

Table 1. List of the survey items at T0, T1, and T2.

	Item	Reference
Screening Survey (T0)	Characteristics of participants	
	Sex	
	Age	
	Educational background	
	Marital status	
	Household income	
	Drinking alcohol	
	Smoking	
	Hospital visit	
	Time spent online per day	
	Suicide-related Internet use	(Sueki, 2013)
	Disclosing one's suicidal ideation	
	Mental health consultation with anonymous other	
Browsing for information about suicide methods		
Baseline Survey (T1)	Stress coping	(Ozeki, 1993)
	Mental state	
	Suicidal ideation	(Beck et al., 1979)
	Hopelessness	(Beck et al., 1974)
	Depression/Anxiety tendency	(Kessler et al., 2002)
	Loneliness	(Ochiai, 1983)
	Lifetime suicidal behaviours	
	Deliberate self harm	
	Thoughts of death	
	Thoughts of suicide for revenge	
Thoughts of suicide as the only way of solving the problem		
Suicide plan		
Follow up (T2)	Mental state	
	Suicidal ideation	(Beck et al., 1979)
	Hopelessness	(Beck et al., 1974)
	Depression/Anxiety tendency	(Kessler et al., 2002)
Loneliness	(Ochiai, 1983)	

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adjust strong observed confounders for targeted populations with high validity. Other methods like matching have some limitations from a modern epidemiological perspective. In the other methods, the numbers of adjustment factors are limited. Second, these methods carry risks of over or under adjustments. Third, adjusted results using these methods would not be representative of the targeted population. Only regression modeling can overcome these limitations.

In the regression model, we selected confounding factors in the model on the basis of prior knowledge of risk factors, because the confounders could not be identified in the observed data [33]. However, the knowledge from previous studies was limited. Therefore, we performed three models with potential confounders to check the sensitivity of the confounders, step-by step. Model 3 (the full model) allowed adjustment for all observed confounders.

Regression coefficients (β) and their 95% confidence intervals (CI) were calculated in the models. The p-values presented are for two-tailed tests. The analysis was performed using SPSS software (SPSS 19.0 for Windows; SPSS Inc., Chicago, IL). The present

study is in accordance with the STrengthening the Reporting of OBServational studies in Epidemiology (STROBE) statement.

Results

Characteristics of the participants

The primary number of analysed participants was 5495: 43.3% were women and the mean age was 35.5 years (standard deviation = 7.8, range = 20–49); 2813 participants were the group with suicide-related or mental health consultation-related internet use and 2682 were the control group (see Figure 1). No participants were excluded because of their suicidality. There were no missing values for any variable in the final data set.

Characteristics of the participants are shown in Table 2. Significant differences in the proportions of age, marital status, household income, drinking alcohol, smoking, and hospital visit were found between the group with suicide-related or mental health consultation-related internet use and the control group at the T0 survey. There were no differences of gender and education. Compared with the control group at T0, the group with suicide-

Table 2. Comparison between the group with suicide-related or mental health consultation-related internet use and the control group who completed T2 survey.

	Group with suicide-related or mental health consultation-related internet use (n=2813)	Control group (n=2682)	Difference	p
Characteristics of participants				
Male: n (%)	1587 (56.4)	1529 (57.0)	-0.6	0.663
Age: mean (s.d.)	34.1 (7.9)	36.9 (7.5)	-2.8	<0.001
Educational background, junior high and high school graduate: n (%)	825 (29.3)	729 (27.2)	2.1	0.082
Marital status, not married: n (%)	1724 (61.3)	1140 (42.5)	18.8	<0.001
Household income less than 4 million yen (USD \$40,000) a year: n (%)	1092 (38.8)	731 (27.3)	11.5	<0.001
Drinking alcohol more than once a week: n (%)	1315(48.5)	1498(53.8)	-5.3	<0.001
Smoking more than once a day: n (%)	873(31.0)	59.3(21.7)	9.3	<0.001
Hospital visit (Present, Total): (%)	1248 (44.4)	693 (25.8)	18.6	<0.001
Hospital visit (Present, Psychiatry and/or Psychosomatic Internal): (%)	658 (23.4)	119 (4.4)	19.0	<0.001
Time spent online per day: mean (s.d.)	3.5 (1.4)	2.7 (1.6)	0.8	<0.001
Suicide-related Internet use				
Disclosing one's suicidal ideation (up until a month ago): n (%)	1292(45.9)	0(0)	45.9	<0.001
Disclosing one's suicidal ideation (within a month): n (%)	331(11.8)	0(0)	11.8	<0.001
Mental health consultation with anonymous other (within a month): n (%)	497(17.7)	0(0)	17.7	<0.001
Browsing for information about suicide methods (within a month): n (%)	1242(44.2)	0(0)	44.2	<0.001
Stress coping scores: mean (s.d.)				
Problem-focused	6.0 (3.2)	6.5 (3.1)	-0.5	<0.001
Emotion-focused	3.5 (2.4)	4.5 (2.3)	-1.0	<0.001
Avoidance/escape	8.5 (3.7)	9.2 (3.7)	-0.7	<0.001
T1 Mental state scores: mean (s.d.)				
Suicidal ideation	8.5 (5.7)	2.4 (3.3)	6.1	<0.001
Hopelessness	13.0 (5.0)	8.4 (5.0)	4.6	<0.001
Depression/Anxiety tendency	17.0 (5.9)	11.0 (4.6)	6.0	<0.001
Loneliness	1.1 (8.7)	-5.0 (8.1)	6.1	<0.001
T2 Mental state scores: mean (s.d.)				
Suicidal ideation	8.0 (5.7)	2.4 (3.3)	5.6	<0.001
Hopelessness	13.0 (4.8)	8.6 (4.8)	4.4	<0.001
Depression/Anxiety tendency	16.7 (6.1)	11.1 (4.8)	5.6	<0.001
Loneliness	0.9 (8.8)	-4.9 (8.1)	5.8	<0.001
T1 Lifetime suicidal behaviours: number (%)				
Deliberate self harm	874 (31.1)	209 (7.8)	23.3	<0.001
Thoughts of death	2091 (74.3)	764 (28.5)	45.8	<0.001
Thoughts of suicide for revenge	972 (34.6)	247 (9.2)	25.4	<0.001
Thoughts of suicide as the only way of solving the problem	1691 (60.1)	463 (17.3)	42.8	<0.001
Suicide plan	1246 (44.3)	228 (8.5)	35.8	<0.001

The t-test was employed for continuous data, and the chi-square test was used for categorical data.
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related or mental health consultation-related internet use were likely to have lower scores for coping with stress and higher scores for mental health problems at T1. The proportion of lifetime suicidal behaviours of the group with suicide-related or mental

health consultation-related internet use was significantly greater than that of the control group at T1.

Drinking alcohol, smoking and hospital visit had some differences between dropouts and completed responders in the

Table 3. Relationships between suicide-related or mental health consultation-related internet use and changes in mental health scores between T1 and T2.

	Suicidal ideation (T2-T1)			Hopelessness (T2-T1)			Depression/Anxiety (T2-T1)			Loneliness (T2-T1)		
	β	95%CI	P	β	95%CI	P	β	95%CI	P	β	95%CI	P
Model 1	0.40	0.23–0.57	<0.001	0.05	–0.13–0.23	0.590	0.56	0.31–0.80	<0.001	–0.04	–0.39–0.32	0.835
Model 2	0.36	0.19–0.53	<0.001	0.07	–0.11–0.26	0.423	0.38	0.13–0.63	0.003	0.00	–0.36–0.36	0.994
Model 3	0.38	0.20–0.55	<0.001	0.11	–0.07–0.29	0.242	0.37	0.12–0.61	0.004	0.04	–0.32–0.41	0.815

CI: Confidence interval.

Bold type indicates significance ($P < 0.05$).

Model 1 (minimally adjusted): Controlled variables were T1 mental health scores (suicidal ideation, hopelessness, depression/anxiety, and loneliness).

Model 2: Controlled variables were T1 mental health scores and characteristics of participants.

