

constraints and lack of support staff also hinder the recognition of late-life depression in the primary care setting.⁷ It seems therefore that there is a considerable need for a screen for depression that can be used easily by non-mental health professionals.

A two-staged procedure was undertaken to address this issue. We first developed a brief screen from two established screening scales (study 1), and then we examined its reliability and validity (study 2).

PART 1: SCALE DEVELOPMENT STUDY (STUDY 1)

Subjects

This study was conducted in a provincial community in town A, which is located in Aomori Prefecture in northern Japan. The total population of town A at the time of survey was 10 093 (4940 males and 5153 females). The number of elderly (≥ 65 years old) was 2593 (1085 males and 1508 females), which made up 26.3% of the whole population of town A. This rate was higher than the average elderly rate of Japan, which was estimated to be 17.2% in 2000. The participants were 433 elderly residents who were over the age of 64 years (166 males and 267 females) living in one area of the town (population 1685: 845 males and 840 females). They responded to a request that they attend a workshop 'For a Healthier Mind' that was sponsored by the local government, and were then asked to participate in our study. Those who did not attend the workshop were contacted and visited at home the following day by trained staff. Informed consent to participate was obtained from 198 individuals (61 males and 137 females) at the workshop and 160 individuals (68 males and 92 females) at home. The data of five participants were excluded because of suspected dementia. Consequently, 353 people (128 males and 225 females) were enrolled in the study. The details of the selection procedure are reported elsewhere.⁸

Procedure

Two self-report questionnaires were administered: the Self-rating Depression Scale (SDS)⁹ and the Hospital Anxiety and Depression Scale (HADS).^{10,11} A structured interview was administered to establish the presence of symptoms of major depression by clinical psychologists, social workers, counselors, or nurses, using a modified version of the Composite International Diagnostic Interview (CIDI) version 2.1,¹² which we referred to as CIDI-MD-R. We defined those subjects who answered positive to any of the questions in the CIDI-MD-R as 'depressed'; subjects were otherwise defined as 'non-depressed'. We also defined those

subjects who answered positively to either of the two items in the CIDI-MD-R concerning suicidal thoughts as 'suicidal'.

Remarkably high interrater reliability has been reported concerning the Japanese version of CIDI 2.1 (Kappa = 1.0).¹³ The reliability of CIDI-MD-R has not been examined in our study, but one of the authors (YO), who has prominent expertise using CIDI, has supervised the training in rating CIDI-MD-R.

Analysis

Associations between SDS and HADS, and CIDI-MD-R were examined by receiver operating characteristic (ROC) analysis.¹⁴ ROC analysis demonstrated that HADS failed to discriminate the 'suicidal' group from the 'non-suicidal' group. We therefore only included the SDS in our analysis.

ROC analysis was also used for extracting items from the SDS that could be used to discriminate between 'depressed' and 'non-depressed' subjects, and between 'suicidal' and 'non-suicidal' subjects.

Results

The mean \pm SD age of the 353 participants was 73.61 ± 6.13 years, and was significantly lower than the age of those who refused enrollment (76.47 ± 7.45 years: $P < 0.001$). There was no significant difference in age between genders. A total of 74 participants (20.96%) had one or more symptom of depression by CIDI-MD-R, and were therefore categorized as 'depressed'. A total of 44 subjects (12.46%) had experienced repetitive thoughts about death and/or suicide, and were thereby categorized as 'suicidal'.

ROC analysis demonstrated that seven items of SDS could be used to establish whether a subject was depressed (four items: SDS 18, 17, 10, and 12) or suffered from suicidal ideation (five items: SDS 11, 18, 19, 12, and 20). Among these, two items (SDS 11 and 19) were eliminated: SDS 11 because it was felt that the statement 'I consider myself to be lucid' was irrelevant to depressive symptoms, and SDS 19 because it was felt that the statement 'I feel it would be better if I died so as not to inconvenience anyone' may cause offense to the elderly subjects. Consequently, five items (SDS 10, 12, 17, 18, and 20) were selected.

We modified these five items and created a five-item screen, which will be referred to henceforth as the Depression and Suicide Screen (DSS). The wording was modified to make it interrogative and more acceptable in the primary care setting, and the rating method was changed from a four-point scale to a dichotomous (yes or no) scale (Table 1).

Table 1. The Depression and Suicide Screen

1. Is your life pretty full?
2. Do you still enjoy doing the things you used to do?
3. Do you think it is too much trouble to do the things you used to do?
4. Do you feel that you are a useful person who is needed by others?
5. Do you feel tired without any specific reason?

For items 1, 2 and 4: score 0 if you 'yes', and score 1 if answered 'no'.

For items 3 and 5: score 1 if answered 'yes' and score 0 if answered 'no'.

PART 2: VALIDATION STUDY (STUDY 2)

Subjects

This study was carried out in the year after study 1 in the same area. The participants were also over the age of 64 years who were recruited through the same procedure as study 1. Informed consent to participate was obtained from all of the subjects.

Procedure

The participants were requested to complete the DSS and Geriatric Depression Scale, short-form (GDS-S).^{15,16} Subjects who scored 6 points or more in the GDS-S were defined 'depressed'. They were also asked by our research staff whether they had ever had repetitive thoughts about death, or whether they were depressed enough to consider suicide. Those who replied 'yes' to either of the two questions were defined as 'suicidal'. The association between DSS scores and GDS-S scores was evaluated using ROC analysis.

Results

A total of 382 subjects were enrolled into study 2 (236 females and 146 males). The mean \pm SD age of the female and male subjects was 72.87 ± 6.03 and 73.61 ± 6.33 years, respectively, and there was no significant difference between genders.

The GDS-S exhibited substantial internal consistency for the total sample ($n = 382$; Cronbach's $\alpha = 0.75$). The mean \pm SD score of GDS-S was 3.93 ± 2.99 . A total of 91 participants (23.8%) scored 6 points or more in the GDS-S and were therefore categorized 'depressed'.

Sixty-four (16.8%) subjects replied 'yes' to at least one of the two questions concerning suicidal ideation and were therefore categorized as 'suicidal'. No gender

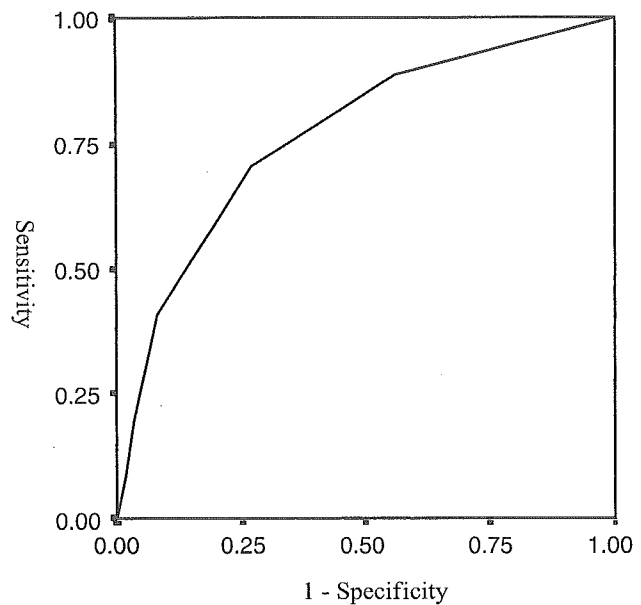


Figure 1. The association between the Depression and Suicide Screen score and presence of depression (ROC analysis).

difference was noted in either the GDS-S score or suicidal ideation.

The internal consistency of the DSS was satisfactory (Cronbach's $\alpha = 0.62$). The mean \pm SD DSS score was 1.27 ± 1.31 , and there was no significant difference in this value between genders.

Figure 1 shows the association between the DSS scores and 'depression' (as screened by GDS-S). Although 10 (2.69%) of the depressed group scored 0 on DSS, the area under the ROC curve was 0.768, which indicates the significant correlation between the DSS score and 'depression' ($P < 0.001$).

