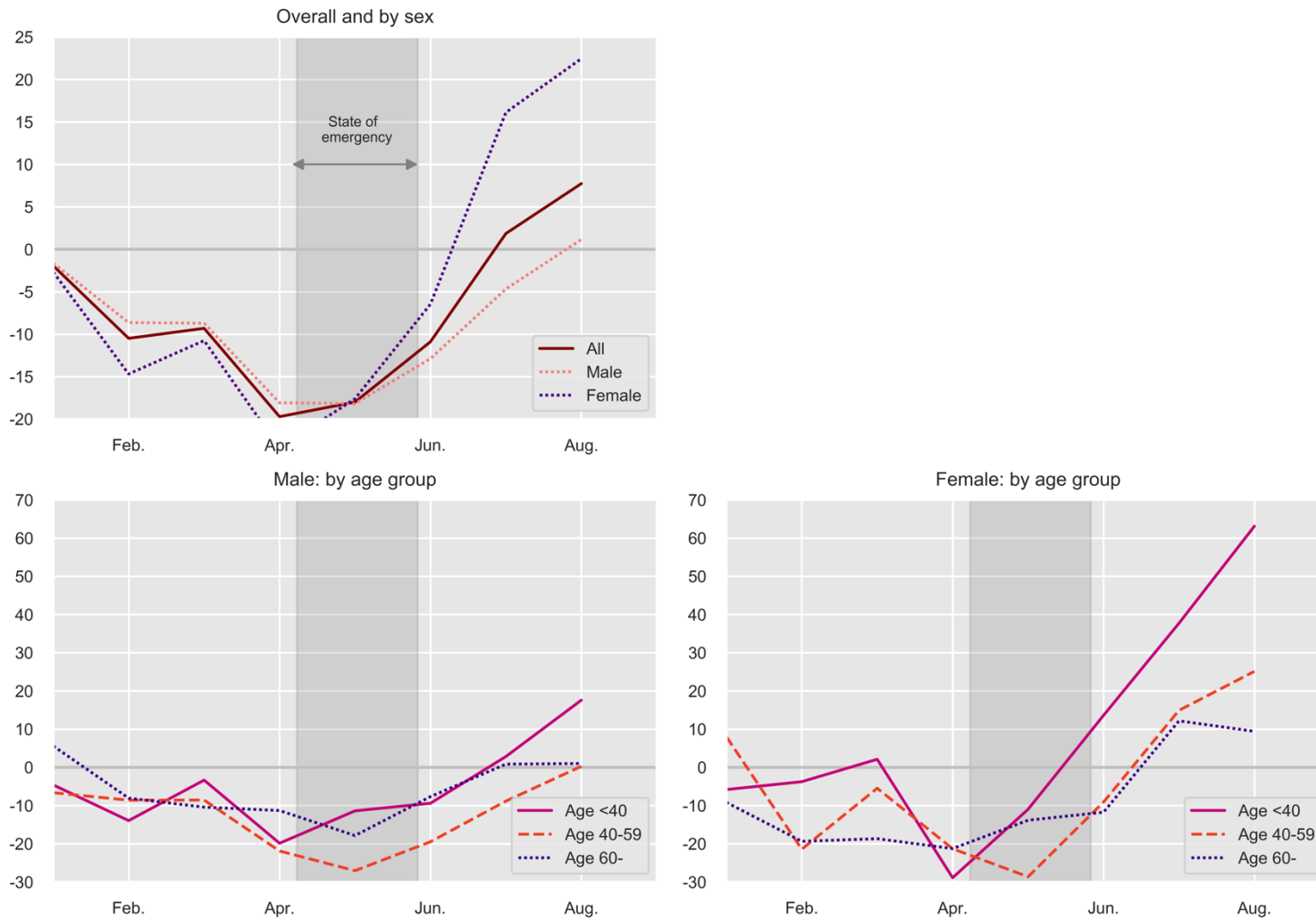Fig. 2: The percentage changes in suicide in Japan between 2020 and 2017-2019

