

Chapter 2

Rationale Behind Suicide Prevention Policies

1 Introduction

Article 25(1) of the Constitution of Japan stipulates: “All people shall have the right to maintain the minimum standards of wholesome and cultured living.” However, data on suicide in Japan suggest that not all people enjoy this right. According to “About deaths by suicide among recipients of livelihood assistance,” a report released by the Ministry of Health, Labour and Welfare in July 2011, the suicide rate among recipients of livelihood assistance was 54.8 per 100,000 people in 2008, 62.4 in 2009, and 55.7 in 2010, more than twice the national average of 25.3, 25.8, and 24.9 respectively (Public Assistance Division, Social Welfare and War Victims’ Relief Bureau, Ministry of Health, Labour and Welfare 2012). Furthermore, according to data from the National Police Agency, suicides caused or triggered by “economic and livelihood issues” in 2010 totaled 7,438. Of these, 1,649 were caused or triggered by “hardships in life” (Community Safety Planning Division, Community Safety Bureau, National Police Agency 2011). Moreover, of these 1,649, 1,049 were unemployed. As we shall explain in Chapter, the suicide rate among unemployed people, including jobless and pensioners, is much higher than in those who have a job. These facts indicate that destitution is an obstacle to attaining the “minimum standards of wholesome and cultured living.” Thus, policy interventions to prevent suicide may be justified from the point of view of the Constitution.

However, in addition to constitutional views, this chapter argues that suicide prevention is necessary for economic reasons. The first is the negative externalities and social costs of suicide, the second is the lifetime work-loss costs of suicide, and the third is market imperfections and incentive distortions that contribute to suicide.

The rest of this chapter is organized as follows: Sects. 2, 3, and 4 discuss the negative externalities that suicide generates, and we argue that these externalities

can be a basic rationale for preventing suicide. Section 2 will show our estimates of the number of bereaved family members of those who died by suicide, Sect. 3 discusses the so-called Werther effect, i.e., suicides induced by media reports on celebrity suicides, and Sect. 4 examines the social costs of suicides arising from railway suicides, loss of individuals, and lifetime work-loss costs, which may justify active policy interventions to prevent suicide. Section 5 shows that socioeconomic factors such as insurance and credit market imperfections, and distortions in incentives can be behind suicide, necessitating carefully designed policy interventions. Finally, potential caveats are discussed in the concluding section.

2 Bereaved Family Members of Suicide Victims¹

Key to preventing suicides is identifying high suicide-risk groups. In the US National Strategy for Suicide Prevention, risk factors for suicide are divided into three categories. Among these, family history of suicide is one of the biopsychosocial risk factors. Relational or social loss is one of the environmental risk factors, and exposure to and influence of others who have died by suicide is one of the socio-cultural risk factors (U.S. Department of Health and Human Services 2001). Hence, family members of suicide victims belong to all three categories. In a resource for general physicians (World Health Organization 2000), the World Health Organization itemizes eight clinically useful individual and socio-demographic risk factors associated with suicide, as documented by Gunnell and Frankel (1999), and among them is family history of suicide and bereavement in childhood. Yet, little is known about those “left behind” family members. In particular, there is little information on the number of family members of suicide victims.² Although some studies attempted to estimate the costs of suicide, estimates of the number of family members of suicide victims in such studies were made only on the basis of ad hoc assumptions or small-scale case studies (Coggan et al. 1997; Clayton and Barcelo 1999; O’Dea and Tucker 2005). Although often neglected, information on the number of family members of suicide victims is valuable in evaluating the cost-effectiveness of suicide prevention programs and in designing appropriate policies.

The next section presents a study by Chen et al. (2009), which was designed to fill in the existing literature. The study developed a method to estimate the number of family members of suicide victims on the basis of aggregate level data and then applied it to the Japanese data.

¹Discussions in this section are based on Chen et al. (2009).

²In this chapter, family members are defined as first-degree relatives: spouses, parents, siblings, and children.

2.1 *Estimating the Number of People Who Became Bereaved in 1993–2006*

The number of suicide victims by gender and 5-year age group from 1993 to 2006 was taken from Vital Statistics data, compiled by the Japanese Ministry of Health, Labour and Welfare.³ The number of bereaved family members for each relationship, gender and age group, and year was estimated using the estimation procedures described below.

Spouses

Data for the marital status of suicide victims in 1995 and 2000 were published by the Ministry of Health, Labour and Welfare in the “2004 Special Report of Vital Statistics.”⁴ The number of spouses of suicide victims, SP , was estimated using Eq. (1)⁵:

$$SP_{t,a,s} = \alpha_{t,a,s} \cdot SCD_{t,a,s} \quad (1)$$

where t , a , and s represent year, age group, and gender, respectively. α is the marriage rate of suicide victims, and SCD is the number of suicide victims. Note that because marriage rates are available only for 1995 and 2000, the marriage rates for other years were interpolated linearly using Eq. (2):

$$\alpha_{t,a,s} = \frac{\alpha_{t_2,a,s} - \alpha_{t_1,a,s}}{t_2 - t_1} (t - t_1) + \alpha_{t_1,a,s} \quad (2)$$

where $t_1 = 1995$ and $t_2 = 2000$.

Siblings

The number of bereaved siblings was estimated using the total fertility rate in the year in which the suicide victims were born, taking into account the survival rate for

³Suicide victims of unknown age are excluded. This should not affect the estimates because they account for less than 1% of all suicide victims.

⁴Marital status is classified into 5 categories: married, single, widowed, divorced, and unknown.

⁵Data on suicide victims are divided into 19 age groups up to age 90 years and above, while data on marital status are divided into only 17 age groups up to age 80 years and above. To adjust for this difference, the same marital status was used for all suicide victims age 80 years and above.

the siblings.⁶ The probability γ_{t_1, t_2} that a person who was born in t_1 was alive in t_2 was calculated using Eq. (3)⁷:

$$\gamma_{t_1, t_2} = \frac{POP_{t_2, t_2 - t_1}}{B_{t_1}} \quad (3)$$

where $POP_{t, a}$ is the number of people of a years old in year t , and B_t is the number of births in year t .⁸ The number of bereaved siblings was then computed using Eq. (4):

$$BS_{t, a} = \gamma_{t-a, t}(\beta_{t-a} - 1)SCD_{t, a} \quad (4)$$

where β is the total fertility rate, and SCD is the number of suicide victims of both genders.

Parents

The average age of women who give birth to median birth-order children is about 30 years.⁹ The probability δ_{t_1, t_2} that a person who was 30 years old in t_1 was still alive in t_2 was calculated using Eq. (5):

$$\delta_{t_1, t_2} = \frac{POP_{t_2, t_2 - t_1 + 30}}{POP_{t_1, 30}} \quad (5)$$

The number of bereaved parents was then computed using Eq. (6):

$$PR_{t, a} = 2\delta_{t-a, t}SCD_{t, a} \quad (6)$$

Children

The fertility rate of women by 5-year age group was used to estimate the number of bereaved children. Let $FR_{t, i}$ be the fertility rate in year t of women in age group

⁶The birth year for suicide victims was calculated by subtracting the mid-point of their age group from the year of suicide. Note that suicide victims of age 90 years and above were treated as people of age 92 years.

