interviewers carried out structured face-to-face interviews with those who agreed to participate in the survey using the standardized instrument. We excluded subjects who had died, moved, or had been institutionalized. A total of 1663 interviews was obtained. The Composite International Diagnostic Interview (CIDI) questionnaire was divided into two parts. Part I, which included basic sociodemographic data, a core diagnostic assessment, and service use was administered to all respondents. Part II assessed risk factors, correlates, additional disorders (post-traumatic stress disorder and substance disorders). Part II was then administered to all part I respondents who met the criteria for any mental disorder and to a probability subsample of other respondents ($n = 477$).

The response rate was 56.4%. 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, 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.[12] The Human Subjects Committees of Okayama University (for the Okayama site), National Institute of Mental Health in Japan (for the Kagoshima site), and Nagasaki University (for the Nagasaki site) approved the recruitment, consent, and field procedures. (For details see the previous paper.[9])

Measures

Diagnostic assessment of 12-month mental disorders

The DSM-IV diagnoses were made using the computer-assisted personal interview (CAPI) Japanese version of the WMH-CIDI,[13] a fully structured diagnostic interview that generates DSM-IV[14] diagnoses. The 12-month DSM-IV disorders considered here include anxiety (panic disorder, agoraphobia, specific phobia, social phobia, generalized anxiety disorder, post-traumatic stress disorder), mood (bipolar I and II disorders, major depressive disorder, dysthymia), and substance disorders (alcohol and drug abuse and dependence). All diagnoses are considered with organic exclusions and with diagnostic hierarchy rules, with the exception of the substance disorders, for which abuse is defined with or without dependence.

Twelve-month use of mental health services

All part II respondents were asked whether they ever received treatment for 'problems with your emotions or nerves or your use of alcohol or drugs'. A list of types of treatment providers was presented in a respondent booklet to provide a visual recall aid. Separate assessments were made for different types of professionals, support groups, self-help groups, mental health crisis hotlines (assumed to be visits with non-psychiatrist mental health specialists), complementary and alternative (CAM) therapies, and use of other treatment settings. Other treatment settings included admissions to hospitals and other facilities (each day of admission was assumed to include a visit with a psychiatrist). Follow-up questions were first asked about age and the most recent contacts as well as the number and duration of visits in the past 12 months.

Types of 12-month service use were classified into the following categories: psychiatrist; non-psychiatrist mental health specialist (psychologist or other non-psychiatrist mental health professional in any setting, a social worker or counselor in a mental health specialty setting, use of a mental health hotline); general medical provider (general medical doctor, nurse, any other health professional not previously mentioned); human services professional (religious or spiritual advisor, social worker or counselor in a non-mental health setting); and CAM professional (any other type of healer such as chiropractors, participation in an internet support group, participation in a self-help group). The subjects who had used psychiatrist or non-psychiatrist specialist services in the previous 12 months were placed in a category labeled 'any mental health specialty'. The subjects who had used any mental health specialty or general medical services in the previous 12 months were placed in a category labeled 'any health care'. The subjects who had used human services or CAM services in the previous 12 months were placed in a category labeled 'any non-health care'. The subjects who had used any of these services in the previous 12 months were placed in a category labeled 'any treatment'. The subjects who had used any service of two or more categories in the previous 12 months were placed in each category.

Minimally adequate treatment

Minimally adequate treatment was defined as: (i) at least four visits in the prior year to any type of provider (general medical, human services, CAM etc.); or (ii) at least two visits and any type of medication (i.e. this includes medications that are known to be inappropriate for the assessed disorder); or (iii) respondent still in treatment at the time of interview.

Sociodemographic predictor variables

Sociodemographic variables included age (defined by age at interview and categorized as 20–29 years, 30–

44 years, 45–59 years, 60+ years); gender; completed years of education (0–11 years, 12 years, 13–15 years, and 16+ years); marital status (married-cohabitating, previously married, never married); family income in relation to the federal poverty line[15] (categorized as low, <1.5-fold below the poverty line; low average, 1.5+ –3-fold; high average, 3+ –6-fold; and high, 6+-fold higher).

Analysis procedures

Our data were weighted to adjust for differences in the probabilities of selection, differential non-response, residual differences between the sample and the site population, and over-sampling in the part II sample. Basic patterns of service use were examined by computing the proportions in treatment, mean numbers of visits among those in treatment, and proportion of treatments meeting criteria for minimal adequacy. Logistic regression analysis was used to study sociodemographic predictors for receiving any 12-month treatment in the total sample.[16] Standard errors were estimated using the Taylor series method as implemented in SUDAAN (Research Triangle Institute, NC, USA). Multivariate significance tests in the logistic regression analyses were made using Wald χ^2 tests based on coefficient variance–covariance matrices that were adjusted for design effects using the Taylor series method. Statistical significance was evaluated using two-sided design-based tests and the 5% level of significance.

RESULTS

Proportion of 12-month service use

It was found that 7.3% of total respondents used any services in the past 12 months, including 20.0% of those with 12-month DSM-IV disorders and 6.2% of those without any of the assessed disorders (Table 1). The majority of treatments occurred in the health care sectors (5.8% of respondents, representing 79.4% of those in treatment) and, within the health care sectors, the general medical sector (3.7% of respondents, representing 50.8% of those in treatment).

Similarly for those with 12-month DSM-IV disorders, the majority of treatments occurred in the health-care sectors (16.9% of those with disorders, representing 84.6% of those in treatment) and, within the health-care sectors, any mental health care (14.0% of those with disorders, representing 69.9% of those in treatment), including psychiatrists (7.9% of those with disorders, representing 39.3% of those in treatment).

Those with major depressive disorder (MDD) were found to use relatively less general medical treatment (8.9% of those with MDD, representing 26.4% of those in treatment), and more than in any non-health-care sector (14.6% of those with MDD, representing 43.3% of those in treatment).

Number of visits

The mean number of 12-month visits among those receiving any treatment in total part II samples was 6.6 (SE = 1.1, $n = 67$).

Minimally adequate treatment

The data showed that 64.7% (SE = 8.0%, $n = 477$) of treated patients could be classified as receiving at least minimally adequate treatment.

Sociodemographic predictors of treatment

Receiving any 12-month mental health treatment was significantly associated with only education. The probability of people with 13–15 years of education receiving mental health treatment was fourfold higher [odds ratio (OR): 4.4, 95% confidence interval (CI): 1.4–13.9) than those with ≥16 years of education (Table 2). Gender, age, or income were not significant.

Some interesting associations were found, but they were not statistically significant ($P < 0.05$). It may be because of the low statistical power due to the low treatment rate. More people with any mood disorder were more likely to receive treatment than those without (Wald $\chi^2 = 4.2$, d.f. = 1, $P = 0.041$), and more people who were separated, widowed, or divorced were more likely to receive treatment than those who were married or cohabiting (Wald $\chi^2 = 5.4$, d.f. = 2, $P = 0.067$).