Figure 2 shows the association between the DSS score and suicidal ideation screened out by the interview. Although 10 subjects (2.69%) from the 'suicidal' group scored 0 on DSS, the area under the ROC curve was 0.721, which demonstrates that DSS can be used to effectively discriminate between the 'suicidal' and 'non-suicidal' groups ($P < 0.001$).

Table 2 shows the sensitivity and specificity of the DSS under the noted cutoff scores. In detecting subjects with 'depression', a cutoff of 1/2 produced sufficient sensitivity (70.5%) and specificity (72.9%). With this cutoff point, the positive predictive value (PPV) was 0.446, the negative predictive value (NPV) was 0.888, and the overall diagnostic power was 0.723. In detecting subjects with suicidal ideation, a cutoff of 1/2 was also considered suitable (sensitivity = 69.8%, specificity = 69.3%). With this cutoff point, the PPV was 0.317, the NPV was 0.926, and the overall diagnostic power was 0.694.

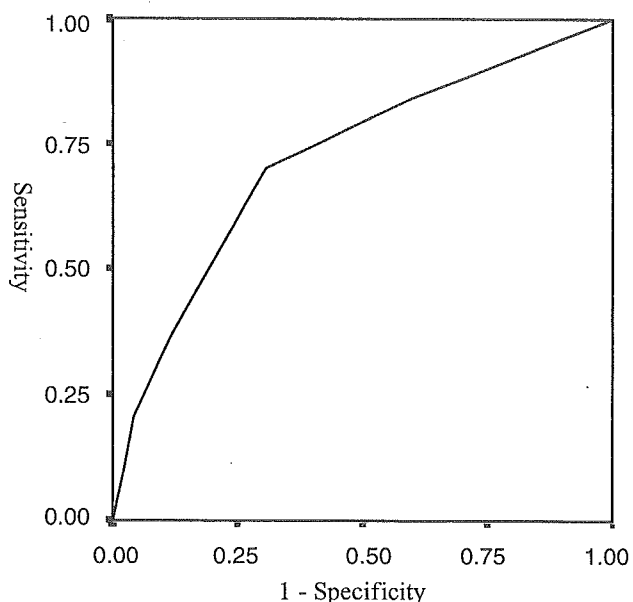


Figure 2. The association between the Depression and Suicide Screen score and presence of suicidal ideation (ROC analysis).

Table 2. Sensitivity and specificity of the Depression and Suicide Screen in the detection of subjects with depression or suicidal ideation

Cutoff score	Depression		Suicidal ideation	
	Sensitivity	Specificity	Sensitivity	Specificity
0/1	0.886	0.440	0.841	0.405
1/2	0.705	0.729	0.698	0.693
2/3	0.409	0.919	0.365	0.883
3/4	0.193	0.968	0.206	0.958
4/5	0.080	0.982	0.095	0.981

DISCUSSION

The DSS, which is a self-rated, five-item scale, was developed and validated in a sample of elderly people within a single community. The DSS has several advantages over other screening instruments. First, using an optimal cutoff score (≥ 2), the DSS exhibited satisfactory sensitivity and specificity in detecting both depression and suicidal ideation, which is comparable to other screening tools. Although there have been several other screening tools for depression and suicidal ideation, it is noteworthy that this DSS is able to screen out both depression and suicidal thought simultaneously. Second, this screen is fairly simple and is easy to administer. Questionnaires with many items are not applicable to people in the community, particularly elderly people. The DSS contains only five items, requiring only 'yes' or 'no' answers, so that it can be

administered with no assistance or with only minimal assistance from health workers who might also not be familiar with psychiatric problems. Although there are other simple screening tools that include only a few items, such as the 'two-question method', they often require the involvement of mental health professionals, while other screens are too complicated to be filled out in practical settings. Third, we devised the screen such that it would be acceptable to elderly people in the community in the following ways: the wording was modified and the questions regarding thoughts of death were omitted. This screen is therefore likely to be acceptable to the general elderly population, even by those who are either unaware of their own psychiatric symptoms or those who would be offended by explicit queries about their moods or thoughts. In addition, this questionnaire can be completed within only 2–3 min. These advantages make the DSS very useful in both the community and primary care settings.

We have demonstrated that a considerably high percentage of the elderly people who took part in this study had thoughts of death or suicide. According to the review by Moscicki,¹⁷ the prevalence of suicidal ideation in adult community samples varies from 0.8 to 9.6%, and suicidal thoughts are reported to decline with age.¹⁸ However, in the present series of studies, as much as 12.5% (44 out of 353 subjects) of elderly subjects in study 1 and 16.8% (64 subjects) of those in study 2 reported having thoughts about death or suicide. Considering that only a small percentage of people with psychological problems seek help from the mental health services,^{19,20} it is extremely important for suicide prevention among the elderly to be able to positively identify depressive symptoms. Use of screening instruments such as the DSS will be of great help in this matter.

There are some limitations to this study. First, the study sample was limited to people in only one rural area of Japan. Whether the results of this study can be extrapolated to the individuals of other geographic areas needs to be established. Second, in study 1 (the scale development study), the CIDI was carried out by non-mental health professionals, which may have affected the results to some extent. The depression and suicide rate were rather high in the study area, but this could be an observation error due to the lack of clinical experience of the research workers. Third, in study 2 (scale validation study), only one self-rated questionnaire (GDS-S) was used as the external criterion. Although reliability of GDS-S has been proved, it is not more than a screening tool for depression, and therefore, further verification is desirable in order to diagnose subjects as having depression, by using structured diagnostic interviews. The same can be said

about suicidal ideation, since only simple inquiries were performed by those who are not mental health professionals. Finally, the cognitive function of the subjects was not strictly evaluated. Although those with clinically apparent dementia were excluded from the study sample, it may be possible that people with potential cognitive impairment were enrolled in the study.

Despite these limitations, the DSS is a very useful screen in that it is brief and easily applied. Given the high prevalence of depression and suicide among the Japanese, it is important for primary care physicians and community health workers to routinely evaluate depression and suicidal ideation in the primary care setting, and we have shown that using the DSS would be a useful way to achieve this goal. Furthermore, this screen could be used as an educational aid for the general population as part of a community-based mental health promotion activity. Further study is desirable to prove whether this screening tool can be extrapolated to subjects of other age groups.

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Regular Article

Twelve-month prevalence, severity, and treatment of common mental disorders in communities in Japan: preliminary finding from the World Mental Health Japan Survey 2002–2003

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Abstract

To estimate the prevalence, severity, and treatment of *Diagnostic and Statistical Manual of Mental Disorders* (4th edn; DSM-IV) mental disorders in community populations in Japan, face-to-face household surveys were conducted in four community populations in Japan. A total of 1663 community adults responded (overall response rate, 56%). The DSM-IV disorders, severity, and treatment were assessed with the World Mental Health version of the World Health Organization (WHO) Composite International Diagnostic Interview (WMH-CIDI), a fully structured lay-administered psychiatric diagnostic interview. The prevalence of any WMH-CIDI/DSM-IV disorder in the prior year was 8.8%, of which 17% of cases were severe and 47% were moderate. Among specific disorders, major depression (2.9%), specific phobia (2.7%), and alcohol abuse/dependence (2.0%) were the most prevalent. Although disorder severity was correlated with probability of treatment, only 19% of the serious or moderate cases received medical treatment in the 12 months before the interview. Older and not currently married individuals had a greater risk of having more severe DSM-IV disorders if they had experienced any within the previous 12 months. Those who had completed high school or some college were more likely to seek medical treatment than those who had completed college. The study confirmed that the prevalence of DSM-IV mental disorders was equal to that observed in Asian countries but lower than that in Western countries. The percentage of those receiving medical treatment was low even for those who suffered severe or moderate disorders. Possible strategies are discussed.

Key words

CIDI, descriptive epidemiology, mental disorders, WMH surveys.