Model 3 (fully adjusted): Controlled variables were T1 mental health scores, characteristics of participants, and coping style scores.

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group with suicide-related or mental health consultation-related internet use. However, in the control group, there were no differences in drinking alcohol, smoking and hospital visit.

Relationships between suicide-related or mental health consultation-related internet use and mental health score changes from T1 to T2

As seen in Table 3, the regression models show the relationships between suicide-related or mental health consultation-related internet use and changes of suicidal ideation, hopelessness, depression/anxiety, and loneliness from T1 to T2. Statistically significant positive coefficients were found for suicidal ideation ($\beta = 0.38$ [95%CI: 0.20 to 0.55]) and depression/anxiety ($\beta = 0.37$ [95%CI: 0.12 to 0.61]). The scores for hopelessness and loneliness did not show any effects of suicide-related or mental health consultation-related internet use.

Table 4 reports the regression coefficients of each suicide-related or mental health consultation-related internet use. Disclosing one's suicidal ideation up until a month ago ($\beta = 0.37$, 95%CI: 0.17 to 0.57), disclosing one's suicidal ideation within the last month ($\beta = 0.55$, 95%CI: 0.23 to 0.88), and browsing for information about suicide methods within a month ($\beta = 0.45$, 95%CI: 0.26 to 0.63) significantly increased suicidal ideation from T1 to T2. Internet mental health consultation with an anonymous other within the last month did not increase suicidal ideation. We obtained a similar result in the other three models for suicidal ideation.

Those who disclosed their suicidal ideation up until a month ago showed increased depression/anxiety ($\beta = 0.30$, 95%CI: 0.02 to 0.58) from T1 to T2. Those with mental health consultation within a month ($\beta = 0.34$, 95%CI: –0.03 to 0.71) and browsing for information about suicide methods within a month ($\beta = 0.26$, 95%CI: –0.01 to 0.53) showed increased depression/anxiety also. The scores for hopelessness and loneliness did not show any effects of suicide-related or mental health consultation-related internet use.

We described the differences between primary analysed cases and non-responders and missing cases. There were few differences in background of the participants. However, the main results of our analysis were still robust. (data was not shown).

Discussion

Principal findings

Disclosing one's suicidal ideation and browsing for information about suicide methods increased suicidal ideation. Mental health

consultation with anonymous others by internet users did not increase suicidal ideation but increased depression/anxiety. Our large-sized prospective longitudinal study confirmed the effects of suicide-related internet use on suicidality. Those with suicide-related or mental health consultation-related internet use showed increased suicidal ideation and depression/anxiety, and the three types of suicide-related internet use were each independently related to these same changes in mental health scores. As in previous studies [11] [22], our results extended and strengthened the causal link between browsing for information about suicide methods online and increased suicidal ideation. Those who disclosed suicidal ideation, which was considered to be suicide-preventive in some previous studies [14] [16], showed increased suicidal ideation. Those who had mental health consultation with an anonymous other showed no effect on suicidal ideation, but had increased depression/anxiety. We showed a negative effect of disclosing one's suicidal ideation online, which dovetailed with the indication that there was the potential harm of a downward depressive spiral in online anonymous communities consisting of users with depressive tendencies [34].

The effect size of suicide-related or mental health consultation-related internet use might be interpreted as relatively small. Each suicide-related or mental health consultation-related internet use increased suicidal ideation scores only by 0.37–0.55 points during a 6-week observed period. The observation was over a relatively short period. Also, as we have presented in the backgrounds of the group with suicide-related or mental health consultation-related internet use, they have a high probability of being diagnosed with mental disorders associated with suicide, as indicated by the mean scores of K6, the screening scale for detecting CIDI/DSM-IV mood and anxiety disorders. A previous study showed that increasing suicidal ideation was significantly associated with a diagnosis of a principal mood disorder, a diagnosis of a personality disorder and previous suicide attempts [35]. Under such circumstances, those with suicide-related or mental health consultation-related internet use may show more serious consequences such as self-harm, repeated suicidal behaviours and completed suicide in the long term.

Strengths and limitations

Our internet survey was the first large-scale prospective longitudinal study with a control group chosen by stratified random sampling. There is almost no prospective research in the related area [36]. Most of the previous studies dealing with the effects of suicide-related internet use were based on internet suicide pacts or used a cross-sectional study design [12] [16] [17].

Table 4. Relationships between each type of suicide-related or mental health consultation-related internet use and suicidal ideation, hopelessness, depression/anxiety, and loneliness.

		Suicidal ideation (T2-T1)			Hopelessness (T2-T1)			Depression/Anxiety (T2-T1)			Loneliness (T2-T1)		
		β	95%CI	P	β	95%CI	P	β	95%CI	P	β	95%CI	P
Model 1	Disclosing one's suicidal ideation (up until a month ago)	0.41	0.21–0.60	<0.001	0.07	–0.13–0.28	0.480	0.51	0.23–0.79	<0.001	–0.13	–0.54–0.23	0.534
	Disclosing one's suicidal ideation (within a month)	0.62	0.30–0.94	<0.001	–0.24	–0.58–0.10	0.163	0.31	–0.15–0.78	0.186	0.07	–0.61–0.75	0.834
	Mental health consultation with anonymous other (within a month)	–0.10	–0.35–0.16	0.447	–0.09	–0.36–0.18	0.516	0.54	0.17–0.91	0.004	–0.13	–0.67–0.40	0.629
	Browsing for information about suicide methods (within a month)	0.41	0.23–0.60	<0.001	0.02	–0.17–0.21	0.835	0.29	0.02–0.55	0.033	0.23	–0.16–0.62	0.247
Model 2	Disclosing one's suicidal ideation (up until a month ago)	0.36	0.16–0.55	<0.001	0.06	–0.14–0.27	0.551	0.31	0.02–0.59	0.033	–0.04	–0.46–0.37	0.836
	Disclosing one's suicidal ideation (within a month)	0.55	0.23–0.88	0.001	–0.20	–0.55–0.14	0.244	0.10	–0.36–0.57	0.668	0.24	–0.44–0.93	0.484
	Mental health consultation with anonymous other (within a month)	–0.16	–0.41–0.10	0.230	–0.04	–0.31–0.23	0.785	0.36	–0.01–0.73	0.059	0.05	–0.49–0.59	0.850
	Browsing for information about suicide methods (within a month)	0.43	0.24–0.62	<0.001	0.05	–0.14–0.25	0.601	0.26	–0.01–0.53	0.056	0.13	–0.26–0.52	0.519
Model 3	Disclosing one's suicidal ideation (up until a month ago)	0.37	0.17–0.57	<0.001	0.08	–0.12–0.29	0.432	0.30	0.02–0.58	0.038	–0.02	–0.43–0.40	0.936
	Disclosing one's suicidal ideation (within a month)	0.55	0.23–0.88	0.001	–0.18	–0.52–0.16	0.297	0.10	–0.36–0.57	0.662	0.26	–0.42–0.94	0.459
	Mental health consultation with anonymous other (within a month)	–0.15	–0.41–0.11	0.248	–0.01	–0.28–0.26	0.959	0.34	–0.03–0.71	0.069	0.09	–0.45–0.63	0.738
	Browsing for information about suicide methods (within a month)	0.45	0.26–0.63	<0.001	0.08	–0.12–0.27	0.455	0.26	–0.01–0.53	0.062	0.16	–0.24–0.55	0.433

CI: Confidence interval.

Bold type indicates significance ($P < 0.05$).

Model 1 (minimally adjusted): Controlled variables were T1 mental health scores (suicidal ideation, hopelessness, depression/anxiety, and loneliness).

Model 2: Controlled variables were T1 mental health scores and characteristics of participants.

Model 3 (fully adjusted): Controlled variables were T1 mental health scores, characteristics of participants, and coping style scores.

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The sampling process in this study was based on the demographic composition of the latest census to minimize sampling and representative bias. In addition, our research clarified the level of suicidal risk of the group with suicide-related or mental health consultation-related internet use, which has not been previously examined.