DISCUSSION

The present study has the following limitations. The first is a sampling bias. The survey excluded people who were institutionalized, and the sampling was done in several rural and urban areas but not in metropolitan areas, so the results do not reflect the specific features of metropolitan areas. In addition, the WMH-CIDI did not assess all the DSM-IV disorders such as schizophrenia, eating disorder, and antisocial behavior. Therefore, some respondents in treatment without a DSM-IV diagnosis considered in the present study may actually have met criteria for another type of DSM-IV disorder. And the low response rate may cause another bias. People who were treated for mental disorders may be more likely to agree to participate in this survey than those who did not use any service for their

Table 1. WMH: 12-month service usage in Japan: Percent using any service among people with 12-month mental disorder[†]

Mental disorder	Health care: Mental health specialty: Psychiatrist % (SE)	Health care: Mental health specialty: Non-psychiatrist % (SE)	Health care: Mental health specialty: Any mental health specialty % (SE)	Health care: General medical % (SE)	Health care: Any health care % (SE)	Non-health care: Human Services % (SE)	Non-health care: CAM % (SE)	Non-health care: Any non-health care % (SE)	Any service use % (SE)	$n^{\ddagger}$	$n^{\S}$
GAD	–	–	–	–	–	–	–	–	–	18	16
Panic disorder	–	–	–	–	–	–	–	–	–	6	7
Agoraphobia w/o Panic	–	–	–	–	–	–	–	–	–	4	5
Social phobia	–	–	–	–	–	–	–	–	–	8	9
Specific phobia	13.1 (5.6)	3.4 (2.4)	14.2 (5.6)	8.5 (4.1)	18.6 (6.1)	0.0 (0.0)	4.6 (3.1)	4.6 (3.1)	20.7 (6.3)	47	45
Posttraumatic stress disorder[¶]	–	–	–	–	–	–	–		–	6	2
Any anxiety disorder[¶]	7.7 (3.5)	8.7 (4.1)	15.0 (4.7)	9.0 (2.3)	19.1 (3.6)	2.4 (1.9)	4.2 (2.5)	6.6 (3.6)	21.5 (4.7)	66	23
Major depressive disorder	13.6 (4.9)	14.0 (6.5)	25.2 (6.5)	8.9 (5.2)	27.1 (7.3)	6.7 (3.7)	7.9 (5.5)	14.6 (7.3)	33.8 (8.2)	42	43
Dysthymia	–	–	–	–	–	–	–	–	–	10	10
Bipolar I or II	–	–	–	–	–	–	–	–	–	2	2
Any mood disorder	14.4 (4.9)	12.9 (6.1)	25.1 (6.4)	10.2 (5.2)	26.8 (7.1)	6.2 (3.5)	9.2 (5.4)	15.4 (7.1)	33.0 (8.0)	46	47
Alcohol abuse or dependence[¶]	–	–	–	–	–	–		–	–	11	8
Alcohol dependence[¶]	–	–	–	–		–	–	–	–	3	2
Drug abuse or dependence[¶]	–	–	–	–	–	–	–	–	–	2	1
Drug dependence[¶]	–	–	–	–		–	–	–	–	1	0
Any substance[¶]	–	–	–	–	–	–	–	–	–	12	8
Any disorder[¶]	7.9 (2.7)	7.0 (2.6)	14.0 (2.9)	6.7 (1.8)	16.9 (2.5)	3.1 (1.8)	3.3 (1.8)	6.3 (2.7)	20.0 (2.8)	102	38
No disorder	1.3 (0.7)	0.3 (0.1)	1.5 (0.7)	3.5 (0.9)	4.8 (1.0)	1.0 (1.0)	0.5 (0.3)	1.5 (0.8)	6.2 (1.6)	375	439
Total part II sample	1.9 (0.7)	0.8 (0.3)	2.5 (0.6)	3.7 (0.8)	5.8 (1.0)	1.2 (0.8)	0.7 (0.3)	1.9 (0.7)	7.3 (1.5)	477	477

GAD, generalized anxiety disorder; WMH-CIDI, World Mental Health version of the World Health Organization Composite International Diagnostic Interview.

[†]Missing cells entries indicate that the unweighted number of patients with disorder who were treated in the sector was less than 30, in which case no estimate was made.

[‡]Unweighted number of respondents meeting criteia for each 12-month DSM-IV/WMH-CIDI disorder.

[§]Weighted number of respondents meeting criteia for each 12-month DSM-IV/WMH-CIDI disorder.

[¶]Part II sample.

Table 2. WMH: 12-month service usage in Japan: Sociodemographic and disorder type predictors of any treatment

	Any treatment given any 12-month disorder OR	(95%CI)
Age (years)		
20–29	0.2	(0.0, 7.9)
30–44	0.9	(0.2, 4.6)
45–59	0.4	(0.1, 1.5)
60+	1.0	–
Overall test of effect	Wald $\chi^2 = 2.4$ d.f. = 3, $P = 0.498$	
Any anxiety disorder		
Yes	4.0	(0.6, 29.4)
No	1.0	–
Overall test of effect	Wald $\chi^2 = 2.2$ d.f. = 1, $P = 0.142$	
Any mood disorder		
Yes	13.4	(0.9, 190.6)
No	1.0	–
Overall Test of Effect	Wald $\chi^2 = 4.2$ d.f. = 1, $P = 0.041$	
Any substance disorder		
Yes	1.8	(0.2, 21.4)
No	1.0	–
Overall test of effect	Wald $\chi^2 = 0.3$ d.f. = 1, $P = 0.614$	
No. years education		
0–11	1.3	(0.1, 13.7)
12	0.7	(0.1, 5.2)
13–15	4.4	(1.4, 13.9)
≥16	1.0	–
Overall test of effect	Wald $\chi^2 = 8.9$ d.f. = 3, $P = 0.030$	
Income		
Low	0.6	(0.1, 2.7)
Low average	0.5	(0.1, 3.3)
High average	0.4	(0.1, 2.0)
High	1.0	–
Overall test of effect	Wald $\chi^2 = 1.6$ d.f. = 3, $P = 0.652$	
Marital status		
Never Married	2.1	(0.1, 88.7)
Separated/Widowed/Divorced	6.8	(0.8, 54.6)
Married/Cohabitating	1.0	–
Overall test of effect	Wald $\chi^2 = 5.4$ d.f. = 2, $P = 0.067$	
Sex		
Male	1.2	(0.4, 3.3)
Female	1.0	–
Overall test of effect	Wald $\chi^2 = 0.1$ d.f. = 1, $P = 0.738$	

CI, confidence interval; OR, odds ratio; WMH, World Mental Health.

mental disorders. Because of these biases, the rates of service use may have been overestimated or underestimated.

Second, we cannot examine the validity of self-reported treatment use in the WMHJ 2002–2003 because we have no comparable data on service use. Potentially biased recall of mental health service use may have occurred,[17] and we therefore have likely underestimated the unmet need for treatment, especially among those with more serious disorders.

Third, the WMH-CIDI was not fully validated against clinical diagnosis in Japan, although it was developed by an expert group with a back-translation procedure and checked though an expert review. The

observed proportion of service use may have been overestimated or underestimated in the present study.

Fourth, small sample size and low prevalence[9] is an important limitation. The present study failed to find significant correlates of service use because all the CI were very wide. A large sample will allow narrowing of the CI. Then the significant correlation will be clarified. Some of these limitations could be resolved by expanding the survey field and including respondents for other areas of Japan.

Even with these limitations, however, the results do highlight a very serious issue. Our results have confirmed that 80% of people with a 12-month mental disorder have not received treatment for it. As for a total sample of part II, the treatment rate was only 7.3%, meaning that more than 90% did not receive treatment. Compared with the results of a previous study by Fujihara and Kitamura carried out more than 10 years ago, the rate of health care use has modestly increased from approximately 10% to 16.9%.[8] Although the mental health-care system has developed in the last 10 years, it remains insufficient for people suffering from mental disorders. Compared with other WMH collaborating countries, the utilization rate in Japan was higher than that in China, Lebanon, Nigeria, Mexico, Italy, and Ukraine, and the same as that in Colombia.[6] The service use rates of Western countries are generally higher than those in Japan; in particular, those in the USA or France are twice those in Japan.