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INTRODUCTION

Cross-national psychiatric epidemiology has consistently revealed a lower prevalence of mood and anxiety disorders among East-Asian countries, such as South Korea,¹ Taiwan² and China (Hong Kong),³ com-

pared with Western countries.²⁻¹⁵ A similar pattern was observed for alcohol abuse/dependence,⁴⁻⁶ with an exception for South Korea, in which a high prevalence was reported.¹

In a community-based survey in Japan with an original diagnostic instrument, Kitamura *et al.* reported a high lifetime prevalence of *Diagnostic and Statistical Manual of Mental Disorders* (3rd edn, revised; DSM-III-R) major depression (14%) but modest lifetime prevalences for other mood and anxiety disorders (1-2%).¹⁶ Another community-based survey of mental disorders was conducted using the University of Michigan version of the Composite International Diagnostic Interview (CIDI)⁶ in an urban population in Japan. The findings showed that the prevalences of mood and anxiety disorders and alcohol abuse/dependence were intermediate between those in East Asia (Taiwan and Hong Kong) and those in the USA and Europe.^{2,3,15} For medical treatment rates among those who suffered mental disorders, Kitamura *et al.* reported that only 10% of those who received a diagnosis of mental disorders visited a doctor for medical treatment.¹⁶ This rate was far lower than those reported in previous surveys in the USA.^{13,17} The other survey did not report the medical treatment rate.¹⁵ In addition, one dimension that has been lacking in previous psychiatric epidemiologic surveys in relation to the assessment of unmet needs is the severity of mental disorders.¹⁸ Many mental disorders are mild and do not require treatment. No previous study in Japan has considered the severity of mental disorders in the epidemiology of mental disorders and medical treatment. Needs and unmet needs relevant to mental disorders are still not clear for the Japanese population.

The World Health Organization (WHO) established the World Mental Health (WMH) Survey Consortium in 1998 to address unmet needs considering the severity of the disorders across developed and developing countries.¹⁹ The WMH collaborators expanded the CIDI to include detailed questions about disorder severity, impairment, and treatment and then carried out a coordinated series of WMH-CIDI surveys in 28 countries around the world, including Japan. The first paper from the cross-national collaborative study reported 12-month prevalence, severity, impairment, treatment, and sociodemographic correlates in 14 countries, indicating a large difference in these indicators among countries, particularly, between Western and Asian countries.¹⁸ The survey revealed that the medical treatment rate was still lower among people who suffered mental disorders with a severe or moderate impairment, almost in every country.

An objective of the present paper was to describe the 12-month prevalence, severity, and treatment of

mental disorders and their demographic correlates based on data specific to Japan that were collected between 2002 and 2003 (WMH Japan 2002-03 Survey) as a part of the WMH surveys.¹⁸ Based on the findings, the specific needs, unmet needs, and possible treatment options are presented and discussed in relationship to a proposal for a plan to provide mental health care in Japan.

METHODS

Survey populations and subjects

Four community populations in Japan were selected as study sites in 2002-03. The sites included two urban cities (Okayama, population 660 000; and Nagasaki, population 450 000) and two rural municipalities (Kushikino, population 25 000) and Fukiage, population 8500, in Kagoshima prefecture). These sites were selected in consideration of geographic variation and the availability of site investigators. Mainly due to the latter factor, all survey sites were located on the west coast of Japan for the 2002-03 WMH Japan surveys. The proportion of those aged ≥ 65 years old ranged from 17% (Okayama) to 36% (Fukiage); the proportion of those who engaged in agricultural or fishery occupations to the total employed population ranged from 2% to 3% (Nagasaki and Okayama) to 16% (Fukiage). A random sample was selected from residents aged ≥ 20 years old in each survey site, based on a voter registration list or a resident registry. After a letter of invitation was sent, trained interviewers contacted the subjects and interviewed those who agreed to participate in the survey using the standardized instrument. We excluded subjects who did not meet eligible criteria: those who had died, moved, or were institutionalized. A completed interview was defined as one in which, at least, the pharmacoepidemiology (PH) section of the instrument had been completed. A total of 1664 interviews were obtained. One respondent from the Okayama site was eliminated from the analysis presented in the previous WMH collaboration paper¹⁸ because of a coding error. Thus, we eliminated this respondent from further analysis to maintain consistency with the previous study.¹⁸ The response rate was calculated as the number of completed interviews divided by the number of eligible subjects (excluding ineligible subjects who were deceased, had moved, or had been institutionalized). The overall response rate was 56% (Table 1). Unfortunately, the response rate at the Nagasaki site was very low (26%) because a different survey method had been used, while the

Table 1. Survey site details: WHO WMH Japan 2002–2003 survey

Disposition	Okayama		Nagasaki		Kagoshima Prefecture				Total	
	<i>n</i>	(%)	<i>n</i>	(%)	Kushikino <i>n</i>	(%)	Fukiage <i>n</i>	(%)	<i>n</i>	(%)
Total initial sample	1607	100	800	100	587	100	230	100	3224	100
Completed interview	925	57.6	208	26.0	354	60.3	177	77.0	1664	51.6
Incomplete interview	6	0.4	3	0.4	–	–	–	–	9	0.3
No contact	80	5.0	296	37.0	–	–	–	–	376	11.7
Refused	397	24.7	280	35.0	185	31.5	40	17.4	902	28.0
Ineligible [†]	199	12.4	13	1.6	48	8.2	13	5.7	273	8.5
Response rate [‡]		65.7		26.4		65.7		81.6		56.4

WHO WMH, World Health Organization World Mental Health.

[†]Ineligible subjects include those who were deceased, had moved, or had been institutionalized. Ineligible subjects also include a small number ($n = 15$) of those who had impaired cognitive functions in the Okayama site.

[‡]Response rate = (no. completed interviews)/(no. total initial sample–no. ineligible).

response rates were fairly high (66–81%) at the other three sites. Excluding data from the Nagasaki site did not greatly alter the findings. Thus we included the data in the analysis, together with data from other three sites.

An internal sampling strategy was used in all surveys to reduce respondent burden by dividing the interview into two parts. Part I included the diagnostic assessment, and part II included information about correlates of a disorder. All respondents completed part I. All part I respondents who met the criteria for any mental disorder and a probability subsample of approximately 10% of other respondents were then given part II ($n = 477$). The interviews for the respondents who were not selected into part II were terminated after part I. The part I sample was used to estimate the 12-month prevalence, severity, and treatment for most disorders; the part II sample, that is, a subsample of the part I sample, was used to estimate the 12-month prevalence of some disorders and to examine the association between demographic variables and the 12-month prevalence, severity and treatment. The part II respondents were weighted by the inverse of their probability of selection to adjust for the differential sampling of cases and non-cases. In addition to this part II weight, all samples were weighted to adjust for differential probabilities of selection and post-stratified to match the population distributions on the cross-classification for sex and age,²⁰ for which the non-response weight in a given group for sex and age was the inverse of the response rate in this category (Appendix I). The unweighted and weighted distributions of the subjects in part I and part II are shown in Appendix II.

Training and field procedures

The fieldwork for the WMH Japan Survey was carried out by a survey center at each survey site in connection with the headquarters at the National Institute of Mental Health (NIMH), Japan. The centers include Okayama University Graduate School of Medicine and Dentistry, Ijuin Public Health Center, Kagoshima Prefecture, and Nagasaki University Graduate School of Biomedical Sciences. The development of the instrument, training of the interviewers, and preparation of data analysis were supported by the technical support center at Okayama University Graduate School of Medicine and Dentistry (NK).

Before the survey, interviewers received a 5-day standardized instrument-specific training. The training included didactic sessions of general interview skills and reviews of the instrument sections, mock interviews and role-playing exercises. Two official trainers (NK, NI) and other assistants who were previously trained in the instrument provided 5-day training to the interviewers at each survey site.

At the Okayama site, an invitation letter was sent to each subject and then an interviewer visited the homes of the subjects to seek permission to participate in the survey. In the two Kagoshima prefecture sites, community volunteers first contacted the subjects in their homes to recruit them into the survey. If the subject agreed, the interviewer conducted a face-to-face interview in the home or at the survey center if the participant preferred. At the Nagasaki site, an invitation letter was sent to each subject, and an interviewer conducted the face-to-face interview with those who replied positively. When an invitation letter was mailed

twice and no response was received within a month, no further effort was made to contact the individuals. Written consent was obtained from each respondent at each site. The Research Ethics Committees of Okayama University (for the Okayama site), Japan NIMH (for the Kagoshima site), and Nagasaki University (for the Nagasaki site) approved the recruitment, consent, and field procedures.

