Suicide by gender and 10-year age groups during the COVID-19 pandemic vs previous five years in Japan: An analysis of national vital statistics

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ABSTRACT

Using daily vital statistics data from the Japanese Ministry of Health, Labour and Welfare, we provide the first weekly and age-group-specific estimates of the additional suicide burden during the COVID-19 pandemic in Japan by gender, from January through November 2020. Our results indicate that compared with the previous five years, suicide cases in 2020 in Japan have increased from late July to November for women in all age groups and for men in the 20–29 and 80+ years age group. Targeted interventions based on age and gender might be more effective in reducing suicide during the COVID-19 pandemic in Japan.

Many studies have raised concerns that the 2019 novel coronavirus disease (COVID-19) has exacerbated multiple factors that may increase suicides, such as isolation, fear, marginalization, psychological disorders, economic fallout, and domestic abuse and intimate partner violence (Banerjee et al., 2021; Gunnell et al., 2020; Kawohl and Nordt, 2020; Reger et al., 2020). Suicide mortality varies considerably by age and gender in Japan, with much higher rates in men and older age groups (Dhungel et al., 2019), and it is important to understand how these patterns are affected by lockdowns and pandemic restrictions. According to a previous study using published monthly data on the number of suicides in Japan (Nomura et al., 2021), in 2020, excess suicide deaths were observed among women from July onward, especially in October, with an estimated increase of 72–84% compared to previous years. For men, the excess number of suicide deaths was also observed in October, with an estimated increase of 10–22% compared to

previous years. This report provides more detailed estimates of the additional suicide burden during the COVID-19 pandemic in Japan by gender, using for the first time daily, individual-level vital statistics data from the Ministry of Health, Labour and Welfare of Japan (MHLW) from January through November 2020. This data allowed for estimates on a weekly basis and by 10-year age group, which can better inform and tailor suicide prevention measures.

Methods

In this study, we obtained daily data on the number of suicide deaths from the MHLW. Data from 2012 (including the last few days of 2011 for weekly analysis purposes) through November 2020 were considered in this analysis. The target population covered by vital statistics is all persons who have resident cards and died in Japan, regardless of

nationality.

To estimate the expected weekly number of deaths from suicide, a quasi-Poisson regression model was used. We employed the Farrington algorithm for the estimation of parameters in the regression (Farrington et al., 1996; Noufaily et al., 2013). The Farrington algorithm is designed to limit the data for the estimation, as detailed in the supplementary material and elsewhere (Bedubourg and Le Strat, 2017; Noufaily et al., 2013): in the present study, the expected number of suicide deaths for each week was estimated using the data from the three weeks before and after the same week for the previous five years. This is the same parameter selection that was applied in the original paper that developed this algorithm (Farrington et al., 1996; Noufaily et al., 2013). This means that, for example, data from 2015 to 2019 was used to estimate the expected number of deaths in 2020.

The regression estimation was stratified by gender and age group (0–19, 20–29, 30–39, 40–49, 50–59, 60–69, 70–79, and 80+ years). These age groups were determined by considering the number of persons sufficient for analysis. The conversion from daily data to weekly data is based on the categorization used by the National Institute of Infectious Diseases' Infectious Diseases Weekly Report (National Institute of Infectious Diseases 2021).

The point estimate and upper bound of the two-sided 95% prediction interval were set as the threshold for excess deaths, and the point estimate and lower bound as the threshold for exiguous deaths—the number of deaths that is greater/lesser than would be expected under normal circumstances (e.g. in the absence of the pandemic). A range for excess and exiguous deaths was then obtained from the differences between the observed deaths and each of these thresholds. As a measure of the magnitude of the suicide burden of the COVID-19 pandemic, we calculated the percent excess and deficit as the number of excess and exiguous deaths divided by the threshold, respectively.

Since weekly excess and exiguous suicide deaths could occur in the past due to a variety of factors (including psychological, environmental, societal, and interpersonal), this study also reports excess and exiguous suicide deaths in the same period in 2017–2019 in order to compare the magnitude of excess and exiguous deaths during the COVID-19 pandemic with the past.