There were, however, some limitations to our study. First, an online panel survey has some biases such as coverage bias [21]. Second, the T0 participation rate in the survey was relatively low (14.5%). However, the proportion of participation was nearly equal to that of other internet research [21] and the population characteristics of this study were also similar to the latest census data. Third, we showed only short-term results. The long-term effects of suicide-related or mental health consultation-related internet usage are not clear. Fourth, we did not examine the effects of professional mental health services online. This is because there are not yet such validated services in Japan. Fifth, we did not define the contents of the websites or the services rendered in consequence of disclosing suicidal ideation or in seeking mental health consultation with anonymous others. Finally, it is impossible to know which websites participants actually visited and whether the websites they visited were topically related to suicide or not from our research. As an alternative, we asked about the actions that suicidal internet users frequently perform instead of identifying the websites that the participants actually visited in the questionnaire. Because a website may have a function of both prevention and promotion of suicide [37], it is not possible to verify whether the internet use of such a specific website enhances

suicide prevention or not. It is useful for us to identify which actions may predict increases or decreases in the internet user's suicidality in order to utilize online helping resources. Therefore the four questions about suicide-related internet usage were made by reference to our previous study about the internet and suicide. However, these items were not used frequently and did not cover all the actions performed on websites that might be suicide-related.

Conclusion

Increased suicidal ideation was observed in the young and middle-aged with suicide-related or mental health consultation-related internet use. Those who disclosed their suicidal ideation up until a month ago, disclosed their suicidal ideation within the previous month, and browsed for information about suicide methods within the previous month had significantly increased suicidal ideation 7 to 8 weeks later. Meanwhile, mental health consultation via the internet was not useful but may have worsened depression/anxiety. Therefore, regulation of information regarding suicide on the internet should be promoted as a health policy. As a next challenge, new and more effective interventions for vulnerable populations with suicide-related internet use should be developed.

Author Contributions

Conceived and designed the experiments: HS NY TT MI. Analyzed the data: HS NY MI. Wrote the paper: HS NY MI.

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Original Article

Suicide prevention strategies in Japan: A 15-year review (1998–2013)

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Abstract Suicide is a global public health problem and solutions to it can be found only through a global dialog. The suicide rate in Japan has been alarming, but Japan has made substantial efforts to reduce this rate, making prevention a high priority. This report reviews the developmental stages of a comprehensive policy of suicide prevention in Japan from 1998 to 2013. Our review suggests that suicide prevention activities were facilitated by the 2006 Basic Act for Suicide Prevention and the 2007 General Principles of Suicide Prevention Policy. Along with the establishment of a Special Fund program for local governments, the Basic Act and General Principles led to the development of a comprehensive and multi-sector approach to suicide prevention. Suicide rates in Japan, especially among middle-aged men, decreased consistently after 2009, suggesting that the initiatives were effective. Continuous monitoring is needed to evaluate Japan's suicide prevention policy. *Journal of Public Health Policy* (2015) 36, 52–66. doi:10.1057/jphp.2014.42; published online 30 October 2014

Keywords: suicide; suicide prevention; policy development; Basic Act for Suicide Prevention; Japan

Introduction

Worldwide, inadequate prevention of suicide persists for lack of awareness that suicide is a major public health problem. This has been especially true in the Asia-Pacific region, including Japan.¹ According to the National Police Agency of Japan,² the annual number of deaths by suicide remained at approximately 25 000 or fewer from 1978 to 1997. Except for some notable efforts by local governments and private organizations,³ suicide prevention attracted limited attention during this period. In 1998, the annual number of suicides rapidly increased from 24 391 in the previous year to 32 863, and it remained at over 30 000 until 2011 (Figure 1). This increase, more pronounced among males than among females, affected particularly men aged 45–64 years (Figure 2). Several possibilities may explain the rapid increase in suicide. Fujita, who analyzed vital statistics, found the suicide increase was most notable in males aged 15–69 years, males without an occupation, divorced males, and males in urban areas.⁴ Amagasa suggested the rapid increase in suicides among middle-aged, urban males was associated with three major developments resulting from Japan's economic recession: (i) corporate downsizing (restructuring), (ii) hastily introduced performance evaluations, and (iii) a decrease of regular employment plus rapid expansion of contractual employment.⁵ Greater stress in the work environment would have had a great impact on middle-aged men.

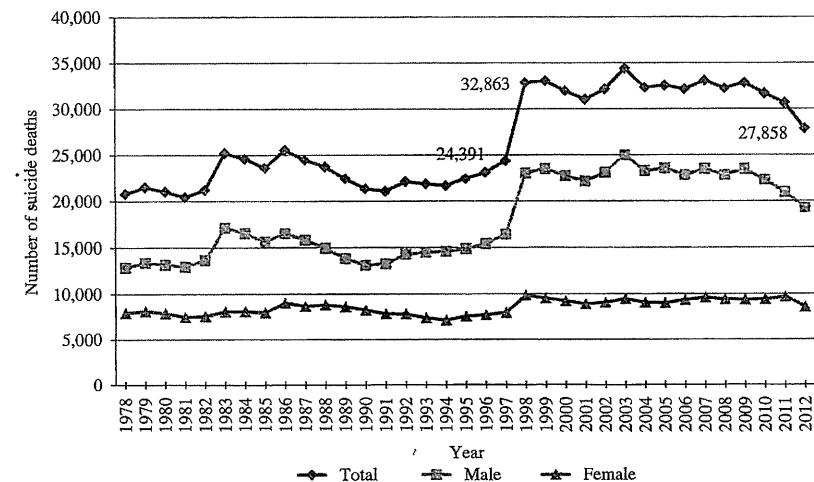


Figure 1: Number of suicide deaths in Japan, 1978–2012.

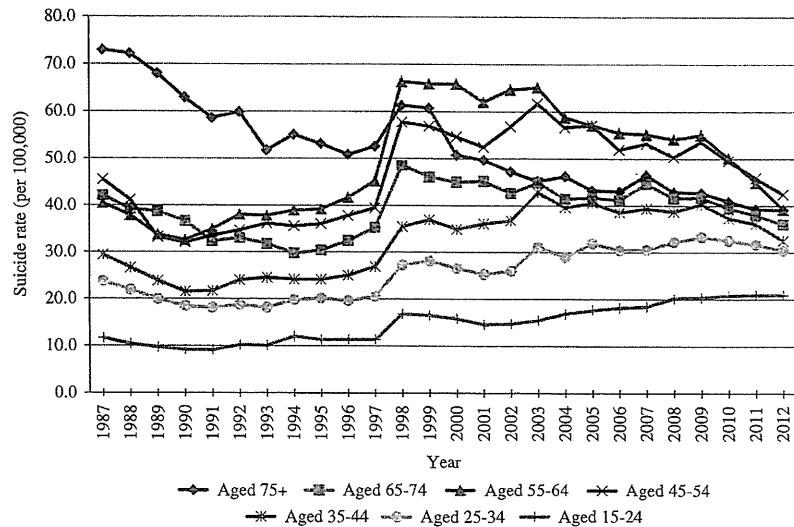
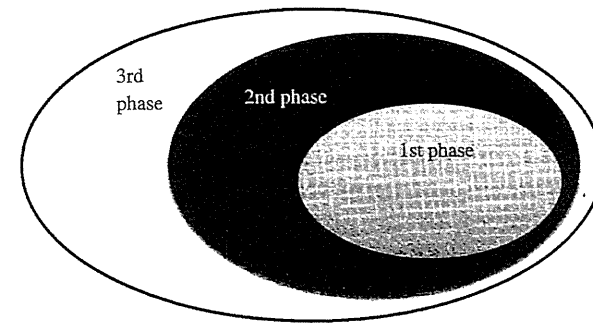


Figure 2: Male suicide rates in Japan by age, 1987-2012.