Survey instrument

The survey used the Japanese computer-assisted personal interview (CAPI) version of the WMH Initiative version of the WHO Composite International Diagnostic Interview (WMH-CIDI),²¹ a fully structured diagnostic interview, to assess disorders and treatment. The original English version of WMH-CIDI was translated into Japanese by a team under the supervision of the investigators (NK, NI, TF). Key questions of the final draft of the Japanese version were translated back into English and sent to the WMH Coordinating Center at the Harvard Medical School for a review to check for cross-national consistency. Methodological evidence collected in the WHO-CIDI Field Trials and later clinical calibration studies showed that all disorders were assessed with acceptable reliability and validity both in the original CIDI²² and in the original version of the WMH-CIDI. A pilot study using the Japanese version of WMH-CIDI with a small number of clinical patients showed good concordance between clinical diagnosis and WMH-CIDI diagnosis of major depression and alcohol abuse/dependence.²³

Twelve-month diagnosis, severity and treatment

Disorders assessed in the survey were (i) anxiety disorders [agoraphobia, generalized anxiety disorder (GAD), panic disorder, post-traumatic stress disorder (PTSD), social phobia, specific phobia], (ii) mood disorders (bipolar I and II disorders, dysthymia, major depressive disorder), (iii) disorders that share a feature of problems with impulse control [intermittent explosive disorder (IED)], and (iv) substance disorders (alcohol and drug abuse and dependence). Disorders were assessed using the definitions and criteria of the *Diagnostic and Statistical Manual of Mental Disorders* (4th edn, DSM-IV). The CIDI organic exclusion rules were imposed on all diagnoses.

The WMH-CIDI/DSM-IV disorders were classified as serious, moderate, or mild. Serious disorders were defined as either those meeting the criteria for bipolar I disorder or substance dependence with a physiological dependence syndrome; a suicide attempt in conjunction with any other WMH-CIDI/DSM-IV

disorder; reporting at least two areas of role functioning with severe role impairment due to a mental disorder in the disorder-specific Sheehan Disability Scales (SDS);²⁴ or reporting overall functional impairment at a level consistent with a Global Assessment of Functioning (GAF)²⁵ of ≤ 50 in conjunction with any other WMH-CIDI/DSM-IV disorder.¹⁸ Respondents not classified as having a serious disorder were classified as moderate if interference was rated at least moderate in any SDS domain or if the respondent had substance dependence without a physiological dependence syndrome. All other disorders were classified as mild.

Twelve-month treatment was assessed by asking respondents if they ever saw any of a list of professionals either as an outpatient or inpatient for problems with emotions, nerves, mental health, or use of alcohol or drugs. Professionals were classified into the following categories: (i) psychiatrist or mental health specialist, (ii) general medical (other MD or nurse), and (iii) human services (religious provider, social worker or counselor in a non-mental health setting) and complementary and alternative (Internet group, self-help group, or alternative provider). Further, health-care service was defined as psychiatrist, mental health specialist, or general medical. The subjects who had used any of these services in the previous 12 months were placed in a category labeled 'any treatment', and those who did not seek treatment were categorized as 'no treatment'.

Patient variables

The demographic characteristics used in the analysis were age, gender, education, marital status, and income. Income was dichotomized based on the median income per family member. Demographic characteristics of the study sample after sampling weighting were: for gender and age (Appendix II); for education, none or some primary, 30.9%; completed secondary, 34.1%; some post-secondary, 18.8%; and college graduate, 16.5%; for marital status, married, 62.8%; and not married, 37.2% (previously married, 15.1%; and never married, 22.1%); for income, below average, 50%; and above average, 50%.

Analysis methods

Data are reported on prevalence, severity, and associations of severity with treatment. Simple cross-tabulations were used to calculate prevalence and severity. Logistic regression analysis was used to study sociodemographic correlates. Standard errors of descriptive statistics were estimated using the Taylor

series method implemented in the SUDAAN software system (Research Triangle Park, NC, USA) to adjust for the weighting of cases.²⁶ The logistic regression coefficients were transformed to odds ratios (OR) and are reported here with design-adjusted 95% confidence intervals (CI). Multivariate tests were based on Wald χ^2 tests computed from design-adjusted coefficient variance-covariance matrices. Statistical significance was based on two-sided design-based tests evaluated at the 0.05 level of significance.

RESULTS

Twelve-month prevalence and disorder severity

Approximately 9% of community residents had experienced any WMH/CIDI DSM-IV disorder in the pre-

vious 12 months (Table 2); 5% had experienced any anxiety disorder; 3%, any mood disorder; 1%, an impulse-control disorder (i.e. IED); and 1.7%, any substance use disorder. Among the specific disorders assessed in the survey, the 12-month prevalence was greater for major depressive disorder (2.9%), specific phobia (2.7%), and then GAD (1.2%).

Among those who had experienced a disorder in the previous 12 months, one of six (1.5% of the total population) had experienced a severe disorder, and approximately one half (4.1% of the total population) had experienced a moderate disorder in the previous 12 months. More severe cases were in the categories of PTSD, bipolar I-II disorders (as defined), alcohol dependence, and drug abuse and dependence.

Table 2. Prevalence of 12-month WMH-CIDI/DSM-IV disorders and disorder severity

Disorder	12-month prevalence		Severity of the disorder					
	%	(95% CI)	%	Serious (95% CI)	%	Moderate (95% CI)	%	Mild (95% CI)
Anxiety disorders								
Panic disorder	0.5	(0.0–1.1)	24.8	(0.0–58.3)	69.1	(32.8–100.0)	6.1	(0.0–18.6)
GAD	1.2	(0.6–1.8)	29.2	(8.0–50.4)	70.8	(49.6–92.0)	–	NA
Specific phobia	2.7	(1.5–3.9)	10.9	(0.0–24)	46.9	(27.9–65.9)	42.2	(26.1–58.3)
Social phobia	0.8	(0.2–1.4)	31.6	(0.0–66.7)	68.4	(33.3–100.0)	–	NA
Agoraphobia without panic	0.3	(0.1–0.5)	33.7	(0.0–79.6)	66.3	(20.4–100.0)	–	NA
PTSD [†]	0.4	(0.0–0.8)	65.6	(37.4–93.8)	5.9	(0.0–16.3)	28.5	(0.0–59.7)
Any anxiety disorder [‡]	4.8	(3.0–6.6)	15.4	(4.8–26.0)	59	(46.1–71.9)	25.6	(14.8–36.4)
Mood disorders								
Major depressive disorder	2.9	(2.1–3.7)	22.1	(10.7–33.5)	60.4	(44.9–75.9)	17.5	(5.3–29.7)
Dysthymia	0.7	(0.3–1.1)	41.2	(0.0–83.3)	43.7	(0.0–93.1)	15.1	(0.0–32.7)
Bipolar I-II disorders	0.1	(0.0–0.3)	100	NA	–	NA	–	NA
Any mood disorder	3.1	(2.1–4.1)	25.8	(13.6–38.0)	56.4	(39.5–73.3)	17.8	(6.2–29.4)
Impulse-control disorders								
IED	1.0	(0.4–1.6)	15.3	(0.0–40.6)	33	(0.0–71.4)	51.7	(20.1–83.3)
Substance use disorders								
Alcohol abuse or dependence [†]	1.6	(0.2–3.0)	26.7	(1.2–52.2)	10.6	(0.0–24.7)	62.7	(30.6–94.8)
Alcohol dependence [†]	0.4	(0.0–0.8)	81.7	(44.1–100.0)	18.3	(0.0–55.9)	–	NA
Drug abuse or dependence [†]	0.1	(0.0–0.3)	100.0	NA	–	NA	–	NA
Drug dependence [†]	0.1	(0.0–0.3)	100.0	NA	–	NA	–	NA
Any substance use disorder [†]	1.7	(0.3–3.1)	29.7	(3.2–56.2)	10.2	(0.0–23.7)	60.1	(27.8–92.4)
Any disorder								
Any [‡]	8.8	(6.4–11.2)	16.7	(9.8–23.6)	46.6	(35.6–57.6)	36.7	(26.3–47.1)
Total sample	–	–	1.5	(0.7–2.3)	4.1	(2.7–5.5)	3.2	(1.8–4.6)

CI, confidence interval; GAD, generalized anxiety disorder; IED, intermittent explosive disorder; NA, 95% confidence intervals could not be calculated; PTSD, post-traumatic stress disorder; WMH-CIDI/DSM-IV, World Mental Health version of the World Health Organization Composite International Diagnostic Interview/*Diagnostic and Statistical Manual of Mental Disorders* 4th edn.

