

# The effect of long-term sickness absence on coworkers in the same work unit

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**Abstract:** After workers take long-term sickness absence due to mental disorders (LTSA-MD), the occupational stress of the coworkers in the same work unit might be affected. The aims of this study were to evaluate the effect of the incident of LTSA-MD on the coworkers' occupational stress. A retrospective cohort study of 16,032 public servants was conducted. The Brief Job Stress Questionnaire (BJSQ) was used, which was administered in 2011 and 2012. To analyze the amount of change in occupational stress, the difference between the scores of the BJSQ scales in 2011 and 2012 was calculated. After adjusting for the baseline BJSQ scales, sex, age, total number of workers, and social support, analysis of covariance of the difference between the BJSQ scales' scores showed that job stressors and stress responses worsened among the coworkers after the incident of LTSA-MD. Social support did not change among the coworkers. This study indicates that an incident of LTSA-MD in the same work unit adversely affects the coworkers' occupational stress. Focusing on the coworkers' mental state after an incident of LTSA-MD in the same work unit and an early intervention strategy are needed to prevent secondary mental illness and sickness absence in the coworkers.

**Key words:** Sickness absence, Coworkers, Public servant, Job stress, Mental disorder

## Introduction

Mental disorders have become a major global burden of disease, accounting for 7.4% of the social burden of all diseases<sup>1</sup>. In Japan, in 2014, psychiatric and behavioral inpatient morbidity was 209 in 100,000 people and outpatient morbidity was 203 in 100,000 people<sup>2</sup>, and there is a continuously increasing trend. Mental disorders often lead to work disability and decreased job productivity<sup>3, 4</sup>. In the United Kingdom, mental disorders are the cause of 40% of all sickness absences<sup>5</sup>.

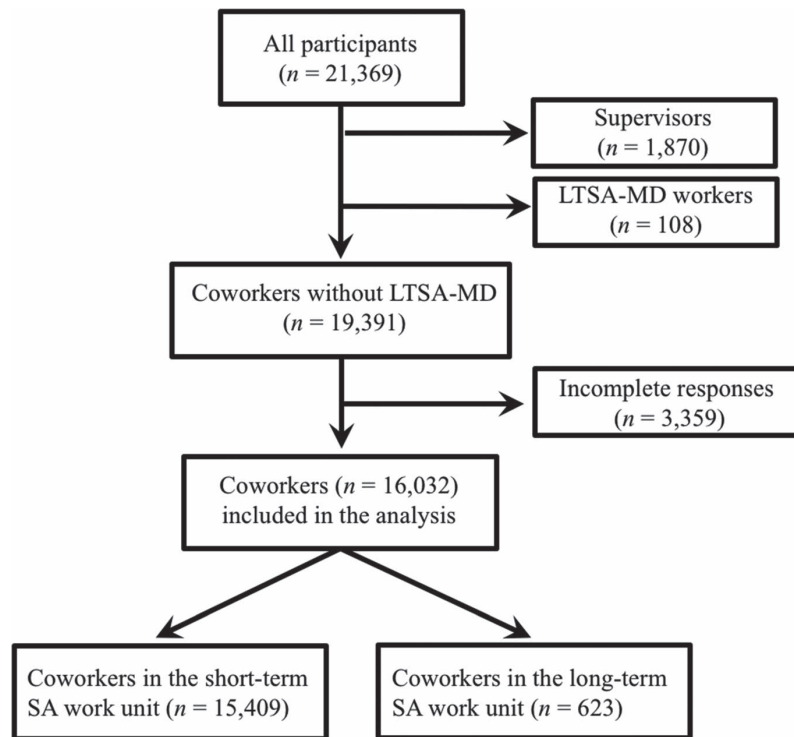
Long-term sickness absence due to mental disorders (LTSA-MD) in the workplace has become a global public health problem<sup>6</sup>. The Japanese Ministry of Health, Labour

and Welfare reported that employees in about 10% of all companies took more than 1 month of sickness absence, or resigned, because of mental disorders<sup>7</sup>. A cohort study of 7,112 Spanish patients over two yr reported that older age, severe mental disorders, being self-employed, having a non-permanent contract, and working in the real estate and construction sectors were associated with an increased probability of LTSA-MD for more than 60 d<sup>8</sup>. A case-control study of 385 workers on sick leave for more than 15 d demonstrated that LTSA-MD was associated with high job strain and low social support at work, effort-reward imbalance, and high over-commitment to work<sup>9</sup>. Job control and role ambiguity were reported to be important predictors of LTSA-MD for 30 d or more due to depressive disorders among Japanese male employees<sup>10</sup>. However, importantly, these studies have investigated only the association between an individual's factors and their own sickness absence.

