

Work and family characteristics as socioeconomic determinants in long sickness absence: the Japanese civil servants study

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Abstract: Long sickness absence is more common among low socioeconomic status (SES) groups than high SES groups. This study aimed to evaluate whether work and family characteristics contribute to SES and sex differences in long sickness absence (7 days or more). The participants were 3080 civil servants working for a local Japanese government. In both sexes, low-grade employees were likely to take long sickness absence, with a statistically significant association for men (age-adjusted OR of lowest-grade employees for long sickness absence: 2.30 (95% Confidence Interval (CI): 1.32–4.02)). After adjusting for all variables, SES differences in long sickness absence in men decreased to OR 1.98 (CI 1.10–3.55) but remained significant; in men, being without a spouse was significantly associated with long sickness absence. Employees working long hours had lower OR for long sickness absence after adjusting for all variables in both sexes. Conversely, poor sleep quality and longstanding illness significantly increased OR for long sickness absence. In conclusion, SES differences in sickness absence were explained partly by work and family characteristics, longstanding illness, and poor sleep quality; however, other factors that were not evaluated in this study may also be associated with SES differences.

Key words: Sickness absence, Socioeconomic status, Grade of employment, Job stress, Family characteristics, The JACS study

Introduction

Sickness absence is an important occupational problem. Approximately 2,400 people per 100,000 population among Japanese civil servants have been taking long sickness absence since 2006, and the number has increased to more than 2,500 people per 100,000 population in 2017¹⁾. A study conducted in 2011 showed that economic loss result-

ing from sickness or injury amounted to 3.3 trillion yen (approximately 29.7 billion US dollars), and economic loss resulting from absenteeism another 2.9 trillion yen (approximately 26.1 billion US dollars) while presenteeism accounted for 0.5 trillion yen (approximately 4.5 billion US dollars)²⁾. In 2015, sickness absence caused an economic loss of 3.8% of gross domestic product (GDP) in Japan, which is expected to rise to 4.1% in 2030³⁾. In this way, sickness absence has serious effects on both individuals and society at large.

There have been many studies on employees' sickness absence. For example, older employees tend to take longer

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sickness absence than do younger ones⁴). Employees with sleep problems had a higher risk for sickness absence than did those without⁵⁻⁶). As for work characteristics, having high job stress, low job satisfaction, and long working hours were associated with higher rates of sickness absence⁷⁻¹²). As for family characteristics, single men and women were more likely to have poor mental health than those who were married¹³), and fatigue from stress is associated with an increased risk of long-term sickness absence⁶).

The problem of sickness absence is due to sex differences, suggesting that women are more likely to take sickness absence than men¹⁴). Especially for women, there is a glass ceiling phenomenon in salary increase and promotion¹⁵), which is thought to lead to sickness absence and gender gap. The gender gap is very low in Japan, ranking at 120th out of 156 countries in the world in 2021¹⁶). A previous study showed differences in sex and socioeconomic status (SES) regarding work environment¹³).

While SES is an important determinant of occupational and individual health. In a previous study¹³), the low SES of male employees was found to be associated with poor physical and mental health. SES differences are known risk factors for the leading causes of sickness absence such as cardiovascular diseases, low back pain, and depression¹⁰⁻¹²).

Although there have been previous studies on the association of SES with sickness absence, and the associations of work and family characteristics with sickness absence, whether SES differences in sickness absence are explained by work and family characteristics has not been comprehensively evaluated. Moreover, although work and family characteristics and SES differences in sickness absence may differ between men and women, very few studies have focused on sex differences¹⁷). Thus, this study aimed to evaluate whether work and family characteristics contribute to SES differences in sickness absence and whether the associations differ between men and women.

Methods

Study and Questionnaire

The Japanese civil servants study (the JACS study)^{13, 18-19}) was an international joint study with the Whitehall II Study (British civil servants study) and the Helsinki Health Study (HHS). Most questionnaire items in our study were selected from the Whitehall II study^{4, 7, 17, 20}). These items were translated into Japanese; thereafter, they were back-translated into English by someone who did not know the original questionnaire. The accuracy of the back-trans-

lated questionnaire was confirmed by researchers in the Whitehall II study.