Six percent of the respondents with no disorder visited any services and 77% of them received any health care. This may be because some respondents who had a mental disorder that was not assessed in the present study, visited mental health services. This could also be because distress and impairment in social functioning can be caused not only by a mental disorder that meets the diagnostic criteria, but also by subthreshold symptoms.[18] A further study should clarify the reasons for visiting mental health services among those who do not meet the diagnostic criteria for mental disorders.

As for diagnosis, the utilization rate of those with mood disorders in the past year was relatively higher than that for those with other mental disorders. In particular, it was found that 25.1% of people with any mood disorder (representing 76.1% of those in treatment) have used any mental health care as compared with 10.2% for general medical (representing 30.9% of those in treatment). Compared with the reports of other WMH collaborators, in the USA for people with 12-month MDD, 55.1% of those in treatment used mental health professionals versus 47.5% of those in treatment using general medical;[19] in Colombia for people with 12-month any mood disorder, 66.1% of those in treatment used mental health professionals versus 29.4% of those in treatment using general medical.[20] The primary care system by general practice was developed in the USA, so many depressive patients may easily receive treatment by general practicioners.[21] Miki has reported that 59.5% of patients with primary depression visit general practitioners in Japan.[22] The present study findings suggest that people with severe mental disorder such as depression are referred to mental health professionals by internists in Japan. Meanwhile, the Minister of Health, Labor and Welfare has been promoting a depression prevention campaign for the past few years, so early intervention for depression might function effectively, and the barriers to mental health service usage for the treatment of depressive mood might be reduced somewhat. Those with any substance disorder had very low usage compared with the USAs and other Western countries.[5,6,23] This finding is consistent with the fact that the Japanese government has a strong justice and security policy for controlling the use of illicit and other psychotropic drugs, so the 12-month prevalence of substance disorder is remarkably low.

As for the service sector, as described above, the relatively high rate of utilization of psychiatrists was a feature of Japanese usage. In any diagnostic category, the utilization of psychiatrists was higher than that of general medical. For other countries the utilization of general medical or non-psychiatrist mental health professional was often higher than that of psychiatrists.[5,20,24] The majority of people receiving treatment for mental disorder were treated by psychiatrists in Japan. As for the human service sector or CAM, some people did use these sectors. In particular, people in treatment for mood disorder are likely to use these sectors, with 16.1% utilizing human services and 27.9% utilizing CAM. In comparison, in the USA, the usage rates for those with MDD who are in treatment are 16.1% for human services and 26.7% for CAM;[19] and in Colombia, the usage rates for those with any mood disorder who are in treatment are 20.9% for human services and 19.8% for CAM.[20] The Japanese rate was near that of the USA. In a previous study about CAM in the USA, Eisenberg *et al.* found that people who use CAM do so for chronic disorders such as back problems, depression, anxiety, or headaches.[11] Kessler *et al.* have also found that many people use CAM openly along with treatment by mental health professionals.[25] The situation for Japanese people with mood disorders is probably similar, but the present small sample size and low 12-month prevalence prevent us from carrying out more detailed analysis.

As for sociodemographic variables, sex and age do not appear to significantly affect service use. Some reports have indicated that mental health service use

decreases over age 65 based on the US community-sample.[5,23,26] Several studies have shown that women use more mental health services than men.[5,23,27] This result may be another specifically Japanese feature, so further examination is necessary. It is an unexpected result that educational background is significantly related to service use, with the utilization rate of people with 13–15 years education being higher than that for others. Those with less education may lack knowledge of mental disorders and mental health care. In contrast, those with higher levels of education are unwilling to seek help for their mental health problems because they would fear a real or perceived loss of social status.

As for the mean number of visits in the past year and the percentage of those receiving minimally adequate treatment from professionals, the present study cannot provide specific Japanese features because of the small sample size. The on-going WMHJ Survey will replicate and expand on the present findings.

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Original Article

Social Class Inequalities in Self-rated Health and Their Gender and Age Group Differences in Japan

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BACKGROUND: Few studies have examined social inequalities in self-rated health in Japan, and the issue of gender differences related to social inequalities in self-rated health remains inconclusive.
METHODS: The data derived from interviews with 2987 randomly selected Japanese adults in four prefectures in Japan who completed the cross-national World Mental Health survey from 2002 through 2005. We calculated odds ratios (ORs) of having poor self-rated physical and mental health by two social class indicators independently with multivariate logistic regression models, adjusted for age, gender, marital status, and area. Stratified analyses by gender and age group were also conducted.
RESULTS: The adjusted ORs of the lowest educational attainment category having poor self-rated physical and mental health were 1.42 (95% confidence interval [CI]: 1.15-1.76) and 1.37 (95% CI: 1.10-1.70), respectively. Among females, educational attainment had significant linear associations with self-rated physical and mental health. Adjusted household income was also significantly associated with self-rated physical health among female respondents. No associations were found among males. While educational attainment was associated with self-rated health among the young age group, adjusted household income was associated with self-rated physical health in the middle and old age group.
CONCLUSION: These results indicated social inequalities in self-rated health and prominent social inequalities in self-rated health among females in Japan. Social inequalities in self-rated health seemed to exist across age groups. However, the mechanism of social inequalities in self-rated health could be different depending on the age group.
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Japan demonstrates the longest life expectancy in the world: the life expectancies at birth in Japan were estimated to be 78.4 years for males and 85.3 years for females in 2003.[1] In addition to the improvement of living conditions due to economic growth since the early 1960s, several researchers have noted that, compared to other countries, the relatively smaller social disparities in Japanese society may be a reason for this longevity.[2,3] However, the relatively egalitarian Japanese society has been changing; the gap between social classes has been increasing since the late 1980s,[4] and social inequalities with respect to the health of Japanese society are now becoming a concern.

The relationship between social class and health status is a well-established finding in epidemiologic research,[5-12] which consistently shows that people from higher social classes have lower morbidity and mortality from various diseases, illnesses, and health problems, compared to those from lower social classes.[13-17]

Social inequalities in self-rated health are also well documented; people from lower social classes rate their health poorer compared to those from higher social classes.[18-21] In terms of gender differences in social inequalities of self-rated health, several previously conducted studies have shown that the magnitudes of social class inequalities in self-rated health differ between males and females, with shallower or more inconsistent gradients found among females than males.[20-22] However, some studies show that males and females have a similar pattern of social inequality in self-rated health. Marmot et al[23] demonstrated a similar social gradient in self-rated health and psychological wellbeing between genders. Moreover, Matthews et al[24] indicated that there was no consistent evidence for greater gradients in self-rated health for men; rather, they suggested that the magnitude of social inequalities was greater for women with poor self-rated health at age 23 years and psychological distress at age 33. Clearly, the issue of gender differences with respect to the social inequalities of self-rated health is inconclusive and requires further research.