The rapid rise in suicides highlighted a clear need to develop a national suicide prevention policy. Japan's expansion of suicide prevention efforts can be divided into three phases,⁶ as summarized in Figure 3. The Ministry of Health, Labour and Welfare (MHLW) initiated and led the first phase, from 1998 to 2005. In the second phase, from 2005 to 2006, leadership gradually shifted to the Cabinet Office (CaO), which promoted suicide prevention as a comprehensive government policy. The third phase, which began in 2006, saw passage of the Basic Act for Suicide Prevention (hereinafter, 'Basic Act') in 2006 and a Cabinet decision to adopt General Principles of Suicide Prevention Policy (GPSP) in 2007. Both substantially changed social attitudes toward suicide.

During and just before these three periods, Japan enacted or revised other laws to support people at high risk. These included the Long-term Care Insurance Act (1997), the Act for the Prevention of Child Abuse (2000), the Health Promotion Act (2002), the Act for Special Measures concerning Assistance in Self-Support of Homeless (2002), the Money Lending Business Act revision (2006), the Labour Contract Act (2007), the Basic Act for Measures against Alcohol-related Health Harm (2013), and the Act on Support for People Living in Poverty (2013).



The first phase (1998-2005)

- 2000 Numerical target set as part of "Healthy Japan 21"
- 2001 Budget for suicide prevention set by MHLW
- 2002 Report by Suicide Prevention Council
- 2004 Introduction of Policy for Depression

The second phase (2005-2006)

- 2005 Upper House resolution to wrap up a comprehensive strategy against suicide
- 2005 Suicide Prevention Liaison Committee (SPLC) established
- 2005 A report on national suicide prevention strategy by SPLC

The third phase (2006-)

- 2006 Basic Act for Suicide Prevention (Basic Act) passed
- 2006 Foundation of the Center for Suicide Prevention (CSP) in NIMH, NCNP
- 2006 Basic Act enforced
- 2007 General Principles of Suicide Prevention Policy (GPSP) established
- 2008 Partial Revision of the GPSP
- 2009 Preparation of special fund for local governments
- 2012 Complete revision of the GPSP

Figure 3: Developmental stages and chronological chart of suicide prevention policy in Japan.

The purpose of the Basic Act was to prevent suicide and provide support to survivors of suicide, thus helping to create a more stable society where people could lead healthy and meaningful lives. Its basic principles were as follows: (i) suicide prevention activities should be examined with an understanding of the complexity of factors related to suicide and be supported by the entire society; (ii) suicide prevention efforts should be based on the social context of suicide and not be dismissed as a mere mental health issue; (iii) suicide prevention activities must include prevention, intervention, and *postvention* (an intervention which involves provision of support to family members and others affected by a suicidal behavior)⁷; and (iv) suicide prevention should be carried out effectively with the close cooperation of central government, local governments, medical institutions, workplaces, schools, and non-governmental organizations (NGOs).

The Basic Act also mandated the Government of Japan to establish a set of immediate objectives, the General Principles of Suicide Prevention Policy. The GPSP, developed in 2007, was based on the Basic Act and provided a practical framework for suicide prevention activities. The immediate objectives of the GPSP were: (i) to promote research on suicide; (ii) to deepen citizens' understanding of suicide prevention; (iii) to secure and train human resources; (iv) to promote mental health; (v) to develop mental health services; (vi) to act on social factors; (vii) to support the survivors of suicide attempts; (viii) to support the bereaved; and (ix) to support the activity of NGOs. The GPSP was revised in part in 2008, establishing 50 activities under these nine immediate objectives. The revision included measures to provide suicide-related information on the Internet plus outreach to high-risk individuals, such as people with schizophrenia or alcohol/drug dependence, as well as young people who exhibit self-injurious behavior. The GPSP was totally revised in 2012.

Other countries have also developed national suicide prevention programs.⁸ Research indicates that such programs are effective, particularly for the elderly and young people.⁹ The United States enacted the Garrett Lee Smith Memorial Act in 2004 to support youth suicide prevention programs.¹⁰ To our knowledge, in 2006, Japan became the first country to pass a law specifically creating a comprehensive suicide prevention policy. As of 2013, only a few countries had enacted legislation for suicide prevention, including the United States,¹⁰ Japan, South Korea,¹¹ and Canada.¹² Because suicide rates in East Asian countries tend to be high,¹³ the legislation in Japan and South Korea were important events for improving public health policy. As yet, no academic research has reviewed the development of suicide prevention policies in Japan or South Korea.

The purpose of our current study is to review the development of Japan's suicide prevention policy under the Basic Act and the GPSP from a public health perspective.

Developmental Phases of Suicide Prevention Policy in Japan

The first phase (1998–2005)

In the first phase, the MHLW initiated Japan's suicide prevention policy as part of the "National Health Promotion Movement in the 21st Century (Healthy Japan 21)" in 2000,¹⁴ and set a budget for suicide

prevention in fiscal year 2001. At that time, the MHLW led Japan's suicide prevention policy, organizing the Suicide Prevention Council. The council's 2002 report strongly recommended that suicide prevention include prevention, intervention, and postvention, and should be carried out through an integrated effort, following guidelines published by United Nations in 1996 for implementing national suicide prevention strategies.¹⁵

We present the development of suicide prevention efforts by prefectures and designated cities in Table 1. In the first phase, only 10.3 per cent (6 local governments of the 58 local governments) formally established suicide prevention committees, while 13.8 per cent (8 local governments of the 58 local governments) prepared budgets. These local governments were primarily those with historically high suicide rates.

Nevertheless, this phase sowed the seeds for the future development of suicide prevention policy. In 2000, the situation began to change when children who had lost their parents by suicide began to break the taboo by speaking out their experiences in the media.¹⁶ They published a book to tell of experiences that they had not been able to confide to anyone for a long time. In 2001, the children met Prime Minister and petitioned him to develop suicide prevention policy.

The second phase (2005–2006)

In the second phase (see Figure 3), the NGO LIFELINK collaborated with a member of the Diet to organize the first forum on suicide prevention. At the forum, LIFELINK and other NGOs submitted

Table 1: Suicide prevention efforts by local governments in Japan

Time of investigation (number of local governments)	December 2002 (58)	March 2008 (64)	April 2009 (65)	April 2010 (66)	April 2011 (66)	April 2012 (67)
Cross-sectional network in local government	—	37 (57.8%)	45 (70.3%)	51 (77.3%)	56 (84.8%)	54 (80.6%)
Suicide prevention committee	6 (10.3%)	61 (95.3%)	64 (98.5%)	64 (97.0%)	63 (95.5%)	65 (97.9%)
Budget for suicide prevention	8 (13.8%)	63 (98.4%)	65 (100.0%)	65 (98.5%)	66 (100.0%)	—

proposals for comprehensive suicide prevention. The Minister of MHLW, who attended the forum, vowed as a representative of the government to tackle the issue of suicide. This vow was widely reported in the media.¹⁶ With suicide deaths still exceeding 30 000 annually, the Upper House of the Diet resolved to create and implement an urgent, comprehensive policy for suicide prevention. The government then organized the Suicide Prevention Liaison Committee with related ministries and agencies represented.

In this phase, leadership for suicide prevention gradually shifted from the MHLW to the CaO. It promoted suicide prevention as a comprehensive government policy. Thus, the second phase transformed Japan's suicide prevention policy into a more comprehensive model. Even so a limited number of local governments took active measures to promote suicide prevention.

The third phase (2006–present)

What happened to improve policy? By 2007 the Diet had passed the Basic Act and the Cabinet adopted the GPSP. After the global economic crisis of 2008, Japan's government established a Special Fund for local governments to reinforce suicide prevention efforts. Central government expenditure for the Fund reached 16.7 billion JPN Yen, in total, between fiscal year 2009 and 2013. In fiscal year 2011, the total national budget for suicide prevention, according to the CaO, was 11 655 million JPN Yen (approximately US\$1 = 80 JPN Yen in October 2011).²

After the Cabinet adopted the GPSP, three entities – the Center for Suicide Prevention (CSP) at the National Center of Neurology and Psychiatry (NCNP) of Japan, CaO, and MHLW – collaborated on a survey to review implementation of activities by local governments. All prefectural and designated city governments participated in the study.