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**Fig. 1. Flow chart of the selection of the study population.**

LTSA-MD: Long-term sickness absence due to mental disorders.

SA: Sickness absence.

Short-term SA: Total sickness absence period in the work unit is <12 months.

Long-term SA: Total sickness absence period in the work unit is  $\geq 12$  months.

After workers leave a work unit on LTSA-MD, many problems occur in the same work unit. For example, the workload and undesired overtime work may increase for the coworkers in the same work unit to compensate for the absent worker<sup>11)</sup> (in this study, the term “coworkers” refers to the coworkers without LTSA-MD in the same unit). These problems could lead to a conflict between the coworkers and absent worker; as such, the workplace environment could deteriorate. In terms of the possible problems in the work unit, staffing coordination problems could increase and productivity could decrease<sup>11)</sup>. In this way, these various problems can affect the condition of the coworkers.

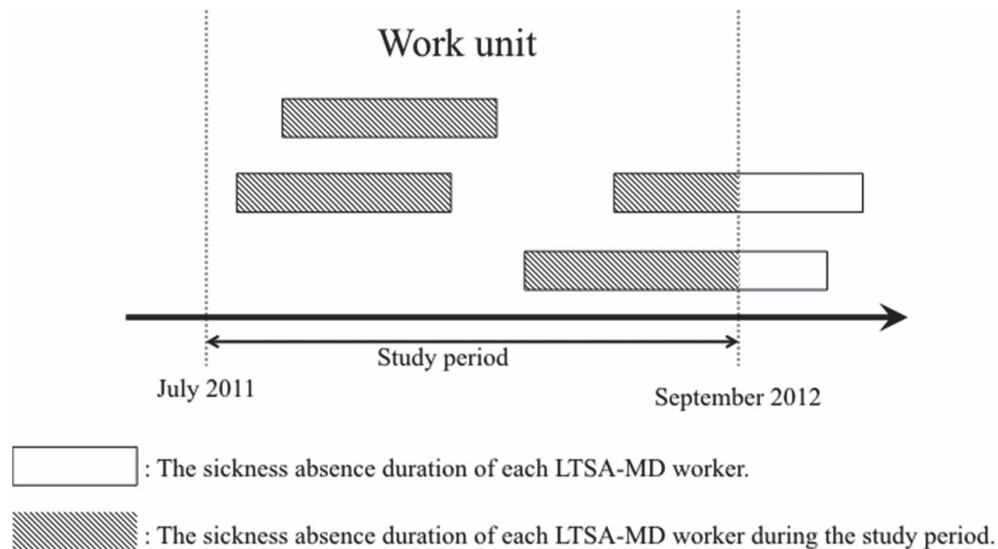
However, no study has evaluated the association between the incident of LTSA-MD and its effect on the coworkers of the absent workers. Therefore, the aims of this study were to evaluate the effect of the incident of LTSA-MD on the coworkers’ occupational stress (e.g., job stressors, stress responses, and social support), by using a brief stress questionnaire, and to clarify the effect of the incident of LTSA-MD on the coworkers. We hypothesized that the coworkers might be influenced by the incident of

LTSA-MD in the same work unit and that their occupational stress might worsen, which might lead to secondary future mental illness and sickness absence in the coworkers.

## Subjects and Methods

### Participants

This study was a retrospective cohort study that examined the effect of the incident of LTSA-MD on the coworkers in the same work unit. In City A in the Kinki region in Japan, 21,369 public servants belonged to the municipal office or the ward office during 2011 and 2012. They completed the Brief Job Stress Questionnaire (BJSQ) as part of a periodic medical examination every year. Participants answered the BJSQ in both July 2011 and September 2012, and we set this term as the study period. We excluded 1,870 supervisors from the analysis to reduce any bias arising from the effect of the supervisors’ support (the rank of supervisor was defined as managers and supervisors beyond deputy manager class). No supervisor took LTSA-MD during the study period. After the LTSA-MD workers



**Fig. 2.** Diagram of the duration of long-term sickness absence due to mental disorders in this study. LTSA-MD: Long-term sickness absence due to mental disorders. Participants answered the Brief Job Stress Questionnaire in both July 2011 and September 2012. The LTSA-MD was defined as sickness absence due to mental disorders for more than 90 d. We calculated the total duration of sickness absence of all LTSA-MD workers in each work unit. An LTSA-MD worker may have had multiple episodes during the study period, with each episode lasting for more than 90 d.

