Decrease in Suicide During the First Year of the COVID-19 Pandemic in Taiwan

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The outbreak of the coronavirus disease 2019 (COVID-19) and control measures could have adverse consequences on population mental health and suicide rates.[1,2] However, recent studies, mainly from high-income Western countries, found no increase in suicide in the early months of the pandemic.[3,4] By contrast, a recent study from Japan found an initial fall in suicide in the first wave of the outbreak (February–June 2020), followed by an increase in suicide during the second wave (July–December 2020).[5] Nevertheless, analyses of the medium-term impact of the pandemic on suicide were lacking in other countries. We investigated the impact of the COVID-19 pandemic on overall and age-specific suicide rates in Taiwan between January and December 2020.

Methods

Monthly data for suicides (2015–2020) in people aged 15+ years were extracted from Taiwan's national cause-of-death data files, using the *International Classification of Diseases*, Tenth Revision, codes X64–X80. The COVID-19 pandemic period was defined as January–December 2020 in this study, as the first COVID-19 case was identified on January 21, 2020, in Taiwan. Negative binomial regression models were used to estimate suicide rate ratios (RRs) and their 95% confidence intervals (CIs) during the COVID-19 pandemic period, relative to that expected based on pre-pandemic trends (January 2015–December 2019) (see Supplementary Methods for more details of the regression models).

Results

The COVID-19 case number reached a peak in March–April 2020 and subsequently decreased to nearly zero until a second wave of mainly imported cases occurred in October–December 2020 (Figure 1A). After controlling for pre-pandemic suicide trend and seasonal variations, overall suicide rates in people aged 15+ years decreased 7% (RR = 0.93, 95% CI = 0.88–0.97; 272 fewer suicides, 95% CI = 119–418) in 2020 (Supplementary Tables 1 and 2). Older people aged 65+ years showed no change in suicide rates (RR = 1.00, 95% CI = 0.90–1.12) in 2020, while suicide rates decreased 27%, 9%, and 11% in those aged 15–24 years (RR = 0.73, 95% CI = 0.55–0.96), 25–44 years (RR = 0.91, 95% CI = 0.85–0.98), and 45–64 years (RR = 0.89, 95% CI = 0.82–0.96), respectively. Regarding monthly variations in 2020, overall suicide rates were 16% (RR = 0.84, 95% CI = 0.73–0.97) and 14% (RR = 0.86, 95% CI = 0.74–0.99) lower than those expected in March and April 2020, respectively (Figure 1B and Supplementary Table 1).

Discussion

The period of the COVID-19 pandemic was associated with a 7% reduction in suicide among people aged 15+ years in Taiwan in 2020. The reduction in suicide appeared to be mainly attributable to the decreases in people aged 15–64 years and in the early months of the pandemic (March and April 2020), corresponding to the peak of COVID-19 cases. However, it is important to remain vigilant as the outbreak situation may change rapidly and impact population mental health and suicide risk.

Our finding is in keeping with those from several high-income countries[3,4] but in contrast to the increase in suicide during the second half of 2020 in Japan.[5,6] The difference could be attributable to the severity of the COVID-19 outbreak—Japan experienced a far more severe second wave of infections than the first wave. By contrast, Taiwan did not experience a second wave of local infection in 2020 following the first-wave outbreak—the increase in COVID-19 cases toward the end of 2020 was almost entirely due to imported cases. There was a total of only 799 COVID-19 cases and 7 deaths in Taiwan (population = 23 million) as of December 31, 2020. Taiwan's early success of containing the COVID-19 outbreak in 2020 was attributable to measures such as early and strict border controls, contact tracing and quarantine, and physical distancing and facial masking[7,8]; no lockdowns or school and work closures, as imposed in many other countries, were implemented in Taiwan in

