

Outcomes of Community-Based Screening for Depression and Suicide Prevention Among Japanese Elders

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Purpose: In this study we evaluate outcomes of a community-based program to prevent suicide among elderly individuals aged 65 and older. **Design and Methods:** We used a quasi-experimental design with intervention and referent municipalities. The program included a 7-year implementation of depression screening with follow-up by general practitioners and a 10-year implementation of public education conducted in Yasuzuka (population 4,940; elderly suicide rate for women, 275/100,000; for men, 323/100,000). We estimated changes in the risk of completing suicide before and after the 10-year implementation by the incidence-rate ratio (IRR). **Results:** The risk for women in the intervention area was reduced by 64% (age-adjusted IRR = 0.36; 95% confidence interval = 0.14-0.93), whereas there was no significant change in the risk for men in the intervention area and either men or women in the referent municipalities. A ratio of the IRR for women aged 65 to 74 in the intervention area to that in its prefecture was estimated at 0.23 (90% confidence interval = 0.05-0.99), showing that the risk reduction was greater than the secular trend. **Implications:** The management of depression by use of community resources involving public health and primary care physicians is effective in the prevention of suicide for elderly women but uncertain for men.

Key Words: *Community-based intervention, Controlled clinical trial, Gender difference, Incidence rate ratio, Quasi-experimental design*

Elderly people have a higher risk of completed suicide than any other age group in Western and Asian countries (O'Connell, Chin, Cunningham, & Lawlor, 2004). However, suicide among elderly individuals is a more serious problem in Asian countries, especially in rural areas, than in Western countries (Cheng & Lee, 2000). Recent psychological autopsy studies demonstrate that depression is a major cause of suicide among elderly individuals (Conwell et al., 1996; Lönnqvist, 2000; Takahashi, 1997). Because it is difficult for depressed elders to seek help from others (Ono et al., 2001), we expected a community-based outreach program for depression to be effective in preventing suicide among elders.

To our knowledge, there are few community-based suicide-intervention trials that have used rigorous study designs to report on the outcome of completed suicide (Mann, Hendin, Rihmer, Kalmar, & Szanto, 2005). Of those trials, seven were cohort studies that resulted in the lowering of suicides or the suicide rate in localized areas with the following prevention strategies: (a) general practitioner education aimed at improving detection and treatment of depression (Mann et al.; Rutz, Von Knorring, & Walinder, 1989); (b) public education campaigns aimed at improving recognition of depression with suicide risk, help seeking, and developing a community network (Oyama, Koida, Sakashita, & Kudo, 2004; Oyama et al., 2005; Takahashi et al., 1998); (c) depression screening for the general population, aimed at identifying at-risk individuals and directing them to treatment (Mann et al.; Oyama et al., 2004; Takahashi et al.); (d) hotline services and phone checks for the residents who need help, aimed at monitoring and providing prompt intervention (De Leo, Dello Buono, & Dwyer, 2002); and (e) restriction of access to lethal means (Loftin, McDowall, Wiersema, & Cottey, 1991).

A comparison of results from the five studies focused on community-based management of depression shows a gender difference in the effect of management practices on suicide risk. Of the five studies,

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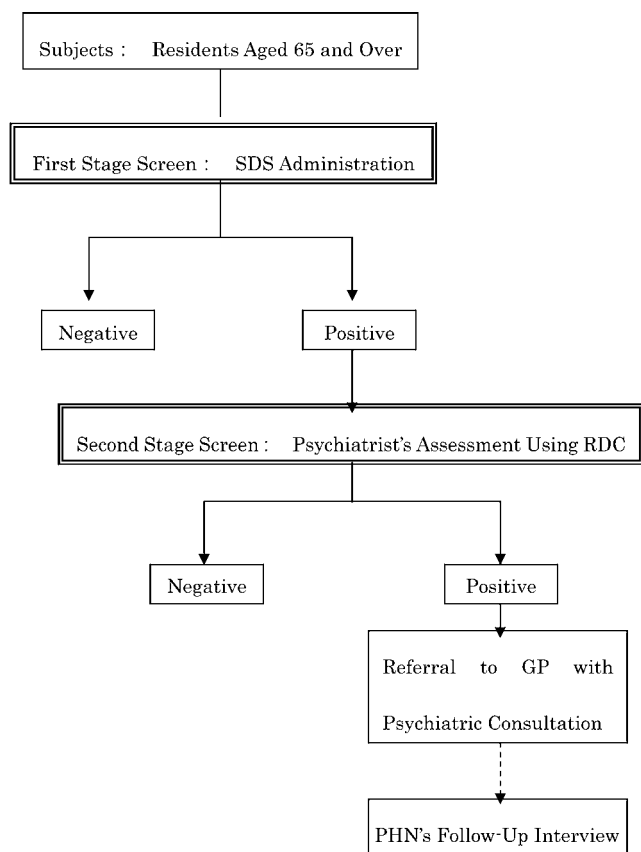