Results

For women, from January through November 2020, 6251 suicides were observed in Japan, of which 15.93% were in the age group 70–79 years, followed by 15.50% and 15.20% in the age groups 40–49 and 50–59 years, respectively. The first significant excess deaths in 2020 were observed from late July to early August, and although not every week, excess suicide deaths were observed most weeks through November, with the exception of the 0–19 and 80+ age groups (Fig. 1). In the 0–19 and 80+ age groups, excess suicide deaths were also observed in some weeks, albeit sporadically, from August and October, respectively. The largest total number of excess suicide deaths during the period was observed in the 40–49 age group (excess deaths 92–223), with the peak in the week of September 28 to October 4 (excess deaths 35–42, percent excess 205.88–247.06). Exiguous suicide deaths in 2020 were not observed in any age group for most weeks during the study period, while a few exiguous suicide deaths were observed in the age groups 40–49, 50–59, and 80+ years in April and May. Exact values of the weekly number of observed suicide deaths and weekly number of excess and exiguous suicide deaths are provided in the supplementary tables 1 and 2, respectively. The total number of excess and exiguous suicide deaths from January through November in 2020, as well as in 2017–2019 are provided in the supplementary tables 3, which shows that the total number of suicide deaths in 2020 was higher than in the past for all age groups.

For men, 12581 suicides were observed in Japan between January and November 2020, of which 17.37% were in the age group 40–49 years, followed by 16.79% and 13.65% in the age groups 50–59 and 70–79 years, respectively. Excess suicide deaths in the 20–29 and 80+ age group began to be observed since around the end of July, and the trend continued until the beginning of November, although not every week. The largest total number of excess suicide deaths during the period was observed in the 20–29 age group (excess deaths 72–274), with the peak at the week of September 28 to October 4 (excess deaths 24–32, percent excess 88.89–118.52). In the age groups 20–29, 30–39, 40–49, 50–59, and 60–69 years, exiguous suicide deaths were observed for some weeks during April and May (Fig. 2).

Discussion

While all previous analyses of suicide under the COVID-19 pandemic in Japan have been based on monthly data from the National Police Agency (Nomura et al., 2021; Sakamoto et al., 2021; Tanaka and Okamoto, 2021; Ueda et al., 2021), we have for the first time used daily, individual-level vital statistics data from the MHLW. With the increased number of observations this data provides, we were able to evaluate suicide trends on a weekly basis with finer stratification (by gender and 10-year age group), allowing for a more targeted and policy-oriented analysis. We especially highlight the increase in women of all age groups and men in the 20–29 and 80+ age group. The fact that suicides increased in women around July 2020 and in men at a similar time in the younger generation is consistent with other previous studies conducted in Japan (Nomura et al., 2021; Sakamoto et al., 2021; Tanaka and Okamoto, 2021; Ueda et al., 2021). This study is the first to suggest the possibility of a similar increase in the 80+ age group among men.

Our findings are also consistent with previous observations that the burden of mental health and suicidal ideation among young people and women was disproportionate during the COVID-19 pandemic (Knolle et al., 2021; Mansfield et al., 2021). Moreover, it is consistent with evidence that a short-term decline in suicide rates can occur first during times of crisis (Wasserman et al., 2020; Zortea et al., 2020). Although suicide mortality in Japan has historically been much higher among men than women and among older people than among younger people (Dhungel et al., 2019), our findings may suggest that women and younger people were particularly vulnerable to the economic downturn following social distancing measures introduced to curb the pandemic (Sakamoto et al., 2021). Young people and women are likely to be employed in lower-paid temporary jobs with unstable, precarious contracts who have been greatly affected by the pandemic, as well as in the service sector, particularly in retail, leisure and hospitality, recreation, and transportation services, which tends to be subject to social measures such as business self-restraint and shorter working hours. In fact, as of March 2021, the number of temporary workers has decreased by 27% for men compared to March 2020, while for women it has decreased by 68% (Ministry of Internal Affairs and Communications, 2021). Several previous studies have shown an association between unemployment and rising suicide rates in Japan (Liu et al., 2013), raising concerns that financial hardship as a result of the pandemic has been associated with increased suicide rates (Brown and Seals, 2019; Kawohl and Nordt, 2020).

Furthermore, violence against women may be one of the reasons for the gender difference in the COVID-19 related suicide burden in Japan. Anecdotal evidence from several countries indicates that restrictions on movement for COVID-19 control have led to an increase in family problems and domestic violence (Usher et al., 2020), which could lead to suicidal thoughts and attempts among women (Ellsberg et al., 2008). Violence against women increased substantially with the COVID-19 pandemic, and the need for emergency shelter and protection services for women has been emphasized by the United Nations Development Programme (United Nations Development Programme, 2020). In Japan, it has been reported that after the first declaration of the state of emergency in April 2020, consultations on domestic violence with national and local governments increased by 60% (Tokyo Shimbun, 2020). Also, women have historically and universally played a more caregiving