Social inequalities in self-rated health are well documented in Europe and the United States.[18,25] However, few studies have been conducted to examine them in Japan. Shibuya et al[26] showed that household income adjusted by the number of family members had an independent association with self-rated health, adjusting for income distribution at the prefecture level, and ecological and individual level covariates. They did not, however, examine gender differences in social inequalities in self-rated health. A study conducted by Martikainen et al[20] indicated socioeconomic differences in self-rated health among Japanese employees. They found an inverse association between self-rated health and employment grade among Japanese male employees, while among Japanese female employees they concluded that there were small and inconsistent differences in self-rated health by employment grade. Nishi et al[21] demonstrated an inverse association of self-rated health by employment grade in both male and female Japanese civil servants; however, educational attainment level was a significant predictor for self-rated health only in male employees. Although still limited, the above evidence suggests that social class gradients in self-rated health exist in Japan and that social inequalities in self-rated health seem to be more meaningful among males than females.

According to the national data,[27] it is clear that Japan has been drastically moving toward the popularization of higher education over the last few decades. As people became eager to attain higher education, the range of educational attainment levels has become wide and social inequalities have deepened in Japan.[4] Considering such drastic social changes over the last few decades, social inequalities in self-rated health in Japan should be greater in the younger generation than in older generations as social inequality becomes more manifest.

In this study, we examined the association between self-rated health and social class using educational attainment and household income adjusted for household size independently in random samples from four selected prefectures in Japan. Our aims were: (1) to test the association between relevant social class indicators (educational attainment and adjusted household income) and self-rated physical and mental health; (2) to examine gender differences with respect to the social inequalities of self-rated health; and (3) to examine the age group influence on social inequalities in self-rated health. We hypothesized that people in lower social classes were more likely to report poor self-rated physical and mental health than those in higher social classes, that social inequalities in self-rated health were greater among males than females, and that social inequalities in self-rated health were greater in the younger generation compared to older generations.

METHODS

Survey Populations and Study Sample

The data derive from face-to-face interviews of Japanese adults in Japan collected as part of the cross-national World Mental Health (WMH) survey conducted in 28 countries around the world. In Japan, based on the availability of site investigators and the cooperation of local governments, eight sites in four prefectures were selected as study sites between 2002 and 2005: Okayama Prefecture (the cities of Okayama and Tamano), Nagasaki Prefecture (the city of Nagasaki), Kagoshima Prefecture (the city of Kushikino, and the towns of Fukiage, Ichiki, and Higashiichiki), and Tochigi Prefecture (the city of Sano). The WMH Japan surveys were conducted with a probability sample of adult residents 20 years of age and older at each survey site, based on voter registration lists or resident registries.

Trained interviewers initially contacted 5622 subjects and then interviewed 3517 subjects who agreed to participate in the survey. We excluded 519 subjects who did not meet eligibility criteria: those who had died, moved, or were institutionalized. Eleven subjects did not complete the interview. The sample for the present analysis was drawn from the 2987 respondents who completed the survey from November 2002 through March 2005. The overall response rate (the number of completed interviews divided by the number of eligible subjects) was 58.5 %. In addition, the sub-

jects who did not complete the interview were more likely to be younger than our study subjects, and males were less likely to complete the interviews than females.

The procedures were fully explained to respondents, and written consent was obtained from each respondent at each site. The study was approved by the Committees of Ethics in Research of Human Subjects at Okayama University (for the Okayama site), at Japan National Institute of Mental Health (for the Kagoshima site), at Nagasaki University (for the Nagasaki site), and at Jichi Medical School (for the Tochigi site). The sampling design and procedures have been described in further detail elsewhere.[28]

Measurements

The primary independent variable in this study was social class. We independently used educational attainment and household income adjusted by the number of family members as indicators of social class.

The respondents were categorized into three groups according to the duration of education: 13 years or longer (0), 12 years (1), and 11 years or shorter (2). Household income was estimated by the total of before-tax personal income, the partner's income, other family members' incomes, public pensions, government assistance, and income from other sources in the past year. As all questions on income were asked using categories, we assigned income values based on the mid-point of each category. We adjusted household income for household size with an equivalence elasticity of 0.5, as used in previous studies.[26,29,30] All respondents were categorized into four groups by adjusted household income: (0) highest group, (1) second highest group, (2) second lowest group, and (3) lowest group.

Self-rated health is widely used and there is extensive evidence that it predicts mortality and morbidity. It has been shown to be not only strongly associated with a variety of indicators of well-being[31] but also a strong predictor of mortality in longitudinal studies.[32] Respondents were asked to rate their general physical health on a five-point scale ranging from excellent to poor. We grouped this rating into a binary variable of poor physical health ("poor" and "fair") and good physical health ("good," "very good," and "excellent"). Good physical health was the reference group. Similarly, self-rated mental health was grouped into a binary variable of poor mental health ("poor" and "fair") and good mental health ("good," "very good," and "excellent"). Good mental health was the reference group.

Age was measured in years and categorized into three groups: 20-40, 41-60, and 61 and older. Gender was treated as a bivariate variable; the reference group was male. Marital status was categorized into three groups: married, separated/widowed/divorced, and never married.

Data Analysis

We examined the social inequalities in self-rated physical health and self-rated mental health, hypothesizing that people in lower social classes would have higher odds of having poor self-rated physical and mental health compared to those in higher social classes. We used chi-square tests to estimate bivariate associations between social class (educational attainment and adjusted household income) and other covariates with health outcomes.

Logistic regression analyses were used to estimate odds ratios (ORs) of having poor self-rated physical and mental health by two social class indicators (educational attainment and adjusted household income). We entered social class indicators as categorical variables first and then added the covariates to the models, regardless of their statistical significance. The covariates based on theory are age in years, gender, marital status, and area. We calculated the adjusted OR and 95% confidence interval (CI) of having poor self-rated physical and mental health by the two social class indicators (educational attainment and adjusted household income) independently. A test for linear trend was performed for each model. We also conducted a stratified analysis by gender for both outcomes in order to accomplish our second aim as well as a stratified analysis by age group in order to achieve our third aim. The standard errors for the ORs were calculated using the Wald test.[33] All analyses were conducted with the SAS® statistical package.[34]

RESULTS

Table 1 represents the selected characteristics of the study population, which consisted of Japanese adults in Japan 20 years of age and older who completed the survey (n=2987). Forty-eight percent (n=1443) of the respondents reported poor physical health, while 41% (n= 1234) reported poor mental health. Both the mean and median ages were 54 years. Fifty-six percent of the respondents were female. Approximately 72% of the respondents were married, while 13% had never married. Both the mean and median years of educational attainment were 12 years. Thirty percent of the respondents had received education for equal to or shorter than 11 years, while 34% had received education for 13 years or longer. Forty-three percent of the respondents were from the Okayama site, while 7% were from the Nagasaki site. The proportion of respondents who had poor self-rated physical health varied significantly by age group, marital status, educational attainment, adjusted household income, and area. There was no statistically significant association between self-rated physical health and gender. Similarly, the proportion of respondents who reported poor self-rated mental health varied significantly by age group, gender, marital status, adjusted household income and area, while there was no statistically significant association between self-rated mental health and educational attainment.

Table 2 shows the adjusted ORs of having poor self-rated health by educational attainment and adjusted household income along with the p values for the linear trend test for each model. Controlling for age, gender, marital status, and area, the ORs of the lowest educational attainment category having poor self-rated physical and mental health were 1.42 (95% CI: 1.15-1.76) and 1.37 (95% CI: 1.10-1.70), respectively. The associations between

two social class indicators (educational attainment and adjusted household income) and self-rated physical health were significantly linear (p=0.04 and p=0.01, respectively).