Participants

The study was conducted between January and February 2003. The participants of this study were all civil servants aged 20–65 years at the time of the survey, who were working in a local government, approximately in the center of Japan's main island. A postal questionnaire was sent to participants. Once filled out, they returned it to the researchers in sealed envelopes. The Ethical Committee of the University of Toyama approved the study. The subjects gave informed consent and participated voluntarily in this study.

Altogether, 4,272 participants responded to the questionnaire (response rate 79.2%). Participants who did not answer questions on age, sex, family status, longstanding illness, sleep status, Karasek's job strain model, grade of employment, shift work, job satisfaction, and work hours were excluded from the analysis. Finally, data on 3080 participants (2,091 men and 989 women, with gender ratios of 67.9% men and 32.1% women, and analysis rates of 76.3% men and 70.3% women, respectively) were analyzed. The mean ages of the participants were 44.2 ± 9.7 years for men and 40.6 ± 10.8 years for women.

Measures for sickness absence

The participants were asked to provide information on the total number of days of sickness absence in the previous year. We defined short-term sickness absence as periods less than 7 days and long-term sickness absence as 7 days or more in the previous year¹⁹). Previous studies showed that short-term sickness absence (less than 7 days) was mainly attributable to minor symptoms, while long-term was attributable to more serious diseases such as cardiovascular diseases^{21, 22}). Furthermore, the previous Whitehall II studies chose 7 days as the cut-off for long-term sickness absence because it required a medical certificate^{4, 7}). Therefore, we also took 7 days or more as long-term sickness absence in this study.

Measures for SES

Our study used grade of employment to investigate SES. We asked "Which of the following is your position in the workplace?", and we got an answer classified into 3 grades.

According to our previous studies^{13, 18}), grade of employment was classified into 3 grades: the highest grade (grade 1) includes senior administrative workers (e.g., Head of Bureau, Head of Department, Deputy Head of Department, and Head of Section); the intermediate grade (grade 2), ad-

ministrative workers (e.g., Assistant Head of Section and Subsection Chief); and the lowest grade (grade 3), clerical workers.

Measures for the working environments

The participant's working environment was evaluated using work hours, job satisfaction, shift work and Karasek's job strain model^{20, 23}.

Work hours per day were classified into four periods: less than 7 hours, from 7 to 9 hours, from 9 to 11 hours, 11 hours or more.

Regarding job satisfaction, we asked "How satisfied are you with your job as a whole, taking everything into consideration?" Items on job satisfaction had four response categories: very satisfied, satisfied, unsatisfied, very unsatisfied about their job. We created two categories: "satisfied" (very satisfied and satisfied) and "unsatisfied" (unsatisfied and very unsatisfied). A previous study showed that the reliability of the single-item measurement of job satisfaction is 0.68²⁴.

Regarding shift work, we asked "Does your job have shift work?" Shift work was classified in two response categories: "shift workers" or "no shift workers".

A job strain (demand-control-support) model²³ was used to evaluate psychosocial work characteristics, consisting of 25 self-reported items, including 15 items for job control, 4 items for job demand, and 6 items for social support at work²⁰. Response categories ranged from 0 (often) to 3 (never). After all items were re-coded in the same direction, scores for each scale were calculated by summing item scores. Participants were divided into tertiles according to scores. A high score in each scale indicates high control, high demand, or high support at work, respectively. The reliability coefficient (Cronbach's alpha²⁵) was 0.78 for control, 0.69 for demand, and 0.83 for social support in this study population.

Measures for family characteristics

Participants were asked, "Who are you living with?" There were 9 response categories to this question: alone, with a spouse, with children under 5 years old, with children 5–15 years old, with children 15 years old or more, with father, with mother, with father-in-law, and with mother-in-law. Responses were classified into three categories: "spouse status" (living with a spouse), "children status" (living with children under 5 years old, with children 5–15 years old, with children 15 years old or more) and "parents status" (living with father, mother, father-in-law, or mother-in-law).