( $n=108$ ) were excluded, 19,391 coworkers remained. We then excluded questionnaires with incomplete responses ( $n=3,359$ ). Finally, the data of 16,032 coworkers (82.2%) were analyzed (Fig. 1).

#### *Long-term sickness absence due to mental disorders*

The LTSA-MD was defined as sickness absence due to mental disorders for more than 90 d. The reason for LTSA-MD was confirmed with a medical certificate issued by a doctor. The International Classification of Diseases, Tenth Revision (ICD-10) codes<sup>12)</sup> were used to diagnose and classify the mental disorders (F code) that resulted in the LTSA-MD. Each LTSA-MD began after the baseline point (July 2011). On the other hand, the end points of each LTSA-MD episode may have occurred outside of the study period. Any sickness absence period of the LTSA-MD episode must have overlapped the study period (Fig. 2). An LTSA-MD worker may have had multiple episodes during the study period, with each episode lasting for more than 90 d.

We summed the sickness absence duration of each LTSA-MD worker during the study period. A work unit was defined as a specific part of a large organization in which both supervisors and general employees work together. Then, we calculated the total duration of sickness absence of all LTSA-MD workers in each work unit during the study period, and defined this as the total sick-

ness absence period. The work units were separated into two categories as follows: a long-term sickness absence (SA) work unit, in which the total sickness absence period was 12 months or more, and a short-term SA work unit, in which the total sickness absence period was shorter than 12 months. The short-term SA work units included work units without any sickness absence. Participants were categorized into two groups according to the type of work unit to which they belonged. The criterion for splitting the work units into long-term SA and short-term SA work units was 12 months; this was used in order to consider whether there was always nearly one employee on leave from a work unit during the study period.

## Measurements

#### *Demographic and occupational variables*

The demographic variables were sex and age. The occupational variable was the total number of workers in a participant's work unit.

#### *The Brief Job Stress Questionnaire*

The BJSQ was originally created from questions in the Job Content Questionnaire and the Generic Job Stress Questionnaire of the National Institute for Occupational Safety and Health (NIOSH)<sup>13)</sup>. A large-scale investigation has confirmed the reliability and validity of the BJSQ and

that it is a useful measure of the mental health of Japanese workers<sup>14</sup>). It is an established and widely used method for assessing job stress and it has sufficient reliability and validity in Japan<sup>15</sup>). The BJSQ contains 57 items and uses a 4-point Likert-type scale ranging from “agree” (4) to “disagree” (1) to measure job stressors (17 items), stress responses (29 items), social support (nine items), and work and life satisfaction (two items). Job stressors are psychological stressors related to work (e.g., job demands and job control), stress responses are psychological and physiological stress reactions (e.g., depression and vigor), and social support is social support in the workplace (e.g., supervisor support and coworker support). In this study, we focused on three scales of the BJSQ: job stressor, stress response, and social support. Higher scores of the three scales indicate greater stress, and reverse scoring was used where necessary. The Cronbach’s alpha coefficient for each scale was as follows: 0.764, 0.936, and 0.863 (in 2011), and 0.757, 0.938, and 0.862 (in 2012).

#### *Ethics statement*

The Human Subjects Review Committee of Osaka City University approved the protocol of this study (authorization number: 2969). As the data already existed, the review committee did not require the participants’ written informed consent. Before we obtained the data, the staff in City A had anonymized and de-identified the participants’ data. We acquired the anonymous BJSQ data of the workers (with encrypted identification) and a list of workers on LTSA-MD, which the healthcare center of City A had collected as part of an annual mental health checkup to evaluate and improve the psychological work environment.