Figure 1. Flow chart of two-step depression screening with follow-up in the intervention area, Yasuzuka. SDS: Self-Rating Depression Scale; RDC: Research Diagnostic Criteria; GP: general practitioner; PHN: public health nurse.

three reduced the suicide risk for both men and women by using the resources of public health and psychiatric care (Mann et al., 2005; Oyama et al., 2004; Takahashi et al., 1998), and two reduced the risk for women but not men by using the resources of public health and primary care (Rutz et al., 1989; Oyama et al., 2005). These findings suggest that it is difficult both to have an impact on men without psychiatric care and to maintain such psychiatric care resources in communities that do not have a psychiatrist.

We implemented a community-based program including both depression screening and public education for elderly residents, using one community's public health and primary care resources and a neighboring community's psychiatric care resources. Our aim in the present study was to evaluate the effectiveness of this program for the prevention of suicide among elders by using a quasi-experimental design involving comparison of the intervention community with neighboring communities.

Methods

Intervention Program

We implemented the community-based intervention program from January 1991 to December 2000

in the municipality of Yasuzuka, a town located in the southwest of Niigata prefecture in central Japan. Japan is divided into 47 prefectures (large-area local governing units), and each is further divided into municipalities (basic local-level governing units: cities, towns, or villages). Several neighboring towns or villages also constitute a county. Yasuzuka is a rural agricultural area having a high suicide rate among the elderly population. The participatory program included (a) public health education from 1991 to 2000 and (b) screening for depression with follow-up from 1991 to 1997, using the public health and primary care resources in the town with the assistance of the psychiatric care resources in the neighboring county.

Initially, we had all households in the intervention community notified by means of the municipal newspaper that the municipality would implement a program providing voluntary, anonymous, annual depression screening and follow-up referrals, if appropriate, for residents aged 65 and older. Next, elderly people were called upon to attend the mental health workshops in a small district of the town. During the workshops, municipal public health nurses conducted the psychoeducational program promoting awareness of depression and suicide risk, and information about the depression screening, with assistance from our colleagues in the next county.

Finally, we had the annual two-step screening conducted by three municipal public health nurses in order to detect depression at an early stage (Figure 1). In the first-stage screen, nurses distributed a self-report questionnaire based on a Japanese version of Zung's Self-Rating Depression Scale (SDS; Zung, 1965) to all residents aged 65 and older. Family members or community welfare professionals were permitted to help respondents complete the SDS. Those residents who agreed to participate in the program completed the SDS, which the welfare professionals collected.

In the second-stage screen, one of our psychiatrists gave those participants enrolled as SDS positive a mental health assessment by using a Japanese version of the Research Diagnostic Criteria (RDC; Spitzer, Endicott, & Robins, 1981). Following this assessment, if the participants were diagnosed as possibly having depression, the psychiatrist made a clinical decision whether to refer them to a general practitioner in Yasuzuka or to conduct a follow-up interview with the public health nurse. In the referred cases, if needed, the psychiatrist provided consultations.

Study Design

We used a quasi-experimental design, with preimplementation and postimplementation registrations covering the population aged 65 and older in the intervention area and the neighboring reference area. We studied the intervention effect by using the

prospective registration of all suicide episodes during the study period.