We found no significant associations between social class indicators and self-rated physical and mental health among male respondents, while we identified significant social inequalities in self-rated physical and mental health among female respondents (Table 2). The ORs of the lowest educational attainment category having poor self-rated physical and mental health among female respondents were 1.63 (95% CI: 1.21-2.21) and 1.46 (95% CI: 1.08-1.97), respectively. The ORs of the second lowest and the lowest adjusted household income categories having poor self-rated physical health among female respondents were 1.38 (95% CI: 0.98-1.95) and 1.57 (95% CI: 1.14-2.17), respectively.

In order to explore the mechanisms of gender differences with respect to social inequalities in self-rated health, we conducted a further stratified analysis by employment situation in addition to gender (Table 3). The ORs of the lowest educational category having poor self-rated physical and mental health among female workers were 1.72 (95% CI: 1.19-2.50) and 1.43 (95% CI: 1.00-2.07), respectively. The ORs of the lowest and second lowest adjusted household income groups having poor self-rated physical health were 1.55 (95% CI: 1.05-2.30) and 1.59 (95% CI: 1.03-2.46), respectively. The associations between educational attainment level and self-rated physical and mental health among housewives were similar to those among employed females, although they were not significant. However, adjusted household income seemed to be associated with only self-rated physical health and not with mental health among housewives. We identified no significant association between social class and self-rated health among male respondents stratified by employment situation (Not shown in the table).

Age group influence on the association between social class and self-rated health was identified by stratified analysis by age

Table 1. Characteristics of survey sample in the WHO World Mental Health Japan Survey 2002-2003 (n=2987).

		Poor physical health		Poor mental health	
	n(%)	1443(48.3%)	p-value	1234(41.3%)	p-value
Age (mean/median: 54 years)					
20-40 years	739 (24.8)	254 (34.4)	<0.0001	280 (37.9)	0.03
41-60	1166 (39.0)	571 (49.0)		511 (43.9)	
61+	1082 (36.2)	618 (57.1)		443 (40.9)	
Gender					
Male	1314 (44.0)	656 (49.9)	n.s.	519 (39.5)	0.07
Female	1673 (56.0)	787 (47.1)		715 (42.8)	
Marital status					
Married	2142 (71.7)	1033 (48.2)	<0.0001	860 (40.2)	0.01
Divorced/Separated/Widowed	456 (15.3)	254 (55.7)		217 (47.6)	
Never married	388 (13.0)	155 (40.0)		156 (40.2)	
Education (years of education)	(mean/median: 12)				
13 years or longer	945 (34.0)	387 (41.0)	<0.0001	357 (37.8)	n.s.
12 years	976 (35.2)	446 (45.7)		402 (41.2)	
11 years or shorter	854 (30.8)	486 (56.9)		357 (41.8)	
Adjusted household income					
Highest group	550 (24.5)	248 (45.1)	0.006	217 (39.5)	0.04
2nd highest	574 (25.6)	249 (43.4)		216 (37.6)	
2nd lowest	560 (25.0)	281 (50.2)		233 (41.6)	
Lowest group	557 (24.9)	293 (52.6)		255 (45.8)	
Area					
Okayama	1274 (42.7)	583 (45.8)	0.025	505 (39.6)	0.007
Kagoshima	955 (32.0)	472 (49.5)		382 (40.0)	
Nagasaki	208 (7.0)	117 (56.3)		106 (51.2)	
Tochigi	548 (18.4)	270 (49.3)		241 (44.0)	

group (Table 4). Among respondents who were between 20 and 40 years old, the OR of the lowest educational attainment category having poor self-rated physical health was 1.96 (95% CI: 1.18-3.24), and the ORs of the lowest and the second lowest educational attainment categories having poor self-rated mental health were 1.85 (95% CI: 1.17-3.05) and 1.46 (95% CI: 1.04-2.05), respectively. Among respondents who were between 41 and 60 years of age, the ORs of the lowest and the second lowest adjusted household categories having poor self-rated physical health were 1.26 (95% CI: 0.91-1.75) and 1.61 (95% CI: 1.11-2.34), respectively. Associations between educational attainment level and self-rated health were also identified but were not significant. Among those 61 years old and older, the OR of the lowest adjusted household income group with poor self-rated physical health was 1.57 (95% CI: 1.01-2.45). The association between both social class indicators (educational attainment and household income) and self-rated physical health was significantly linear (p=0.04, p=0.003, respectively).

DISCUSSION

The primary objective of this research was to examine the existence of social gradients in health among the general population in Japan. The results of our study indicated a gradient association between self-rated physical and mental health with levels of educational attainment. The respondents with lower levels of educational attainment were more likely to rate their physical and mental health as poor than those with higher educational attainment.

U or J-shaped associations were found to exist between adjusted household income and self-rated physical and mental health for all respondents (Table 2), between adjusted household income and mental health for males (Table 2), and between adjusted household income and self-rated physical health for female workers (Table 3). A recent study in Japan reported that leisure-time physical activity, a health-related habit, was less among both higher-class and lower-class occupations, indicating a reversed U-

Table 2. Adjusted* odds ratios (ORs) and their 95% confidence intervals (CIs) for poor self-rated physical and mental health according to social class indicators (educational attainment and adjusted household income) and p values for trend test stratified by gender.

	All (n=2986)			Male (n=1314)			Female (n=1673)		
	n (%)	OR (95% CI)	p†	n (%)	OR (95% CI)	p†	n (%)	OR (95% CI)	p†
Self-rated physical health									
Educational attainment model									
13 years or longer	945 (34.0)	1.00	0.04	454 (37.2)	1.00	n.s.	491 (31.6)	1.00	0.02
12 years	976 (35.2)	1.10 (0.91-1.33)		417 (37.2)	1.07 (0.82-1.41)		559 (36.0)	1.15 (0.89-1.49)	
11 years or shorter	854 (30.8)	1.42 (1.15-1.76)		350 (26.7)	1.21 (0.89-1.64)		504 (32.4)	1.63 (1.21-2.21)	
Adjusted household income model									
Highest	550 (24.5)	1.00	0.01	294 (29.3)	1.00	n.s.	256 (20.7)	1.00	<0.001
2nd highest	574 (25.6)	0.95 (0.75-1.21)		293 (29.3)	0.90 (0.65-1.25)		281 (22.7)	1.02 (0.71-1.44)	
2nd lowest	560 (25.0)	1.21 (0.95-1.54)		237 (23.7)	1.04 (0.78-1.57)		323 (26.1)	1.38 (0.98-1.95)	
Lowest	557 (24.9)	1.23 (0.98-1.55)		177 (17.7)	0.92 (0.66-1.28)		380 (30.7)	1.57 (1.14-2.17)	
Self-rated mental health									
Educational attainment model									
13 years or longer	945 (34.1)	1.00	0.22	454 (37.2)	1.00	n.s.	491 (31.7)	1.00	0.04
12 years	975 (35.2)	1.17 (0.97-1.41)		417 (34.1)	1.11 (0.84-1.48)		558 (35.9)	1.22 (0.95-1.58)	
11 years or shorter	854 (30.8)	1.37 (1.10-1.70)		350 (28.7)	1.29 (0.95-1.76)		504 (32.5)	1.46 (1.08-1.97)	
Adjusted household income model									
Highest	549 (24.5)	1.00	0.12	294 (29.4)	1.00	n.s.	255 (20.6)	1.00	0.004
2nd highest	574 (25.6)	0.92 (0.73-1.18)		293 (29.3)	0.86 (0.61-1.21)		281 (22.7)	0.98 (0.69-1.39)	
2nd lowest	560 (25.0)	1.09 (0.85-1.39)		237 (23.7)	1.07 (0.75-1.53)		323 (26.1)	1.11 (0.80-1.56)	
Lowest	557 (24.9)	1.13 (0.90-1.42)		177 (17.7)	1.11 (0.80-1.55)		380 (30.7)	1.14 (0.83-1.56)	

* : all ORs were adjusted by age, marital status, and area.