As shown in Table 1, all local governments established budgets for suicide prevention in fiscal year 2011. Figure 4 shows the activities undertaken by local governments between fiscal years 2008 and 2011 to achieve the nine GPSP objectives.¹⁷ These increased sharply in fiscal year 2010 because the central government provided Special Funds. (The decrease in 2011 was likely caused by a change in reporting methods.) The increase in universal prevention activities to “promote mental health”, “deepen citizen's understanding of suicide prevention”, and “secure and train human resources” was greater than the increase in selective and

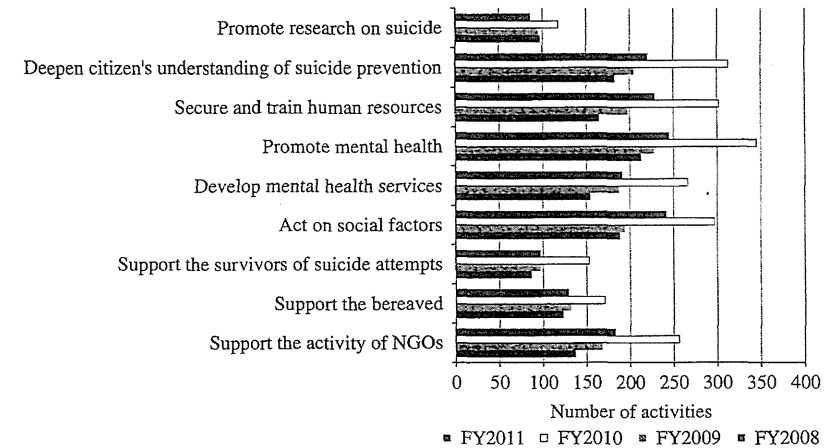


Figure 4: Number of suicide prevention activities by local governments, fiscal years 2008–2011.

indicated prevention measures, such as “support the survivors of suicide attempts” and “support the bereaved”. The survey also found that the implementation rate was high in fields targeted to “deepen citizen's understanding of suicide prevention”, “secure and train human resources”, and “promote mental health”. It was low in areas targeted to “support the survivors of suicide attempts”.¹⁸

The survey found that local governments tended to focus on universal prevention activities. An audit of Special Funds conducted by the CaO showed that local governments and municipalities had improved selective prevention activities.¹⁹ For instance, an activity led by a prefecture and a municipality intended to promote networking between primary care physicians and psychiatrists treating insomnia or sleep-related problems among middle-aged men attracted nationwide attention as a promising effort.²⁰ A revision of the Money Lending Business Act of 2006, plus a task force in the central government and councils in local governments to address multiple debts, supported counseling services for people with multiple debts. Decrease in suicide rates among men aged 45–64 after 2009 (see Figure 2), may, in part, be the result of efforts that specifically targeted middle-aged men.

Notably only a limited number of suicide prevention activities included objective evaluations. This underscores the need to heighten awareness about evaluation methods.

Evaluation

In January 2012, the NCNP invited a World Health Organization (WHO) team for a field visit to review Japan's national program for suicide prevention. The WHO report emphasized the importance of conducting efficacy and effectiveness evaluations for each suicide prevention effort, as well as promotion of selective and indicated prevention measures.²¹ To discuss the evaluation of suicide prevention initiatives in Japan, we summarize some major activities.

Recommendations by the Ministry of Internal Affairs and Communications (MIC)

The Administrative Evaluation Bureau of the MIC released a report on suicide prevention policies in June 2012.²² From May 2011 to June 2012 it surveyed many entities: the CaO; National Police Agency; Financial Services Agency; Consumer Affairs Agency; MIC; Ministry of Justice; Ministry of Education, Culture, Sports, Science and Technology; MHLW; Ministry of Agriculture, Forestry and Fisheries; Ministry of Economy, Trade and Industry; Ministry of Land, Infrastructure, Transport and Tourism; Ministry of Defense; 47 local governments (including 30 municipalities); 3 independent administrative corporations, including the NCNP; and 52 private organizations. The report:

1. noted that evaluations of suicide prevention activities performed under the GPSP were insufficient, particularly as they offered few good examples of suicide prevention measures undertaken by local governments and focused on high-risk groups and individuals;
2. recommended additional support for private organizations that provide counseling services for people at risk of suicide;
3. recommended further cooperation among related organizations, including clarification of procedures and connections among emergency and critical-care centers and community support for those who attempt suicide;
4. recommended that educational activities for preventing suicide be reinforced, with a focus on concrete objectives;
5. recommended that suicide prevention activities be enhanced for the disaster area of the 2011 Tohoku Earthquake and Tsunami, as it is important to monitor the mental health of victims, volunteers, support staff from local governments, and other affected persons.

Recommendations for revision of the GPSP by the NCNP and related societies

Before the scheduled revision of the GPSP in 2012, the CSP of the NCNP and societies with experience in suicide prevention activities began recommending revisions. They were based on research since the GPSP was established. A working group founded by the CSP requested from 88 societies: (i) policy proposals for the GPSP revision and (ii) details of evidence-based suicide prevention activities to implement then or in the future. The working group prepared its recommendations for revising the GPSP and submitted them in June 2012 to the Minister of State for Suicide Prevention.²³

Here are a few recommendations in the executive summary: (i) local governments should focus resources on suicide prevention activities specific to local conditions and directly related to suicide; (ii) three types of suicide prevention – universal prevention (efforts that affect everyone in a defined population regardless of the risk of suicide), selective prevention (efforts that target subgroups at elevated suicide risk), and indicated prevention (for individuals with a risk factor or condition that puts them at very high risk)²⁴ – should be specified to reinforce safe and effective prevention; (iii) require proper use of evidence on suicide and suicide prevention; (iv) emphasize concrete, focused approaches to the social factors, including socioeconomic factors such as bankruptcies, heavy debt, and joblessness, underlying suicide; (v) cultivate better understanding of mental health; and (vi) reinforce monitoring schemes to support suicide survivors and people at high risk for suicide. Cooperation between the mental health and social service sectors is essential for suicide prevention.

The total revision of the GPSP in August 2012^{24,25} reflected an immense effort to obtain scientific evidence and opinions. The revised GPSP's was subtitled: "Achieving a society where nobody is driven to suicide", thus underscoring importance of practical approaches at the local level. It emphasized the need to support people who attempt suicide, and for selective and indicated prevention for high-risk groups and individuals. The revised policy noted the importance of cooperation among the central government, local governments, municipalities, and private organizations to expand support of high-risk people, possibly by linking suicide prevention policy with other policies.

Suicide statistics after 2006

Approximately 30 000 people each year died from suicide between 2006 and 2011 (see Figure 1). After 2009 the suicide rate declined, bringing the annual number of suicides in 2012 to below 30 000, for the first time since 1998.

After 2009, suicide rates among men aged 45–64 dramatically decreased (Figure 2). According to police statistics,² the number of suicides attributed to economic and livelihood issues decreased steadily from more than 8000 in 2009 to approximately 5200 in 2012. Of suicides where reasons could be determined, economic and livelihood issues remained the most frequently reported among middle-aged men. The CaO analyses of police statistics²⁶ suggested that the decreased suicide rate among middle-aged men might be in part the result of the suicide prevention policy initiated by the Basic Act and GPSP, and relevant activities under the Money Lending Business Act. Efforts by local governments and related organizations, including support for middle-aged, jobless men or multiply-indebted men, may also have contributed to the decrease. Moreover, the CaO suggested that the decrease in suicide after 2009 may be due to a decrease in suicide associated with health problems.²⁶

Nakanishi *et al* examined progress in community systems for suicide prevention and initiatives for suicide prevention by local governments using the Special Fund.²⁷ The Special Fund seemed to have successfully promoted creation of community systems for suicide prevention and local government suicide prevention effort. Although, to our knowledge, it was the first empirical study to assess the impact of the Special Fund, future research should evaluate the impact of the suicide prevention policy initiated by the Basic Act and GPSP and by the Special Fund with a focus on national and small area-specific suicide rates.