⁷Whenever γ became larger than 1, it was set to 1. γ can be larger than 1 due to immigration and missing observations.

⁸Data on population and birth rates are taken from “Population Statistics of Japan 2008,” published by the National Institute of Population and Social Security Research.

⁹The average age of women at childbirth was calculated based on “Average Age of Women at Birth by Birth Order” in Population Statistics of Japan 2008 by the National Institute of Population and Social Security Research.

i . The average number of children of mothers in age group i who died by suicide in year t was calculated using Eq. (7)¹⁰:

$$\xi_{t,a_i} = \sum_{i=0}^{I-1} \Delta a FR_{t-a_i+i\Delta a,i} + \frac{\Delta a}{2} FR_{t-a_i+I\Delta a,I} \quad (7)$$

where $\Delta a = 5$ is the width of the age group interval and a_i is the midpoint of age group i . To take into account the discrepancy between the actual age at suicide and the upper cutoff for age group i , the width of the age group was divided in half. The average number of children of fathers in age group i who died by suicide in year t can be safely assumed to be the same as that of a mother because the average age difference between husband and wife was about 3 years during the sample periods (Chen et al., 2009).

Note that for some age groups, the average marital status is different between the suicide victims and the general population. To take that into account, the estimated number of bereaved children was adjusted by the ratio of the unmarried percentage of suicide victims, NMS , to that of the general population, NM ¹¹:

$$\eta_{t,a} = \frac{NMS_{t,a}}{NM_{t,a}} \quad (8)$$

Substituting in the results from Eqs. (3), (7), and (8) above, the number of living bereaved children, CH , was computed using Eq. (9)¹²:

$$CH_{t,a} = \eta_{t,a} \xi_{t,a} \gamma_{t-a+a_c,t} SCD_{t,a} \quad (9)$$

The number of minor children was also calculated. The index function for minor children whose parents died by suicide in year t is defined by Eq. (10):

$$\theta_{t,a} = 1[a - a_c < 20] \quad (10)$$

where t and a index the year and age at which a person dies by suicide. Therefore, the number of minor children who lost their parents to suicides was computed using Eq. (11):

$$CHJ_{t,a} = \theta_{t,a} CH_{t,a} \quad (11)$$

¹⁰Data on fertility rates are divided into 7 age groups from 15 to 49 years.

¹¹The average unmarried rates in 1995 and 2002 in Japan were taken from the ‘‘Census’’ of the Ministry of Internal Affairs and Communications. The unmarried rate for suicide victims was taken from the ‘‘2004 Vital Statistics’ Special Report of Japan’’ of the Ministry of Health, Labour and Welfare. The data for other years were calculated through linear interpolation in a similar manner as Eq. (2).

¹²By using this approach, children who lost a parent who was less than 30 years old are assigned an age of less than 0 years old. In these cases, the survival rate was set to 1.

2.2 *Estimating the Total Number of Living Bereaved Family Members in 2006*

To estimate the total number of bereaved family members who were still alive in 2006, the family members who became bereaved from 1993 to 2006 were aggregated with an adjustment for survival rates. Next, the number of all family members who became bereaved before 1992 was estimated. Finally, the number of all the above family members who were still alive in 2006 was estimated.

Estimating the Total Number of Living Family Members Who Became Bereaved from 1993 to 2006

The “2000 Prefectural Life Table” was used to calculate the survival rate in 2006, that is, the probability of a bereaved person being alive in 2006.¹³ The probability that a person who was a_1 years old at the time of the suicide becoming a_2 years old was calculated using Eq. (12):

$$p_{a_1, a_2} = \prod_{k=a_1+1}^{a_2} q_k \quad (12)$$

where q_a is the probability of survival from a_{1-1} year to a_1 years. The ages of spouses and siblings were assumed to be the same as those of the suicide victims. The parents of suicide victims were assumed to be 30 years older than the suicide victims, and the children of suicide victims were assumed to be 30 years younger than the suicide victims.

Estimating the Total Number of Living Family Members Who Became Bereaved Before 1992

Due to data limitation only the total number of bereaved family members was estimated, as opposed to the relationship-by-relationship estimates described above. By using the age assumptions in the previous section, together with the relationship-specific estimates of bereaved family members for 1993 to 2006 as calculated above (Table 1), the average age of bereaved family members was calculated to be 47. Since the average life expectancy of a Japanese individual is about 80 years, going back about 35–45 years provides a good estimate of the total number of family members alive in 2006.¹⁴

¹³These data were published by the Ministry of Health, Labour and Welfare.

¹⁴The survival rate is thought to have increased over time. On the other hand, the birth rate is thought to have decreased over time. This chapter assumes that the latter has a greater effect than the former. Although it is not certain that the birth rate increases continuously back through the time period evaluated, even if this factor is changed, the results remain intact.

Table 1 Estimated numbers of bereaved family members 1993–2006

Year	Suicide victims	Spouses	Wives	Husbands	Siblings	Parents	Children	Minor children	Total
1993	20,516	10,070	6,896	3,174	35,970	16,990	35,583	9,284	98,612
1994	20,923	10,050	6,993	3,057	39,020	17,745	36,350	9,005	103,165
1995	21,420	10,350	7,127	3,223	39,429	18,189	37,441	9,304	105,409
1996	22,138	10,747	7,488	3,259	41,495	18,672	38,815	9,717	109,728
1997	23,494	11,434	8,045	3,389	41,547	19,860	41,075	10,199	113,916
1998	31,755	15,490	11,319	4,171	53,152	27,130	51,423	12,659	147,196
1999	31,413	15,255	11,258	3,997	57,017	27,150	51,557	12,684	150,979
2000	30,251	14,722	10,919	3,803	54,254	26,222	49,653	11,762	144,850
2001	29,375	14,290	10,643	3,647	52,888	25,598	48,598	11,374	141,375
2002	29,949	14,600	10,923	3,678	50,333	26,436	49,736	11,912	141,105
2003	32,109	15,397	11,576	3,821	48,746	29,466	49,354	12,344	142,963
2004	30,247	14,345	10,758	3,587	49,951	27,623	46,839	11,757	138,759
2005	30,553	14,338	10,780	3,558	48,813	28,730	46,745	12,345	138,626
2006	29,921	13,973	10,349	3,624	47,769	27,796	45,899	11,954	135,436
Total	384,064	185,062	135,074	49,988	660,386	337,604	629,067	156,300	1,812,119