† : p value for trend test

Table 3. Adjusted* odds ratios (ORs) and their 95% confidence intervals (CIs) for poor self-rated physical and mental health according to social class indicators (educational attainment and adjusted household income) and p values for trend test among females stratified by employment situation.

	Employment situation								
	Housewife (n=601)			Worker (n=1010)			Retired (n=62)		
	n (%)	OR (95% CI)	p†	n (%)	OR (95% CI)	p†	n (%)	OR (95% CI)	p†
Self-rated physical health									
Educational attainment model									
13 years or longer	115 (19.6)	1.00	0.22	364 (40.2)	1.00	0.14	12 (20.0)	1.00	n.s.
12 years	189 (32.1)	1.30 (0.79-2.13)		351 (38.7)	1.19 (0.77-1.46)		19 (31.7)	1.16 (0.22-6.01)	
11 years or shorter	284 (48.3)	1.54 (0.87-2.75)		191 (21.1)	1.72 (1.19-2.50)		29 (48.3)	1.00 (0.14-7.02)	
Adjusted household income model									
Highest	64 (13.7)	1.00	0.13	191 (26.2)	1.00	0.03	1 (2.5)	not applicable	
2nd highest	82 (17.6)	1.26 (0.64-2.47)		191 (26.2)	0.91 (0.59-1.38)		8 (20.0)		
2nd lowest	142 (30.5)	1.10 (0.59-2.03)		168 (22.9)	1.59 (1.03-2.46)		13 (32.5)		
Lowest	178 (38.2)	1.58 (0.87-2.85)		184 (25.7)	1.55 (1.05-2.30)		18 (45.0)		
Self-rated mental health									
Educational attainment model									
13 years or longer	115 (19.6)	1.00	0.20	364 (40.2)	1.00	0.55	12 (20.0)	1.00	n.s.
12 years	189 (32.1)	1.28 (0.77-2.13)		350 (38.7)	1.21 (0.90-1.65)		19 (31.7)	1.13 (0.21-6.308)	
11 years or shorter	284 (48.3)	1.42 (0.78-2.58)		191 (21.1)	1.43 (1.00-2.07)		29 (48.3)	1.13 (0.21-9.98)	
Adjusted household income model									
Highest	64 (13.7)	1.00	n.s.	190 (25.9)	1.00	0.04	1 (2.5)	not applicable	
2nd highest	82 (17.6)	0.84 (0.43-1.66)		191 (26.6)	1.00 (0.66-1.52)		8 (20.0)		
2nd lowest	142 (30.5)	0.81 (0.44-1.50)		168 (22.9)	1.39 (0.90-2.13)		13 (32.5)		
Lowest	178 (38.2)	0.82 (0.45-1.49)		184 (25.1)	1.39 (0.94-2.05)		18 (45.0)		

* : all ORs were adjusted by age, marital status, and area.

† : p value for trend test

shaped association between occupational class and health-related behaviors in Japan.[35] A greater commitment to work and longer overtime hours among those who earned high incomes and were employed in high-class occupations, such as managers, may cause poor physical and mental health status in Japan.

Overall, our results suggested that educational attainment was a better predictor of self-rated health than adjusted household income. Shibuya et al[26] showed that adjusted household income was a strong predictor of self-rated health, controlling regional income inequalities in Japan. One of the possible reasons for the inconsistency between our results and those of Shibuya et al might be differences in the study population. They used random samples of the general population throughout Japan, while we used random samples from selected areas, which did not include urban cities.

Our secondary objective in conducting this research was to examine gender differences related to social inequalities in self-rated health. We identified significant social inequalities in self-rated physical and mental health only among female respondents. Our results were somewhat inconsistent with previously conducted studies. Martikainen et al[20] showed the association between self-rated health and employment grade among 40- to 60-year-old Japanese male employees in selected cities, but they indicated small or inconsistent social inequalities in self-rated health among Japanese female employees. One possible reason for this inconsistency with our results could be the difference in indicators of social class. They used employment grade as a social class indicator. As they noted, their indicator could not be a relevant measure of female social class, and therefore they suggested that a household-based measure could be a better indicator for females. On the other hand, it is possible that their indicator is a better measure for males than educational attainment and household income, especially for middle-aged males. Unfortunately, we did not use employment or occupational classification as an indicator of social class in the present study. A further study should directly test this hypothesis using multiple measures of social class, education, income, and occupation.

A previously conducted study by Nishi et al[21] showed an inverse association of self-rated health with employment grade in both male and female Japanese civil servants aged 35 years or

Table 4. Adjusted* odds ratios (ORs) and their 95% confidence intervals (CIs) for poor self-rated physical and mental health according to social class indicators (educational attainment and adjusted household income) and p values for trend test for all respondents and stratified analysis by age groups.

	Age (year)								
	20-40 (n=739)			41-60 (n=1165)			61 and older (n=1082)		
	n (%)	OR (95% CI)	p†	n (%)	OR (95% CI)	p†	n (%)	OR (95% CI)	p†
Self-rated physical health									
Educational attainment model									
13 years or longer	409 (60.2)	1.00	n.s.	405 (36.9)	1.00	0.13	131 (13.2)	1.00	0.04
12 years	244 (35.9)	0.88 (0.62-1.26)		485 (44.1)	1.28 (0.97-1.67)		247 (24.8)	0.76 (0.49-1.17)	
11 years or shorter	27 (4.0)	1.96 (1.18-3.24)		209 (19.2)	1.28 (0.91-1.79)		618 (62.1)	1.32 (0.88-1.98)	
Adjusted household income model									
Highest	83 (16.2)	1.00	n.s.	350 (35.6)	1.00	0.07	117 (15.7)	1.00	0.003
2nd highest	145 (28.3)	0.64 (0.36-1.14)		177 (27.4)	1.16 (0.84-1.60)		160 (21.5)	0.94 (0.58-1.53)	
2nd lowest	149 (29.1)	1.04 (0.59-1.84)		187 (18.0)	1.61 (1.11-2.34)		234 (31.4)	1.14 (0.72-1.81)	
Lowest	135 (26.4)	0.93 (0.53-1.62)		187(19.0)	1.26 (0.91-1.75)		235 (31.5)	1.57 (1.01-2.45)	
Self-rated mental health									
Educational attainment model									
13 years or longer	409 (60.2)	1.00	0.17	405 (36.9)	1.00	0.56	131 (13.2)	1.00	0.25
12 years	244 (35.9)	1.46 (1.04-2.05)		484 (44.1)	1.13 (0.86-1.48)		247 (24.8)	0.76 (0.49-1.18)	
11 years or shorter	27 (4.0)	1.85 (1.17-3.05)		209 (19.0)	1.27 (0.91-1.77)		618 (62.1)	1.15 (0.77-1.72)	
Adjusted household income model									
Highest	83 (16.2)	1.00	n.s.	349 (35.6)	1.00	0.05	117 (15.7)	1.00	0.17
2nd highest	145 (28.3)	0.70 (0.39-1.23)		269 (27.4)	1.12 (0.81-1.50)		160 (21.5)	0.85 (0.52-1.40)	
2nd lowest	149 (29.1)	1.18 (0.67-2.06)		177 (18.0)	1.26 (0.87-1.83)		234 (31.4)	0.96 (0.60-1.54)	
Lowest	135 (26.4)	0.83 (0.48-1.46)		187 (19.0)	1.34 (0.96-1.86)		235 (31.5)	1.20 (0.77-1.88)	

* : all ORs were adjusted by age, gender, marital status, and area.
† : p value for trend test

older in a city. They also found an inverse association of self-rated health with education, but only in male employees. This discrepancy with our results could be due to differences in the study populations. Their study population comprised civil servants in an urban city, while ours consisted of the general population from selected areas, excluding urban cities. In addition, because their study subjects were all civil servants, the range of social classes that they captured could have been narrower than that of our study population.