#### *Statistical analysis*

To analyze the amount of change in occupational stress, the differences between the BJSQ scales’ scores in 2011 and 2012 ( $\Delta$ BJSQ scales) were calculated. To examine the effect of LTSA-MD, analysis of covariance (ANCOVA) of the baseline BJSQ scales, sex, age, total number of workers in a participant’s work unit, and social support was performed for the  $\Delta$ BJSQ scales. The ANCOVA model was calculated using IBM SPSS Statistics for Windows version 24 (IBM Corp., Armonk, NY, USA).

## **Results**

#### *Participants’ characteristics*

During the study period, 108 workers took LTSA-MD. The ICD-10 diagnostic code used most frequently in the

classification of workers with LTSA-MD was F3 mood disorders (85 workers; 78.7%); the second most frequent code was F4 stress-related and somatoform disorders (18 workers; 16.7%), and this was followed by “others” (five workers; 4.6%).

Regarding the sickness absence period, 41 workers (38.0%) were on leave for less than 6 months, 34 workers (31.5%) were on leave for 6 to 8 months, 20 workers (18.5%) were on leave for 9 to 11 months, and 13 workers (12.0%) were on leave for 12 months or more. Regarding the work units, there were 810 short-term SA work units and 16 long-term SA work units.

Of the 16,032 coworkers, 11,178 (69.7%) were male and 4,854 (30.3%) were female, with a mean age of  $42.0 \pm 9.5$  yr. Of the 15,409 participants in the short-term SA work units, 10,770 (69.9%) were male and 4,639 (30.1%) were female, with a mean age of  $42.1 \pm 9.5$  yr. Of the 623 participants in the long-term SA work units, 408 (65.5%) were male and 215 (34.5%) were female, with a mean age of  $40.9 \pm 9.3$  yr.

#### *The scores of the Brief Job Stress Questionnaire’s scales by year and the differences between the scales’ scores in 2011 and 2012*

Table 1 shows the BJSQ scales’ scores by year and the differences between the BJSQ scales’ scores in 2011 and 2012. Table 2 presents the results of the ANCOVA of the differences between the BJSQ scales’ scores in 2011 and 2012 among the short-term and long-term SA work units. After adjusting the baseline BJSQ scales’ scores, sex, age, total number of workers in a participant’s work unit and social support using ANCOVA, it was found that job stressors ( $p=0.000$ ) and stress responses ( $p=0.009$ ) worsened among the coworkers in the long-term SA work units compared with the coworkers in the short-term SA work units after the incident of LTSA-MD. Social support ( $p=0.342$ ) did not change significantly among the workers in both groups after the incident of LTSA-MD.

## **Discussion**

In this study, we evaluated the changes in the coworkers’ occupational stress after the incident of LTSA-MD in the same work unit. The current study is the first to investigate the effect of an incident of LTSA-MD on the coworkers in the same workplace. It was found that, after the incident of LTSA-MD, job stressors and stress responses worsened among the coworkers. However, contrary to our hypothesis, social support did not change significantly after the

**Table 1. The Brief Job Stress Questionnaire scales' scores by year and the differences between the scales in 2011 and 2012**

	BJSQ scales' score in 2011			BJSQ scales' score in 2012			ΔBJSQ scales (2012–2011)		
	Whole ( <i>n</i> = 16,032)	Short-term SA ( <i>n</i> = 15,409)	Long-term SA ( <i>n</i> = 623)	Whole ( <i>n</i> = 16,032)	Short-term SA ( <i>n</i> = 15,409)	Long-term SA ( <i>n</i> = 623)	Whole ( <i>n</i> = 16,032)	Short-term SA ( <i>n</i> = 15,409)	Long-term SA ( <i>n</i> = 623)
Job stressor (17–68)	42.2 ± 6.5	42.2 ± 6.5	42.0 ± 6.7	42.6 ± 6.4	42.5 ± 6.4	43.3 ± 6.7	0.4 ± 5.8	0.3 ± 5.8	1.3 ± 5.8
Stress response (29–116)	57.0 ± 14.7	57.0 ± 14.7	56.5 ± 14.6	58.0 ± 15.2	57.9 ± 15.2	58.9 ± 16.0	1.0 ± 12.4	0.9 ± 12.3	2.4 ± 13.3
Social support (9–36)	19.2 ± 5.1	19.2 ± 5.1	19.1 ± 5.0	19.6 ± 5.1	19.5 ± 5.1	19.7 ± 5.3	0.4 ± 4.6	0.4 ± 4.6	0.5 ± 4.7

BJSQ: Brief Job Stress Questionnaire.