[†]Part II sample.

[‡]Part II sample. No adjustment was made for the fact that one or more disorders in the category were not assessed for all part II respondents.

–, no cases.

The 12-month prevalence of any DSM-IV disorder was significantly different among the four survey sites after controlling for gender and age groups (data not shown, *d.f.* = 3, $P = 0.038$): The estimated OR of having any DSM-IV disorder in the previous 12 months were 1.63 (95% CI, 1.00–2.66) in Nagasaki-city, 0.92 (95% CI, 0.56–1.50) in Kushikino, and 0.47 (95% CI, 0.20–1.10) in Fukiage, compared with Okayama as a reference. Similar tendencies were observed for any mood disorder and any anxiety disorder, although the difference was not significant for any of the four disorder categories (*d.f.* = 3, $P > 0.05$).

Association of 12-month disorder severity with treatment

A severe disorder and a moderate disorder were combined into one category because <30 cases had a serious disorder. Those who had a severe/moderate disorder were more likely to receive health care and medical treatment ($P < 0.05$), particularly among the mental health specialties (Table 3). However, only 19% of those who had a severe/moderate disorder sought medical treatment.

Sociodemographic correlates of 12-month prevalence, severity, and health-care treatment

None of the sociodemographic predictors (i.e. sex, age, family income, marital status and education) was significantly associated with the 12-month prevalence of any disorder ($P > 0.05$, Table 4). The severity of any disorder experienced was significantly greater among older individuals and those who were not currently

married ($P < 0.05$). The probability of seeking medical treatment was greater among those who had completed high school than among those who had received less education and those who had graduated from college ($P = 0.001$).

Sociodemographic correlates of WMH-CIDI/DSM-IV disorder types

Any mood disorders experienced in the previous 12 months were more prevalent in those who were never married (Table 5). Substance use disorders in the previous 12 months were more prevalent among men, those aged 35–49 years old, and among those who had higher-than-average income ($P < 0.05$). None of the sociodemographic predictors was significantly associated with 12-month prevalence of any anxiety disorder or impulse control disorder ($P > 0.05$).

DISCUSSION

The present study has confirmed that the prevalence of mental disorders was lower in Japan than that in Western countries.^{15,18,27,28} The 12-month prevalences of any DSM-IV disorder, four broad categories of mental disorders, and specific mental disorders were almost equal to those in WMH surveys in Beijing, and some European Union (EU) countries (Spain, Italy, and Germany), greater than those in Shanghai and Nigeria, and lower than those reported in the USA, Colombia, and most EU countries.^{6,12,14,18,29}

The present survey added new information on the prevalence of PTSD, IED and drug abuse/dependence in Japan. The 12-month prevalence of PTSD in the

Table 3. Association of 12-month WMH-CIDI/DSM-IV disorder severity with treatment

Treatment	Any disorder		Mild (95% CI)	No disorder (95% CI)		Total respondents (95% CI)		
	Serious or moderate [†] %	%		%	%	%	%	
Any treatment	22.7	(10.7–34.7)	12.0	(1.4–22.6)	6.2	(3.1–9.3)	7.3	(4.4–10.2)
Mental health specialty	17.5	(7.1–27.9)	6.0	(0.0–14.4)	1.3	(0.0–2.7)	2.5	(1.3–3.7)
General medical	6.6	(0.9–12.3)	5.1	(0.0–11.4)	3.5	(1.7–5.3)	3.7	(2.1–5.3)
Any health care	18.8	(8.4–29.2)	4.8	(2.8–6.8)	5.8	(3.8–7.8)	5.8	(3.8–7.8)
Non-health care (Human services or CAM)	8.6	(1.3–15.9)	0.9	(0.0–2.9)	1.5	(0.0–3.1)	1.9	(0.5–3.3)
No treatment	77.3	(65.3–89.3)	88.0	(77.4–98.6)	93.8	(90.7–96.9)	92.7	(89.8–95.6)

CAM, complementary and alternative; WMH-CIDI/DSM-IV, World Mental Health version of the World Health Organization Composite International Diagnostic Interview/*Diagnostic and Statistical Manual of Mental Disorders* 4th edn.

[†]The categories were combined because fewer than 30 individuals had a serious disorder. Significant differences in a proportion for any treatment, mental health specialty, health care, absence of health care, and proportion of no treatment between the two severity categories of a disorder (*d.f.* = 1, all $P < 0.05$).

Table 4. Predictors of WMH-CIDI/DSM-IV 12-month prevalence, severity, and health-care treatment (part II sample, $n = 477$)

	Any 12-month disorder		Severity/Disorder [†]		Treatment [‡]	
	OR	95% CI	OR	95% CI	OR	95% CI
Sex						
Male	1.00	–	1.00	–	1.00	–
Female	0.89	(0.48–1.64)	1.18	(0.27–5.13)	0.91	(0.40–2.06)
		$\chi^2_1 = 0.2$		$\chi^2_1 = 0.1$		$\chi^2_1 = 0.1$
Age (years)						
20–34	1.58	(0.67–3.75)	0.13	(0.01–2.72)	0.60	(0.16–2.21)
35–49	1.76	(0.64–4.86)	0.12	(0.01–2.25)	0.64	(0.14–2.88)
50–64	1.40	(0.63–3.09)	0.53	(0.03–8.46)	0.57	(0.12–2.78)
65+	1.0	–	1.00	–	1.00	–
		$\chi^2_3 = 1.7$		$\chi^2_3 = 11.0^*$		$\chi^2_3 = 0.7$
Family income						
Low	0.72	(0.26–2.05)	2.71	(0.70–10.54)	1.18	(0.44–3.17)
High	1.00	–	1.00	–	1.00	–
		$\chi^2_1 = 0.4$		$\chi^2_1 = 2.4$		$\chi^2_1 = 0.1$
Marital status						
Currently married	1.00	–	1.00	–	1.00	–
Never married/separated/widowed/divorced	1.50	(0.55–4.10)	4.30	(1.17–15.82)	0.75	(0.24–2.33)
		$\chi^2_1 = 0.7$		$\chi^2_1 = 5.5^*$		$\chi^2_1 = 0.3$
Education						
Middle school or less	0.85	(0.29–2.54)	0.28	(0.03–2.54)	0.65	(0.12–3.63)
High school	1.45	(0.54–3.92)	0.54	(0.13–2.17)	1.88	(0.51–6.95)
Some college	1.88	(0.60–5.93)	0.53	(0.11–2.50)	1.05	(0.35–3.21)
College or higher	1.00	–	1.00	–	1.0	–
		$\chi^2_3 = 3.1$		$\chi^2_3 = 1.6$		$\chi^2_3 = 20.4^*$

CI, confidence interval; OR, odds ratio; WMH-CIDI/DSM-IV, World Mental Health version of the World Health Organization Composite International Diagnostic Interview/*Diagnostic and Statistical Manual of Mental Disorders* 4th edn.

[†]Serious or moderate (coded 1) vs mild (coded 0) among those who experienced any 12-month disorder.

[‡]Controlling for disorder severity.