How can Japan assess the effect of initiatives on suicide rates? The Special Fund, for example, dates from fiscal year 2009, providing only a few years of data. Because of the complexity of risk factors for suicide,¹ it is very difficult to know whether changes in suicide rate are due to national suicide prevention initiatives (that is, the Basic Act and GPSP) and to the Special Fund. Furthermore, due to the low rate of completed suicides, the suicide rate should not be considered as the only primary indicator of measuring the effectiveness of suicide prevention efforts.¹ To evaluate suicide prevention policy effects on suicide in an and in other

countries, other outcome measures, such as suicide attempt rate and increase in mental health literacy are relevant. Help-seeking behavior among the public, as well as suicide rate, should be considered.

Conclusion

Our review suggests that the Basic Act and the GPSP facilitated Japan's suicide prevention activities by establishing a Special Fund for local governments, emphasizing networking among relevant stakeholders. Increased funding and activities led to a comprehensive, multi-sector approach²⁸ with attention to social factors underlying suicide. The essence of Japan's suicide prevention program can be found in the Basic Act: suicide prevention must be implemented as part of a society-wide effort, because suicide is not just a personal problem. Japan's suicide prevention policy has attended to social factors that contribute to suicide and has tried to increase public awareness to help develop a comprehensive prevention policy, as advocated in the WHO Mental Health Action Plan 2013–2020.²⁹ Public attention helped the government allocate substantial budgets to local governments and municipalities to promote grass-root activities by non-profit organizations.

In Japan, a serious lack of evaluation of suicide prevention activities persists. One exception is the suicide prevention program led by Oyama *et al*³ that measured improvement in detection and treatment of depression among the elderly living in a rural area in Japan. A recent study reports on a community-based multimodal intervention for suicide prevention in rural areas with high suicide rates in Japan.³⁰ As described in the revised GPSP of 2012, Japan's suicide prevention strategy should enhance evaluation and monitoring schemes.

As suicide is a global problem requiring a global dialog, the WHO published the World Suicide Report in September 2014.¹⁶ The report prescribes that (i) suicides are preventable and a comprehensive multi-sectoral suicide prevention strategy is needed; (ii) restricting access to the means for suicide, including pesticides, firearms, and certain medications, is an effective strategy for preventing suicides and suicide attempts; (iii) health-care services need to incorporate suicide prevention efforts as a core component; and (iv) communities play a critical role in suicide prevention, providing social support and follow-up care, fighting stigma, and supporting those bereaved by suicide.

We believe that Japan's experience with a comprehensive suicide prevention strategy, based on a legal foundation, can assist other countries in planning a suicide prevention policy. Japan's experience can be of particular help to countries that have undergone rapid changes in their social structure, such as sudden economic growth or population decline. The development of suicide prevention policy should be closely monitored so that other countries can benefit from the experience.

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Regular Article

National strategy for suicide prevention in Japan: Impact of a national fund on progress of developing systems for suicide prevention and implementing initiatives among local authorities

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Aim: In Japan, the Cabinet Office released the 'General Principles of Suicide Prevention Policy' in 2007 and suggested nine initiatives. In 2009, a national fund was launched to help prefectures (the administrative divisions of Japan) and local authorities implement five categories of suicide-prevention programs. This paper examines the impact of the national fund on the establishment of the systems for suicide prevention and the implementation of these initiatives among local authorities.

Methods: The present study included 1385 local authorities (79.5%) from all 47 prefectures that responded to the cross-sectional questionnaire survey.

Results: Improved suicide-prevention systems and the implementation of nine initiatives in April 2013 were observed among 265 local authorities (19.1%) that implemented 'Training of community service providers' and 'Public awareness campaigns'; 178 local authorities (12.9%) that implemented 'Face-to-face counseling', 'Training of community service pro-

viders' and 'Public awareness campaigns'; and 324 local authorities (23.4%) that implemented 'Trauma-informed policies and practices'. There was no significant difference in suicide-prevention systems and the implementation of nine initiatives between 203 local authorities (14.7%) that implemented only 'Public awareness campaigns' and 231 local authorities (16.7%) that did not implement any suicide-prevention programs.

Conclusion: The results of our study suggest that the national fund promoted the establishment of community systems for suicide prevention and helped implement initiatives among local authorities. The national suicide-prevention strategy in Japan should explore a standard package of programs to guide community suicide-prevention efforts with a sustained workforce among local authorities.

Key words: health policy, Japan, local government, suicide.

SUICIDE IS ONE of the leading causes of death worldwide for all age groups. Nearly one million

people die from suicide every year.¹ National suicide-prevention strategies have been developed in several countries, including Australia,² Canada,³ England,⁴ Finland,^{5,6} Norway,⁷ Scotland,^{8,9} Sweden,¹⁰ and the USA.¹¹ Historically, Japan has had a higher suicide rate than these countries.¹² In 2011, the suicide rate per 100 000 people was 20.9 in Japan and 6.7–16.4 in the aforementioned Western countries. Although some small-area trials have been demonstrated to reduce suicide rates,^{13,14} overall suicide rates have

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remained high following a striking increase in 1998 across the nation.^{15,16}

In 2006, the Basic Act for Suicide Prevention was enacted to clarify the responsibilities of all stakeholders, including local authorities, employees, and citizens, for preventing suicide in Japan. In 2007, the Cabinet Office released the 'General Principles of Suicide Prevention Policy', which was aimed at reducing the overall suicide rate by 20% over the next decade.^{15,17} The General Principles of Suicide Prevention Policy include nine initiatives and 48 objectives. The nine initiatives consist of the following: (i) research on the prevalence, risk, and protective factors for suicidal behaviors; (ii) increased public awareness; (iii) human resources for early intervention; (iv) community efforts for mental health; (v) better access to mental healthcare; (vi) supportive community environments; (vii) prevention of suicide reattempts; (viii) support for persons bereaved by suicide; and (ix) enhanced public-private partnerships. Additionally, the Cabinet Office launched a national fund to help prefectures (the administrative divisions of Japan) and local authorities implement suicide-prevention programs during a 3-year period from 2009 to 2011 (which was extended to 2012). The fund is allocated to each prefecture, which can then implement suicide-prevention programs and/or distribute the fund to local authorities. Each prefecture and local authority voluntarily determines the components of the suicide-prevention programs from five categories. The five categories of programs include the following: (i) face-to-face counseling; (ii) tele-counseling; (iii) training of community service providers; (iv) public awareness campaigns; and (v) trauma-informed policies and practices (Fig. 1). 'Face-to-face counseling' programs include screening for mental health needs and making appropriate referrals. The 'Trauma-informed policies and practices' program includes 'reinforcement models', in which local authorities adopt a flexible approach based on the situation in each area, such as suicide hot spots and railway suicides.

The five categories of suicide-prevention programs do not directly correspond with the nine initiatives of the General Principles of Suicide Prevention Policy. Together, these suicide-prevention programs aimed to endorse progress in community systems with respect to suicide prevention among local authorities. In 2013, the Council for Evaluation on Suicide Prevention Programs was established to provide an evaluation of the progress and outcomes from the

national fund and support for updating the national suicide-prevention strategy. The Council indicated that the 4-year period may be too short to monitor the changes in suicide rates because long-term programs, not short-duration interventions, have been more effective in reducing suicide rates in the community.¹⁸ Policy evaluation at this stage should examine the implementation process of the suicide-prevention programs by the national fund. Therefore, the outcome measures here were defined as the progress on developing the systems and implementing the nine initiatives for suicide prevention. This paper describes the results from the task force within the Council and examines the impact of the national fund on the establishment of systems, and on the implementation of the nine initiatives for suicide prevention. This study is the first nationwide examination to investigate the impact of a national suicide-prevention strategy on small areas within Japan as well as in other countries.

METHODS

Design and subjects

In this study, we used a cross-sectional design with a 4-week investigation period from 1 to 30 April 2013. The Center for Suicide Prevention, National Institute of Mental Health (NIMH), National Center of Neurology and Psychiatry (NCNP) mailed a paper questionnaire on 1 April 2013, to each local authority being assessed. The Center sent reminders by mail to the local authorities that did not return the questionnaire by 30 April 2013.