Study Population

We divided the study periods into two 10-year stages: the baseline stage, from January 1981 through December 1990 (before the implementation), and the implementation stage, from January 1991 through December 2000. The study population consisted of two identical dynamic cohorts, that is, an intervention cohort and a reference cohort between 1981 and 2000. The intervention cohort was the population aged 65 and older in Yasuzuka (total population, 4,940; 2,444 women and 2,496 men), where the percentage of elderly individuals was 20.6% and the average suicide rate per 100,000 for men was 322.6 and for women was 274.6 in the period from 1986 to 1990.

The neighboring 10 municipalities were eligible as study references by use of the following criteria: (a) total population 4,000–10,000, (b) elderly percentage $\geq 15\%$, and (c) elderly suicide rates ≥ 150 in both women and men. Of those municipalities, only Kawanishi fulfilled the criteria and was entered as a neighboring reference (total population, 9,091; percentage of elderly individuals, 18.5%; and average suicide rates for people ≥ 65 years of age, 212.2 and 151.9 for men and women, respectively, in 1986–1990). Kawanishi is located in a rural agricultural area that is 35 km east of Yasuzuka. Thus, the reference cohort was composed of the population aged 65 and older in Kawanishi.

The 1990 census showed that the unemployment rates (Yasuzuka, 0.44%; Kawanishi, 1.26%) of the study population were less than two thirds of its prefectural mean (Niigata, 2.02%). The census data also showed that the average yearly income of the study population (Yasuzuka, 2,340,000 yen; Kawanishi, 2,177,000 yen) was around 75% of its prefectural mean (2,636,000 yen). These findings suggest that the characteristics of employment rate and income in the intervention area were similar to those in the reference area.

We derived the data on suicide from the prospective registration of all suicide episodes at the Joetsu and Tokamachi Public Health Centers, which surveyed and controlled the mental health activities in the study municipalities, with the exception of the present intervention program. The diagnoses in the register were based on codes from the *International Statistical Classification of Diseases*, 9th revision, in which confirmed suicides and probable suicides were combined.

Statistical Analysis

We based our statistical analyses on an incidence rate of completed suicide with stratification for age and gender. The suicide incidence rate is the number

of incident suicide cases divided by the population. We derived the incidence of suicide cases and populations from the dynamic cohort during each 10-year stage.

Assessment of Risk Change Between Pretests and Post-tests.—We expressed changes in the risk of completing suicide associated with exposure to the community program as the incidence-rate ratio (IRR) between the baseline and the implementation. This is because the risk ratio, indicating the risk change, was interchangeable with the IRR under (a) the assumption of constancy of the incidence rate over each stage and (b) the rarity of suicide (incidence rate less than 0.5%; Rothman & Greenland, 1998). We assessed the IRR of the population aged 65 and older between the two stages by using a corrected Mantel–Haenszel stratified chi-square test that we adjusted for 10-year age categories with the maximum likelihood method. We assessed the homogeneity of the IRR in age levels by means of the Breslow–Day test.

Evaluation of Trend Effect on Risk Change.—For the suicide risk in the prefecture including the study municipalities, a gradual upward or downward trend over the past two decades occurs independently of the intervention effect. This phenomenon is referred to as a secular trend. Our analysis compared the IRR in Yasuzuka with that in Niigata prefecture. It evaluated the effect of the secular trend, which is indicated by the risk change in the prefecture, on the change in the suicide risk. We calculated the three-factor interaction parameter obtained from a saturated general log linear model for a $2 \times 2 \times 2$ cross-classification by using the maximum likelihood estimation with the chi-square test ($df = 1$) for comparison. This parameter expresses a ratio of two IRRs (Agresti, 2002).

We calculated descriptive statistics and confidence intervals (CIs) by using the SPSS 10.0 J software package (SPSS Inc., Chicago, IL).

