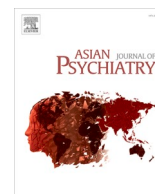




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Short communication

Is an increase in Japan's suicides caused by COVID-19 alone?

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ABSTRACT

Similar to other countries, the Japanese government quickly undertook preventative measures against increasing suicides during the pandemic, but could not suppress the increase. Suicide mortality among both sexes under 20 and females aged 20–39 significantly increased during the pandemic, but unexpectedly had already slowed decreasing trends before the pandemic onset. Furthermore, before the pandemic, a higher complete unemployment rate contributed to increasing suicide mortality of both sexes, whereas during the pandemic, the positive relationship between females suicide mortalities and complete unemployment rates was not observed.

1. Introduction

In the early stages of the COVID-19 pandemic, there were concerns about the increasing suicides due to the socioeconomic/psychosocial deteriorations (Fountoulakis et al., 2022; Gunnell et al., 2020; Kawohl and Nordt, 2020; Klomek, 2020; Tandon, 2021); however, to our knowledge, Japan and India were the only countries where this phenomenon was accentuated during the pandemic (Arya et al., 2022; Matsumoto et al., 2022, 2021; Menon et al., 2021; Okada et al., 2022; Seposo, 2021; Yoshioka et al., 2022). Both Japan and India were known for their success in decreasing suicides before the pandemic (Arya et al., 2022; Kato and Okada, 2019; Okada et al., 2020; Shiroyama et al., 2021). The suicide trends in Japan contrasted with the decreasing ones in the United States during the pandemic, where suicides had increased before the pandemic (Ehlman et al., 2022). The fact that suicides increased for the second consecutive year in 2020–2021 (although less than the five-year average before the pandemic) (Tandon, 2021) is a crucial problem for Japan, where suicides continued to decrease in the past decade before the pandemic.

Several studies reported that the governmental measures for preventing the COVID-19 expansion in the communities possibly suppressed not only the COVID-19 but also the number of suicides. This was done via countermeasures against restriction measures, such as supports for economic and mental health, in Germany, Canada, and the United States (Bray et al., 2021; McIntyre et al., 2021; Mitchell and Li, 2021; Radeloff et al., 2021). In Japan, the Ministry of Health, Labour and Welfare (MHLW) budgeted for “Suicide prevention measures in response to COVID-19 pandemic” (MHLW, 2022b). This measure was essentially

enhanced program of the conventional governmental “Regional comprehensive suicide prevention program” (RCSPP) (MHLW, 2022b), which had contributed to continuous decreasing suicides between 2009 and 2019 in Japan (Hasegawa et al., 2021; Nakano et al., 2021; Okada et al., 2020).

Despite these efforts, increasing suicides during the pandemic suggests that factors other than the pandemic played important roles in increasing suicides in Japan during 2020–2021. According to this hypothesis, this study determined the fluctuation trends in annual suicide mortalities disaggregated by gender/age during 2009–2021, and the fixed-effect of complete unemployment rate (CUR), which has been a major target for RCSPP in Japan (Nakamoto et al., 2021), on suicide mortality between before and during the pandemic.

2. Methods

Prefectural annual/quarterly suicide numbers, population sizes, and quarterly complete unemployment rates (CUR) were obtained from Basic Data on Suicide in the Region (BDSR), Regional Statistics Database, and Labor Force Survey, respectively (JILPT, 2022; MHLW, 2022a; SBMIAC, 2022). Prefectural standardized suicide mortality per 100,000 inhabitants (SMR), disaggregated by sex/age, were calculated by dividing the numbers by the prefecture population in the same year. SMR was calculated using “Empirical Bayes Estimator for Poisson-gamma Model” to eliminate the artifacts induced by small prefectural populations (NIPH, 2022). Trends of average of 47 annual prefectural SMRs during 2009–2021 were analyzed with joinpoint regression model (NCI, 2022). The fixed-effects of quarterly CUR on

Abbreviations: ANOVA, Analysis of variance; BDSR, Basic Data on Suicide in the Region; CUR, Complete unemployment rate; MHLW, Ministry of Health, Labor and Welfare; RCSPP, Regional comprehensive suicide prevention program; SMR, Standardized suicide mortality rates per 100,000 inhabitants.