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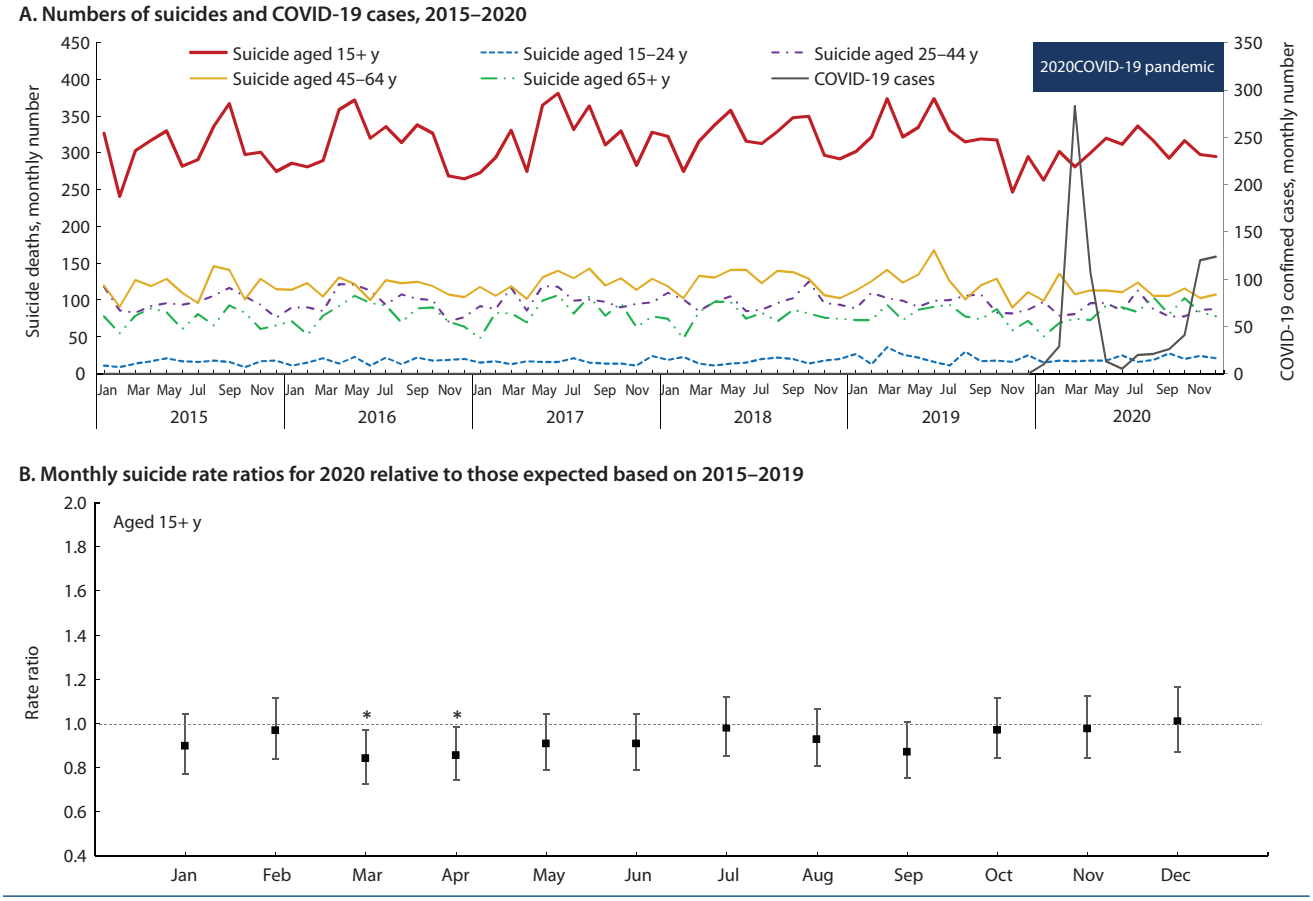
J Clin Psychiatry 2021;82(6):21br14137

To cite: Lin C-Y, Chang S-S, Shen L-J. Decrease in suicide during the first year of the COVID-19 pandemic in Taiwan. J Clin Psychiatry. 2021;82(6):21br14137

To share: https://doi.org/10.4088/JCP.21br14137

Figure 1. (A) Monthly Numbers of Suicides in 2015–2020 and COVID-19 Confirmed Cases in 2020 and (B) Monthly Suicide Rate Ratios and 95% CIs During the COVID-19 Pandemic (January–December 2020) Relative to Those Expected Based on Pre-Pandemic Trends Between January 2015 and December 2019 in Taiwan, After Accounting for Long-Term Trends and Seasonal Variations in Suicide



*95% confidence intervals that do not include 1.

2020. A strong sense of success and safety, together with less impact on people's lives due to control measures such as lockdowns, may have led to the observed reduction in suicide in Taiwan. Furthermore, Taiwan experienced a rapid economic recovery—the unemployment rate decreased from 4.07% in May 2020 to 3.68% in December 2020; the non-elderly working population may have benefited the most from this.

In contrast to our findings, a systematic review[3] of research into suicidal behavior during the COVID-19 pandemic showed that the prevalence of suicide ideation increased in several countries during the pandemic period compared with the pre-pandemic period. Potential explanations for different findings about the impact of COVID-19 on suicide ideation and suicide death include selection bias in the survey studies of suicidal ideation,[9] social cohesion or policies during the acute phase of the pandemic that may prevent the transition from suicidal ideation to suicidal act,[4] reduced movement that may decrease access to lethal means for suicide, and stay-at-home orders that may reduce the opportunities of being alone and carrying out suicidal behavior at home.