Results

Implementation of Intervention Program

Table 1 shows the number of participants in the annual two-step screening with follow-up during the initial 7 years in the implementation stage. More than 90% of female or male residents aged 65 and older participated in the first-stage screen. Of those participants, 8% to 14% were enrolled as SDS positive. Of the SDS-positive participants, 49% to 62% took part in the second-stage screen. Of those referred in the second-stage screen, very few (1.2% or fewer yearly) were diagnosed with major or minor depression. This could be because depressed people were less likely to participate in the second-stage screen. All of the RDC-positive participants agreed to be referred to the general practitioner in the town,

Table 1. Two-Step Screening in the Intervention Area: Annual Participants

Subject and Program Item	1991	1992	1993	1994	1995	1996	1997
Population aged 65+ years	1,079	1,108	1,189	1,227	1,241	1,275	1,313
First-stage screen participants	1,047	998	1,142	1,137	1,193	1,154	1,260
Positive	127	140	137	152	98	163	164
Second-stage screen participants							
Positive	69	76	67	72	59	71	63
Major depression	6	5	5	0	2	0	2
Minor depression	7	5	7	0	2	0	2

Notes: First-stage and second-stage screens use the Self-Rating Depression Scale and the Research Diagnostic Criteria, respectively.

with a psychiatric consultee-centered approach by telephone. During the implementation stage, the general practitioner performed no postmortems on suicide victims because coroners in other counties performed the postmortems.

Of 43 individuals referred to the general practitioner, 29 received a follow-up interview with three public health nurses, and 14 received treatments from the general practitioner with psychiatric consultations. None of those referred to the general practitioner committed suicide. Unfortunately, it is unknown how many suicides had been screened, because the written questionnaires were shredded immediately after they were scored in order to protect privacy.

We held the workshops for health education annually over 10 years in one third of the districts of Yasuzuka. During the workshops, we had municipal public health nurses give basic information about the signs and treatment of depression, as well as how to utilize mental health services. We did not emphasize in the present study that suicide is taboo in most world cultures, although such emphasis had been given in the studies by Takahashi and colleagues (1998) and by Oyama and colleagues (2004).

In addition to the present intervention program, in the intervention and reference communities during the study periods, we implemented secondary prevention programs for individuals with dementia and tertiary prevention programs for individuals with schizophrenia.

Change in Incidence Rates of Suicide in the Study Population

In the intervention area, we observed a 64% reduced risk of suicide among women aged 65 and older (age-adjusted IRR = 0.36, 95% CI = 0.14–0.93) during the implementation stage, compared with the baseline stage (Table 2). In contrast, a 49% reduction of the risk in men aged 65 and older did not reach significance (age-adjusted IRR = 0.51, 95% CI = 0.22–1.19). There was no significant change in the risks for either women or men in the reference community. The study results would have approximately 70% or more statistical power cal-

culated for a two-tailed *t* test at a *p* = .05 one-tail level of significance in each cohort by gender.

Comparison of Risk Change and a Secular Trend

The suicide incidence rate (number of suicides per person-years) for women aged 65 to 74 years in Niigata prefecture was 586/1,163,200 in the baseline stage and 535/1,524,894 in the implementation stage. A general log linear analysis for cell degrees added 0.5 because of the less than 5 degrees estimated for a ratio of the IRR for the younger old women [(1/3,824)/(8/3,490)] in the intervention area to that [(535/1,524,894)/(586/1,163,200)] in the prefecture of 0.23 (90% CI = 0.05–0.99). This suggests that a reduction of the female IRR in the intervention area was greater than the regional secular trend estimated as the reduction in its prefecture.

Discussion

Although it is widely known that most elderly people who commit suicide suffer from depression (Conwell, 1997; Shah & De, 1998), there are few interventions proven to reduce suicidal behavior in senior adults (Beautrais, 2002). In the present study, we evaluated a community-based program, which included both depression screening with follow-up by the community's general practitioners and public health education. The suicide risk for elderly women, but not men, in the intervention population was reduced by 64% during the 10-year implementation.

