

The Economic Impact of Loss of Performance Due to Absenteeism and Presenteeism Caused by Depressive Symptoms and Comorbid Health Conditions among Japanese Workers

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Abstract: We aimed to determine the economic impact of absenteeism and presenteeism from five conditions potentially comorbid with depressive symptoms—back or neck disorders, depression, anxiety, or emotional disorders, chronic headaches, stomach or bowel disorders, and insomnia—among Japanese workers aged 18–59 yr. Participants from 19 workplaces anonymously completed Stanford Presenteeism Scale questionnaires. Participants identified one primary health condition and determined the resultant performance loss (0–100%) over the previous 4-wk period. We estimated the wage loss by gender, using 10-yr age bands. A total of 6,777 participants undertook the study. Of these, we extracted the data for those in the 18–59 yr age band who chose targeted primary health conditions (males, 2,535; females 2,465). The primary health condition identified was back or neck disorders. We found that wage loss due to presenteeism and absenteeism per 100 workers across all 10-yr age bands was high for back or neck disorders. Wage loss per person was relatively high among those identifying depression, anxiety, or emotional disorders. These findings offer insight into developing strategies for workplace interventions on increasing work performance.

Key words: Absenteeism, Back pain, Depression, Presenteeism, Workers

Introduction

The economic impact depressive symptoms have on work is significant in most countries, including Japan^{1, 2}. Okumura and Higuchi estimated that the annual cost of

workplace absenteeism and presenteeism in Japan due to depression²) amounted to US\$6.9 billion. In the United States, depression costs \$44 billion per year in absences from work and reduced performance while at work¹. Alleviating both presenteeism, which is the condition whereby workers' performance is reduced owing to health conditions, and absenteeism, taken in this study to mean those staying away from work because of ill health, are issues of concern for occupational health practices^{3, 4}.

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To build a strategy for allocating future funding and resources to deal with depressive symptoms, the total burden of those symptoms on presenteeism and absenteeism in the workplace has to be examined. A small sample study in Japan on presenteeism showed that depression, anxiety, or emotional disorders affected individual work performance⁵⁾ and that the prevalence of allergies and back or neck disorders was high. Since wages vary by age and gender, the burden of health conditions needs to be converted into economic indicators, such as wage losses, to clarify the situation for employers.

Depressive symptoms include comorbid conditions such as depression, anxiety, or emotional disorders, back or neck disorders⁶⁾, migraines or chronic headaches⁷⁾, stomach or bowel disorders⁸⁾, and insomnia⁹⁾. To determine the total burden of depressive symptoms, it is necessary to take these comorbid conditions into account. The aim of this study was to determine the economic impact due to absenteeism and presenteeism in terms of five conditions that are potentially comorbid with depressive symptoms—back or neck disorders, depression, anxiety, or emotional disorders, chronic headaches, stomach or bowel disorders, and insomnia—among Japanese workers in the 18–59 yr age bracket. For the purpose of this study, we calculated the economic impact on wages, not only for individuals but for the entire population, by assuming 100 workers for each 10-yr age band.

Subjects and Methods

We recruited participants from 19 workplaces and asked them to complete an anonymous questionnaire featuring the Stanford Presenteeism Scale¹⁰⁾. Six research projects (A to F) were conducted during the course of the study. Research A was carried out at five manufacturing companies among 3,014 workers from October to December 2006; the response rate was 89.0% (2,682 responses). Research B was conducted among 2,397 nurses in three hospitals from October to December 2007; the response rate was 63.2% (1,515 responses). Research C was performed among 950 workers at a manufacturing company in March 2008; the response rate was 74.2% (705 responses). Research D was a Web survey and was carried out in June 2008; of the 1,133 responses, 1,100 participants were recruited. Research E was conducted at a health seminar among 428 employees of three taxi companies; the response rate was 98.8% (423 responses). Research F was performed at training seminars among all 403 solvent-handling workers who participated from January to June 2009; the response rate was 84.3%

(340 responses). From the 6,777 participants (male, 3,819; female, 2,958) we analyzed 5,000 individuals (male, 2,535; female, 2,465) who were aged between 18–59, and for whom there were no missing values.