Table 2 Estimated numbers of bereaved family members per suicide 1993–2006

Year	Spouses	Wives	Husbands	Siblings	Parents	Children	Minor children	Total
1993	0.49	0.34	0.16	1.77	0.83	1.75	0.46	4.85
1994	0.48	0.34	0.15	1.88	0.86	1.75	0.43	4.97
1995	0.49	0.34	0.15	1.86	0.86	1.76	0.44	4.96
1996	0.49	0.34	0.15	1.89	0.85	1.77	0.44	5.00
1997	0.49	0.35	0.15	1.79	0.85	1.77	0.44	4.89
1998	0.49	0.36	0.13	1.69	0.86	1.63	0.40	4.68
1999	0.49	0.36	0.13	1.83	0.87	1.66	0.41	4.85
2000	0.49	0.36	0.13	1.81	0.87	1.66	0.39	4.83
2001	0.49	0.37	0.13	1.82	0.88	1.67	0.39	4.85
2002	0.49	0.37	0.12	1.69	0.89	1.67	0.40	4.75
2003	0.48	0.36	0.12	1.53	0.92	1.55	0.39	4.49
2004	0.48	0.36	0.12	1.66	0.92	1.56	0.39	4.62
2005	0.47	0.36	0.12	1.61	0.95	1.54	0.41	4.57
2006	0.47	0.35	0.12	1.60	0.93	1.54	0.40	4.55
Average	0.49	0.35	0.13	1.74	0.88	1.66	0.41	4.78

The average numbers of bereaved family members per suicide are referred to as “bereavement coefficients” in the remainder of the chapter. The bereavement coefficients of all family members decline gradually over time (Table 2). On the basis of the results for 1993 to 2006, the bereavement coefficients of all family members were assumed to be 5 in 1992 and to increase by 0.5 for each 15 years into the past. Multiplying the bereavement coefficients with the numbers of suicide victims, the number of all family members who became bereaved in and before 1992 was estimated. The last step was to account for the survival rates of those family members. First, the survival rate of bereaved family members in 1993 was set equal to the actual survival rate in 1993, which is approximately 0.847.¹⁵ Second, three different geometric series for the survival rates were computed, which become zero at 81, 86, and 91 years, respectively.¹⁶

2.3 Results

Estimate of the Number of People Who Became Bereaved in 1993–2006

Estimates of the total and average numbers of family members of suicide victims are presented in Tables 1 and 2. The bereavement coefficients for total family

¹⁵This number can be calculated using information from Tables 1 and 3.

¹⁶The “Life Table” shows that the probability of death for the elderly increases approximately in a geometric progression.

members are between 4 and 5 during the period of 1993–2006 and decline gradually. The bereavement coefficients for siblings and children both decline gradually; this may reflect the declining birth rate in Japan. The coefficients for parents increase gradually; this may reflect the prolonged life span in Japan. The coefficients of spouses are almost constant.

Estimate of the Total Number of Bereaved Family Members Who Were Living in 2006

As shown in Table 3, as of 2006 there were 1.7 million family members who became bereaved in 1993–2006. Among them, the number of minors who lost their parents to suicide is 86,000. Soeda (2001, 2002) estimated the number of bereaved minors to be about 77,000 in the 14 years from 1986 to 1999, about 10% less than the present study's estimate. However, the number of suicides for the present study period (1993–2006) is approximately 17% more than that for the period of 1986–1999, suggesting that Soeda's number may overestimate the number of total bereaved children. Furthermore, Soeda postulates that the age of bereaved children follows a uniform distribution. Yet, in reality, the age distribution of suicide victims is skewed to an older age, and thus the age distribution of the bereaved children is also skewed to an older age. Because the present study considers the age distribution explicitly, there is a discrepancy between Soeda's estimate and the present study due to the difference in treatment of the age distribution.

An estimate of the number of family members who became bereaved before 1992 is shown in Table 4. By looking at both Tables 3 and 4, it is estimated that the number of all bereaved family members alive in 2006 ranges from 2.92 to 3.46 million. Therefore, considering that the population of Japan was 127.77 million in 2006, 2.31% to 2.71% of Japanese are estimated to be bereaved family members.

Costs of Suicides in Japan

Table 3 indicates that 123,482 (135,436 minus 11,954) Japanese working-age family members were affected by suicide in 2006. Chen et al. (2009) also estimated direct loss of productivity because of absence of family members. They assumed that a family member would be away from work for a week (O'Dea and Tucker 2005). Japanese GNP per working-age population in 2006 was 7,644,962 JPY, which results in an average weekly income of 159,270 JPY or approximately 1,600 USD. The total direct cost was then computed as the product of 1,600 USD and the estimated number of adult bereaved family members, which is 197 million USD.

Three main findings emerge from Chen et al. (2009). First, there are approximately five bereaved family members per suicide. Second, in 2006, there were about 90,000 children who had lost a parent to suicide. Third, in 2006, there were about 3 million family members bereaved by suicide. On the basis of these results and the assumption that each adult family member would be absent from work for a

Table 3 Estimate of the total number of living family members who became bereaved 1993–2006

Year	Suicide victims	Spouses	Wives	Husbands	Siblings	Parents	Children	Minor children	Total
1993	20,516	8,420	5,923	2,497	30,234	10,366	34,566	892	83,586
1994	20,923	8,522	6,065	2,457	33,625	11,532	35,396	2,559	89,074
1995	21,420	8,908	6,263	2,645	34,504	12,136	36,588	2,622	92,136
1996	22,138	9,396	6,678	2,717	36,869	12,889	38,077	2,746	97,230
1997	23,494	10,137	7,246	2,891	37,192	14,065	40,403	3,072	101,797
1998	31,755	14,076	10,449	3,627	48,297	20,332	50,765	3,445	133,470
1999	31,413	14,043	10,496	3,547	52,850	21,195	50,978	6,831	139,066
2000	30,251	13,732	10,301	3,431	50,935	21,181	49,205	6,619	135,053
2001	29,375	13,474	10,121	3,352	50,233	21,527	48,249	6,732	133,482
2002	29,949	13,928	10,491	3,437	48,253	22,940	49,470	7,190	134,591
2003	32,109	14,923	11,280	3,643	47,246	26,711	49,177	7,466	138,058
2004	30,247	14,042	10,565	3,477	48,952	25,988	46,722	11,757	135,704
2005	30,553	14,188	10,684	3,504	48,342	27,912	46,689	12,345	137,131
2006	29,921	13,973	10,349	3,624	47,769	27,796	45,899	11,954	135,436
Total	384,064	171,761	126,911	44,850	615,301	276,570	622,182	86,230	1,685,815

Table 4 Estimate of the total number of living family members who became bereaved before 1992