Suicides were commonly underreported. We did not include deaths that may be misclassified suicides, such as deaths of undetermined intent,[10] in the analysis, as relevant data were unavailable at the time of study. The impact of COVID-19 may differ in males and females[5]; however, sex-specific suicide data were unavailable at the time of study. Future research is needed to investigate the impact of including possible misclassified suicides and any sex difference in the pandemic's impact on suicide.

Received: June 22, 2021.
Published online: November 9, 2021.
Author contributions: Chien-Yu Lin: formal analysis, writing—original draft, writing—review and editing. Shu-Sen Chang: conceptualization, data curation, writing—original draft, writing—review and editing. Lih-Jong Shen: data curation, writing—review and editing.
Potential conflicts of interest: The authors declare no competing interests.
Funding/support: The study was not funded. Prof Shu-Sen Chang was supported by Ministry of Sciences and Technology, Taiwan (grant number MOST 109-2314-B-002-144-MY3).
Supplementary material: Available at PSYCHIATRIST.COM

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THE JOURNAL OF
CLINICAL PSYCHIATRY
THE OFFICIAL JOURNAL OF THE AMERICAN SOCIETY OF CLINICAL PSYCHOPHARMACOLOGY

Supplementary Material

Article Title: Decrease in Suicide During the First Year of the COVID-19 Pandemic in Taiwan

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DOI Number: 10.4088/JCP.21br14137

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Decrease in suicide during the first year of the COVID-19 pandemic in Taiwan: supplementary material

Methods

A previous study showed that trends in suicide were stable across age groups in Taiwan over the period 2015-2018,[1] and therefore 2015 was chosen as the start year of the study period to provide stable estimates of pre-pandemic suicide trends.

The overall and age-specific monthly numbers of suicides were plotted for graphic examination. We used interpolation to estimate monthly population from the annual population data (2015-2020) from the Taiwan Ministry of the Interior.

A dummy variable for the year 2020 were included in the negative binomial regression models to estimate suicide rate ratios for the overall pandemic period, with log-transformed population as the offset. Separate models that included dummy variables for each of the 12 months in 2020 were also estimated to investigate changes in suicide rates over different periods of the pandemic. We controlled for age group in the all-age group model. Analyses stratified by age were also conducted. We controlled for pre-pandemic long-term suicide trends using fractional polynomials; seasonal variations were controlled using Fourier terms.[2] All statistical analyses were conducted using Stata version 15 (StataCorp, College Station, Texas).

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Supplementary Table 1. Whole-year and monthly suicide rate ratios (RRs) and 95% confidence intervals (CIs)[a], overall (aged 15+ years) and by age group, in Taiwan during the COVID-19 pandemic (January-December 2020) relative to those expected based on pre-pandemic trends between January 2015 and December 2019, after accounting for long-term trends and seasonal variations in suicide.

	Aged 15+		Aged 15-24		Aged 25-44		Aged 45-64		Aged 65+	
	RR	(95% CI)	RR	(95% CI)	RR	(95% CI)	RR	(95% CI)	RR	(95% CI)
Whole-year	**0.93**	**(0.88 , 0.97)**	**0.73**	**(0.55 , 0.96)**	**0.91**	**(0.85 , 0.98)**	**0.89**	**(0.82 , 0.96)**	1.00	(0.90 , 1.12)
Jan	0.90	(0.77 , 1.04)	0.70	(0.41 , 1.20)	1.10	(0.89 , 1.35)	0.86	(0.69 , 1.08)	0.82	(0.60 , 1.13)
Feb	0.97	(0.84 , 1.12)	0.82	(0.49 , 1.35)	0.83	(0.66 , 1.05)	1.13	(0.93 , 1.38)	1.06	(0.80 , 1.40)
Mar	**0.84**	**(0.73 , 0.97)**	0.78	(0.47 , 1.31)	0.81	(0.64 , 1.01)	0.86	(0.69 , 1.06)	1.01	(0.77 , 1.34)
Apr	**0.86**	**(0.74 , 0.99)**	0.85	(0.51 , 1.40)	0.94	(0.76 , 1.15)	0.87	(0.70 , 1.07)	0.89	(0.67 , 1.17)
May	0.91	(0.79 , 1.04)	0.85	(0.51 , 1.40)	0.95	(0.77 , 1.17)	0.85	(0.69 , 1.06)	1.10	(0.85 , 1.43)
Jun	0.91	(0.79 , 1.04)	1.16	(0.74 , 1.79)	0.86	(0.69 , 1.07)	0.84	(0.68 , 1.04)	1.12	(0.86 , 1.46)
Jul	0.98	(0.85 , 1.12)	0.73	(0.43 , 1.24)	1.12	(0.92 , 1.36)	0.93	(0.76 , 1.15)	1.11	(0.84 , 1.46)
Aug	0.93	(0.81 , 1.06)	0.88	(0.54 , 1.44)	0.86	(0.69 , 1.06)	**0.80**	**(0.64 , 1.00)**	**1.41**	**(1.08 , 1.82)**
Sep	0.87	(0.75 , 1.00)	1.34	(0.88 , 2.04)	**0.76**	**(0.61 , 0.96)**	0.82	(0.66 , 1.02)	1.10	(0.83 , 1.45)
Oct	0.97	(0.84 , 1.11)	0.98	(0.60 , 1.58)	0.80	(0.64 , 1.01)	0.93	(0.75 , 1.15)	**1.44**	**(1.11 , 1.88)**
Nov	0.98	(0.85 , 1.13)	1.16	(0.74 , 1.81)	0.96	(0.77 , 1.19)	0.87	(0.70 , 1.08)	1.29	(0.97 , 1.71)
Dec	1.01	(0.87 , 1.16)	0.97	(0.60 , 1.56)	1.01	(0.81 , 1.25)	0.94	(0.75 , 1.17)	1.34	(1.00 , 1.80)