The Stanford Presenteeism Scale aims to determine the effect of presenteeism and absenteeism due to primary health conditions over the previous 4-wk period^{10, 11)}. Participants first selected one primary health condition from 15 possible conditions. The participants then estimated the performance loss (0–100%) as a result of the primary health condition for the previous 4-wk period and the number of resultant absent days.

Of the 5,000 participants we analyzed the data for those who chose one of the following as the primary health condition: depression, anxiety or emotional disorders; migraines or chronic headaches; back or neck disorders; stomach or bowel disorders; and insomnia (male, 1,393; female, 1,427).

We calculated the wage loss caused by absenteeism as the number of days absent multiplied by the average hourly wage by age multiplied by 8 (assumed as the number of working hours in a day). We calculated the wage loss caused by presenteeism as follows: (20 [assumed as the number of working days in 4 wk] minus the number of absent days) multiplied by 8 multiplied by 100 (%) (the proportion of the work performance with presenteeism as the primary health condition compared with the ideal condition) multiplied by the average hourly wage by age. Then, we added the wage loss caused by absenteeism and presenteeism for each person. We calculated the mean and 95% confidence intervals for each indicator. We also assumed that there were 100 workers for each 10-yr age band and calculated the total wage loss of presenteeism and absenteeism of the primary health condition by multiplying individual wage losses by the prevalence (the proportion of people who chose primary health condition). Finally, we calculated the proportion of the total wage loss due to absenteeism and presenteeism and divided it by the total wages of 100 persons for 4 wk in each 10-yr age band.

We set the wage per hour for the 10-yr age groups for males and females using the basic survey on wage structure conducted by the Ministry of Health, Labour and Welfare, Japan¹²⁾. The hourly wage was calculated by the mean monthly wage divided by 160 (20 days with 8 working hours per day). All costs were expressed in 2008 US dollar terms (US\$1.00=117 yen). The hourly wage by age for men was \$11.9 (20–29 yr), \$16.6 (30–39 yr), \$21.3 (40–49 yr), and \$21.8 (50–59 yr). The hourly wage by age

Table 1. Prevalence of primary health condition of participants

	Male		Female	
	Primary health condition chosen		Primary health condition chosen	
	n	%	n	%
Age 18–29 (yr)	(n=340)		(n=749)	
Back or neck disorders	67	19.7	207	27.6
Depression, anxiety, or emotional disorders	57	16.8	84	11.2
Migraine or chronic headaches	25	7.4	76	10.1
Stomach or bowel disorders	31	9.1	70	9.3
Insomnia	20	5.9	32	4.3
Age 30–39 (yr)	(n=763)		(n=737)	
Back or neck disorders	224	29.4	190	25.8
Depression, anxiety, or emotional disorders	102	13.4	114	15.5
Migraine or chronic headaches	44	5.8	56	7.6
Stomach or bowel disorders	51	6.7	46	6.2
Insomnia	39	5.1	29	3.9
Age 40–49 (yr)	(n=867)		(n=513)	
Back or neck disorders	212	24.5	165	32.2
Depression, anxiety, or emotional disorders	115	13.3	60	11.7
Migraine or chronic headaches	44	5.1	30	5.8
Stomach or bowel disorders	74	8.5	24	4.7
Insomnia	45	5.2	22	4.3
Age 50–59 (yr)	(n=565)		(n=466)	
Back or neck disorders	120	21.2	143	30.7
Depression, anxiety, or emotional disorders	43	7.6	23	4.9
Migraine or chronic headaches	17	3	19	4.1
Stomach or bowel disorders	44	7.8	28	6
Insomnia	19	3.4	9	1.9

for women was \$10.8 (20–29 yr old), \$12.7 (30–39 yr), \$13.2 (40–49 yr), and \$12.5 (50–59 yr). All analyses were performed using IBM SPSS Statistics 19.

The data collection was approved by ethical committees: Research A, B, and C by Osaka University, Japan; Research D and E by the International University of Health and Welfare, Japan; and Research F by Kitasato University School of Medicine, Japan.