Year	Number of suicides	Factor	Bereaved family members	Survival rate1 ^a	Survival rate2 ^a	Survival rate3 ^a	Bereaved family members1	Bereaved family members2	Bereaved family members3
1962	16,724	6	100,344			0.00			
1963	15,490	5.5	85,195			0.02			2,001
1964	14,707	5.5	80,889			0.08			6,642
1965	14,444	5.5	79,442			0.14			10,902
1966	15,050	5.5	82,775			0.19			15,647
1967	14,121	5.5	77,666		0.00	0.24			18,463
1968	14,601	5.5	80,306		0.04	0.28		2,928	22,766
1969	14,844	5.5	81,642		0.11	0.33		8,575	26,657
1970	15,728	5.5	86,504		0.17	0.37		14,595	31,743
1971	16,239	5.5	89,315		0.23	0.40		20,354	36,169
1972	18,015	5.5	99,083	0.00	0.28	0.44		28,024	43,664
1973	18,859	5.5	103,725	0.05	0.33	0.47	5,557	34,631	49,193
1974	19,105	5.5	105,078	0.14	0.38	0.51	14,317	40,064	53,152
1975	19,975	5.5	109,863	0.21	0.43	0.54	23,258	46,726	58,832
1976	19,786	5.5	108,823	0.28	0.47	0.56	30,532	50,735	61,310
1977	20,269	5.5	111,480	0.34	0.50	0.59	38,283	56,208	65,729
1978	20,199	5	100,995	0.40	0.54	0.61	40,475	54,486	62,036
1979	20,823	5	104,115	0.45	0.57	0.64	47,175	59,581	66,364
1980	20,542	5	102,710	0.50	0.60	0.66	51,445	61,904	67,705
1981	20,096	5	100,480	0.54	0.63	0.68	54,709	63,401	68,291
1982	20,668	5	103,340	0.58	0.66	0.70	60,379	67,919	72,222
1983	24,985	5	124,925	0.62	0.68	0.72	77,527	85,153	89,566
1984	24,344	5	121,720	0.65	0.70	0.73	79,572	85,727	89,337
1985	23,383	5	116,915	0.68	0.73	0.75	79,967	84,803	87,678

(continued)

Table 4 (continued)

Year	Number of suicides	Factor	Bereaved family members	Survival rate1 ^a	Survival rate2 ^a	Survival rate3 ^a	Bereaved family members1	Bereaved family members2	Bereaved family members3
1986	25,667	5	128,335	0.71	0.74	0.76	91,321	95,595	98,169
1987	23,831	5	119,155	0.74	0.76	0.78	87,791	90,920	92,828
1988	22,795	5	113,975	0.76	0.78	0.79	86,595	88,890	90,305
1989	21,125	5	105,625	0.78	0.80	0.80	82,467	84,032	85,006
1990	20,088	5	100,440	0.80	0.81	0.82	80,343	81,368	82,011
1991	19,875	5	99,375	0.82	0.82	0.83	81,228	81,848	82,236
1992	20,893	5	104,465	0.83	0.84	0.84	87,055	87,352	87,530
Total	520,856		2,700,051				1,199,994	1,475,820	1,724,154

^a Three different geometric series of survival rates were computed: Survivalrate1, Survivalrate2, and Survivalrate3, which become zero at 81, 86, and 91 years, respectively

week (O'Dea and Tucker 2005), in 2006 the estimated direct loss of because of absence of family members alone is around 197 million USD. This number can be interpreted as a lower bound estimate because it does not include indirect costs such as psychological counseling or other expenditures.

3 The Werther Effect

In some cases, the “negative externalities” of suicide not only affects bereaved family members and acquaintances, but can also impact a broad range of people outside of the deceased's immediate circle of influence. In particular, suicides by celebrities, family suicides, or suicides resulting from bullying, which receive considerable media coverage, may induce a series of related suicides once they are publicized.

Since the 1970s, many studies have been carried out on the influence that media reporting on suicides by celebrities has on the general public. For example, Phillips (1974) compared the number of suicides in a month when suicide stories were published on the front pages of American newspapers with the number of suicides in a month in which no suicide stories appeared on the front pages, and found that the number of suicides tends to increase when suicide stories are featured prominently in the newspapers. This “Werther effect” (named after a novel by Goethe) has been confirmed by many of the subsequent studies (e.g., Wasserman 1984; Stack 1987). These studies generally indicate that the suicide rate tends to increase following the media reports on celebrity suicides, suggesting that suicides that receive considerable media coverage have an extremely large social impact.

However, because most of the previous studies employed monthly data on the number of suicides, the timing and duration of the Werther effect continues to be understudied. Moreover, because many of the existing studies used only a few celebrity suicide cases for analysis, they show only the impact of suicides by those specific celebrities, which makes it difficult to generalize their findings. As for studies on celebrities in Japan, only a limited number of studies have examined the impact of media reports on their suicides (Ishii 1991; Stack 1996). Bearing this in mind, Ueda et al. (2014) estimated the effect that media reports on suicides by 109 nationally “well-known figures” in Japan had on the total number of suicides. The 109 well-known figures included not just entertainment celebrities, as in typical past studies, but also politicians, business owners, and athletes. In addition, as opposed to monthly data, they used daily death records for a period of 22 years from 1989 to 2010. Then they compared the number of suicides occurring in the three-week period before and after the suicide stories were publicized, with that of a period without any suicide stories. In their estimations, they controlled for the effects that other factors, including seasons and economic conditions, have on suicide.

Figure 1 shows the estimation results. The vertical axis of the graph shows the percent changes in the number of suicides compared with the baseline period in which there was no media reports on celebrity suicides. The horizontal axis shows the number of days from media reports on celebrity suicides, with positive and

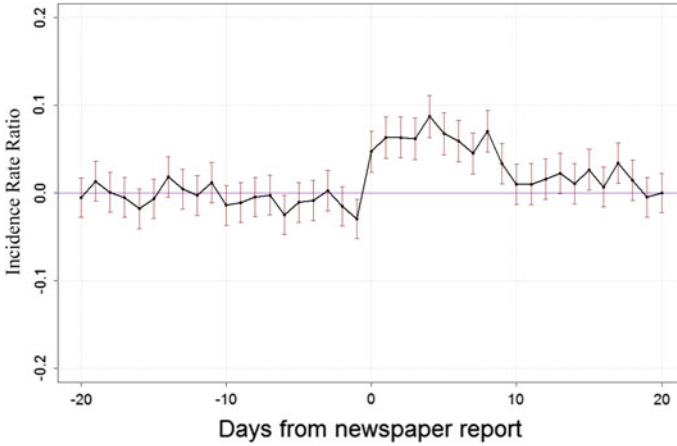


Fig. 1 Percentage increase in total suicides before and after the media reports on celebrity suicide
Source Ueda et al. (2014)

negative values indicating a post- and pre-reporting period, respectively. The vertical lines around the estimated figures indicate a 95% confidence interval. Thus, if the vertical lines do not cross the horizontal line at 0 in the post-reporting period, it indicates that media reports on celebrity suicides had a statistically significant effect on actual suicides in the general population.

According to the results, the number of suicides increases by around 7% immediately after the publication of celebrity suicide stories and the effect lasts for around 7 days. About a week after the stories are publicized, the effect is halved (approximately 4%) but the number of suicides remains elevated for around 20 days after the publication of such suicide stories. As expected, there was no increase in the number of suicides before celebrity suicide stories were publicized (left half of the graph). These results suggest that some individuals' decisions to take their lives are clearly affected by the media reports on celebrity suicides, indicating large negative externalities of prominent suicides.