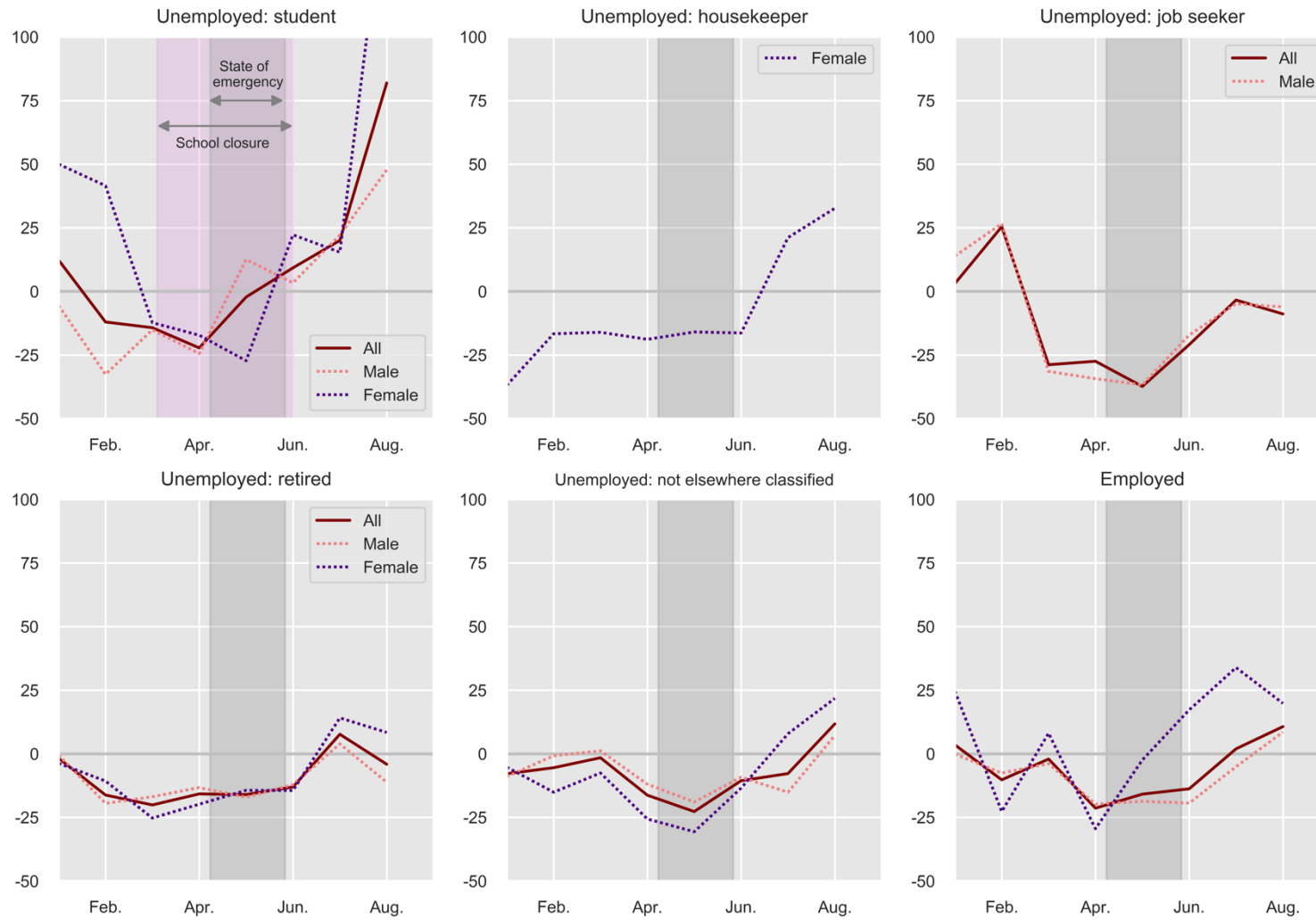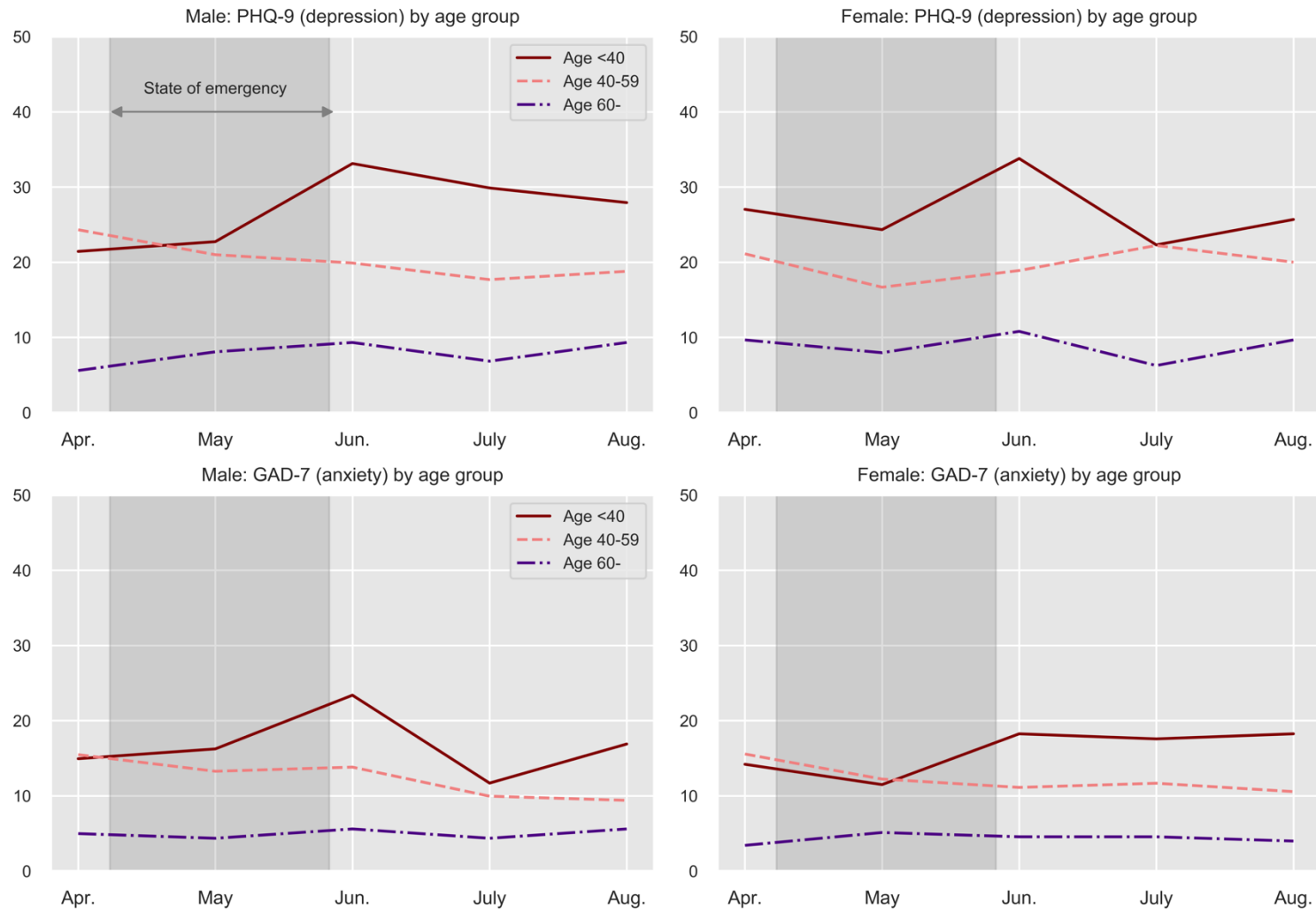