The results of the stratified analysis by gender and employment situation indicated that female workers have significant social inequalities in self-rated physical and mental health. We also saw some associations between educational attainment level and self-rated physical and mental health among housewives. However, housewives had no associations between adjusted household income level and self-rated mental health. The effect of multiple social roles on self-rated mental health could be one explanation for the greater social inequalities in self-rated mental health among female workers than among housewives. According to national polls conducted in 2000, 84.9% of two-income couples reported that the wife was responsible for daily household affairs such as cleaning, washing, and cooking.[36] Multiple social roles are thought to affect an individual's health in two ways: role overload and role enhancement.[37] From the former perspective, female multiple-role experiences are likely to lead to role overload and conflict, which result in poor physical and mental health. From the latter perspective, female multiple-role experiences could benefit and enhance physical and mental health. Previous research suggests that the health enhancing effect of multiple-role experiences among females is less clear or even absent for lower social classes, while it is more prominent among higher social classes.[38] The functioning of multiple social roles, therefore, could be different depending on social class, and household financial conditions could be an important factor in determining the function of multiple social roles. Further longitudinal studies will be required to examine the mechanism of inequalities in health among Japanese females.

We identified a significant association of educational attainment with self-rated physical health and a gradient association of educational attainment with self-rated mental health among

respondents 20 to 40 years of age. On the other hand, no associations were found between adjusted household income and self-rated health. Educational attainment, therefore, could be a better social class indicator than household income for younger generations. Among middle-aged respondents, there was a gap found with respect to physical and mental health by educational attainment level, although the associations were not clearly linear. Adjusted household income had a significant association with self-rated physical health, and it seemed to have an inverse association with mental health. One reason that household income seemed to be a more significant predictor of self-rated health than educational attainment in this group was, as previous studies have indicated,[20,21] that employment grade may be an important indicator in a middle-aged population and that household income may link to employment grade more closely than educational attainment. Among those 61 years old and older, adjusted household income showed a significant association with self-rated physical health. Those in the lowest income group were at significantly higher risk of having poor self-rated physical health, compared with those in the highest household income group. The other associations between social class and self-rated heath seemed to be either U- or J-shaped, although they were not significant.

Our data suggested that social inequalities exist across all age groups. However, the appropriate indicators for social class may be different depending on the age group; educational attainment may be a better social class indicator for a younger generation, while adjusted household income may be a better indicator for older generations. The different results among age groups suggest differences in the mechanisms of social inequalities in self-rated health, that is, how social class influences self-rated health across age groups. For example, among young respondents, differences in their future prospects as a result of their educational attainment levels could affect self ratings for physical and mental health, while among older respondents material conditions based on their financial situation could be the most important factor in influencing self rated health.

There are several limitations in this study. First, the results may be limited by the use of a biased sample. We used random samples from only selected sites, mainly from western Japan, and did not include a metropolitan city. Second, the relatively low response rate (58.5%) may also limit the interpretation of our results. Subjects who did not complete the survey were likely to be younger than our study sample and likely to be men, which may lead to a potential bias due to non-response. Third, our study was also limited by weak measurement of social class. Assessment of social class is quite complex.[9,39] Although we used two social class indicators, imprecise measurements of social class could have distorted the association between social class and self-rated health. Additional measures of social class (such as occupation and wealth) would have increased the reliability of our findings. Fourth, we used an interview survey to measure self-rated health, which may lead to somewhat different results from those obtained by studies using self-administrated questionnaires. Finally, although we showed differences in self-rated health status across social class, we need to be cautious about inferring a causal association between social class and health status from our cross-sectional study. The mechanism of reverse causation could be possible, especially for adjusted household income and health.

In summary, the results of this study imply discrepancies in self-rated physical and mental health along lines of social class in Japan. Japanese females disproportionately experienced social inequalities in self-rated health. In addition, although we identified social inequalities in self-rated health across all age groups, differences in the respective mechanisms of social inequalities in self-rated health were suggested.

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Mental disorders among adults with asthma: results from the World Mental Health Survey

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Abstract

Objective: Our objectives were (a) to determine which common mental disorders are associated with asthma in the general population after controlling for age and sex, and (b) to assess whether the associations of mental disorders with asthma are consistent across diverse countries.
Method: Eighteen population surveys of household-residing adults were carried out in 17 countries (N=85,088). Mental disorders were assessed with the Composite International Diagnostic Interview 3.0, a fully structured diagnostic interview. The disorders considered here are 12-month anxiety disorders (generalized anxiety disorder, panic disorder/agoraphobia, posttraumatic stress disorder and social phobia), depressive disorders (dysthymia and major depressive disorder) and alcohol use disorders (abuse and dependence). Asthma was ascertained by self-reports of lifetime diagnosis among a subsample (n=42,697).
Results: Pooled estimates of age-adjusted and sex-adjusted odds of mental disorders among persons with asthma relative to those without asthma were 1.6 [95% confidence interval (95% CI)=1.4, 1.8] for depressive disorders, 1.5 (95% CI=1.4, 1.7) for anxiety disorders and 1.7 (95% CI=1.4, 2.1) for alcohol use disorders.

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Conclusion: This first cross-national study of the relationship between asthma and mental disorders confirms that a range of common mental disorders occurs with greater frequency among persons with asthma. These results attest to the importance of clinicians in diverse settings being alert to the co-occurrence of these conditions.

Keywords: Adult; Asthma; Cross-sectional; Mental disorders

1. Introduction

Asthma is a major public health problem in industrialized countries, and its prevalence has been increasing in both developed and developing countries in recent decades [1,2]. A considerable number of studies have suggested that there is an association between asthma, particularly at the severe end, and some mental disorders. In research among adults, studies conducted among clinical and general practice samples have found higher-than-expected rates of anxiety disorders (particularly panic disorder) and major depression among those with asthma [3–10]. However, treatment-seeking biases limit the extrapolation of findings from clinical studies to resolving the question of whether asthma and mental disorders are associated in the general population [11].