Results

Table 1 shows the prevalence of conditions. The leading primary health condition was back or neck disorders in all age groups. The prevalence of depression, anxiety, or emotional disorders was 13.3–16.8% (males) and 11.2–15.5% (females) among those aged 18–49, the prevalence of depression, anxiety, or emotional disorders among those in their 50s was 7.6% (males) and 4.9% (females).

Table 2 (males) and Table 3 (females) show the days absent, the wage loss due to absenteeism, the loss of working hours due to presenteeism, and the wage loss due to

presenteeism over the previous 4-wk period. The leading cause of absenteeism and presenteeism due to the primary health condition varied by gender and by age. For men aged 18–39 yr, the leading cause of absenteeism was depression, anxiety, or emotional disorders, and the leading cause of presenteeism was migraines or chronic headaches. For men in their 40s, the leading cause of absenteeism was stomach or bowel disorders, while the leading cause of presenteeism was depression, anxiety, or emotional disorders. For men in their 50s, the leading cause of absenteeism was insomnia, while the leading cause of presenteeism was depression, anxiety, or emotional disorders. In all age groups, the leading cause of wage loss due to absenteeism and presenteeism was depression, anxiety, or emotional disorders. For women, the leading cause of absenteeism was stomach or bowel disorders, while the leading cause of presenteeism was depression, anxiety, or emotional disorders for those aged between 18–39 yr. For women in their 40s, the leading cause of absenteeism and presenteeism was depression, anxiety, or emotional disorders. For women in their 50s, the leading cause of absenteeism was

Table 2. Days of absenteeism and lost hours due to presenteeism, with the estimated wage loss for male workers over the previous 4-wk period (n=1,393)

	Days absent due to primary health condition (d)		Wage loss due to absenteeism over 4 wk per person through the primary health condition (US\$)		Loss of working hours due to presenteeism (h)		Wage loss due to presenteeism per person through the primary health condition (US\$)		Wage loss due to absenteeism and presenteeism through the primary health condition (US\$)	
	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
Age 18–29 (yr)										
Back or neck disorders	1.6	(0.5–2.6)	150	(50–249)	35.6	(29.0–42.2)	426	(347–504)	575	(465–686)
Depression, anxiety, or emotional disorders	2.4	(0.9–3.9)	228	(83–373)	43.5	(35.0–52.0)	520	(419–622)	748	(610–887)
Migraine or chronic headaches	1.2	(0.1–2.3)	115	(8–222)	49.5	(38.2–60.9)	592	(456–728)	707	(582–831)
Stomach or bowel disorders	2.2	(0.3–4.2)	213	(28–397)	39.4	(28.8–50.0)	471	(345–597)	684	(498–869)
Insomnia	0.6	(0.0–1.9)	57	(0–177)	43.8	(32.4–55.2)	524	(388–660)	581	(429–733)
Age 30–39 (yr)										
Back or neck disorders	2.2	(1.5–2.9)	289	(199–380)	35.9	(32.3–39.6)	596	(535–657)	885	(794–976)
Depression, anxiety, or emotional disorders	4.8	(3.4–6.3)	641	(447–835)	50	(42.8–57.1)	828	(710–946)	1469	(1,316–1,621)
Migraine or chronic headaches	2.4	(0.7–4.1)	316	(93–540)	52	(39.9–64.1)	862	(662–1,063)	1179	(947–1,410)
Stomach or bowel disorders	2.1	(0.8–3.3)	273	(107–439)	45.1	(36.9–53.4)	748	(611–885)	1021	(842–1,200)
Insomnia	1.8	(0.4–3.2)	238	(58–418)	44	(37.0–51.0)	729	(613–846)	967	(804–1,130)
Age 40–49 (yr)										
Back or neck disorders	2.3	(1.6–3.0)	392	(268–516)	34.2	(30.6–37.9)	731	(652–809)	1123	(1,001–1,244)
Depression, anxiety, or emotional disorders	3.6	(2.4–4.7)	607	(410–804)	45.2	(39.6–50.7)	965	(846–1,083)	1572	(1,408–1,736)
Migraine or chronic headaches	2.4	(0.6–4.2)	411	(110–713)	40.2	(29.0–51.3)	858	(619–1,096)	1269	(949–1,589)
Stomach or bowel disorders	4.5	(2.9–6.1)	771	(492–1,049)	33.4	(25.8–40.9)	712	(551–873)	1483	(1,239–1,726)
Insomnia	3.3	(1.3–5.3)	565	(224–907)	35.9	(28.4–43.4)	766	(605–927)	1331	(1,047–1,616)
Age 50–59 (yr)										
Back or neck disorders	2.0	(1.2–2.8)	344	(202–487)	30.9	(26.9–34.9)	674	(587–761)	1019	(874–1163)
Depression, anxiety, or emotional disorders	5.2	(2.9–7.5)	912	(510–1,315)	40.1	(30.0–50.2)	874	(654–1,094)	1787	(1,446–2,127)
Migraine or chronic headaches	5.2	(1.3–9.1)	913	(231–1,595)	31.6	(17.8–45.4)	690	(388–991)	1603	(1,046–2,159)
Stomach or bowel disorders	4.4	(2.5–6.3)	769	(433–1,105)	26.4	(21.0–31.9)	577	(457–696)	1346	(1,056–1,635)
Insomnia	5.8	(1.6–9.9)	1010	(286–1,734)	31.5	(19.9–43.0)	687	(435–938)	1697	(1,127–2,266)