In summary, the negative externalities of suicide affect not only the deceased's bereaved family members but also a wider segment of the population. Thus, suicide prevention measures can lead to saving lives of not only those at risk of suicide but also many others in a much broader scale.

4 Social Costs of Suicide

4.1 Social Losses Caused by the Loss of Individuals

Thus far, we have examined the negative externalities generated by suicide in the surrounding environment. In this section, we would like to consider the implication

of losing individuals due to suicide from a different perspective. Losing members of society due to suicide is itself a loss to society as a whole. Furthermore, because those members are no longer able to participate in economic activities, their suicides can affect the country's overall economy. We start this section by considering how many years of individual lives have been lost in Japan due to premature deaths by suicide. Then, we will discuss lifetime work-loss cost caused by the loss of individuals due to suicide.

Potential Years of Life Lost (PYLL)

An indicator called Potential Years of Life Lost (PYLL) is often used to measure the consequences caused by the death of an individual sooner than his or her life expectancy. PYLL is used not only for suicides but also to measure the degree of losses caused by premature deaths due to diseases. In the case of suicides, PYLL is used to calculate the “years lost” by suicide based on an estimate of the average years a person would have lived if he or she had not died by suicide. More specifically, it is calculated by summing the life expectancies of all suicide victims. Because life expectancies vary by age and sex, PYLL is usually calculated by taking into consideration the age and sex of the suicide victims.

To calculate PYLL in this book, we first obtained age-specific PYLL by multiplying the number of suicide victims by their life expectancies for each age. Then, we aggregated the age-specific PYLL of all ages to obtain the total PYLL in Japan for each year. In terms of data, we used the numbers of suicides from the Vital Statistics that are available every 5 years from 1950 to 2010 and data on the life expectancies from the Life Tables (Ministry of Health, Labour, and Welfare, annually). Age groups under 9 or over 99 were excluded from the calculation because the number of suicides in those age groups is extremely low.

According to our estimations of PYLL due to suicide in 2010, the total PYLL of men of all ages was 590,000 years, while that of women was 260,000 years. In other words, 850,000 years' worth of life was lost from the future of Japan by the suicides that occurred in merely 1 year.

Next, we look at age-specific PYLL of year 2010 by 5-year age group. Figures 2 and 3 show PYLL of suicides in 2010 by sex. According to Fig. 2, men in the age group 35–39 have the longest PYLL. The number of potential years of life lost by this age group alone amount to 70,000 years. Figure 2 also shows suicide rates by age group in 2010 (right axis). As expected, the elderly had the highest suicide rate. However, those in their 30 s and early 40 s had much greater PYLL than the elderly, indicating that suicides among the younger generations have a large impact on society.

In addition, according to Fig. 3, which shows PYLL of female suicides in the same period, the PYLL values of women were generally lower than those of men. This is due to the fact that the number of suicides is lower among women (8,626 women versus 21,028 men, according to the 2010 Vital Statistics). Figure 3 also indicates that as is the case for men, women in their 30 s have the highest PYLL.

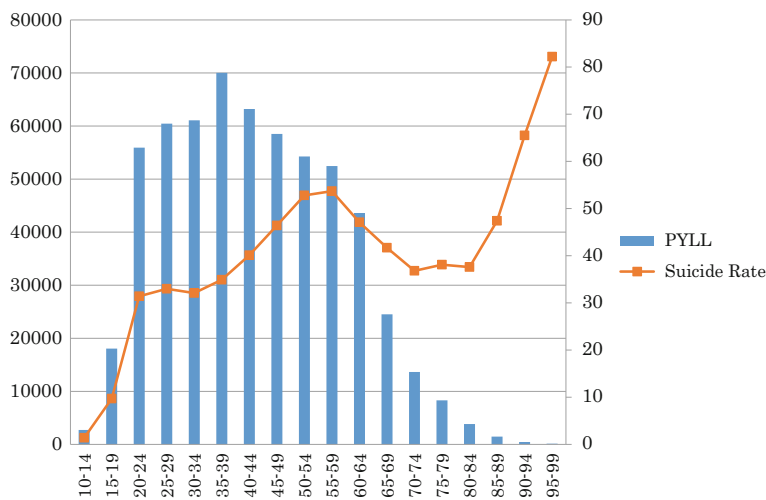


Fig. 2 Potential years of life lost (PYLL) due to suicide and suicide rates by age groups in Japan (Male, 2010)

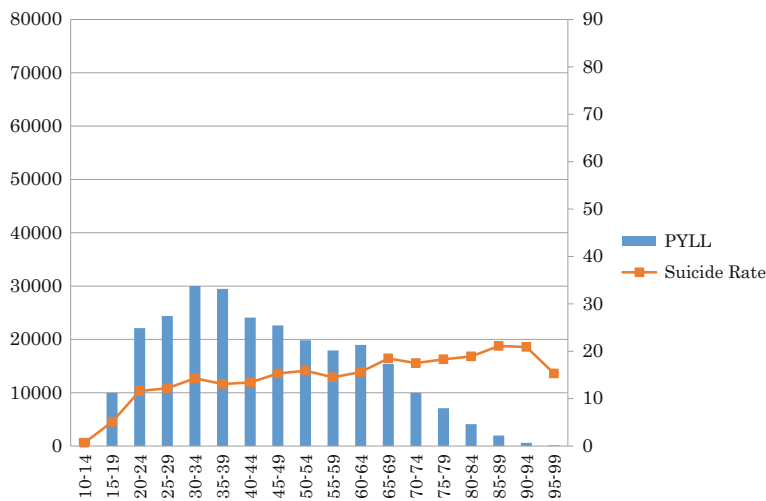


Fig. 3 Potential years of life lost (PYLL) due to suicide and suicide rates by age groups in Japan (Female, 2010)

The PYLL of women aged 30 to 34 is approximately 30,000 years, nearly 60,000 years for women in their 30 s, and 50,000 for women in their 20 s.

When women in their 20 s and 30 s die, those who may have given birth in the future have been removed from the life cycle. Although this factor is not included in this estimation, we expect that PYLL of the next generations resulting from this will not be trivial. This indicates that even though suicide rates among young women are

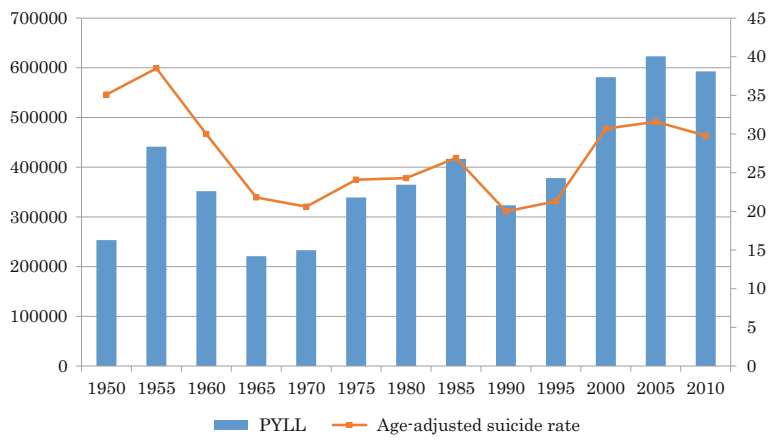


Fig. 4 PYLL due to suicide in Japan (Male, 1950–2010)

lower than women in older age groups, suicide prevention measures targeted at young women are important when considering their profound cross-generational impact.