[a] 95% CIs that do not include one are highlighted in bold.

Supplementary Table 2. Whole-year and monthly number of suicides, and estimated changes in the number of suicide and their 95% confidence intervals (CIs)[a] based on rate ratios (RRs), overall (aged 15+ years) and by age group, in Taiwan during the COVID-19 pandemic (January-December 2020). RRs are between the observed rates and the expected rates based on pre-pandemic trends in 2015-2019 from negative binomial regression models.

	Aged 15+			Aged 15-24			Aged 25-44			Aged 45-64			Aged 65+		
	Number	Estimated changes based on RR	(95% CI)	Number	Estimated changes based on RR	(95% CI)	Number	Estimated changes based on RR	(95% CI)	Number	Estimated changes based on RR	(95% CI)	Number	Estimated changes based on RR	(95% CI)
Whole-year	3635	**-272**	**(-418 , -119)**	239	**-65**	**(-107 , -10)**	1068	**-92**	**(-158 , -22)**	1343	**-149**	**(-241 , -49)**	985	2	(-102 , 118)
Jan	263	-27	(-60 , 11)	15	-5	(-9 , 3)	98	10	(-11 , 34)	99	-14	(-31 , 8)	51	-9	(-20 , 6)
Feb	302	-10	(-49 , 35)	18	-3	(-9 , 6)	79	-13	(-27 , 4)	136	18	(-10 , 52)	69	4	(-14 , 28)
Mar	281	**-45**	**(-77 , -8)**	17	-4	(-9 , 5)	81	-16	(-29 , 1)	108	-16	(-34 , 7)	75	1	(-17 , 25)
Apr	300	**-43**	**(-77 , -4)**	18	-3	(-9 , 7)	96	-6	(-23 , 15)	113	-15	(-34 , 8)	73	-8	(-24 , 13)
May	320	-29	(-67 , 14)	18	-3	(-9 , 7)	96	-5	(-22 , 16)	113	-16	(-35 , 6)	93	9	(-14 , 40)
Jun	312	-29	(-66 , 14)	25	4	(-6 , 20)	86	-12	(-27 , 6)	111	-18	(-36 , 4)	90	11	(-13 , 41)
Jul	337	-7	(-50 , 41)	16	-4	(-9 , 4)	113	14	(-9 , 41)	124	-8	(-30 , 18)	84	9	(-13 , 38)
Aug	317	-23	(-62 , 21)	19	-2	(-9 , 8)	88	-13	(-27 , 6)	106	**-21**	**(-38 , 0)**	104	**42**	**(9 , 86)**
Sep	293	-38	(-72 , 1)	28	9	(-3 , 29)	78	**-18**	**(-31 , -3)**	106	-19	(-36 , 2)	81	8	(-14 , 37)
Oct	317	-10	(-50 , 36)	20	0	(-8 , 12)	78	-15	(-28 , 1)	116	-8	(-28 , 17)	103	**45**	**(11 , 90)**
Nov	298	-7	(-46 , 37)	24	4	(-6 , 20)	87	-4	(-20 , 17)	103	-13	(-31 , 9)	84	24	(-3 , 60)
Dec	295	2	(-37 , 48)	21	-1	(-8 , 12)	88	1	(-17 , 22)	108	-7	(-26 , 18)	78	26	(0 , 63)

[a] 95% CIs that do not include null are highlighted in bold.