Fig. 1. Weekly observed and 95% upper and lower bound of the expected weekly number of deaths from suicide in Japan from January 2017 through November 2020 by age groups for women. Green: upper bound; Black: point estimate; Red: lower bound; cross symbols indicate weeks with the observed exceeding or being below the 95% upper or lower bounds.
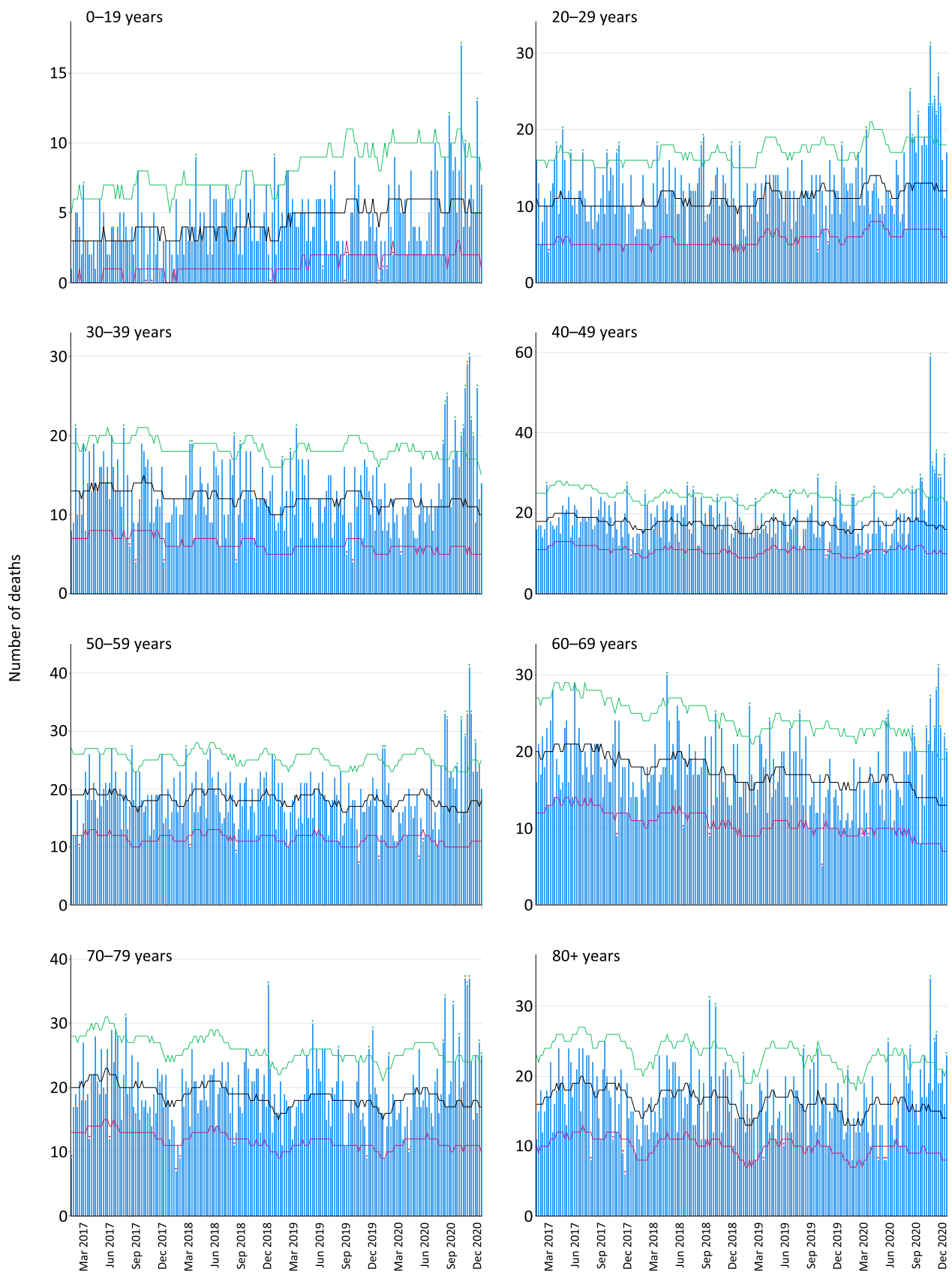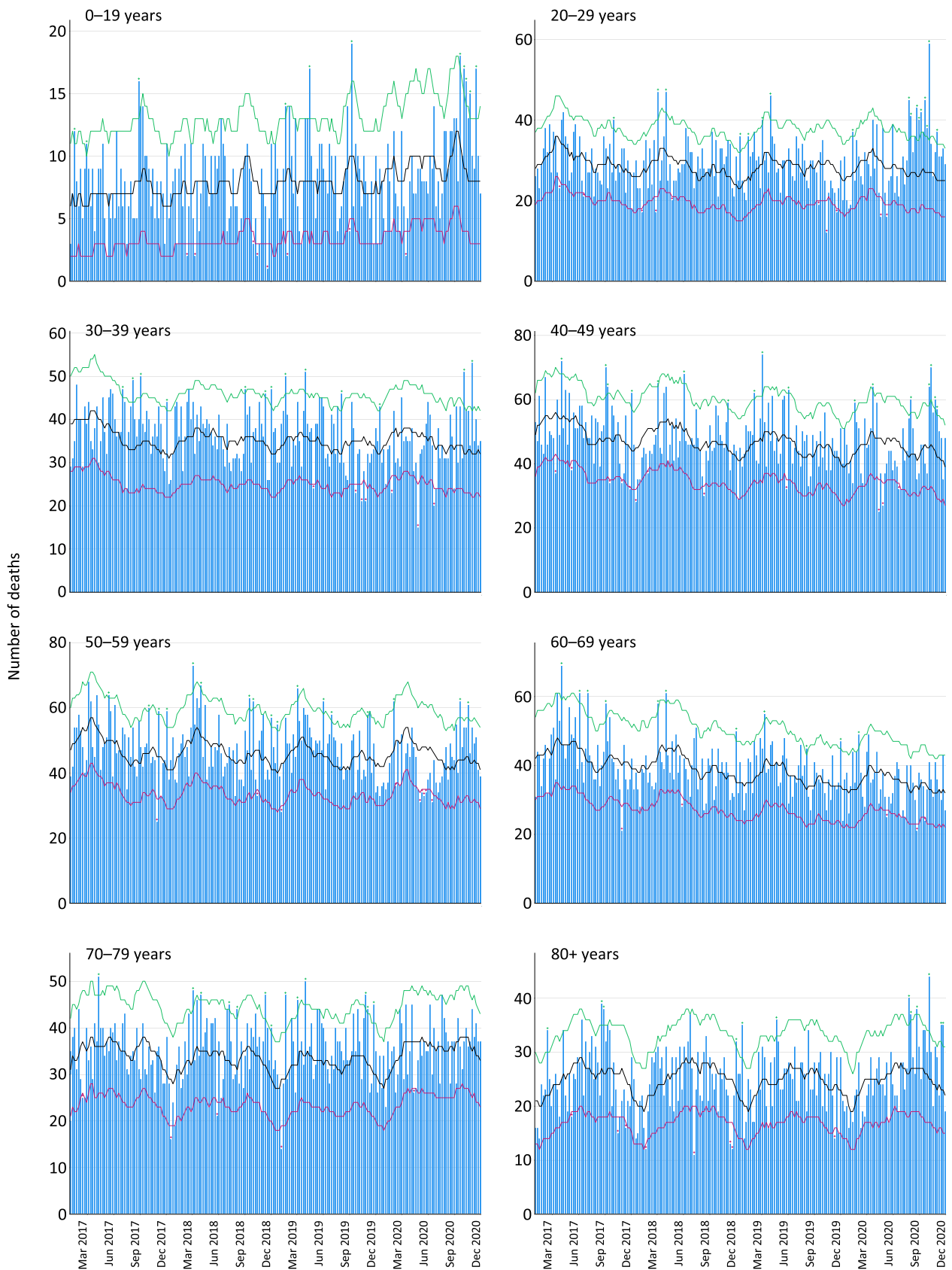
Fig. 2. Weekly observed and 95% upper and lower bound of the expected weekly number of deaths from suicide in Japan from January 2017 through November 2020 by age groups for men. Green: upper bound; Black: point estimate; Red: lower bound; cross symbols indicate weeks with the observed exceeding or being below the 95% upper or lower bounds.