Next, in order to understand trends in PYLL over the last 60 years, we also calculated PYLL for men from 1950 to 2010. The results are shown in Fig. 4. For reference, Fig. 4 also contains the “age-adjusted suicide rates,” in which the differences in age distribution are controlled for to make better comparisons over time. According to Fig. 4, PYLL peaked in 1955, because there were many suicides among young people in their 20 s in that year.

Next, to see the shifts in the age distribution of the suicide victims, PYLL and the ratios of the suicide victims by 10-year age group are shown in Figs. 5 and 6,

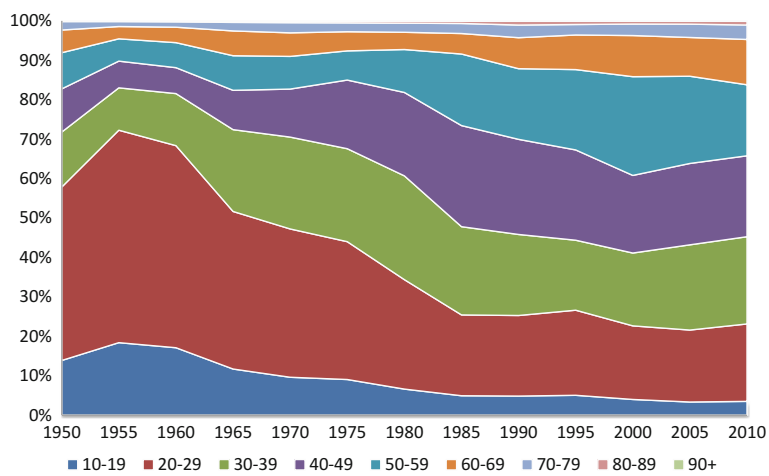


Fig. 5 PYLL in Japan by age group (% , Male, 1950–2010)

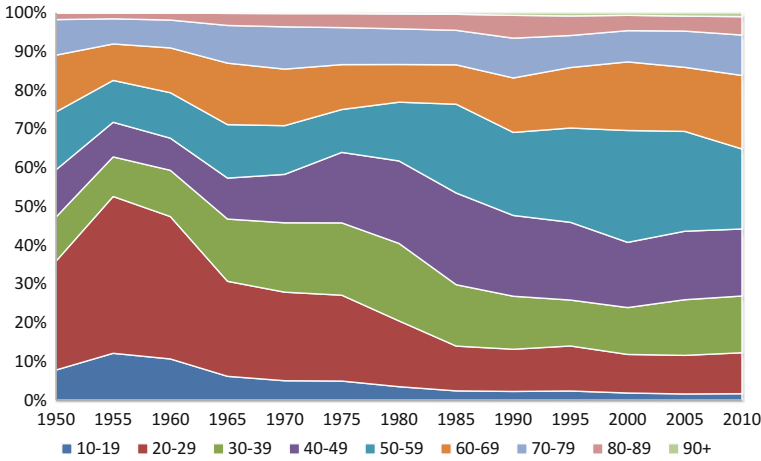


Fig. 6 Suicide deaths in Japan by age group (% Male, 1950–2010)

respectively. According to Fig. 5, the number of suicides of those in their teens and 20 s was highest in 1955, and as shown in Fig. 6, teens and those in their 20 s accounted for nearly 50% of all suicide victims in that year. Because these age groups have long life expectancies, PYLL of those in their teens and 20 s accounted for 70% of PYLL for all ages (Fig. 5). Suicides among these age groups are decreasing today after peaking in 1955. However, suicides by those in their 30 s and 40 s are increasing. Because the life expectancies of these groups are also relatively long, PYLL for these age groups account for 40 to 50% of PYLL for all ages since 1980. In recent years, along with the sharp increase in the number of suicides from 1997 to 1998, PYLL increased drastically between 1995 and 2000. PYLL for men was approximately 380,000 years in 1995 and rose to about 580,000 years in 2000, a 53% increase. PYLL for women increased from about 190,000 to 250,000 during the same period, but the rate of increase was not as high (32%). Since 2000, PYLL for men has been around the level of 600,000. Assuming that this level has been maintained since 1998, the cumulative PYLL for men for 13 years from 1998 to 2010 amounts to 8,000,000 years. The fact that such an overwhelming number of years of life and amount of potential future productivity are lost should justify implementing suicide prevention measures.

4.2 Lifetime Work-Loss Cost of Suicide

Suicide has direct and indirect costs. Direct costs include the cost for the dispatch of ambulances, autopsy, and treatment. Indirect costs refer to the lifetime income that one is no longer able to receive in the future because of suicide.

Table 5 Suicide-related medical and work-loss costs in the United States in 2010

		Suicide	Self-harm	
			Hospitalized	Treated and released in emergency department
Number of cases		38,364	316,572	134,202
Medical cost	Average	\$4,015	\$11,116	\$3,459
	Total	\$154,032,000	\$3,519,174,000	\$464,155,000
Work loss cost	Average	\$1,160,484	\$19,903	\$1,088
	Total	\$44,520,795,000	\$6,300,746,000	\$145,992,000
Combined cost	Average	\$1,164,499	\$31,019	\$4,546
	Total	\$44,674,827,000	\$9,819,920,000	\$610,147,000

Source Centers for Disease Control and Prevention, National Center for Injury Prevention and Control

To gauge the scale of the cost of suicide, we consider the estimated lifetime work-loss and medical costs of suicide in 2010, estimated by the Centers for Disease Control and Prevention (CDC), a governmental organization in the United States. The CDC's website gives detailed information on the costs associated with deaths as a result of injuries, including homicides and suicides. By entering the manner of injury (for example, suicide, homicide, unintentional injury), age group of the injured person, sex, cause (for example, firearm, fall), and so on, the CDC's Web-based Injury Statistics Query and Reporting System (WISQARS) determines the estimated costs of the incident. Only medical costs are included as direct costs in the CDC's calculation. Table 5 shows the average medical and lifetime work-loss costs per case and the total of all the cases in the country. The total cost is the combined medical and work-loss cost. To calculate work-loss for each suicide death, the age-specific probability of surviving to a given age was multiplied by the mean earnings of the persons of that age, assuming that no one would live beyond 102 years of age. In the case of self-harm, costs from reduced working hours due to injury and so on are included in the calculation. The value of domestic tasks is also included in the calculation as earnings. Because there are differences in wage and probability of surviving between men and women, sex is also taken into account in the CDC estimation.