Measures for sleep time and quality

This study used data on sleep time and quality. We asked regarding sleep time, "What is the actual average sleep time last month?" and regarding sleep quality, "How do you evaluate your sleep quality last month?" The item on sleep quality consisted of four response categories: very good, good, poor, very poor. Responses were classified into two categories: "good" (very good and good) and "poor" (poor and very poor). Participants were asked to provide sleep hours as average sleeping time in the previous month. Regarding sleep time, a previous study showed that the association of sleep hours and physical and mental health formed a U-shaped curve and that people who slept from 6 to 8 hours were mostly healthy²⁶. Therefore, we divided sleep time into the following categories: 6 hours or less, from 6 to 8 hours, and more than 8 hours.

Statistical analyses

We performed χ^2 tests to evaluate whether there were sex differences in work and family characteristics and longstanding illnesses. Logistic regression analyses were performed to examine whether there were employment-grade differences in sickness absence and whether such SES differences are explained by work and family characteristics and longstanding illnesses. Odds ratio (OR) and 95% confidence intervals (95%CI) were calculated. Statistical analysis was performed using SPSS (22.0.J). A two-tailed *p*-value of less than 0.05 was considered significant.

Results

Table 1 shows the participants' characteristics according to sex. Women were relatively young and more likely to be unmarried than men. More women belonged to lower grades of employment. Further, women had lower control and higher demands at work, worked longer, and were more often shift workers. However, men were likely to sleep longer and have better sleep quality than women, and men had more longstanding illnesses than women.

Table 2 shows SES differences in sickness absence before and after adjusting for work and family characteristics in men. In the age-adjusted model (model 1), low-grade employees had significantly higher OR for long sickness absence (OR=2.30(95%CI:1.32–4.02)). After adjustment for work characteristics (model 2), the association between grade of employment and long sickness absence was lower (OR=2.01(1.12–3.56)). After adjusting for family characteristics (model 3) and all covariates (model 4), the SES differences in long sickness absence decreased slightly

Table 1. Participant characteristics by sex

		Men (n=2091)		Women (n=989)		χ^2 -test
		n	(%)	n	(%)	p-value
Age						
	20–29	192	9.2	232	23.5	
	30–39	636	30.4	288	29.1	
	40–49	620	29.7	261	26.4	
	50–65	643	30.7	208	21.0	<0.001
Grade of employment						
	Grade1	298	14.2	15	1.5	
	Grade2	422	20.2	123	12.4	
	Grade3	1,371	65.6	851	86.0	<0.001
Job satisfaction						
	satisfied	1,417	67.8	602	60.9	
	not satisfied	674	32.2	387	39.1	<0.001
Shift work						
	Yes	165	7.9	441	44.6	
	No	1,926	92.1	548	55.4	<0.001
Work hours						
	<7h	175	8.4	45	4.6	
	7–9h	1,314	62.8	573	57.9	
	9–11h	430	20.6	297	30.0	
	≥11h	172	8.2	74	7.5	<0.001
Job stress						
control	low	567	27.1	359	36.3	
	middle	839	40.1	416	42.1	
	high	685	32.8	214	21.6	<0.001
demand	high	496	23.7	339	34.3	
	middle	570	27.3	277	28.0	
	low	1,025	49.0	373	37.7	<0.001
support	low	746	35.7	328	33.2	
	middle	744	35.6	334	33.8	
	high	601	28.7	327	33.1	<0.05
Living with family						
parent	without	1,050	50.2	552	55.8	<0.005
	with	1,041	49.8	437	44.2	
spouse	without	1,700	81.3	651	65.8	<0.001
	with	391	18.7	338	34.2	
children	without	1,140	54.5	456	46.1	<0.001
	with	951	45.5	533	53.9	

Table 1. Continued

		Men (n=2091)		Women (n=989)		χ^2 -test
		n	(%)	n	(%)	p-value
Sleep						
time	≤6h	611	29.2	457	46.2	
	6h–8h	1,403	67.1	519	52.5	
	>8h	77	3.7	13	1.3	<0.001
Subjective sleep quality	good	1,605	76.8	719	72.7	
	poor	486	23.2	270	27.3	<0.05
Longstanding illness						
Yes		753	36.0	281	28.4	
No		1,338	64.0	708	71.6	<0.001

Note: Grade1: the highest grade employees; Grade2: intermediate grade employees; Grade3: the lowest grade employees.