CI: confidence Interval, 1 US\$=117 yen.

migraines or chronic headaches, while the leading cause of presenteeism was insomnia. As with males, the leading cause of wage loss due to absenteeism and presenteeism for females in all age groups was depression, anxiety, or emotional disorders.

Table 4 (males) and Table 5 (females) show the wage loss assuming 100 workers per 10-yr age group over the previous 4-wk period. Assuming 100 workers in each age band and considering the prevalence and wage structure differences by age, the total wage loss due to absenteeism and presenteeism through the primary health condition was high for back or neck disorders. The exception to this was males in their 20s, whose highest mean wage loss was for depression, anxiety, or emotional disorders. The mean total wage loss due to absenteeism and presenteeism through depression, anxiety, or emotional disorders was high among men in their 40s and women in their 30s. Assuming 100 workers per 10-yr age band, the proportion of wage loss of the total wage owing to back or neck disorder was 5.9–9.8% for men and 6.5–9.8% for women;

the proportion of wage loss of the total wage as a result of depression, anxiety, or emotional disorders was 3.9–7.4% for men and 2.4–6.1% for women.

Discussion

This study aimed to determine the wage loss in work performance due to absenteeism and presenteeism using five chronic conditions that are potentially comorbid with depressive symptoms among working populations in Japan: back or neck disorders; depression, anxiety, or emotional disorders; migraines or chronic headaches; stomach or bowel disorders; and insomnia. This is the largest study to date determining the economic impact of presenteeism and absenteeism using individual data for workers in Japan. The leading cause of absenteeism and presenteeism varied by gender and by age. For males and females of all ages, the greatest economic impact due to the primary health condition was caused by depression, anxiety, or emotional disorders; among the 100 people in each age

Table 3. Days of absenteeism and lost hours due to presenteeism with the estimated wage loss for female workers over the previous 4-wk period (n=1,427)