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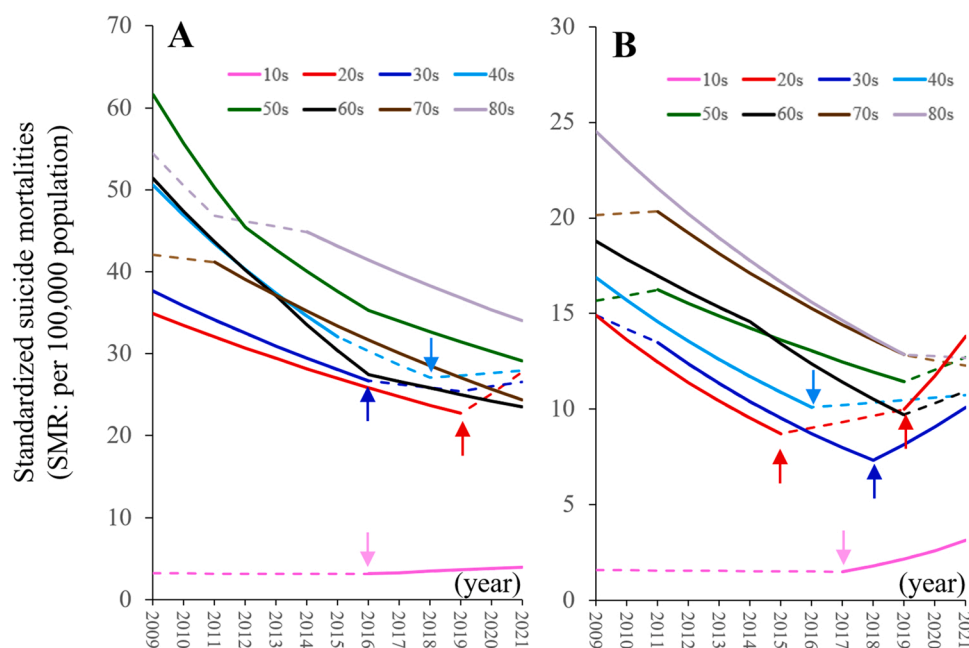


Fig. 1. Trends of SMRs disaggregated by genders (males and females) and ages (under 20 age (10 s), 20–29 (20 s), 30–39 (30 s), 40–49 (40 s), 50–59 (50 s), 60–69 (60 s), 70–79 (70 s) and over 80 ages (80 s)) during 2009–2021 in Japan. Fig. A and B indicate the SMRs among males and females, respectively. Ordinate and abscissa indicate the SMR (per 100,000 population) and years, respectively. Solid lines indicate significant change. Arrows indicate the joinpoint (turn from significantly decrease to not significant change before the pandemic).

Table 1

Impacts of CUR on SMR between before and during the COVID-19 pandemic.

Male					During				
Age	Before	SE	T	p	β	SE	T	p	
10 s	-0.340	0.224	-1.514	0.130	0.038	0.668	0.057	0.955	
20 s	1.751	0.874	2.003	0.045	2.761	1.703	1.621	0.112	*
30 s	1.630	0.243	6.702	< 0.001	3.862	1.288	2.999	0.003	**
40 s	3.752	0.367	10.220	< 0.001	1.891	0.574	3.296	0.001	**
50 s	3.405	0.350	9.721	< 0.001	1.795	0.582	3.083	0.002	**
60 s	3.102	0.205	15.110	< 0.001	3.272	1.273	2.570	0.010	*
70 s	2.520	0.210	11.980	< 0.001	1.286	0.427	3.010	0.003	**
80 s	2.803	0.458	6.126	< 0.001	0.490	1.107	0.443	0.658	
Total	2.043	0.561	3.646	< 0.001	1.907	0.693	2.749	0.006	**
Female					During				
Age	Before	SE	T	p	β	SE	T	p	
10 s	-0.250	0.184	-1.357	0.175	0.937	0.582	1.609	0.108	
20 s	0.282	0.458	0.616	0.538	1.081	1.304	0.829	0.407	
30 s	1.157	0.431	2.686	0.007	0.573	1.131	0.506	0.613	*
40 s	0.653	0.183	3.574	< 0.001	1.125	1.243	0.905	0.365	
50 s	0.896	0.387	2.318	< 0.001	0.605	1.067	0.567	0.571	
60 s	1.483	0.170	8.728	< 0.001	0.559	0.782	0.715	0.474	
70 s	2.534	0.366	6.929	< 0.001	2.860	1.444	1.980	0.054	*
80 s	2.280	0.623	3.661	< 0.001	0.025	0.995	0.026	0.980	
Total	0.980	0.286	3.433	0.001	0.744	0.658	1.130	0.259	

β: coefficient value, SE: standard error, T: T-value of hierarchical linear regression model analysis with robust standard error. *P < 0.05 and **P < 0.01 by hierarchical linear regression model analysis with robust standard error.

SMR before (April/2018–March/2020) and during the pandemic (April/2020–March/2022) were analyzed by hierarchical linear regression with robust standard errors (Gretl v2022b) (Gretl, 2022). Comparisons between average SMR before (2015–2019) and during the pandemic (2020 and 2021) were analyzed using analysis of variance (ANOVA) with Tukey's post-hoc analysis. The Medical Ethics Review Committee of Mie University exempted this research from ethical approval because it only used publicly available data. This study followed the STROBE reporting guidelines for cohort studies. There were no missing values in this study.