According to Table 5, the average medical cost per suicide is about \$4,000 (around 450,000 yen at the exchange rate of February 2017), and the average lifetime work-loss cost is about \$1,100,000 (around 124,000,000 yen at the same exchange rate). A total of 38,364 suicides occurred in 2010 in the United States, which means the total cost to the country is around \$44.67 billion (approximately 5 trillion yen). In addition, in the same period in the United States there were more than 450,000 cases of self-harm (more than 11 times the number of suicides) (Table 5). Although the total cost of self-harm is lower than that of completed suicides, the cost of self-harm to the entire nation was still \$10.4 billion (around 1.2 trillion yen). The medical cost of self-harm alone amounts to more than \$3.9 billion (approximately 440 billion yen).

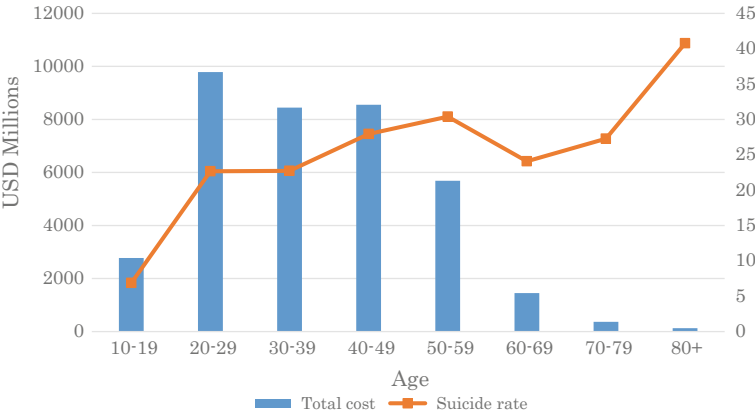


Fig. 7 Estimated total costs of male suicide in the United States in 2010 by age-group *Source* Centers for Disease Control and Prevention, National Center for Injury Prevention and Control

As in the case of PYLL, suicide-associated costs vary by age and gender. Figure 7 shows the estimated total cost (combined total of medical cost and lifetime work-loss cost) of male suicide in the Unites States. It seems that the total cost owes much to suicides by men in their 20 s to 40 s, demonstrating the profound impact these age groups have on society.

The estimates by the CDC include only the earnings of those who died from suicide or those who attempted suicide; they do not pay attention to the impact of the individuals’ inability to participate in economic activities in the macro economy. Thus, the actual social costs are likely to be much higher than the above estimates. Taking this into account, Yoshihiro Kaneko and Itaru Sato, at the National Institute of Population and Social Security Research in Japan, made improved estimates of the social costs of suicides in Japan. In their estimation, they took into consideration the impact of the suicide victims’ consumer activities and participation in the labor market, in addition to lost potential future earnings. Therefore, their estimates seem more comprehensive than other approximations. According to their estimates, in 2009 the lifetime income of the entire country would have increased by 1.9028 trillion yen if no suicides had occurred. Furthermore, if there were no suicides or depression in 2010, the GDP could have increased by 1.7 trillion.

However, it must be noted that these estimates were intended to capture only the lifetime incomes lost by suicide. They do not quantify a wide range of losses, including mental distress suffered by bereaved family members. This fact makes these the lowest possible estimates of the costs of suicide.

Naturally, suicide prevention carries a cost of its own. Some people may be doubtful about the usefulness of allocating financial resources to suicide prevention. Under severe financial conditions, it may be difficult for some localities to secure budgets for suicide prevention. However, the problem of suicide cannot be dealt with as a personal matter, as we have discussed; it is a problem of society as a whole and has a profound impact on a wide range of life aspects. If suicide

prevention measures are effective, it can reduce the burden of massive social and economic costs and losses. The findings discussed in this chapter indicate that the benefits yielded by a decrease in the number of suicides are likely to exceed the costs necessary for suicide prevention. (We will discuss the actual costs necessary for suicide prevention in Chap. 9)

5 Market Imperfections and Distortions in Incentives

In basic economic theory, it is known that if the market is functioning well, market prices will be adjusted in a direction preferable to society. However, if the market is not functioning well, various problems can occur. In economics, this is called “market failure.” In this section we discuss the possibility that such market failures are related to decisions to take one’s own life. Furthermore, we consider why the correction of market failures is justified by means of suicide prevention.

To begin, there is a possibility that friction in the labor market causes involuntary unemployment. As will be discussed in depth in Chap. 3, there is a strong correlation between unemployment rates and suicide rates. According to Chen et al., this likely represents a cause-and-effect relationship between unemployment and suicide. Thus, it seems in order to prevent suicides, the issue of unemployment must be addressed. Furthermore, policies that facilitate public job-placement offices in providing mental health and legal consultations in addition to employment consultations may also help prevent suicides triggered by unemployment.

5.1 *Credit Market Imperfections*

Credit market imperfections and liquidity constraints, in which loans are demanded but cannot be given, may be related to suicide. Chen, Choi, and Sawada (2010) have shown theoretically a relationship between cosigner agreements and suicide from the perspective of ex-post welfare loss. When small and medium-sized businesses and micro-enterprises obtain loans in Japan, it is common for a third party, such as the business owner or a relative of the business owner, to become a co-signer for the borrower. Pointed out that there is a problem when a third party, such as relatives who are not experts in management or finance, become co-signers.

In theory, this co-signer system in Japan operates through the same mechanism as the microcredit concept initiated by Dr. Muhammad Yunus, founder of Grameen Bank. In a situation where there is an information asymmetry between borrowers and lenders (making the market imperfect) and borrowers who do not have collaterals face liquidity constraints, the co-signer system can ease such liquidity constraints and mitigate the problems of adverse selection in uncollateralized loans,

moral hazards, and strategic debt defaults. However, according to Chen et al. (2010), the co-signer system can also attach a significant social stigma to the primary debtor if a “bad state” occurs afterwards, and may impose an excessive burden on primary debtors who feel a strong sense of altruism toward the co-signer. This entails virtually unlimited liability and therefore suicides by the primary debtors. In fact, according to the “1,000-Person Suicide Survey” carried out by the Japanese nonprofit organization (NPO) Lifelink, co-signer problems led to 17 of the 52 suicides of self-employed workers. On the other hand, co-signer problems led to suicide in only 9 out of 253 non-self-employed workers. Furthermore, Rotating Savings and Credit Associations (ROSCAs) use a similar mechanism that forces contracts to be fulfilled and it has been reported that some cases led to suicide (Besley 1995). One could argue that the co-signer problem is generated by the perverse form of contracts adopted to mitigate credit market imperfections. However, if this “perverse” form of contract can induce suicide to a significant extent, then removing this form of contract should be a suicide prevention strategy.