(ORs=1.97(1.10–3.52) and 1.98(1.10–3.55), respectively). Men working 11 hours or more had lower OR for sickness absence (OR=0.48(0.23–0.99)). Men without a spouse had significantly higher OR for long sickness absence (OR=2.07(1.30–3.28)). Additionally, poor sleep quality and longstanding illness were associated with long sickness absence (ORs=1.92(1.38–2.68) and 2.18(1.57–3.03), respectively). Employees with low control, low support, and unsatisfied with their job were relatively more likely to take long sickness absence. However, these associations were not statistically significant.

Table 3 shows SES differences in sickness absence before and after adjusting for work and family characteristics in women. Because of the few highest-grade employees, the highest and intermediate-grade employees were combined in the analysis. Lower-grade employees were likely to take long sickness absence; however, the association was not statistically significant (aged-adjusted OR for long sickness absence=1.40(0.71–2.76)). The SES difference decreased further after adjusting for work characteristics (OR=1.23(0.59–2.55)). In the fully adjusted model (model 4), women working from 9 hours to 11 hours and those working 11 hours or more had a significantly lower OR for long sickness absence (ORs=0.32(0.16–0.60) and 0.24(0.07–0.84), respectively). In women, sickness absence was not significantly associated with family characteristics. However, women without children were more likely to take long sickness absence than those living with children (OR=1.36(0.83–2.24)). Poor sleep quality and longstanding illness had significantly higher OR for long sickness absence (ORs=2.30(1.43–3.70) and 1.88(1.18–

3.01), respectively). In contrast to the results obtained for men, in women, job stress and job dissatisfaction were not associated with long sickness absence.

Discussion

This study showed that SES differences in sickness absence were, in part, explained by work and family characteristics. Notably, after making adjustments for work characteristics (job satisfaction and shift work, work hours, job stress), the SES differences in long sickness absence in men decreased. In women, SES differences in sickness absence were not statistically significant; moreover, they slightly decreased after adjusting for work and family characteristics.

A previous study showed that low-grade employees were more likely to have poor physical and mental functioning than high-grade employees¹⁸). SES differences in physical and mental functioning decreased and were no longer significant after adjustments for work and family characteristics¹⁸). Stressful work characteristics were more common among low-grade employees¹⁸), which may have led to health inequalities. In other studies, employees with physical and mental dysfunction tended to be absent from work^{11, 12}). This study showed that low-grade male employees were twice more likely to take long sickness absence. The results from this study are, therefore, similar to previous findings.

In women, the association of long sickness absence and grade of employment was not statistically significant; moreover, the strength of the association decreased after correcting for work and family characteristics. Previous

Table 2. Socioeconomic differences in sickness absence before and after adjustment for work and family characteristics in men

	The rate of sickness absence 7 days or more(%)	model1 OR (95%CI)	model2 OR (95%CI)	model3 OR (95%CI)	model4 OR (95%CI)
Grade of employment					
Grade1	6.4	1.00	1.00	1.00	1.00
Grade2	9.5	1.66[0.93-2.96]	1.61[0.90-2.88]	1.62[0.90-2.92]	1.52[0.84-2.74]
Grade3	9.9	2.30[1.32-4.02]	2.01[1.12-3.56]	1.97[1.10-3.52]	1.98[1.10-3.55]
Age					
20-29	6.8	1.00	1.00	1.00	1.00
30-39	8.8	1.34[0.72-2.51]	1.29[0.69-2.42]	1.50[0.78-2.88]	1.41[0.73-2.72]
40-49	9.7	1.72[0.91-3.25]	1.50[0.78-2.86]	1.83[0.92-3.64]	1.47[0.73-2.96]
50-65	10.3	2.28[1.18-4.42]	2.02[1.03-3.99]	2.64[1.29-5.42]	1.91[0.91-4.00]
Job satisfaction					
satisfied	8.3	1.00	1.00	1.00	1.00
not satisfied	11.6	1.34[0.97-1.87]	1.34[0.97-1.87]	1.34[0.97-1.87]	1.21[0.86-1.71]
Shift work					
Yes	10.9	1.10[0.65-1.85]	1.10[0.65-1.85]	1.10[0.65-1.85]	1.04[0.61-1.78]
No	9.2	1.00	1.00	1.00	1.00
Work hours					
<7h	10.3	0.95[0.56-1.61]	0.95[0.56-1.61]	0.96[0.57-1.64]	0.95[0.56-1.62]
7-9h	10.0	1.00	1.00	1.00	1.00
9-11h	8.6	0.85[0.57-1.27]	0.85[0.57-1.27]	0.87[0.58-1.31]	0.87[0.58-1.31]
≥11h	5.2	0.49[0.24-0.99]	0.49[0.24-0.99]	0.47[0.23-0.97]	0.48[0.23-0.99]
Job stress					
control	12.7	1.33[0.88-2.03]	1.33[0.88-2.03]	1.31[0.86-1.99]	1.22[0.80-1.87]
low	8.1	0.92[0.62-1.35]	0.92[0.62-1.35]	0.90[0.61-1.33]	0.86[0.58-1.27]
middle	8.0	1.00	1.00	1.00	1.00
high					