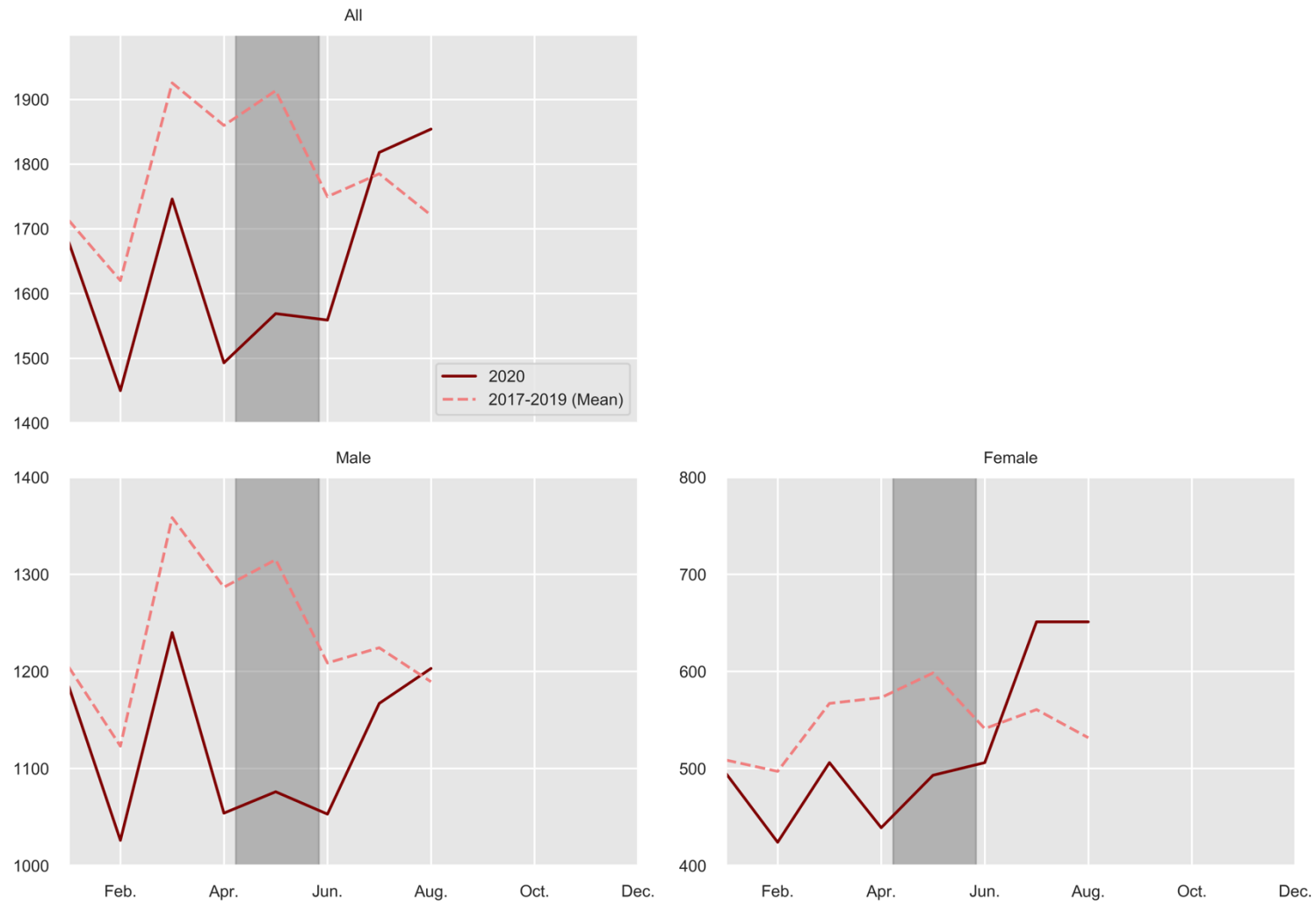Fig. 3: The percentage changes in suicide in Japan between 2020 and 2017-2019 by occupation