*Significant at the 0.05 level, two-sided test.

present study was 0.4%, which is much lower than that recently reported in the USA.³⁰ One of 100 respondents experienced IED in the previous 12 months, which is characterized by discrete episodes of failure to resist aggressive impulses, resulting in serious assaults or destruction of property. However, the estimated figure should be interpreted with caution because the diagnosis of IED should be made only after a thorough medical work-up.³¹ The 12-month prevalence of drug abuse/dependence was much lower than that previously reported in the USA and other Western countries.^{6,32} This is consistent with the fact that the Japanese government has a strong policy for controlling the use of illicit and other psychotropic drugs.³³

The WMH surveys found that mild cases met diagnostic criteria but involved almost no impairment of functioning.¹⁸ However, 5.6% of the total population experienced a severe or moderate disorder in the past 12 months; 2.4% of the total population

experienced a severe or moderate form of major depression in the previous 12 months. These severe or moderate cases should be a primary target of mental health care.

People were more likely to have sought medical treatment if they had experienced a severe or moderate disorder within the previous 12 months. However, only one of five who had a severe disorder sought medical treatment. The medical treatment rate was lower than that in the WMH surveys in most developed countries, such as the USA and Europe, while it was slightly greater than that in China, Columbia and Lebanon.¹⁸ It is somewhat unexpected that those who had completed high school or attended some college were significantly more likely to seek medical treatment than others. Individuals at each end of the educational spectrum may be reluctant to seek medical treatment for mental disorders. Those with the least education may lack knowledge of mental disorders and their treatments,

Table 5. Predictors of WMH-CIDI/DSM-IV disorder types (part II sample, $n = 477$)

	Any mood		Any anxiety		Any impulse		Any substance	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Sex								
Male	1.00	–	1.00	–	1.00	–	1.00	–
Female	1.60	(0.67–3.82)	1.18	(0.44–3.14)	0.50	(0.08–3.27)	0.07	(0.01–0.92)
		$\chi^2_1 = 1.3$		$\chi^2_1 = 0.1$		$\chi^2_1 = 0.6$		$\chi^2_1 = 4.7^*$
Age (years)								
20–34	2.25	(0.29–17.22)	2.43	(0.57–10.31)	0.35	(0.03–4.91)	2.66	(0.35–20.00)
35–49	2.71	(0.35–21.18)	1.94	(0.45–8.30)	1.17	(0.05–25.36)	4.33	(0.95–19.80)
50–64	4.58	(0.71–29.69)	2.43	(0.68–8.68)	0.79	(0.03–18.33)	0.27	(0.02–3.85)
65+	1.00	–	1.00	–	1.00	–	1.00	–
		$\chi^2_3 = 3.5$		$\chi^2_3 = 2.9$		$\chi^2_3 = 1.3$		$\chi^2_3 = 10.7^*$
Family income								
Low	1.06	(0.39–2.91)	0.97	(0.33–2.90)	1.86	(0.07–52.03)	0.04	(0.00–0.61)
High	1.00	–	1.00	–	1.0	–	1.00	–
		$\chi^2_1 = 0.0$		$\chi^2_1 = 0.0$		$\chi^2_1 = 0.2$		$\chi^2_1 = 6.1^*$
Marital status								
Currently married	1.00	–	1.0	–	1.00	–	1.00	–
Never married/separated/ widowed/divorced	3.00	(0.94–9.53)	1.46	(0.59–3.63)	0.12	(0.01–1.71)	3.65	(0.25–53.03)
		$\chi^2_1 = 3.9^*$		$\chi^2_1 = 0.8$		$\chi^2_1 = 2.8$		$\chi^2_1 = 1.0$
Education								
Middle school or less	0.25	(0.03–2.43)	1.00	(0.26–3.88)	1.52	(0.04–52.69)	10.20	(0.37–278.16)
High school	1.04	(0.24–4.54)	1.90	(0.62–5.82)	3.45	(0.13–92.09)	1.65	(0.0–38.93)
Some college	0.73	(0.17–3.17)	2.78	(0.92–8.41)	1.90	(0.09–41.39)	6.26	(0.20–194.00)
College or higher	1.00	–	1.00	–	1.00	–	1.00	–
		$\chi^2_3 = 2.8$		$\chi^2_3 = 6.9$		$\chi^2_3 = 0.9$		$\chi^2_3 = 5.0$

CI, confidence interval; OR, odds ratio; WMH-CIDI/DSM-IV, World Mental Health version of the World Health Organization Composite International Diagnostic Interview/*Diagnostic and Statistical Manual of Mental Disorders* 4th edn.

*Significant at the 0.05 level, two-sided test.

and the more educated may face psychological barriers, such as fear of losing social status, a threat to job security, or humiliation, which might prevent them from seeking care.

As observed in previous studies in Japan and many other countries, women had a greater risk of mood disorder and anxiety disorders and a lower risk of substance use and impulse-control disorders, although the association was not always significant, likely due to a small number of the part-II sample respondents.^{4,6,15,16,18,34} Greater prevalence of any substance use disorder among younger groups is also in concordance with previous studies.⁴ Although not significant, the present study supports a previous observation that mood disorders were more prevalent among the middle-aged in Japan.¹⁵ A greater risk of suicide has been observed among men in the same age range in Japan.³⁵ The most likely factor underlying the phenomenon is economic recession but others should be considered, such as rapid changes in family and society as well as the possible burden of caring for elderly relatives. The middle-aged population may be a primary important

target for mental health care in Japan. In addition, older respondents had a significantly greater risk of having a severe form of a mental disorder after they became affected with one. This may be attributable to a greater risk of recurrence of mental disorders and comorbidity with a somatic disorder among older patients.^{36,37} A greater risk of mood and anxiety disorders among those not currently married is also in concordance with previous observations.^{29,34} However, in contrast to previous observations in other countries,^{18,27,29} income showed almost no association with mood or anxiety disorders; substance use disorder was rather more prevalent in the group with high income. First, this may be attributable to a possible selection bias in that people with low income who suffered from these disorders may be in poor living conditions and were not likely to participate in the study. Another possibility included confounding by employment status: if those who were currently employed (and earned some income) suffered from stress at work and were more likely to develop mental disorders, the deteriorating effect of low income could be diminished or even

reversed. However, a previous study in Japan has reported an inconsistent association between income and depressive episode.²⁷ Income may thus not be a strong correlate of common mental disorders in Japan, meaning that future research in Japan will be needed to address this point.

Among 102 million adults aged 20 years or over in Japan (Japan Statistics Bureau, 2002), 5.7 million (5.6%) may have experienced a severe or moderate mental disorder in the previous 12 months. The majority of them did not seek medical treatment. A primary objective of a future mental health policy in Japan should be to increase medical treatment rates for those experiencing severe or moderate mental disorders. Impaired functioning in several life domains is anticipated in such cases. Awareness of these cases by family, friends, supervisors/coworkers, and neighbors, possibly enhanced through education/training and the dissemination of information, may be useful to facilitate medical treatment, in addition to the increased awareness of such cases. A fairly large portion of those who had experienced mental disorders already received medical treatment from non-psychiatrists. Training non-psychiatrist physicians to treat mental disorders and establishing a liaison between non-psychiatrists and psychiatrists might help bridge the gap.

The survey sites were selected from western Japan, and they did not include a metropolitan city with a population of >1 million. The lower response rate (57%) may also limit the interpretation of the findings, which may lead to either underestimation or overestimation of prevalence. In the Nagasaki site, the response rate was particularly low and the prevalence of mental disorders was several times greater than those at the other three sites, suggesting that those who had a disorder may have been more willing to participate at this site. If this is true, the lower response rate may inflate the overall prevalence. The response rate was lower among younger age groups, which may result in a distorted association between age and the prevalence of mental disorders.

The Japanese version of the WMH-CIDI was not fully validated against clinical diagnoses, although it was developed by an expert group and checked through an expert review and a back-translation procedure. The validity of the instrument should be checked against clinical diagnosis. The observed prevalences may have been over- or under-estimated in the present study because of the use of this instrument.¹³ The prevalence of substance use disorders and PTSD, which was estimated based on the part II sample ($n = 477$), might be unstable. For the relevant analyses based on these respondents, the number of respondents may have been insufficient to provide for the detection of a true

association. The on-going WMH Japan survey will replicate and expand the present findings.