Table 2. Continued

		The rate of sickness absence 7 days or more(%)	model1 OR (95%CI)	model2 OR (95%CI)	model3 OR (95%CI)	model4 OR (95%CI)	
demand	high	9.1		0.97[0.67–1.42]	0.97[0.66–1.41]	0.97[0.66–1.42]	
	middle	8.6		1.08[0.73–1.61]	1.08[0.73–1.61]	1.04[0.69–1.55]	
	low	9.8		1.00	1.00	1.00	
	low	10.7		0.94[0.63–1.39]	0.94[0.63–1.40]	0.90[0.60–1.34]	
	middle	8.2		0.82[0.55–1.21]	0.82[0.55–1.21]	0.78[0.53–1.17]	
support	high	9.0		1.00	1.00	1.00	
	Living with family						
	parent						
parent	without	8.6			0.95[0.70–1.30]	0.96[0.70–1.30]	
	with	10.0			1.00	1.00	
spouse	without	11.8			1.98[1.26–3.11]	2.07[1.30–3.28]	
	with	8.8			1.00	1.00	
children	without	8.9			0.75[0.52–1.07]	0.76[0.53–1.09]	
	with	9.6			1.00	1.00	
Sleep							
time	≤6h	10.8				0.83[0.58–1.19]	
	6h–8h	9.4				1.00	
	>8h	10.4				1.18[0.54–2.58]	
Subjective	good	7.7				1.00	
	poor	14.8				1.92[1.38–2.68]	
Longstanding illness							
Yes		13.9				2.18[1.57–3.03]	
No		6.7				1.00	

Abbreviations: Odds Ratios: OR; 95% Confidence Intervals: 95%CI; Grade1: the highest grade employees; Grade2: intermediate grade employees; Grade3: the lowest grade employees. Model1 is adjusted for age.

Model2 is adjusted for age and work characteristics (job satisfaction, shift work, work hours, and job stress (control, demand and support)).

Model3 is adjusted for age, work characteristics, and family characteristics (living with spouse, child, and parents).

Model4 is adjusted for age, work and family characteristics, sleep time and quality, and longstanding illness.

Table 3. Socioeconomic differences in sickness absence before and after adjustment for work and family characteristics in women