The present study has some limitations resulting from its quasi-experimental design that could significantly affect suicide risk. Because the present study used a preimplementation–postimplementation design with a nonrandomized reference, the following biases could result. First, nonrandomized assignment cannot control for unmeasured confounding variables. For the variables related to suicide, however, the socioeconomic characteristics (i.e., unemployment rates, average yearly income, and welfare service) and the mental health activities (except the present intervention) appear to be similar between the intervention and reference communities, because of similarities in the neighborhoods and because

Table 2. Suicide IR Change: Before and After Program Implementation

Participant	Age (years)	Baseline Stage (1981–1990)		Implementation Stage (1991–2000)		Breslow–Day Test			Corrected Mantel–Haenszel Test				
		<i>n</i>	Person-Years	<i>n</i>	Person-Years	χ^2	<i>df</i>	<i>p</i>	χ^2	<i>df</i>	<i>P</i>	Age-Adjusted IRR	
												Estimate	95% CI
Men													
Intervention area	65–74	9	2,765	7	3,341	0.93	2	.63	1.91	1	.17	0.51	0.22–1.19
	75–84	4	1,219	1	1,487								
	85+	1	192	1	345								
Reference	65–74	5	4,152	6	5,419	5.03	2	.08	1.19	1	.28	0.62	0.29–1.30
	75–84	11	2,104	4	2,608								
	85+	0	405	3	677								
Women													
Intervention area	65–74	8	3,490	1	3,824	2.41	2	.30	3.89	1	.049	0.36	0.14–0.93
	75–84	4	1,819	3	2,289								
	85+	2	306	3	615								
Reference	65–74	4	5,703	4	6,499	0.46	2	.80	1.21	1	.27	0.60	0.28–1.30
	75–84	8	3,082	6	4,322								
	85+	2	586	2	1,384								

Notes: IR = incidence rate; IRR = incidence rate ratio; CI = confidence interval.

both study populations resided in the same prefecture. Second, the preimplementation–postimplementation design could cause time-dependent confounding, including a secular trend, and a regression effect toward the mean. Nevertheless, the reduction of suicide risk among women in the intervention area was greater than the regional secular trend. A regression effect on the decrease in the suicide rate could be also suspected because of the high baseline rate in the intervention area. However, the suicide rate among elders in the neighboring reference community was continuously high, which counters an explanation of the regression effect.

In addition, the different sources of information might cause source bias because some participants in the first-stage screen completed the SDS with assistance from family or professional staff. The source bias appears not to affect the sensitivity of SDS responses, because there seems to be little possibility that the assistance results in an increase of the number of false-negative participants. There is also no evidence that the ongoing intervention influenced the physicians in that community to alter their death-record-certification habits with respect to suicide, because the coroners in other communities examined all suicide victims.

Lastly, poor participation after the first-stage screen suggests selection bias. The selection bias appears not to reduce the suicide risk because selective dropout of depressed people in the screening process will result in more suicides. Thus, to counter a passive participatory approach, follow-up and intensive outreach to those who drop out would be more effective for suicide prevention among the elderly population.

The findings lend support to the conclusion that the risk reduction by depression screening and public health education, using the community’s resources of public health and primary care, was successful for elderly women. The screening with follow-up can intervene on behalf of the overlooked depressed elderly women in the community. Educational activities with information and advice should also improve help-seeking behavior among elderly women.

Of the present results, the reduced risk for women is consistent with the results of three previous studies using community-based screening with the resources of primary or psychiatric care. Our finding of unchanged risk for men with the use of primary care resources contrasts with three prior studies showing reduced risk for men with the use of psychiatric care resources (Mann et al., 2005; Oyama et al., 2004; Takahashi et al., 1998), indicating the benefits of risk reduction among men with the use of psychiatric care resources. This gender difference of the risk changes following the implementation can be explained by (a) the acceptance of more women than men, (b) the lack of psychiatric care ameliorating the suicidal impulse to which men would be more vulnerable than women (Rutz, 2001), and (c) an insufficient sample size to detect the male risk reduction of considerably less than 75% expected in the antecedent study (Oyama et al.).

References

- Agresti, A. (2002). *Categorical data analysis* (2nd ed., pp. 314–356). New York: Wiley.
- Beautrais, A. L. (2002). A case control study of suicide and attempted suicide in older adults. *Suicide and Life-Threatening Behavior*, 32, 1–9.
- Cheng, A. T. A., & Lee, C. (2000). Suicide in Asia and the Far East. In K.