	Days absent due to primary health condition (days)		Wage loss due to absenteeism over 4 wk per person through the primary health condition (US\$)		Loss of working hours due to presenteeism (h)		Wage loss due to presenteeism per person through the primary health condition (US\$)		Wage loss due to absenteeism and presenteeism through the primary health condition (US\$)	
	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
Age 18–29 (yr)										
Back or neck disorders	1.8	(1.2–2.5)	159	(104–215)	35	(31.6–38.3)	379	(343–415)	538	(483–594)
Depression, anxiety, or emotional disorders	2.4	(1.3–3.6)	211	(112–309)	52.5	(45.9–59.1)	569	(498–640)	780	(695–864)
Migraine or chronic headaches	2	(0.9–3.0)	172	(80–264)	40.4	(35.1–45.7)	438	(380–496)	610	(528–693)
Stomach or bowel disorders	3.4	(1.7–5.0)	292	(149–434)	32.2	(26.7–37.6)	349	(290–408)	641	(518–763)
Insomnia	0.8	(0.0–2.0)	73	(0–178)	43.6	(36.1–51.0)	472	(391–553)	545	(433–657)
Age 30–39 (yr)										
Back or neck disorders	1	(0.6–1.4)	101	(57–145)	32.2	(29.7–34.8)	409	(376–441)	510	(459–560)
Depression, anxiety, or emotional disorders	2.2	(1.1–3.2)	221	(116–325)	45.4	(21.2–59.5)	576	(514–638)	797	(706–888)
Migraine or chronic headaches	1.2	(0.3–2.2)	123	(27–219)	37.3	(40.6–50.3)	473	(392–554)	596	(491–701)
Stomach or bowel disorders	3.3	(1.3–5.2)	331	(131–531)	29.9	(30.9–43.6)	379	(312–446)	710	(547–873)
Insomnia	2.5	(0.3–4.7)	255	(33–478)	36.3	(24.6–35.1)	461	(345–576)	716	(514–919)
Age 40–49 (yr)										
Back or neck disorders	2	(1.2–2.8)	210	(125–295)	33.1	(29.3–36.9)	438	(388–488)	648	(569–726)
Depression, anxiety, or emotional disorders	2.6	(1.3–4.0)	279	(139–418)	51.3	(42.2–60.5)	679	(559–800)	958	(824–1,092)
Migraine or chronic headaches	0.9	(0.0–1.8)	95	(0–193)	43.7	(32.4–55.0)	578	(428–728)	674	(494–853)
Stomach or bowel disorders	1.2	(0.0–3.0)	123	(0–317)	42.5	(29.1–56.0)	563	(385–741)	686	(457–915)
Insomnia	0.9	(0.0–2.0)	96	(0–208)	49.1	(40.3–58.0)	650	(533–767)	746	(589–903)
Age 50–59 (yr)										
Back or neck disorders	3.1	(2.1–4.1)	308	(207–408)	23.6	(20.4–26.7)	296	(256–335)	603	(509–697)
Depression, anxiety, or emotional disorders	3.7	(0.9–6.4)	366	(95–638)	47.5	(34.7–60.4)	596	(435–757)	962	(738–1,186)
Migraine or chronic headaches	6.2	(2.6–9.8)	623	(258–988)	25.6	(16.8–34.5)	322	(210–433)	944	(659–1,230)
Stomach or bowel disorders	2.7	(0.4–5.0)	269	(38–499)	29.8	(16.8–42.8)	374	(211–537)	643	(393–892)
Insomnia	0.9	(0.0–2.9)	89	(0–295)	49.8	(21.5–78.1)	624	(269–979)	713	(353–1,074)

CI, confidence interval; 1 US\$=117 yen.

band, the highest loss of wage through presenteeism and absenteeism was caused by back or neck disorders—with the exception of males aged 18–29.

Depression, anxiety, or emotional disorders are the major cause of absenteeism and presenteeism^{5, 13, 14}). In the present study, the total economic loss due to depression, anxiety, or emotional disorders was lower than for back or neck disorders; however, we were unable to include workers with long-term absence due to depression. Based on a survey by the Japan Productivity Center in 2008, 0.4% of workers took more than one month working absence in Japan¹⁵). Hence, our assessment of absenteeism and its wage loss due to depression, anxiety, or emotional disorders could be an underestimation. Symptoms of depression, anxiety, or emotional disorders include feelings of sadness, a lack of interest, difficulty in making decisions, and—at worst—thoughts of death and suicide¹⁶). Those symptoms could severely affect an individual's core work performance as well as making them unable to respond to our questionnaire.