SA: Sickness absence.

ΔBJSQ scales: Calculated value of the differences between the BJSQ scales in 2011 and 2012.

**Table 2. The results of the statistical differences between coworkers in short-term and long-term sickness absence work units, using analysis of covariance for the differences between the Brief Job Stress Questionnaire scales' scores in 2011 and 2012**

The BJSQ scales	Type III sum of squares	<i>df</i>	Mean square	<i>F</i> -value	<i>p</i> -value
Job stressor	474.915	1	474.915	18.132	0.000 *
Stress response	885.351	1	885.351	6.751	0.009 *
Social support	15.204	1	15.204	0.902	0.342

BJSQ: Brief Job Stress Questionnaire.

Adjusted for baseline Brief Job Stress Questionnaire scales' scores, sex, age, total number of workers in a participant's work unit and social support.

incident of LTSA-MD.

In general, after the incident of sickness absence in the work unit, the coworkers may have to do additional work. Moreover, accidents might occur when the coworkers are confronted with unfamiliar work<sup>11</sup>. If any of these negative consequences occur, it is likely to lead to conflict between the coworker and the absent worker, and coworkers might develop negative beliefs about the work environment although they are not absent<sup>11</sup>.

In the present study, the job stressors of the coworkers in the long-term SA work units worsened compared to those in the short-term SA work units. After workers take LTSA-MD, the coworkers in the same work unit may have to deal with work in addition to their own original work to compensate for the absent worker. These changes might lead to higher job demands, lower job control, unfairness, or the deterioration of the workplace environment among the coworkers. In addition, in the present study, the stress responses among the group of coworkers in the long-term SA work units worsened more than in the short-term SA work units. A previous study reported that high levels of stress response have a significant relationship with the onset of depression among Japanese employees in a software company<sup>16</sup>. Our earlier study showed that the BJSQ scale of stress response can effectively predict the occur-

rence of workers with LTSA-MD<sup>17</sup>. Furthermore, the NIOSH job stress model proposes that stress reactions are affected by job stressors<sup>18</sup>. The negative emotions toward the absent workers, work content, and working environment might cause more psychological and physiological stress reactions among the coworkers.

Social support did not change significantly among the coworkers after the incident of LTSA-MD. In general, after the incidents of LTSA-MD, absent workers are rarely substituted with new employees. Hence, the coworkers and supervisors usually have to do additional work and may not be able to help others. Therefore, we expected the social support to get worse due to the incident of LTSA-MD. However, the results were not what we had expected, which might be because the coworkers helped each other more than before and, as a result, this positive change compensated for the negative change due to the incident of LTSA-MD. As social support, which is considered a buffer factor in the NIOSH job stress model, did not change among the coworkers in this study, it can be thought that the deterioration of the job stressors directly caused the deterioration of the stress responses in this study.

The significance of this research is that it demonstrates that an incident of LTSA-MD in the same work unit can adversely affect the coworkers' occupational stress. It is important for occupational health services to pay more attention to the coworkers' mental health after an incident of LTSA-MD in the same work unit. Early countermeasures are necessary, such as personnel recruitment or the fair distribution of additional work to the coworkers.

Previous studies have shown that worker participation in intervention programs improved some job stressors or stress responses and prevented workers' sickness absence due to mental disorders<sup>19, 20</sup>. It is also important for occupational health services to provide mental health programs for the coworkers with higher job stress. After an incident of LTSA-MD in the work unit, the promotion of early intervention and the coworkers' participation in a mental

healthcare program by occupational health staff will prevent secondary future mental illness and sickness absence in the coworkers.

It is assumed that there are potential biases and residual confounding factors besides the items investigated in this study. The magnitude of workload or responsibility which LTSA-MD workers had before they took LTSA-MD affects the degree of changes in coworkers' occupational stress after they took LTSA-MD. If LTSA-MD workers had high workload before they took LTSA-MD, the coworkers would work on behalf of LTSA-MD workers, and experience high occupational stress. Additionally, the seriousness of an illness of LTSA-MD workers affects work performance before they took LTSA-MD. Serious illnesses may make cause high presenteeism among them before they took LTSA-MD. It may have had an impact on the coworkers before and after the incident of LTSA-MD. Several previous studies reported that presenteeism accounts for the majority of the work productivity impairment, compared with absenteeism<sup>21, 22</sup>. It is supposed that coworkers' occupational stress caused by higher presenteeism of LTSA-MD workers before they took LTSA-MD decreased after they took LTSA-MD. We could not obtain data on these factors in this study, which is one of the limitations of this study.