3. Results

SMRs among males aged over 50 showed consistently decreasing trends before and during the pandemic (Fig. 1A). SMRs among males aged 20–49 indicated decreasing trends before the pandemic, which

were absent during the pandemic (Fig. 1A). SMRs among females aged over 40 decreased before the pandemic, but this trend was absent during the pandemic (Fig. 1B). SMR of females aged 30–39 turned from decreasing to increasing in 2018 (Fig. 1B). SMR of females aged 20–29 also decreased until 2015 (trend abolished during 2015–2019), but turned to increasing in 2019 (Fig. 1B). SMRs of males and females under 20 showed no change and then increased in 2016 and 2017, respectively (Figs. 1AB). SMRs for females under 50 and males under 30 during the pandemic increased compared to the average before the pandemic, whereas SMRs for males over 50 and females aged 70–79 during the pandemic decreased (Supplementary Figure). Before the pandemic, CUR positively related to SMRs of males over 20 and females over 30; however, during the pandemic, CUR positively related to SMRs among males aged 30–79, but surprisingly, had no relationship with females SMRs (Table 1).

4. Discussion

This study demonstrated that in Japan, the decreasing trends of SMR during the pandemic generally stalled compared to before the pandemic, except for males over 50 years old. Notably, SMRs among males under 20 and females under 40, that significantly showed increasing trends during the pandemic, had already indicated slowing decreasing trends, or turned increasing before the onset of the pandemic. Therefore, the decreasing trends of suicide in high-risk subgroups, which were not benefited by traditional RCSPP, had already stalled before the pandemic, but SMRs of high-risk subgroups decisively increased during the pandemic. This decisive turn into increasing suicides during the pandemic is probably contributed by something to do with what traditional RCSPP cannot address. To examine this speculation, this study determined the impacts of CUR, one of the major targets of traditional RCSPP, on SMRs between before and during the pandemic. According to expectations, CUR contributed to the increasing SMR of both males and females before the pandemic (Kato and Okada, 2019; Nakamoto et al., 2021; Okada et al., 2020), whereas during the pandemic, the relationship between CUR and SMRs of high-risk subgroups, males aged 20–29 and females, was not observed.

Several studies using regression analyses revealed that the decreasing trends during the pre-pandemic in turn increased during the pandemic in Japan (Seposo, 2021; Yoshioka et al., 2022). However, when excess mortality statistics for a particular periods are reported, it has been recommended that the suicide mortality generally needs to be compared not only with the previous year, but also with the average of the past five years (Aron and Muellbauer, 2020; Tandon, 2021). Indeed, suicide mortality was 3 % higher in 2020 than in 2019, but 5% reduction in 2020 in comparison to the five year average (2015–2019) (Seposo, 2021; Tandon, 2021). In response to these concerns, this study additionally analyzed the SMRs during the pandemic compared to the averages during the pre-pandemic period (2015–2019). ANOVA detected the similar results of joinpoint regression, sustained decreasing SMR of males over 50, and vulnerabilities of younger populations (males under 30 and females under 50).

Although neither risk factors insensitive to traditional RCSPP before the pandemic nor ‘Suicide Prevention Measures in Response to COVID-19 Pandemic’ during the pandemic could be identified in this study, a recent study reported that transformed lifestyles in Japan played an important role in the increasing suicide during the pandemic (Matsumoto et al., 2022). The drastic changes in recreation expenditures, such as the increasing and decreasing expenditures on respective content distribution and pubs, probably contributed to the increasing suicides in females and the younger population during the pandemic (Matsumoto et al., 2022). Remote communication using the internet is becoming an essential tool for “new normal” lifestyles during the pandemic (Salon et al., 2021), whereas it is concerned that excessive online activity and internet usage lead to a range of mental health disorders (Dresp-Langley and Hutt, 2022). This tendency seems to be more pronounced in females and the younger population compared to males and elderly, respectively (Dresp-Langley and Hutt, 2022; Matsumoto et al., 2022; Okada et al., 2022). Decreased expenditures on pubs contributed to increased suicides in the non-metropolitan regions in Japan (Matsumoto et al., 2022). Thus, pubs might have functioned as an important social gathering and/or communication places with other persons, rather than merely serving alcohol in Japan (Matsumoto et al., 2022; Okada et al., 2022).

The BDSR data indicates the increased suicides of several high-risk subgroups, but those of other subgroups remained to decrease or did not change during the COVID-19 pandemic in Japan compared to pre-pandemic (Matsumoto et al., 2022, 2021; Okada et al., 2022; Seposo, 2021; Yoshioka et al., 2022). This discrepancy between SMRs of the high-risk and other subgroups during the pandemic had been observed as similar tendencies before the pandemic. In the context of the COVID-19 pandemic, although we had recognized the importance of expeditious statistical information of suicides, but in the future, to

contribute to the improvement/protect of public health in Japan, we should inform the robust suicide statistical analysis for providing the opportunity of scientifically evidence-based discussion. In other words, the overly embellished “increased suicides due to the pandemic” phrasing is not only inconsistent with actuality but also may miss important risk factors in increasing suicide (Tandon, 2021).

Declaration of Competing Interest

The authors declare no conflicts of interest relevant to the contents of the manuscript.

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Ethics statement

Ethical approval and informed consent were exempted by the Medical Ethics Review Committee of Mie University because the present study only used publicly available data.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.ajp.2022.103320](https://doi.org/10.1016/j.ajp.2022.103320).

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