Some studies have investigated the asthma–mental disorder relationship in the adult general population [11–16]. Collectively, these studies suggest that asthma is related to both mood and anxiety disorders, although this conclusion could be considered premature due to the limitations of many of these studies. These limitations include nonuse of diagnostic measures of mental disorders [12–14], limited age range of participants [16,17] or a limited number of mental disorders investigated [12–15,17]. The study by Goodwin et al. [11], an exception to these limitations, investigated the association between asthma and a range of *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (*DSM-IV*) mental disorders in a general population sample of adults in Germany. They found that lifetime severe asthma was significantly associated with a number of anxiety disorders, bipolar disorder and any severe mental disorder. Lifetime nonsevere asthma was significantly associated with any anxiety disorder, anxiety disorder not otherwise specified and any somatoform disorder. Current severe asthma was associated with a number of anxiety disorders, and current nonsevere asthma was associated with any affective disorder, although not with major depressive disorder on its own. This latter result may have been a power issue, suggested by the fact that the odds ratio (OR) for the association between current nonsevere asthma and any affective disorder was significant, while the ORs for the two components of the any-affective-disorder group (major depressive disorder and bipolar disorder) were of a magnitude similar to that for any affective disorder, yet nonsignificant.

In summary, findings from adult population studies suggest that both mood and anxiety disorders are associated with asthma; yet, in the most informative of these studies [11], asthma was more consistently associated with anxiety disorders, rather than with major depressive disorder. One of the challenges in determining the association of comorbid mental and physical conditions is obtaining samples big enough to provide sufficient numbers with both conditions. The current study aims to extend this literature in two main ways. First, it provides information on the association between mental disorders and lifetime asthma from a meta-analysis of surveys from the World Mental Health Surveys, an approach that has the advantage of being able to provide pooled estimates that overcome the problems of small sample sizes from individual surveys. Second, this study is based on general population surveys that used consistent diagnostic measures of a range of mental disorders, representing both developed and developing regions of the world, thus providing a more global perspective on the association between asthma and mental disorders than has been available thus far. The World Mental Health Surveys have been conducted in over 20 countries using the latest structured psychiatric interviews, generating *DSM-IV* diagnoses for a range of mental disorders and collecting information on chronic physical conditions and other covariates.

The objectives of this paper are (a) to determine which common mental disorders (depressive disorders, anxiety disorders and alcohol use disorders) are significantly associated with asthma after controlling for age and sex, and (b) to assess whether the associations of mental disorders with asthma are consistent across adult populations in diverse countries in Europe, the Americas, Asia and the Middle East.

2. Methods

2.1. Samples

Eighteen surveys were carried out in 17 countries in the Americas (Colombia, Mexico and United States), Europe (Belgium, France, Germany, Italy, The Netherlands, Spain and Ukraine), the Middle East (Israel and Lebanon), Africa (Nigeria and South Africa), Asia [Japan and separate surveys in Beijing and Shanghai, People's Republic of China (PRC)] and the South Pacific (New Zealand). An effort was made to recruit as many countries as possible for the initiative. The final set of countries was determined by the availability of collaborators in the country who were able to obtain funding for the survey. All surveys were based on multistage clustered area probability household samples. All interviews were carried out face-to-face by trained lay interviewers. The six Western European surveys were carried out jointly [18]. Sample sizes ranged from

2372 (The Netherlands) to 12,992 (New Zealand), with a total of 85,088 respondents. Response rates ranged from 45.9% (France) to 87.7% (Colombia), with an overall weighted response rate of 70.8%.

The World Mental Health Survey Initiative version of the World Health Organization (WHO) Composite International Diagnostic Interview (WMH-CIDI) is a long interview; thus, to reduce respondent burden, a strategy of short (Part 1) and long (Parts 1 and 2) forms of the interview was adopted by most countries. A subsample of respondents who completed the first half of the interview (Part 1), which included core diagnostic assessments, and who reported to have no lifetime history of disorder, were terminated at the midpoint of the interview. All respondents who met criteria for any lifetime mental disorder in Part 1 were retained in the second half of the interview (Part 2), along with a probability subsample of noncases. The default value for the noncase probability of selection was 25%, although this varied across countries depending on their survey priorities. Part 2 samples typically retained between 33% and 67% of Part 1 respondents. Part 2 respondents were weighted by the inverse of their probability of selection for Part 2 of the interview to adjust for differential sampling. Analyses in this article were based on the weighted Part 2 sample (n=42,697). Additional weights were used to adjust for differential probabilities of selection within households and to match the samples to population sociodemographic distributions. The samples showed substantial cross-national differences in age structure (younger in less developed countries) and educational status (lower in less developed countries).

2.2. Training and field procedures

The central World Mental Health staff trained bilingual supervisors in each country. Consistent interviewer training documents and procedures were used across surveys. The WHO translation protocol [19] was used to translate instruments and training materials. Two surveys were carried out in bilingual form (Dutch and French in Belgium; Russian and Ukrainian in Ukraine). In Nigeria, interviews were conducted in four languages, Yoruba, Hausa, Igbo and Efik, which are the dominant languages in the regions where the survey was carried out. Others were carried out exclusively in the country's official language. Persons who could not speak these languages were excluded. Standardized descriptions of the goals and procedures of the study, data use and protection, and the rights of respondents were provided in both written and verbal forms to all potentially eligible respondents before obtaining verbal informed consent for participation in the survey. Quality control protocols, which are described in more detail elsewhere [20], were standardized across countries to check on interviewer accuracy and to specify data cleaning and coding procedures. The institutional review board of the organization that coordinated the survey in each country approved and monitored compliance with procedures for obtaining informed consent and protecting human subjects.

2.3. Mental disorder status

All surveys used the WMH-CIDI (now CIDI 3.0) [21], a fully structured diagnostic interview used to assess disorders and treatment. The mental disorders considered in this paper were present in the prior 12 months and included anxiety disorders (generalized anxiety disorder, panic disorder and/or agoraphobia, posttraumatic stress disorder and social phobia), depressive disorders (dysthymia and major depressive disorder) and alcohol use disorders (abuse and dependence). Disorders were assessed using the definitions and criteria of the *DSM-IV* [22]. CIDI organic exclusion rules were imposed in making all diagnoses. Methodological evidence collected in WHO-CIDI field trials and later clinical calibration studies showed that all the disorders considered herein were assessed with acceptable reliability and validity in the original CIDI [23] and the WMH-CIDI [20].

2.4. Asthma status

In a series of questions on chronic conditions adapted from the US National Health Interview Survey, respondents were asked about the lifetime presence of selected chronic conditions. Respondents were asked, "Did a doctor or other health professional ever tell you that you had any of the following illnesses...asthma?" Clinical guidelines for the diagnosis of asthma, such as those issued by the American Thoracic Society, recommend a combination of methods, including medical history, physical examination and respiratory function tests [1,11], but such methods are not feasible in large epidemiological surveys and, indeed, international asthma prevalence surveys such as the European Community Respiratory Health Survey (ECRHS) have used self-reported symptoms of asthma to determine the condition [1,24]. An investigation of the correspondence of self-reported chronic conditions in the US National Health Interview Survey with medical records abstracted in the prior 3 years found self-reported current asthma to be in fairly good agreement with medical record, although underreported by 20–30% [25]. The definition of asthma used in this survey was self-report of a diagnosis of asthma — not simply a self-report of asthma, so it may correspond more closely still to actual medical records. The German population study by Goodwin et al. [11], which has used the most comprehensive methods of assessing asthma among population surveys investigating asthma–mental disorder comorbidity, reported physician confirmation of lifetime asthma in about 78% of those endorsing a screening question about current asthma. That study reported a 5.7% prevalence of lifetime asthma in the German population, which is fairly comparable with the 4.5% estimate of lifetime asthma that this study observed in the German population.

2.5. Analytical methods

The prevalence of specific mental disorders was estimated separately among respondents with and respondents without lifetime asthma. The ORs of the association