The most chosen primary health condition was back or neck disorder, which resulted in the greatest wage loss through presenteeism and absenteeism among 100 workers in the 10-yr age bands. The prevalence of back or neck disorders in this study was similar to a survey finding on the state of employees' health by the Ministry of Health, Labour and Welfare, Japan¹⁷). According to that survey (carried out in 2007 and used multiple-choice questions), the proportion of people with back pain was 25.6% for males and 21.4% for females. In our study, the prevalence of back or neck disorders was 19.7–29.4% for men and 25.8–32.2% for women. However, the prevalence could vary depending on the type of work: some types of occupation are more likely to cause work-related back or neck disorders^{18, 19}).

Migraines or chronic headaches (primarily tension-type headaches), cause intensive work loss by presenteeism among men aged 18–39 yr and by absenteeism among men in their 50s. Globally, tension-type headaches have a four times greater prevalence than migraine²⁰). In the

Table 4. Wage loss due to presenteeism and absenteeism and its proportion of the total wage assuming 100 workers per 10-yr age group for male workers over the previous 4-wk period

	Total wage loss due to absenteeism and presenteeism per 100 workers (US\$)		Proportion of total wage loss due to absenteeism and presenteeism in the total wage of 100 workers (%)	
	Mean	(95% CI)	Mean	(95% CI)
Age 18–29 (yr)				
Back or neck disorders	11,340	(9,170–13,510)	5.9	(4.8–7.1)
Depression, anxiety, or emotional disorders	12,543	(10,220–14,866)	6.6	(5.3–7.8)
Migraine or chronic headaches	5,196	(4,282–6,109)	2.7	(2.2–3.2)
Stomach or bowel disorders	6,234	(4,542–7,927)	3.3	(2.4–4.1)
Insomnia	3,419	(2,524–4,313)	1.8	(1.3–2.3)
Age 30–39 (yr)				
Back or neck disorders	25,986	(23,312–28,660)	9.8	(8.8–10.8)
Depression, anxiety, or emotional disorders	19,634	(17,592–21,676)	7.4	(6.6–8.2)
Migraine or chronic headaches	6,797	(5,463–8,131)	2.6	(2.1–3.1)
Stomach or bowel disorders	6,823	(5,628–8,018)	2.6	(2.1–3.0)
Insomnia	4,944	(4,109–5,778)	1.9	(1.5–2.2)
Age 40–49 (yr)				
Back or neck disorders	27,456	(24,486–30,427)	8.0	(7.2–8.9)
Depression, anxiety, or emotional disorders	20,849	(18,676–23,022)	6.1	(5.5–6.7)
Migraine or chronic headaches	6,439	(4,817–8,062)	1.9	(1.4–2.4)
Stomach or bowel disorders	12,654	(10,578–14,731)	3.7	(3.1–4.3)
Insomnia	6,910	(5,434–8,387)	2.0	(1.6–2.5)
Age 50–59 (yr)				
Back or neck disorders	21,637	(18,564–24,709)	6.2	(5.3–7.1)
Depression, anxiety, or emotional disorders	13,599	(11,007–16,191)	3.9	(3.2–4.6)
Migraine or chronic headaches	4,822	(3,148–6,497)	1.4	(0.9–1.9)
Stomach or bowel disorders	10,480	(8,226–12,733)	3.0	(2.4–3.7)
Insomnia	5,705	(3,789–7,621)	1.6	(1.1–2.2)

CI, confidence interval; 1 US\$=117 yen.

United States, the prevalence of migraine was highest for both men and women aged between 35–45 yr²¹). Our study found the prevalence of migraine has been found to be higher in women than in men^{21, 22}). In the present study, we were unable to determine the proportion of wage loss due to migraines and tension-type headaches; however, based on the epidemiological characteristics of headaches, occupational health practitioners should intervene and provide better access to treatment for those suffering from these conditions²³).

Stomach or bowel disorders, which include a variety of conditions, such as gastritis, gastroesophageal reflux, and irritable bowel syndrome, can also lead to work impairment. Dean *et al.*²⁴) reported that the symptom severity of gastroesophageal reflux and nocturnal heartburn disturbed work performance. In addition, such working conditions as shift and night work can promote the development of stomach disorders, e.g., chronic gastritis, gastroduodenitis, and peptic ulcers^{25, 26}). With regard to bowel disorders,

impairment due to irritable bowel syndrome, whose prevalence is high in Japan as a result of perceived stress, was estimated to amount to 9.7–14 h of lost productivity per week among sufferers^{27, 28}). Stomach or bowel disorders are the leading cause of absenteeism among men in their 40s and women aged 18–39, and those populations need to receive information about controlling their symptoms and treatment.