Fig 4. The prevalence of depressive/anxiety symptoms in Japan by sex/age group and employment status: April - Aug. 2020

Male: PHQ-9 (depression) by age group

Female: PHQ-9 (depression) by age group

State of emergency

Age <40
Age 40-59
Age 60-

Male: GAD-7 (anxiety) by age group

Female: GAD-7 (anxiety) by age group

Age <40
Age 40-59
Age 60-

Supp. Fig 1: The number of suicides in Japan in 2020 and 2017-2019

Supp. Fig. 2: The number of suicides in Japan by occupation in 2020 and 2017-2019
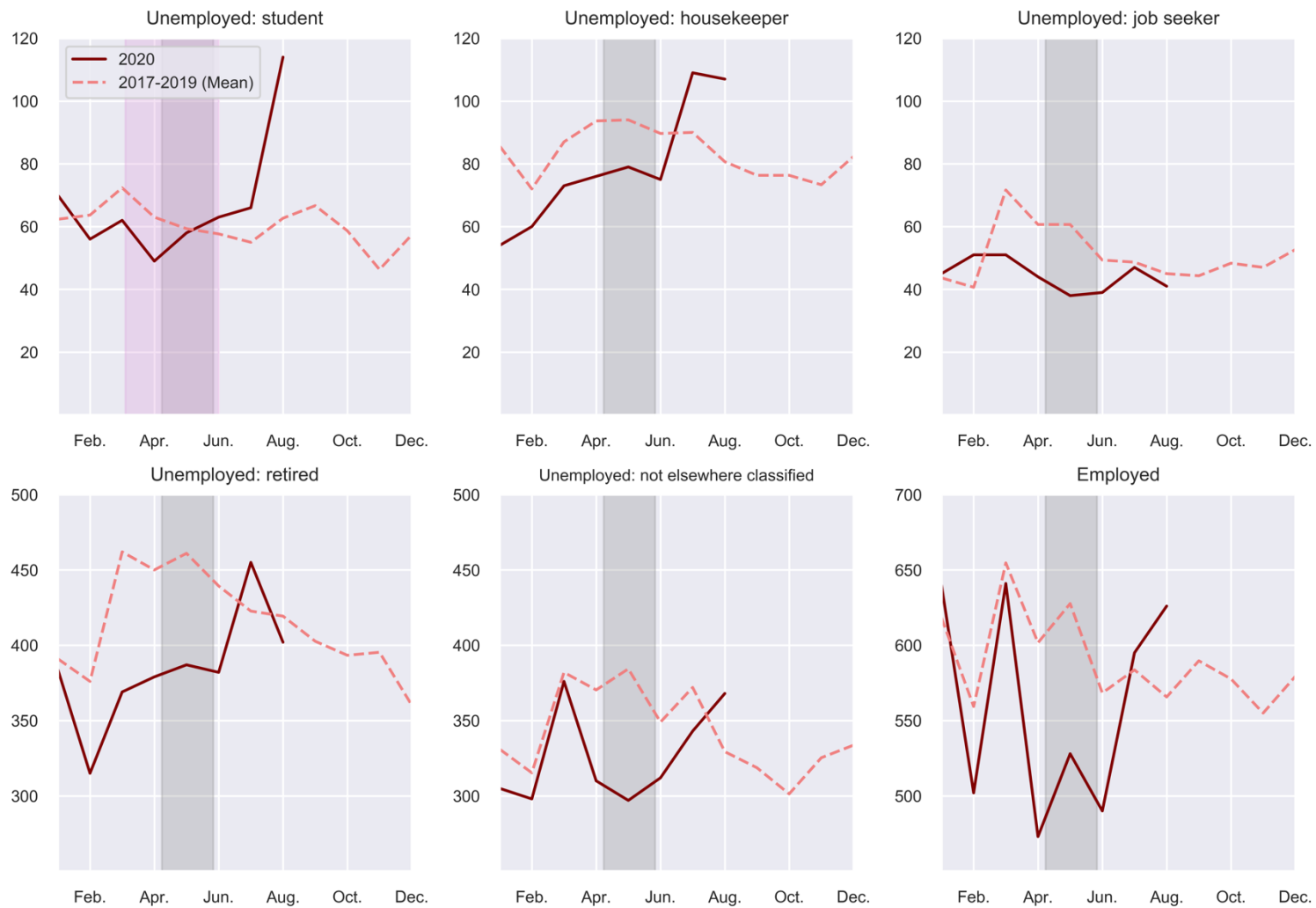
Supplementary file 1: Description of the online surveys

The status of mental health and economic conditions of the general population reported in this study were based on a series of ongoing monthly surveys. We sampled our respondents from a web panel of a major commercial survey company in Japan, the Survey Research Center. Each time, the survey company sent out screening questions to approximately 10,000 registered individuals and then constructed a final sample of 1,000 respondents so that they were representative of the Japanese population in terms of their sex, age groups, and area of residence.

Each of the surveys was conducted on the following dates:

1st survey – April 16-18
2nd survey – May 15-17
3rd survey – June 17-19
4th survey – July 17-21
5th survey – August 24-26

Supplementary Table 1. The prevalence of depressive and anxiety symptoms by employment status

	N	% PHQ9 >=10 (depression)	% GAD7 >=10 (anxiety)
Permanent employee	1835	20.44	11.83
Part-time/temporary worker	536	20.15	12.13
Self-employed	201	13.43	5.47
Unemployed, laid off, on leave	294	30.61	22.79
Not in the labor force	2030	13.69	8.28
Student	104	28.85	17.31
All	5000	18.16	10.92

Note: The data represent respondents from the five original surveys taken between April and August 2020.