	The rate of sickness absence 7 days or more (%)	model1 OR (95%CI)	model2 OR (95%CI)	model3 OR (95%CI)	model4 OR (95%CI)
Grade of employment					
Grade1+2	8.7	1.00	1.00	1.00	1.00
Grade3	10.0	1.40[0.71-2.76]	1.23[0.59-2.55]	1.28[0.79-2.09]	1.29[0.61-2.72]
Age					
20-29	6.9	1.00	1.00	1.00	1.00
30-39	11.1	1.70[0.91-3.18]	1.65[0.87-3.15]	1.55[0.77-3.13]	1.59[0.78-3.25]
40-49	8.8	1.39[0.71-2.73]	1.32[0.66-2.65]	1.08[0.49-2.39]	1.19[0.54-2.64]
50-65	12.5	2.15[1.08-4.25]	1.91[0.92-3.93]	1.40[0.63-3.14]	1.47[0.65-3.32]
Job satisfaction					
satisfied	10.1	1.00	1.00	1.00	1.00
not satisfied	9.3	1.02[0.63-1.65]	1.03[0.64-1.65]	1.02[0.63-1.65]	0.90[0.55-1.48]
Shift work					
Yes	8.2	0.89[0.55-1.44]	0.89[0.55-1.44]	0.91[0.56-1.48]	0.86[0.53-1.42]
No	11.1	1.00	1.00	1.00	1.00
Work hours					
<7h	24.4	2.37[1.13-4.97]	2.37[1.13-4.97]	2.14[1.00-4.56]	2.04[0.94-4.42]
7-9h	12.0	1.00	1.00	1.00	1.00
9-11h	4.7	0.34[0.18-0.65]	0.34[0.18-0.65]	0.34[0.18-0.64]	0.32[0.16-0.60]
≥11h	4.1	0.28[0.08-0.94]	0.28[0.08-0.94]	0.27[0.08-0.90]	0.24[0.07-0.84]
Job stress					
control	10.6	0.93[0.50-1.73]	0.93[0.50-1.73]	0.95[0.51-1.78]	0.88[0.46-1.67]
low	8.7	0.80[0.45-1.44]	0.80[0.45-1.44]	0.80[0.44-1.44]	0.78[0.43-1.43]
middle					
high	10.7	1.00	1.00	1.00	1.00

Table 3. Continued

		The rate of sickness absence 7 days or more (%)	model1 OR (95%CI)	model2 OR (95%CI)	model3 OR (95%CI)	model4 OR (95%CI)
demand	high	8.6		1.46[0.86–2.49]	1.40[0.82–2.40]	1.46[0.85–2.51]
	middle	11.2		1.50[0.82–2.71]	1.48[0.81–2.71]	1.48[0.80–2.75]
	low	9.9		1.00	1.00	1.00
support	low	8.8		0.82[0.45–1.48]	0.78[0.43–1.42]	0.80[0.44–1.47]
	middle	11.1		1.13[0.67–1.92]	1.13[0.66–1.92]	1.11[0.65–1.90]
	high	9.5		1.00	1.00	1.00
Living with family	without	9.6			0.86[0.55–1.35]	0.85[0.54–1.35]
	with	10.0			1.00	1.00
spouse	without	7.4			0.73[0.40–1.32]	0.72[0.39–1.31]
	with	11.1			1.00	1.00
children	without	9.6			1.29[0.79–2.09]	1.36[0.83–2.24]
	with	10.1			1.00	1.00
Sleep time	≤6h	9.8				0.96[0.60–1.53]
	6h–8h	9.6				1.00
	>8h	15.4				1.15[0.22–5.90]
Subjective sleep quality	good	8.1				1.00
	poor	14.4				2.30[1.43–3.70]
Longstanding illness	Yes	14.6				1.88[1.18–3.01]
	No	7.9				1.00

Abbreviations: Odds Ratios: OR; 95% Confidence Intervals: 95%CI; Grade 1: the highest grade employees; Grade2: intermediate grade employees; Grade3: the lowest grade employees. Model1 is adjusted for age.

Model2 is adjusted for age and work characteristics (job satisfaction, shift work, work hours, and job stress (control, demand and support)).

Model3 is adjusted for age, work characteristics, and family characteristics (living with spouse, child, and parents).

Model4 is adjusted for age, work and family characteristics, sleep time and quality, and longstanding illness.

studies showed that male managers and supervisors with high credentials showed better self-reported health than those in other class positions (most notably semi-skilled and unskilled workers). In female employees, the association between social class and self-reported health status was less evident than that among men (lower adjusted OR in logistic models than men)²⁷. And the association between SES and health in women is not as strong when women are categorized by their occupation compared to the head of household²⁸. This is why that social class inequality in health has been a problem among men; women's health is possibly more influenced by other factors, such as household role and the occupation of the head of household^{27, 28}. Therefore, the results on SES differences in long sickness absence in women were not significant, and SES differences in men were more pronounced than those in women in this study.