This study has other limitations. First, the data were obtained from public servants in one city in Japan. Therefore, it may be difficult to generalize the findings to other regions, countries, and job categories. Second, we defined LTSA-MD as taking leave from work for more than 90 d; however, many other studies define LTSA-MD as a period of absence shorter than 60 d. The mental state of the workers on sick leave in our study might be more severe than that in other studies and thus they may require a longer period of absence. Third, the length of time between the completion of the questionnaires and taking sickness absence was not considered strictly. In this study, we could obtain only annual mental health checkup data. Therefore, we could not align the length of the period between the start or end points of LTSA-MD and the time of administering the second questionnaire. Additionally, several work units had multiple LTSA-MD workers. In order to reduce the influence, we calculated the total duration of sickness absence of LTSA-MD workers in each work unit during the study period. Fourth, the differences between the work units were not considered. Differences in the work content and atmosphere of each work unit may affect the coworkers' occupational stress. Fifth, there may be differences depending on the year; the present study period was

only for the two years of 2011 and 2012. Sixth, all of the data were collected by self-report; thus, the results may be influenced by personality differences or response tendencies. Further studies are needed to examine other occupational categories, work units, locations, and years.

## Conclusion

The present study indicated that an incident of LTSA-MD in the same work unit could adversely affect the coworkers' occupational stress. Focusing on the mental state of the coworkers after an incident of LTSA-MD in the same work unit and an early countermeasure strategy are needed to prevent secondary future mental illness and sickness absence in the coworkers.

## References

- 1) Murray CJ, Vos T, Lozano R, Naghavi M, Flaxman AD, Michaud C, Ezzati M, Shibuya K, Salomon JA, Abdalla S, Aboyans V, Abraham J, Ackerman I, Aggarwal R, Ahn SY, Ali MK, Alvarado M, Anderson HR, Anderson LM, Andrews KG, Atkinson C, Baddour LM, Bahalim AN, Barker-Collo S, Barrero LH, Bartels DH, Basáñez MG, Baxter A, Bell ML, Benjamin EJ, Bennett D, Bernabé E, Bhalla K, Bhandari B, Bikbov B, Bin Abdulhak A, Birbeck G, Black JA, Blencowe H, Blore JD, Blyth F, Bolliger I, Bonaventure A, Boufous S, Bourne R, Boussinesq M, Braithwaite T, Brayne C, Bridgett L, Brooker S, Brooks P, Brugha TS, Bryan-Hancock C, Bucello C, Buchbinder R, Buckle G, Budke CM, Burch M, Burney P, Burstein R, Calabria B, Campbell B, Canter CE, Carabin H, Carapetis J, Carmona L, Cella C, Charlson F, Chen H, Cheng AT, Chou D, Chugh SS, Coffeng LE, Colan SD, Colquhoun S, Colson KE, Condon J, Connor MD, Cooper LT, Corriere M, Cortinovis M, de Vaccaro KC, Couser W, Cowie BC, Criqui MH, Cross M, Dabhadkar KC, Dahiya M, Dahodwala N, Damsere-Derry J, Danaei G, Davis A, De Leo D, Degenhardt L, Dellavalle R, Delossantos A, Denenberg J, Derrett S, Des Jarlais DC, Dharmaratne SD, Dherani M, Diaz-Torne C, Dolk H, Dorsey ER, Driscoll T, Duber H, Ebel B, Edmond K, Elbaz A, Ali SE, Erskine H, Erwin PJ, Espindola P, Ewoigbokhan SE, Farzadfar F, Feigin V, Felson DT, Ferrari A, Ferri CP, Fèvre EM, Finucane MM, Flaxman S, Flood L, Foreman K, Forouzanfar MH, Fowkes FG, Fransen M, Freeman MK, Gabbe BJ, Gabriel SE, Gakidou E, Ganatra HA, Garcia B, Gaspari F, Gillum RF, Gmel G, Gonzalez-Medina D, Gosselin R, Grainger R, Grant B, Groeger J, Guillemin F, Gunnell D, Gupta R, Haagsma J, Hagan H, Halasa YA, Hall W, Haring D, Haro JM, Harrison JE, Havmoeller R, Hay RJ, Higashi H, Hill C, Hoen B, Hoffman H, Hotez PJ, Hoy D, Huang JJ, Ibeanusi SE, Jacobsen KH, James SL, Jarvis D, Jasrasaria R,