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APPENDIX I: WEIGHT CALCULATION FOR PART I AND PART II SAMPLES

Part I: weight creation

1. Post-stratification (PS) weight

- Purpose: To compensate for differences between the sample and population characteristics due to frame under-coverage, non-response and sampling variability.
- Five age groups and two gender groups were used in this case. This indicates that we have 10 subgroups within each of four survey sites.

Let $\{PS_{w_i} = \text{The post-stratification weight}\}$, where $i = 1, \dots, 1663$.

$$PS_{w_i} = \frac{\text{Percentage of your Census population in subgroup (k,m)}}{\text{Percentage of your sample in subgroup (k,m)}}, \text{ where } k = 1, \dots, 10 \text{ and } m = 1, \dots, 4.$$

2. Normalize the PS weight

$$\text{Let } \left\{ \begin{array}{l} N_{PS_i} = \text{Normalized PS weight} \\ S_{PS} = \sum_{i=1}^{1663} PS_{w_i} = \text{The sum of the PS weight} \\ n = \text{The total number of observation in your sample (i.e. 1663)} \end{array} \right\}, \text{ where } i = 1, \dots, 1663.$$

$$N_{PS_i} = PS_{w_i} * \frac{n}{S_{PS}}$$

Part II: weight creation

1. The part II (PII) weight

$$\text{Let } \left\{ \begin{array}{l} PII_{s_i} = \text{The Part II selection weight} \\ PII_{w_i} = \text{The Part II adjusted selection weight} \end{array} \right\}, \text{ where } i = 1, \dots, 477.$$

$$PII_{s_i} = \left\{ \begin{array}{l} 1.0 \text{ for diagnostic threshold group} \\ \frac{1}{p_1} \text{ for diagnostic subthreshold group} \\ \frac{1}{p_2} \text{ for disorder symptom negative group} \end{array} \right\}$$

- p_1 and p_2 calculated as empiric probability of selection into Part II sample for each subgroup. Empirical probabilities obtained using data weighted with Part I weight (N_{PS_i}).

$$PII_{w_i} = N_{PS_i} * PII_{s_i}$$

2. Post-stratification (PS) weight

- Post-stratification procedure carried out on Part II sample ($n = 477$). See Part I description.

3. Normalize the PS weight

- Normalization procedure carried out on Part II sample ($n = 477$). See Part I description.

APPENDIX II

Sociodemographic distribution (%) of the survey sample in the WHO WMH Japan 2002–03 survey compared to population[†]

	Part I unweighted	Part II unweighted	Part I weighted	Part II weighted	Population census [‡]
Sex					
Male	44.4	39.2	46.3	46.5	46.5
Female	55.6	60.8	53.7	53.5	53.5
Age (years)					
20–39	25.0	27.3	32.1	34.3	34.3
40–49	17.4	18.9	16.1	16.6	16.6
50–59	21.6	22.2	18.5	18.5	18.5
60–69	17.7	17.2	15.1	14.6	14.6
70+	18.3	14.5	18.1	16.1	16.1

WHO WMH, World Health Organization World Mental Health.

[†]Survey site, gender and age groups were used in the post-stratification of weight.

[‡]Average distributions based on population statistics of four survey sites in 2002.

Regular Article

Community-based suicide prevention through group activity for the elderly successfully reduced the high suicide rate for females

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Abstract

The lack of social support is the most common risk factor for late-life suicide. Few previous community-based interventions against the lack of social relationships reduced suicide. This study aims to evaluate outcomes of a community-based prevention program against suicide amongst the elderly in rural Japan. During 1995–2002, the program based on population strategy including group activity, psychoeducation and self-assessment of depression but no screening for depression, was implemented for elderly residents in Yuri town, Japan (5-year average population 6817; 5-year average suicide rate [≥ 65 years old] 291.4/10⁵). Changes in the relative risk of suicide for individuals (≥ 65 years old) before and after the 8-year implementation were estimated by the incidence rate ratio (IRR), using a quasi-experimental design with a neighboring reference, Chokai town, Japan (5-year average population 8136; 5-year average suicide rate [≥ 65 years old] 216.5/10⁵). The risk of elderly females in Yuri completing suicide was reduced by 76% (age-adjusted IRR, 0.24; 95% CI, 0.10–0.58), while there was no change in the risks for Yuri's elderly males and both Chokai's elderly males and females. General loglinear analysis estimated a ratio of the female IRR in Yuri to that in its Akita prefecture of 0.35 (95% CI, 0.14–0.84), showing that the reduction of the risk in the intervention area was greater than a historical trend. A community-based suicide prevention through a group intervention designed to increase knowledge and to cultivate social relationships would be effective for elderly females but not males.

Key words

community-based intervention, elderly, group intervention, population strategy, suicide prevention.

INTRODUCTION

Suicide among the elderly is a major public health problem in Asia, including Japan. The suicide rates among the elderly in some Asian areas, like Hong Kong, Taiwan, Beijing and Japan, are four to five times

the average of western countries.¹ While the Japanese now have the longest average life expectancy in the world, the elderly people are at higher risk for suicide than any other segment of the population, especially in rural Japan.²

There is some evidence of the effectiveness of prevention programs for suicide among the elderly. The 10-year implementations of screening for depression and follow up with psychiatric care resulted in reducing the high suicide rate for both elderly males and females.^{3,4} With those results, we can see the effectiveness of a high-risk strategy such as screening. However,

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we can also see: (i) the difficulty in maintaining psychiatric services for such programs; and (ii) the fact that a large number of the elderly population at low risk for depression produces more suicide victims than a small number of those at high risk.

Recent studies demonstrate that in addition to depression,⁵ the lack of social relationship is the most common risk factor for late-life suicide.⁶⁻⁸ Previous successful interventions also used the reinforcement of social support, like telephone counseling, with emergency response services which were effective in suicide prevention⁹ and befriending was effective in remission of depression.¹⁰ These findings suggest that a program designed to cultivate social relationships should be effective in suicide prevention among the elderly.

The authors have developed a community-based program founded on population strategy for altering, in the entire population, those lifestyle and environmental factors. The present programs included group intervention for the entire elderly residents in order to increase their knowledge and to cultivate their social relationships, but not to screen. The aim of the present study was to evaluate the effectiveness of this program in an 8-year term using a quasi-experimental design with a neighboring reference. The present analysis was based on changes in the incidence rates (IR) of suicide among the elderly aged 65 and over with stratification for age and gender, before and after the program implementation.

METHODS

Intervention program

The preliminary study compared the psychosocial aspects of elderly residents in Yuri town, Japan, the present intervention area having a high suicide rate in the elderly with those in another area having a lower rate. These results suggested that poor communication with friends, poor reception of health support, and a tendency to endure the stressor seen in Yuri were related to depression.¹¹

The intervention program was implemented during January 1995 to December 2002, by the municipality of Yuri town that consists of 47 districts. This is a rural agricultural area, located at the south inland of Akita prefecture in north Japan. For coordinating the intervention, the committee for suicide prevention in the elderly was organized as follows.

Committee for suicide prevention

The committee for suicide prevention in the elderly has been organized in Yuri town by the local health and

welfare professionals: general practitioners, public health nurses (PHNs), welfare commissioners and the people's old club members. The meeting of the committee was held regularly.

The program based on population strategy included three active participatory components, as follows.

Mental health workshop for the elderly

Elderly residents aged 65 and over were called upon to attend the mental health workshops both in the whole town (whole workshop) and in each district (local workshop). During the workshop, a psychiatrist or PHNs conducted the psychoeducational program in small groups, providing the information regarding depression with suicide risks.