The questionnaire targeted all of the 1742 Japanese local authorities (cities, special wards, towns and villages) as of 1 April 2013. The local authority is the administrative unit below the prefecture level ($n = 47$) in Japan. Japanese cities are defined as having a population of more than 50 000 people. Towns and villages are smaller than cities. Each of the special wards is legally equivalent to a city. Information on the department responsible for suicide prevention in each local authority was obtained from the prefecture. We asked each department to choose one appropriate respondent to answer the questionnaire by 30 April 2013. The questionnaire survey assessed the establishment of systems for suicide prevention, and the implementation of the nine initiatives in the local authorities.

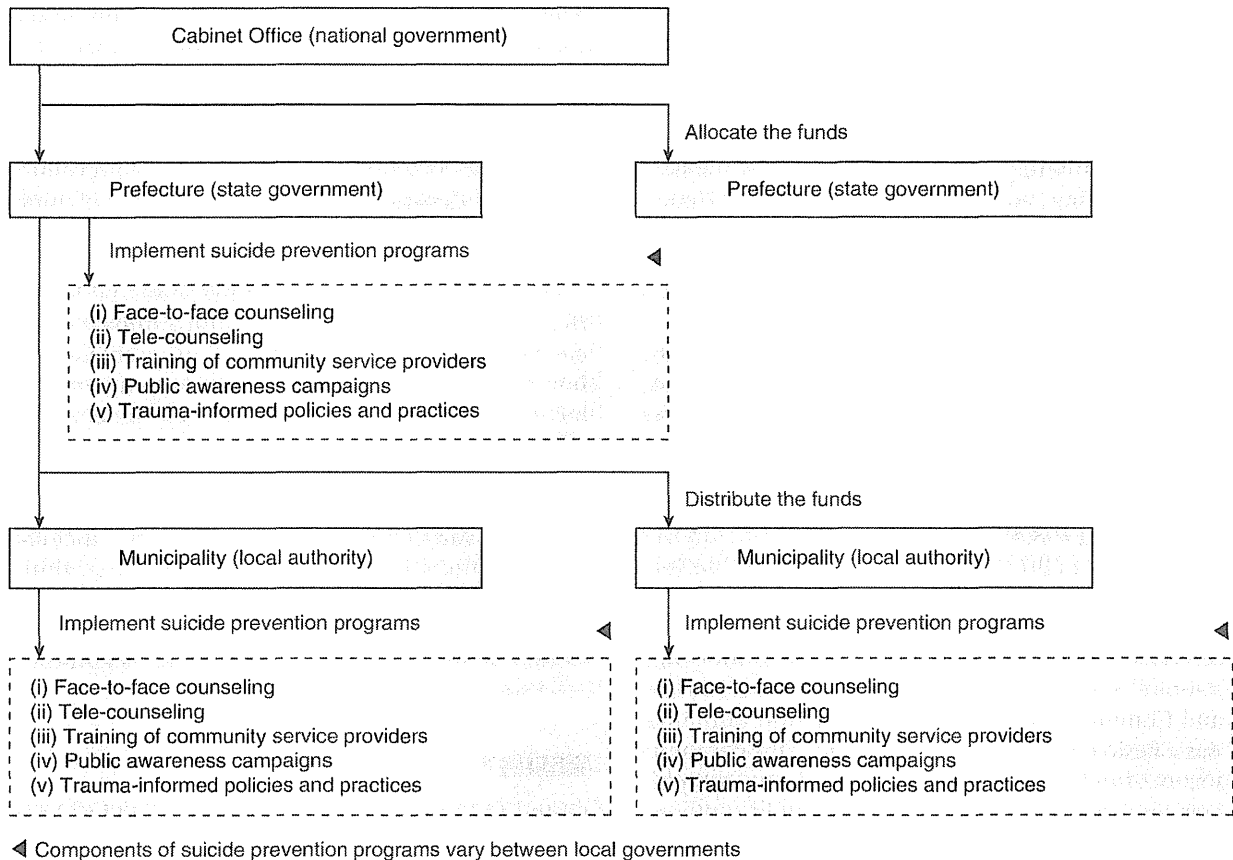


Figure 1. The Cabinet Office allocates a national fund to each prefecture (the administrative division of Japan), which can then implement suicide-prevention programs and/or distribute the fund to municipalities (local authorities). Each prefecture and local authority voluntarily determines the components of the suicide-prevention programs from five categories. Therefore components of suicide-prevention programs vary between local authorities.

Measures

The section of the questionnaire that focused on the establishment of suicide-prevention systems consisted of three items: (i) an organization across multiple departments responsible for suicide prevention in the local authority; (ii) a community network for suicide prevention involving the third sector; and (iii) a local action plan for suicide prevention. Each item asked about the presence of the system in April 2013. These three items were derived from key components of successful programs for suicide prevention as identified by Fountoulakis *et al.*¹⁸

Our assessment also collected information on the implementation of the nine initiatives that both prefectures and local authorities are required to

implement according to the ‘General Principles of Suicide Prevention Policy’. Each item asked about the implementation of the activity in the 2012 fiscal year (from April 2012 to March 2013). We used the total number of implemented items for multivariate analyses.

Information on the implementation of suicide-prevention programs in the local authorities was made available from the Cabinet Office for 2010–2012. Because the national fund was launched in mid-2009, we calculated the total budget implemented during the 3-year period. The total budget showed high correlations with the total population (Pearson’s $r = 0.79–0.80$) and the total number of public officers (Pearson’s $r = 0.75–0.76$) between 2009 and 2012. Therefore, the implementation of

each type of suicide-prevention program was coded into two categories: '0 = no budgets (not implemented)' or '1 = implemented'. With respect to the prefectures, most prefectures implemented suicide-prevention programs: 46 (97.9%) employed 'face-to-face counseling', 45 (95.7%) implemented 'tele-counseling', and 47 (100%) implemented 'training of community service providers', 'public awareness campaign', and 'trauma-informed policies and practices'. Therefore, we excluded the implementation of programs in prefectures from the analysis.

Suicide data were made available from the National Police Agency for 2009–2012. Each suicide was assigned to one of the 1742 local authorities according to the victim's place of usual residence on the date of death. The 1742 local authorities reported 31 924 (98.3%) out of all 32 485 suicide cases in 2009, 30 822 (98.4%) out of 31 334 in 2010, 30 013 (98.8%) out of 30 370 in 2011, and 27 240 (98.7%) out of 27 589 in 2012.

To collect information on the demographic characteristics for 2009–2012, we used the following national statistics of the Ministry of Internal Affairs and Communications: the total population from the Basic Resident Register and Population; the per capita income from the System of Social and Demographic Statistics; and the total number of public officers from the Survey on Wages of Local Government Employees.

Ethical considerations

The study was approved by the Cabinet Office, and the Ministry of Health, Labor, and Welfare. The study did not collect any personal information.

Statistical analysis

Because suicide-prevention programs consisted of five categories, there were 32 (2^5) possible patterns of implementation. The frequency of each pattern was calculated. Therefore, local authorities were categorized according to frequent patterns of implementation. The baseline demographic variables (2009) of local authorities were compared between the categories.

Multiple Poisson regression analysis for cross-sectional time-series (panel) data was conducted using the annual number of suicide cases by sex as a dependent variable. The model included the implementation of suicide-prevention programs. Demo-

graphic variables were also entered as time-series variables. The annual numbers of suicide cases were treated as dependent variables, with the natural logarithm of the population number by sex as an offset.

Binomial logistic regression was employed using the presence of community-based suicide-prevention systems as dependent variables. The model included the implementation of suicide-prevention programs and baseline demographic variables.

Finally, linear regression analysis was performed using the implementation of the nine initiatives as a dependent variable. The model also entered the implementation of suicide-prevention programs and baseline demographic variables as independent variables.