Insomnia is often caused by depressive symptoms, visual display terminal workload, over-involvement in work, and frequent alcohol consumption^{29, 30}). In Japan, the prevalence of insomnia, including mid-sleep awakenings and early morning awakening insomnia, is high among people aged 50–64 yr³⁰). As the present study shows, for men in their 50s insomnia can lead to absenteeism among those severely affected.

This study has its limitations. First, workers tend to develop multiple chronic health conditions; however, we only examined the primary health condition. Thus could

Table 5. Wage loss due to presenteeism and absenteeism and its proportion of the total wage assuming 100 workers per 10-yr age group over the previous 4-wk period for female workers

	Total wage loss due to absenteeism and presenteeism per 100 workers (US\$)		Proportion of total wage loss due to absenteeism and presenteeism in the total wage of 100 workers (%)	
	Mean	(95% CI)	Mean	(95% CI)
Age 18–29 (yr)				
Back or neck disorders	14,880	(13,342–16,419)	8.6	(7.7–9.5)
Depression, anxiety, or emotional disorders	8,744	(7,796–9,691)	5.0	(4.5–5.6)
Migraine or chronic headaches	6,192	(5,356–7,029)	3.6	(3.1–4.1)
Stomach or bowel disorders	5,987	(4,844–7,130)	3.5	(2.8–4.1)
Insomnia	2,329	(1,850–2,808)	1.3	(1.1–1.6)
Age 30–39 (yr)				
Back or neck disorders	13,137	(11,842–14,433)	6.5	(5.8–7.1)
Depression, anxiety, or emotional disorders	12,331	(10,925–13,736)	6.1	(5.4–6.8)
Migraine or chronic headaches	4,530	(3,731–5,329)	2.2	(1.8–2.6)
Stomach or bowel disorders	4,430	(3,413–5,446)	2.2	(1.7–2.7)
Insomnia	2,818	(2,021–3,615)	1.4	(1.0–1.8)
Age 40–49 (yr)				
Back or neck disorders	20,841	(18,317–23,365)	9.8	(8.7–11.0)
Depression, anxiety, or emotional disorders	11,206	(9,643–12,769)	5.3	(4.6–6.0)
Migraine or chronic headaches	3,939	(2,887–4,991)	1.9	(1.4–2.4)
Stomach or bowel disorders	3,210	(2,139–4,281)	1.5	(1.0–2.0)
Insomnia	3,200	(2,526–3,874)	1.5	(1.2–1.8)
Age 50–59 (yr)				
Back or neck disorders	18,512	(15,630–21,394)	9.2	(7.8–10.7)
Depression, anxiety, or emotional disorders	4,748	(3,643–5,854)	2.4	(1.8–2.9)
Migraine or chronic headaches	3,851	(2,686–5,016)	1.9	(1.3–2.5)
Stomach or bowel disorders	3,862	(2,363–5,361)	1.9	(1.2–2.7)
Insomnia	1,378	(681–2,074)	0.7	(0.3–1.0)

CI, confidence interval; 1 US\$=117 yen.

lead to an underestimation of the burden of each chronic health condition. In addition, the health conditions identified by individual workers are not necessarily based on clinical diagnosis. Second, the prevalence of health conditions could vary according to occupation and other work-related factors. Finally, although the response rate was relatively high, the generalizability of our study is limited. Further studies should address the effect of working conditions on absenteeism and presenteeism.

In conclusion, the wage loss due to presenteeism and absenteeism per 100 workers in the 10-yr age bands was high for back or neck disorders, as these were identified by a large number of participants. However, the wage loss per person was relatively high among those choosing depression, anxiety, or emotional disorders. We delineated the burden of presenteeism and absenteeism of depressive symptoms. These values offer insight into forming strategies for workplace interventions toward increasing work performance.

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