Group activity program

The group activity programs were conducted in the community center of each district by PHNs (group activity program). The programs provided opportunities for the elderly residents aged 65 and over to participate in social, voluntary and recreational activities and to exercise together. The programs were composed of: (i) volunteer services, including taking care of kindergarteners, playing roles designed for public elementary schools' needs, and scavenge; (ii) indoor activities, including handicraft-making, woodwork and cooking; and (iii) physical activities, including fitness exercise and gateball (a Japanese adaptation of croquet). They are designed to aid the participants in making acquaintances, bringing about a closer relationship among neighbors, and creating a more fulfilling social life.

Self-assessment of depression in the elderly

A self-reported questionnaire was used to recommend the elderly to have themselves assessed for depression, but not to screen. The questionnaire included 15 sentences from a Japanese version of the Geriatric Depression Scale - Short form (GDS-S)¹² with the description of how to evaluate their own responses. It was distributed to the residents aged 65 and over in the districts where suicide had occurred in the previous 2 years. The residents who agreed to be assessed replied by mail. Referral to a PHN or a psychiatrist was provided for the residents who required a consultation.

Study population and design

The studying terms were divided into two 8-year stages: the baseline set before the initiation in January

1987–December 1994 and the implementation after that in January 1995–December 2002. The study population consisted of two identical dynamic cohorts; an intervention cohort and a reference cohort between 1987 and 2002. The intervention cohort was made up of the annual populations aged 65 and over in Yuri town. The average total population for 5 years before the implementation (January 1990–December 1994) was 6817 (males 3291, females 3525) with an average percentage of the population aged 65 and over of 19.1%, and an average suicide rate for males aged 65 and over of $187.4/10^5$ and for females $363.4/10^5$.

A quasi-experimental design was used with pre- and postimplementation registrations covering the total populations in Yuri town and other 10 municipalities under the Honjo Public Health Center in Akita prefecture. The municipalities were eligible as study references without the implementation of suicide prevention if they met the following criteria; (i) 5-year average population, 4000–10 000; (ii) 5-year average percentage of elderly aged 65 and over, greater than 15%; and (iii) 5-year average rates of suicide among residents aged 65 and over, greater than $150/10^5$ in both males and females. Of those municipalities, only Chokai town (average population, 8136; average percentage elderly, 19.4%; average suicide rate of males [$209.9/10^5$] and of females [$221.4/10^5$] in January 1990–December 1994) fulfilled the criteria and entered in the study as a neighboring reference. Chokai town is located in an agricultural rural area, 15 km geographically south-east of Yuri town. Thus, the reference cohort was made up of the annual populations aged 65 and over in Chokai town.

The 1995 census showed that the unemployment rates (Yuri, 1.65%; Chokai, 2.06%) of the study population were much lower than that of its prefectural mean (Akita, 3.37%). This also showed that the average yearly income (Yuri, 2 630 000 yen; Chokai, 2 446 000 yen) was 80% of its prefectural mean (2 924 000 yen). These findings suggested that both employment rate and income characteristics of the intervention population were similar to those of the reference, in comparison with its prefectural mean.

Data collection

The baseline and the implementation stage took 8 years each from 1 January 1987 to 31 December 1994 and 1 January 1995 to 31 December 2002, respectively.

The data on suicide was derived from prospective registration of all suicide episodes by age and gender at Honjo Public Health Center and the statistical division of Akita prefecture during the study period. The diagnoses in the register were based on ICD-9. According

to an antecedent study, two distinctive groups, confirmed suicides and probable suicides in ICD-9 were treated together. The data on the annual program implementation of Yuri town was collected by the municipal's PHNs.

Statistical analysis

Statistical analyses were based on an IR of suicide, which is the number of incident suicide cases divided by the population-years. The incident suicide cases and annual populations were derived from the dynamic cohort during each 8-year stage. The analyses were as follows.

Assessment of risk change between before and after

Changes in the relative risk (RR) of suicide associated with the factor 'exposure to the community program' were expressed as the IR ratio (IRR). This is because the RR was interchangeable with the IRR between the baseline and the implementation stage under: (i) the assumption of constancy of the IR over each 8-year stage; and (ii) the rarity of suicide (the IR less than 0.5%).¹³ The homogeneity of the IRR in age levels was assessed by the Breslow–Day test. Differences between IR during the 8 years before and after the implementation were also assessed using a corrected Mantel–Haenszel (M-H) stratified χ^2 test adjusted for age owing to none or few incident cases in some cells. Then, the IRR were calculated with adjustment for 10-year age categories using the Mantel extension procedure with maximum likelihood method estimates of the 95% confidence interval (CI).

Evaluation of trend effect on risk change

The analysis compared the crude IRR aged 65 and over between the baseline and the implementation stages in Yuri town with that in its Akita prefecture. It evaluated the effect of a historical trend on the change in the suicide risk detected with the assessment using the M-H test mentioned above. The comparison used a general loglinear analysis with a saturated model on the assumption of the Poisson distribution for cell degrees. A log of a ratio of IRR is a three-factor interaction term in the saturated general loglinear model for a $2 \times 2 \times 2$ cross-classification with parameters constrained to equal zero at the first level of each variable.¹⁴ The three-factor interaction parameter with the 95% CI obtained from the model was calculated using maximum likelihood estimation with χ^2 test (d.f. = 1)

for comparison. This expresses a ratio of the IRR in Yuri to that in Akita.

Descriptive statistics and CI were calculated using the SPSS 10.0 J software package (SPSS Inc., Chicago, IL, USA).

RESULTS

Implementation of the intervention program

Table 1 shows the annual records of the program implementation in Yuri town. The workshops for psychoeducation were held once or twice yearly in the whole town and every 2 years of the first half of implementation in most districts of Yuri town. Approximately one-third or more of the elderly residents participated at least once in the implementation stage. During the workshop, brief information about warning signs for maladjustment and depression were given, as well as how to cope with stress and to consult the mental health services. It was also mentioned that the importance of being close within the community would prevent suicide by, such as, knowing your elderly neighborhood and counteracting permissive attitudes towards suicide. The taboo enhancement on suicide, which was used in Matsunoyama and Joboji studies, was not performed.

The group activity programs were held once every 2–4 months in each district. The number of the imple-

mented districts increased from 5 to 32 in the implementation stage. Approximately half or more of the elderly residents seemed to participate in one or more programs in the stage. The questionnaire for self-assessment was distributed once a year in the 5 or 6 districts. Of the elderly residents who received it, approximately 50–60% replied.

Demographics and statistical power

Table 2 shows the number of suicides and person-years aged 65 and over for 8 years of the baseline and the implementation stage. On the basis of these numbers, we estimated statistical power to demonstrate a reduction in the suicide IR by one-quarter, which derived from an antecedent study of Joboji.⁴ The study would have 53% statistical power of males and 88% of females in Yuri town, and 61% statistical power of males and 92% of females in Chokai town, at a 0.05 one-tail level of significance.

Change in incidence rates of the intervention and reference populations

It clarifies the differences of suicide IR between the baseline and the implementation stage using the corrected M-H test (Table 2). In the intervention area, a 76% reduced risk of suicide among females aged 65

Table 1. Annual records of the 8-year implementation of the intervention program for elderly people aged 65 and over in Yuri town, Japan[†]

Program/year	1995	1996	1997	1998	1999	2000	2001	2002
Population aged 65 and over	1407	1500	1550	1581	1636	1692	1705	1739
Meeting of committee								
Number of times held	3	2	2	0	1	0	1	0
Mental health workshop								
Whole workshop								
Times held	2	2	1	2	1	2	2	1
Total number of participants	114	250	33	173	40	46	161	39
Local workshop								
Number of implemented districts	0	35	0	47	0	0	0	0
Total number of participants	0	530	0	641	0	0	0	0
Group activity program								
Number of implemented districts	5	7	7	12	15	18	24	32
Total number of times held	10	14	18	32	73	108	140	179
Total number of participants times	232	371	497	913	1791	2283	2433	3051
Self-assessment								
Number of implemented districts	0	5	6	6	0	5	0	6
Number of replies	0	82	110	128	0	99	0	134

[†]Yuri town consists of 47 districts.