As for working hours, in both sexes, employees working long hours (men worked 11 hours or more and women worked 9 hours or more) had lower ORs for sickness absence, associations that remained significant in the fully adjusted model. Long hospital shifts have not been associated with either short or long sickness absence, probably because it is difficult for employees working long hours to take sickness absences²⁹⁻³⁰. However, other studies showed the opposite^{31, 32}. As our study is a cross-sectional study, employees working long hours who took long sickness absence might not have participated in this study, considering we required employees not to be absent during the research period.

In contrast, women working less than 7 hours took less long sickness absence than those who worked from 7 to 9 hours. However, the association was not significant after adjustments for sleep quality and longstanding illness, which may mean that employees working short hours do so because of illnesses. Additionally, women who raise young children and care for the elderly may have poor sleep time and quality and be included in the group working less than 7 hours^{33, 34}.

As for family characteristics, men without a spouse were associated with long sickness absence, as were women without children. A previous study showed that men with a spouse (regardless of having children or not) had lower OR for poor sleep and mental dysfunction than men without a spouse^{13, 18}. Therefore, men with a spouse had lower OR for long sickness absences than those without a spouse. Meanwhile, among women, sickness absence is more common in those with children than among those without³⁵. However, in this study, women with children did not take more long

sickness absence. In Japan, women with children may have more motivation to work than those without children because they have made a deliberate choice to continue working after they had their children^{36, 37}. This may make them less prone to taking long sickness absence.

The strengths of this study are the comprehensive investigation of the work and family characteristics as determinants of SES difference in long sickness absence, and the influence of sex on these characteristics and differences. In Japan, studies on this last topic are rare. Despite the Whitehall II study showing that grade of employment was associated with disease in long and short sickness absence¹⁷, comprehensive investigations on these relationships are scarce. In the Japanese civil servants study^{13, 18, 19, 33}, grade differences were associated with work and family characteristics, sleep, quality of life, and, in turn, physical and mental health. Therefore, grade differences were possibly associated with long sickness absence in this study.

This study has several limitations. First, this study was cross-sectional, and it cannot, therefore, determine causal associations between sickness absence and work and family characteristics. Moreover, this study was conducted from January to February 2003, and employees who took long sickness absence during that period may have been excluded from this study. A longitudinal investigation would be needed to reveal those associations and investigate employees who took sickness absences. Second the findings of this study are based on data from 2003 which raises the question whether these findings are still relevant. However, as the sickness absence rate has been increasing from 2006 and continues to remain at a high level¹, presently the associations may be even stronger than the ones we found. Third, a previous study showed that working conditions found in female-dominated occupations contribute to lower sickness absence, and the working conditions found in male-dominated occupations contribute to higher sickness absence after adjusting the selection effect¹⁴. This underlines the need to proceed with research which incorporates perspectives on individual occupational selection and characteristics of the group to which employees belong.

Fourth, in our study, SES differences for long sickness absence decreased in both sexes, but remained significant until final models in men and not significantly from first models in women. Other factors, like self-efficacy and other personal characteristics, were not investigated in this study. A previous study suggested that high work-related self-efficacy is important for early return to work, which may contribute to shorter sickness absence³⁸. Therefore, further research that involves these factors is needed. Fifth,

because the participants were working civil servants, we cannot generalize the results to the Japanese adult working population. Compared to the general adult population, civil servants comprise more regular employees, who are relatively young and mostly white-collar workers. In Japan, the absence rate was high in non-regular employment, old, and blue-collar workers (for example, agriculture, forestry, and fishery industry workers and those involved in construction and cleaning)³⁹). Therefore, the association of sickness absence and working environmental factors which we found may be an underestimation.

In conclusion, this study showed SES differences in long sickness absence in Japanese civil servants. There were SES differences in long sickness absence among men; the differences were attenuated when adjusted for work and family characteristics. Contrastingly, SES differences in sickness absence slightly decreased after adjusting for work and family characteristics among women; however, they were not statistically significant. Work and family characteristics and longstanding illness, including sleep problems, could partially explain the SES and sex differences; however other contributing factors may also underlie this effect. A better understanding of how factors related to SES and work and family characteristics influence sickness absence may help to improve working conditions for workers and at the same time prevent a further increase of long sickness absence.

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