- Jayaraman S, Johns N, Jonas JB, Karthikeyan G, Kassebaum N, Kawakami N, Keren A, Khoo JP, King CH, Knowlton LM, Kobusingye O, Koranteng A, Krishnamurthi R, Laden F, Laloo R, Laslett LL, Lathlean T, Leasher JL, Lee YY, Leigh J, Levinson D, Lim SS, Limb E, Lin JK, Lipnick M, Lipshultz SE, Liu W, Loane M, Ohno SL, Lyons R, Mabweijano J, MacIntyre MF, Malekzadeh R, Mallinger L, Manivannan S, Marcenes W, March L, Margolis DJ, Marks GB, Marks R, Matsumori A, Matzopoulos R, Mayosi BM, McAnulty JH, McDermott MM, McGill N, McGrath J, Medina-Mora ME, Meltzer M, Mensah GA, Merriman TR, Meyer AC, Miglioli V, Miller M, Miller TR, Mitchell PB, Mock C, Mocumbi AO, Moffitt TE, Mokdad AA, Monasta L, Montico M, Moradi-Lakeh M, Moran A, Morawska L, Mori R, Murdoch ME, Mwaniki MK, Naidoo K, Nair MN, Naldi L, Narayan KM, Nelson PK, Nelson RG, Nevitt MC, Newton CR, Nolte S, Norman P, Norman R, O'Donnell M, O'Hanlon S, Olives C, Omer SB, Ortblad K, Osborne R, Ozgediz D, Page A, Pahari B, Pandian JD, Rivero AP, Patten SB, Pearce N, Padilla RP, Perez-Ruiz F, Perico N, Pesudovs K, Phillips D, Phillips MR, Pierce K, Pion S, Polanczyk GV, Polinder S, Pope CA 3rd, Popova S, Porrini E, Pourmalek F, Prince M, Pullan RL, Ramaiah KD, Ranganathan D, Razavi H, Regan M, Rehm JT, Rein DB, Remuzzi G, Richardson K, Rivara FP, Roberts T, Robinson C, De León FR, Ronfani L, Room R, Rosenfeld LC, Rushton L, Sacco RL, Saha S, Sampson U, Sanchez-Riera L, Sanman E, Schwebel DC, Scott JG, Segui-Gomez M, Shahraz S, Shepard DS, Shin H, Shivakoti R, Singh D, Singh GM, Singh JA, Singleton J, Sleet DA, Sliwa K, Smith E, Smith JL, Stapelberg NJ, Steer A, Steiner T, Stolk WA, Stovner LJ, Sudfeld C, Syed S, Tamburlini G, Tavakkoli M, Taylor HR, Taylor JA, Taylor WJ, Thomas B, Thomson WM, Thurston GD, Tleyjeh IM, Tonelli M, Towbin JA, Truelsen T, Tsilimbaris MK, Ubeda C, Undurraga EA, van der Werf MJ, van Os J, Vavilala MS, Venketasubramanian N, Wang M, Wang W, Watt K, Weatherall DJ, Weinstock MA, Weintraub R, Weisskopf MG, Weissman MM, White RA, Whiteford H, Wiebe N, Wiersma ST, Wilkinson JD, Williams HC, Williams SR, Witt E, Wolfe F, Woolf AD, Wulf S, Yeh PH, Zaidi AK, Zheng ZJ, Zonies D, Lopez AD, AlMazroa MA, Memish ZA (2012) Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet* **380**, 2197–223.
- 2) Ministry of Health, Labour and Welfare. Summary of Patient Survey 2014. [http://www.mhlw.go.jp/english/database/db-hss/dl/sps\\_2014\\_02.pdf](http://www.mhlw.go.jp/english/database/db-hss/dl/sps_2014_02.pdf). Accessed December 19, 2016.
  - 3) Hjarsbech PU, Andersen RV, Christensen KB, Aust B, Borg V, Rugulies R (2011) Clinical and non-clinical depressive symptoms and risk of long-term sickness absence among female employees in the Danish eldercare sector. *J Affect Disord* **129**, 87–93.
  - 4) Knudsen AK, Harvey SB, Mykletun A, Øverland S (2013) Common mental disorders and long-term sickness absence in a general working population. The Hordaland Health Study. *Acta Psychiatr Scand* **127**, 287–97.
  - 5) Shiels C, Gabbay MB, Ford FM (2004) Patient factors associated with duration of certified sickness absence and transition to long-term incapacity. *Br J Gen Pract* **54**, 86–91.
  - 6) Henderson M, Glozier N, Holland Elliott K (2005) Long term sickness absence. *BMJ* **330**, 802–3.