- Hawton & K. van Heeringen (Eds.), *The international book of suicide and attempted suicide* (pp. 29–48). New York: Wiley.
- Conwell, Y. (1997). Management of suicidal behavior in the elderly. *Psychiatric Clinics of North America*, 20, 667–683.
- Conwell, Y., Duberstein, P. R., Cox, C., Herrmann, J. H., Forbans, N. T., & Caine, E. D. (1996). Relationships of age and axis I diagnoses in victims of completed suicide: A psychological autopsy study. *American Journal of Psychiatry*, 153, 1001–1008.
- De Leo, D., Dello Buono, M., & Dwyer, J., (2002). Suicide among the elderly: The long-term impact of a telephone support and assessment intervention in northern Italy. *British Journal of Psychiatry*, 181, 266–229.
- Loftin, C., McDowell, D., Wiersema, B., & Cottey, T. J. (1991). Effects of restrictive licensing of handguns on homicide and suicide in the District of Columbia. *New England Journal of Medicine*, 325, 1615–1620.
- Lönngvist, J. K. (2000). Psychiatric aspects of suicide behavior: Depression. In K. Hawton & K. van Heeringen (Eds.), *The international book of suicide and attempted suicide* (pp. 107–120). New York: Wiley.
- Mann, J. J., Hendin, H., Rihmer, Z., Kalmar, S., & Szanto, J. (2005). *Depression recognition and suicide prevention program in the region of Kiskunhalas, Hungary*. Retrieved March 9, 2006, from <http://hu.afsp.org/whats-new/hungary.htm>
- O'Connell, H., Chin, A., Cunningham, C., & Lawlor, B. A. (2004). Recent developments: Suicide in older people. *British Medical Journal*, 329, 895–899.
- Ono, Y., Tanaka, E., Oyama, H., Toyokawa, K., Koizumi, T., Shinohe, K., et al. (2001). Epidemiology of suicidal ideation and help-seeking behaviors among the elderly in Japan. *Psychiatry and Clinical Neurosciences*, 55, 605–610.
- Oyama, H., Koida, J., Sakashita, T., & Kudo, K. (2004). Community-based prevention for suicide in elderly by screening and follow-up. *Community Mental Health Journal*, 40, 249–263.
- Oyama, H., Watanabe, N., Ono, Y., Sakashita, T., Takenoshita, Y., Taguchi, M., et al. (2005). Community-based prevention through group activity for the elderly successfully reduced the high suicide rate for females. *Psychiatry and Clinical Neurosciences*, 59, 337–344.
- Rothman, K. J., & Greenland, S. (1998). *Modern epidemiology* (2nd ed.). Philadelphia: Lippincott-Raven.
- Rutz, W. (2001). Preventing suicide and premature death by education and treatment. *Journal of Affective Disorders*, 62, 123–129.
- Rutz, W., Von Knorring, L., & Walinder, J. (1989). Frequency of suicide on Gotland after systematic postgraduate education of general practitioners. *Acta Psychiatrica Scandinavica*, 80, 151–154.
- Shah, A., & De, T. (1998). Suicide and elderly. *International Journal of Psychiatry in Clinical Practice*, 2, 3–17.
- Spitzer, R. L., Endicott, J., & Robins, E. (1981). *Research diagnostic criteria (RDC) for a selected group of functional disorders* (3rd ed.). New York: New York State Psychiatric Institute, Biometric Research Department.
- Takahashi, K., Naito, H., Morita, M., Suga, R., Ogura, T., & Koizumi, T. (1998). Suicide prevention for the elderly in Matsunoyama Town, Higashikubiki County, Niigata Prefecture: Psychiatric care for elderly depression in the community. *Psychiatria et Neurologia Japonica*, 100, 469–485.
- Takahashi, Y. (1997). Culture and suicide: From a Japanese psychiatrist's perspective. *Suicide and Life-Threatening Behavior*, 27, 137–147.
- Zung, W. W. K. (1965). A self-rating depression scale. *Archives of General Psychiatry*, 12, 63–70.

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