role than men and globally, nearly 70% of the health and social care workforce is women (World Health Organization, 2019). Even under COVID-19, women provide most of the unpaid caregiving, including home health care (World Health Organization, 2020). The additional, disproportionate care burden for women as well as fear associated with COVID-19 also affects their livelihoods, disrupts social and protective networks, and increases stress in the household (Buller et al., 2018), imposing a greater risk for poor mental health. The results of our study confirm the possible need for efforts to protect women from gender-based violence and mental health stressors.

As these previous studies have emphasized (Nomura et al., 2021; Sakamoto et al., 2021; Tanaka and Okamoto, 2021; Ueda et al., 2021), we stressed the importance of coping with the increasing number of COVID-19 related suicides in Japan. Studies have suggested that the impact of unemployment and economic crises on suicide ideation can be mitigated through policy responses and government spending (Stuckler et al., 2009). Measures to mitigate adverse economic impact of COVID-19 include direct income support and tax concessions (Deady et al., 2020). Social support has been identified as a buffering and protective factor for suicidal ideation (Kubota et al., 2020). In May 2020, the Cabinet Secretariat established a 24-hour consultation service for domestic violence as part of its response to COVID-19. In February 2021, the Japanese government also created an office for the issue of loneliness and isolation within the Cabinet Secretariat to address the issue of suicide in relation to COVID-19 in a cross-ministry manner (The Mainichi, 2021). The findings from our study support their importance and warrant the need for further efforts to protect women and younger people from suicidal ideation and behavior. A recent systematic review suggested that self-guided digital interventions, through web-based programs or mobile applications, are effective in reducing suicidal ideation (Torok et al., 2020). Digital interventions need to be promoted widely, especially where there is a lack of or insufficient access to mental health services, and where there is prolonged social isolation.

Meanwhile, in contrast to Japan, other countries reported a different pattern of suicide, with numbers remaining largely unchanged during the COVID–19 pandemic (Pirkis et al., 2021). To our knowledge, the causes are uncertain, but financial hardship, gender-based violence, as well as a Werther effect after celebrity suicide reporting that occurred during the pandemic (although not yet rigorously assessed) may have played a part. However, it is important to note that any changes in suicide risk associated with COVID-19 are likely dynamic (Appleby, 2021; John et al., 2020). In addition, beneath the overall suicide numbers, there may be differences among sociodemographic groups in suicide trends. For example, among males we found a particular increase in suicide among younger age groups. In addition, a possible increase in suicide deaths among under-18s in the United Kingdom was reported during the first two months of lockdown. Recent studies from the United States revealed ethnic differences in suicide rates, with an increase in the black population and a decrease in the white population (Bray et al., 2021; Mitchell and Li, 2021). In the future, the research agenda for the suicide issue may not be whether the suicide rate increased with the pandemic, but rather the nuances of who committed suicide, when, and where (Appleby, 2021).

One of the limitations of our analysis was that there was no occupational level data available for inclusion in the estimation model, so we could not analyze it. Identifying which occupations are at high risk of suicide under the COVID-19 pandemic could allow for more important policy lessons. It is also important to note that this study estimated the expected number of suicide deaths, not the expected suicide rate. However, Japan's population is changing slowly, and this temporal trend was reflected to some extent in the regression models by considering the temporal trend of the weekly number of suicides for the previous five years. The population size was unlikely to change so rapidly on a weekly basis over the period of the study that it could not be considered as a temporal variation in the model.

Conclusions

This study found that compared with previous years, suicide rates in 2020 in Japan had increased since late July for women in all age groups and for men in the 20–29 and 80+ years age group. Targeted interventions and strategies based on age and gender, which address financial hardship and promote social support, may be more effective in reducing suicide during the COVID-19 pandemic in Japan.

Ethics statement

Ethical approval was granted by the ethics committee of the National Institute of Infectious Diseases, under authorization number 1174.

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CRediT authorship contribution statement

Akifumi Eguchi: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Writing – review & editing, Visualization. **Shuhei Nomura:** Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Writing – review & editing, Visualization, Supervision, Project administration. **Stuart Gilmour:** Conceptualization, Writing – original draft, Writing – review & editing, Supervision. **Nahoko Harada:** Conceptualization, Writing – original draft, Writing – review & editing. **Haruka Sakamoto:** Conceptualization, Writing – original draft, Writing – review & editing. **Peter Ueda:** Conceptualization, Writing – original draft, Writing – review & editing. **Daisuke Yoneoka:** Conceptualization, Methodology, Validation, Writing – original draft, Writing – review & editing. **Yuta Tanoue:** Conceptualization, Methodology, Validation, Writing – original draft, Writing – review & editing. **Takayuki Kawashima:** Conceptualization, Methodology, Validation, Writing – original draft, Writing – review & editing. **Takehiko I. Hayashi:** Conceptualization, Methodology, Validation, Writing – original draft, Writing – review & editing. **Yuzo Arima:** Conceptualization, Methodology, Validation, Writing – original draft, Writing – review & editing. **Motoi Suzuki:** Methodology, Software, Validation, Writing – review & editing, Supervision, Project administration, Funding acquisition. **Masahiro Hashizume:** Methodology, Software, Validation, Writing – review & editing, Supervision, Project administration, Funding acquisition.

Declaration of Competing Interest

None.

Acknowledgments

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2021.114173.

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