Because data were taken from local authorities nested in a prefecture, multilevel modeling was used for multivariate analyses. The models included random effects for prefecture to account for within-prefecture correlations. All statistical analyses were conducted using STATA 13.0 for Windows (StataCorp, College Station, TX, USA). The 2-tailed significance level was set at 0.05.

RESULTS

Of the 1742 local authorities targeted, 1385 (79.5%) replied to the questionnaire survey. The final sample for analysis consisted of the 1385 respondent municipalities. The respondent department of each municipality consisted of the following: a health section ($n = 743$), a welfare section ($n = 226$), a 'health and welfare' section ($n = 383$), a policy management section ($n = 6$), or a non-specified department ($n = 27$). The 1385 local authorities in 2009 had a larger population size ($t [1690.97] = 8.15$, $P < 0.001$), a higher per capita income ($t [719.62] = 7.58$, $P < 0.001$), a greater number of public officers ($t [1739.82] = 7.87$, $P < 0.001$), and a greater number of male ($t [1660.51] = 8.15$, $P < 0.001$) and female ($t [1634.97] = 7.37$, $P < 0.001$) suicide cases than the 357 non-respondent authorities.

Suicide prevention programs under the national fund

A majority of the respondent local authorities ($n = 1083$, 78.2%) implemented a 'public awareness campaign'. One-half of the local authorities ($n = 814$, 58.8%) implemented the 'training of community

Table 1. Implementation of suicide-prevention programs among the 1385 local authorities from 2010 to 2012

Pattern of implementation	<i>n</i>	%
'Training of community service providers' and 'Public awareness campaigns'	265	19.1
No program implemented	231	16.7
'Public awareness campaigns' only	203	14.7
'Face-to-face counseling', 'Training of community service providers' and 'Public awareness campaigns'	178	12.9
'Face-to-face counseling', 'Training of community service providers', 'Public awareness campaigns' and 'Trauma-informed policies and practices'	129	9.3
'Training of community service providers', 'Public awareness campaigns' and 'Trauma-informed policies and practices'	91	6.6
Other 26 patterns of implementation	288	20.8

service providers'. One-third of the local authorities ($n = 507$, 36.6%) implemented 'face-to-face counseling'. A quarter of the local authorities ($n = 324$, 23.4%) implemented 'trauma-informed policies and practices'. Few authorities ($n = 132$, 9.5%) implemented 'tele-counseling'. The total budget reached 2 636 248 210 yen during the 3-year period. The number of local authorities that implemented suicide-prevention programs increased from 747 in 2010 to 1152 in 2012.

Among 32 possible patterns of implementation, the highest frequency was observed in the combined implementation of 'training of community service providers' and 'public awareness campaigns'. A frequency of 10% and more was observed only in four patterns of implementation (Table 1). 'Trauma-informed policies and practices' were generally implemented in combination with other categories of suicide-prevention programs ($n = 320$, 98.8%). Therefore, local authorities were divided into the following six categories: (i) 'training of community service providers' and 'public awareness campaigns'; (ii) 'public awareness campaigns' only; (iii) 'face-to-face counseling', 'training of community service providers', and 'public awareness campaign'; (iv) 'trauma-informed policies and practices' (and others); (v) other patterns of implementation; and (vi) no suicide-prevention programs implemented.

Baseline demographic characteristics and suicide rates from 2009 to 2012

The local authorities that implemented 'trauma-informed policies and practices' exhibited a larger population size, a greater number of public officers,

and a greater number of male and female suicide cases in 2009 than those in other categories of implementation. The local authorities that did not implement any suicide-prevention programs indicated a lower per capita income (Table 2).

The results of the multilevel multiple panel Poisson regression analyses demonstrated a significantly smaller annual number of male suicide cases in the local authorities that exhibited a higher per capita income. The number of suicide cases was not significantly different between the categories of implementation of suicide-prevention programs (Table 3).

Community-based suicide-prevention systems and nine initiatives

The results of the multilevel binomial logistic regression analyses revealed a greater likelihood of the establishment of systems for suicide prevention in local authorities that implemented suicide-prevention programs compared with those that did not implement any suicide-prevention programs. The establishment of a community network and local action plan was significantly higher in the local authorities that had a greater number of public officers (Table 4).

The results of the multilevel linear regression analysis demonstrated that a larger number of the nine possible initiatives were put into operation in local authorities that implemented suicide-prevention programs compared with those that did not implement any suicide-prevention programs. The implementation of the nine initiatives was significantly greater in the local authorities that had a

Table 2. Baseline demographic characteristics of the 1385 local authorities

Mean (SD) at 2009	T&P (n = 265)	P (n = 203)	F&T&P (n = 178)	TI (n = 324)	Other (n = 184)	None (n = 231)	F (5)	P-value
Total population	69528.5 [†] (92598.4)	46572.6 [‡] (67029.7)	81406.2 [§] (115044.1)	175157.4 ^{†,‡,§,¶, ,++} (366905.3)	58423.3 (80326.9)	24320.8 ^{§,++} (32775.4)	21.75	<0.001
Annual per capita income, million yen	1.2 [†] (0.4)	1.2 [‡] (0.5)	1.2 [§] (0.4)	1.2 [¶] (0.4)	1.2 (0.4)	1.1 ^{†,‡,§,¶} (0.3)	4.12	0.001
Number of public officers	646.2 [†] (747.5)	456.6 [‡] (602.0)	767.2 [§] (943.4)	1655.4 ^{†,‡,§,¶,} (3732.5)	529.6 [¶] (633.6)	277.3 (334.9)	19.06	<0.001
Number of male suicide cases	21.5 [†] (16.8)	8.5 [‡] (12.3)	14.4 [§] (18.8)	30.8 ^{†,‡,§,¶, ,++} (61.4)	10.6 (14.8)	4.3 ^{§,++} (6.5)	23.32	<0.001
Number of female suicide cases	4.9 [†] (7.0)	3.3 [‡] (5.5)	5.8 [§] (8.0)	12.8 ^{†,‡,§,¶,} (27.2)	4.1 [¶] (5.5)	1.8 (2.7)	21.52	<0.001

^{†,‡,§,¶,||,++}Significant difference between the same symbol by Tukey's ad hoc test ($P < 0.05$).
F&T&P, 'Face-to-face counseling', 'training of community service providers', and 'public awareness campaigns'; Other, other patterns of implementation; P, 'Public awareness campaigns' only; T&P, 'Training of community service providers' and 'Public awareness campaigns'; TI, 'Trauma-informed policies and practices' (and others).

Table 3. Multiple Poisson regression analyses for cross-sectional time-series (panel) data of number of suicide cases from 2009 to 2012 in the 1385 local authorities

	Coefficient (95%CI)	
	Male	Female
Constant value	-7.66 (-7.77--7.54)	-8.86 (-9.03--8.69)
Demographic characteristic (time-series)		
Per capita income	-0.20* (-0.25--0.14)	-0.28 (-0.10--0.04)
Natural logarithm of the number of public officers	0.004 (-0.01--0.02)	0.01 (-0.01--0.03)
Suicide-prevention programs (none = 0)		
'Training of community service providers' and 'Public awareness campaigns'	0.02 (-0.06--0.09)	-0.07 (-0.19--0.05)
'Public awareness campaigns' only	0.05 (-0.03--0.13)	-0.05 (-0.18--0.07)
'Face-to-face counseling', 'training of community service providers', and 'public awareness campaigns'	-0.02 (-0.10--0.06)	-0.06 (-0.18--0.06)
'Trauma-informed policies and practices' (and other)	0.01 (-0.07--0.09)	-0.04 (-0.16--0.08)
Other patterns of implementation	0.04 (-0.05--0.12)	-0.07 (-0.20--0.05)
Random effect		
Intercept (Prefecture)	0.11 (0.08--0.15)	0.14 (0.10--0.19)
Fitness of the model		
χ^2 (7)	53.24	4.71
Log likelihood	-3337.63	-2555.74
P-value	<0.001	<0.001
Akaike's information criterion	6693.26	5129.48

* $P < 0.05$.
Offset = natural logarithm of the total population of each sex.
CI, confidence interval.