Another example of market-related issues contributing to suicide is consumer loan group life insurance. Consumer loan group life insurance can be interpreted as an interlinkage contract (combined contract) consisting of both a loan contract granting a consumer loan to a borrower who faces liquidity constraints, and a life insurance contract. Type of interlinkage contract is generally considered as a mechanism that corrects the distortions in incentives caused by market imperfections. Consumer credit group life insurance is a contract that mitigates liquidity constraints faced by the debtor. However, it strengthens incentives towards suicide to make repayments for the debt incurred. Thus, in this sense, it is not a desirable form of contract. The “Results of the survey on consumer credit group life insurance” published by the Financial Services Agency in October 2006 summarizes the data on five major consumer loan companies. According to the survey, the number of cases of this type of insurance, in which the benefits were actually paid as a result of suicide, was 6,110, 5,074, and 3,476 respectively in 2004, 2005, and 2006. They account for 23.15%, 22.25%, and 19.39% respectively of the 26,388, 22,804, and 17,928 cases in which the causes of death are known and the benefits were paid. If these suicides were caused by imperfections inherent in the credit market and triggered by life insurance contracts designed to overcome such imperfections, then in efforts to further suicide prevention, other forms of contract must be adopted.

5.2 Life Insurance Market Imperfections

If the problem of information asymmetry exists between the insurers and the insured in the life insurance market, there is a theoretical possibility that adverse selection and moral hazard can occur. Thus, suicide can be induced by the presence of life insurance. In Japan, benefits from private life insurance companies are paid

for deaths by suicide only after the suicide exemption period expires. The period set by major life insurance companies in Japan was 1 year in 1999 and 2 years from 2000 onward, and the period has been extended to 3 years since 2005. The benefits paid by a major life insurance company as a result of suicide increased by 50% from 1995 to 2004 and that 10% of all the insurance benefits paid are paid as a result of suicide-related deaths (Mainichi 2005). Shiromizu (2011) indicates that periods with low suicide rates during the exemption period shifted toward the right along with the extension of the exemption period, indicating that there is a close relationship between suicide and life insurance.

The only studies that discuss the relationship between suicide and insurance contracts, to our knowledge, are Tseng (2006). Tseng (2006), using data provided by the Society of Actuaries (SOA) in the United States, found that suicide rates were three times higher after the life insurance exemption period had expired.

Investigated the life insurance exemption periods from 1980 to 2002 using data on 26 OECD countries and analyzed the relationship between suicide rates and average life insurance policy premiums using cross-national data. The results of this study show that there is a positive correlation between the two variables (Fig. 8). They also demonstrate that the shorter the life insurance exemption period, the higher the per capita life insurance premium. These results are consistent with the hypothesis that insurance contracts increase the number of insurance policy holders with a high risk of suicide (adverse selection) and lead to an increased risk of suicide after the purchase of insurance policies. These results correspond with the fact that many life insurance companies have extended the suicide exemption periods since 1999. Therefore, extension of the suicide exemption periods should be regarded by considering how the extension of exemption periods can prevent people from purchasing insurance policies to receive benefits as a result of suicide.

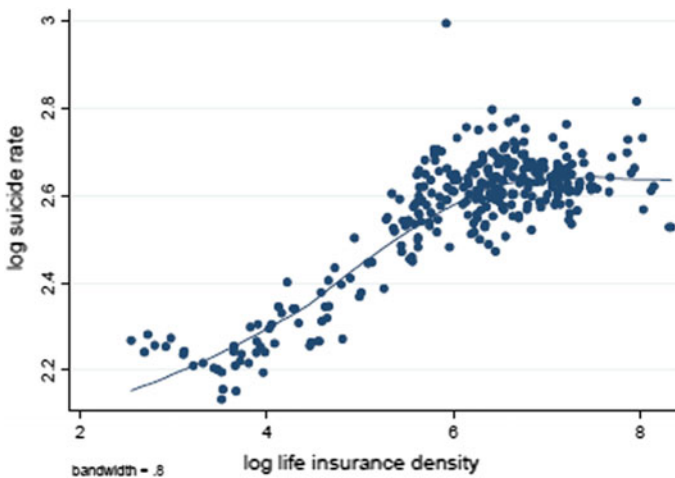


Fig. 8 Suicide rates and average life insurance policy premiums *Source*

The above discussions emphasize the need to carefully reconsider, from the perspective of suicide prevention, the current system of co-signer contracts, and the design of insurance contracts that have complemented the functions of the markets.

6 Conclusion

In this chapter, we have discussed why suicide prevention is necessary from various perspectives. The first rational basis for implementing suicide prevention measures is ensuring “the minimum standards of wholesome and cultured living” as stipulated in the Constitution of Japan. Furthermore, we also argued that suicide prevention can be justified by serious negative externalities and social costs generated by suicide as well as market imperfections.

In this chapter, we made arguments for suicide prevention by casting a spotlight on the fact that suicide is thought to significantly increase the risk of suicide among bereaved family members who are estimated to be 2.92 to 3.46 million people in 2006. Furthermore, we discussed the “Werther effect”, the extremely high number of Potential Years of Life Lost (PYLL), and the seriousness of the lifetime work-loss costs of suicide. In addition, we have seen that involuntary unemployment caused by imperfections in the labor market could contribute to suicide. Other potential causes of suicide include credit market imperfections as well as life insurance market imperfections such as the loan co-signer system, consumer loan group life insurance, and life insurance exemption periods. We believe that these justify proactive suicide prevention. In summary, although people may be forced into suicide with personal problems unique to each individual, suicide is also induced by imperfections in various markets within society and generates serious negative externalities.

However, there are a few points that require careful interpretation. The first is the supposed relationship between unemployment and suicide. Even under the extreme assumption that all suicides are caused by unemployment, the number of suicides would account for 0.9% of the total number of the jobless. In other words, the number of suicide deaths is low even among the jobless.¹⁷ Thus, even if there is a causal relationship between unemployment and suicide, various individual factors are believed to exist before unemployment leads to suicide. In the future, we must develop and implement more in-depth measures by understanding the reality of suicide among the jobless and identifying various factors that exist between the state of unemployment and suicide.

¹⁷This is based on the following facts and assumptions. The total population of Japan is 127 million; the population of the labor force is 65 million; 5% of the labor force is jobless; and the number of suicides is 30,000. The suicide rate calculated using the total population as the denominator would be 0.024% and the number of suicides would account for 0.9% of the total number of the jobless.

The second regards co-signer agreements in loans and consumer loan group life insurance policies. If these collateral supplementation systems were not offered, there is a possibility that borrowers could not get a loan in the first place, which could put them in a worse situation. The primary goal of life insurance policies is to provide a form of security to protect the livelihoods of bereaved family members from the risk of financial difficulties, irrespective of the cause of death. Therefore, the appropriateness of these systems must be weighed against the fact that they may lead to an unfortunate consequence, namely suicide.

Despite its seriousness as a worldwide social problem, the costs of suicide are severely under-investigated and there is a serious lack of data. Further data are necessary to fully understand the true cost of suicide to society.

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