  - 7) Ministry of Health, Labour and Welfare. Survey on State of Employees' Health 2012. [http://www.mhlw.go.jp/toukei/list/dl/h25-46-50\\_01.pdf](http://www.mhlw.go.jp/toukei/list/dl/h25-46-50_01.pdf). Accessed January 13, 2017.
  - 8) Real E, Jover L, Verdaguer R, Griera A, Segalàs C, Alonso P, Contreras F, Arteman A, Menchón JM (2016) Factors associated with long-term sickness absence due to mental disorders: A cohort study of 7,112 patients during the Spanish economic crisis. *PLoS One* **11**, e0146382.
  - 9) Silva-Junior JS, Fischer FM (2014) Long-term sickness absence due to mental disorders is associated with individual features and psychosocial work conditions. *PLoS One* **9**, e115885.
  - 10) Inoue A, Kawakami N, Haratani T, Kobayashi F, Ishizaki M, Hayashi T, Fujita O, Aizawa Y, Miyazaki S, Hiro H, Masumoto T, Hashimoto S, Araki S (2010) Job stressors and long-term sick leave due to depressive disorders among Japanese male employees: findings from the Japan Work Stress and Health Cohort study. *J Epidemiol Community Health* **64**, 229–35.
  - 11) Goodman PS, Adkin RS (1984) *Absenteeism*, 436, Jossey Bass Ltd, London.
  - 12) World Health Organization (2008) ICD-10: International statistical classification of diseases and related health problems, World Health Organization, New York.
  - 13) Harada H, Suwazono Y, Sakata K, Okubo Y, Oishi M, Uetani M, Kobayashi E, Nogawa K (2005) Three-shift system increases job-related stress in Japanese workers. *J Occup Health* **47**, 397–404.
  - 14) Kawakami N, Kobayashi F, Araki S, Haratani T, Furui H (1995) Assessment of job stress dimensions based on the job demands-control model of employees of telecommunication and electric power companies in Japan: reliability and validity of the Japanese version of the Job Content Questionnaire. *Int J Behav Med* **2**, 358–75.
  - 15) Endo M, Muto T, Haruyama Y, Yuhara M, Sairenchi T, Kato R (2015) Risk factors of recurrent sickness absence due to depression: a two-year cohort study among Japanese employees. *Int Arch Occup Environ Health* **88**, 75–83.
  - 16) Wada K, Sairenchi T, Haruyama Y, Taneichi H, Ishikawa Y, Muto T (2013) Relationship between the onset of depression and stress response measured by the Brief Job Stress Questionnaire among Japanese employees: a cohort study. *PLoS One* **8**, e56319.
  - 17) Ishimoto H, Iwasaki S, Inoue K (2016) Brief screening tools for long-term sickness absence due to mental disorders in public servants. *Health* **8**, 1453–64.
  - 18) Hurrell JJ Jr, McLaney MA (1988) Exposure to job stress—

- a new psychometric instrument. *Scand J Work Environ Health* **14** Suppl 1, 27–8.
- 19) Ikegami K, Tahara H, Yamada T, Mafune K, Hiro H, Nagata S (2010) Effects of a mental health training program for manufacturing company managers. *J UOEH* **32**, 141–53.
- 20) Kobayashi Y, Kaneyoshi A, Yokota A, Kawakami N (2008) Effects of a worker participatory program for improving work environments on job stressors and mental health among workers: a controlled trial. *J Occup Health* **50**, 455–70.
- 21) Stewart WF, Ricci JA, Chee E, Hahn SR, Morganstein D (2003) Cost of lost productive work time among US workers with depression. *JAMA* **289**, 3135–44.
- 22) Kessler RC, Heeringa S, Lakoma MD, Petukhova M, Rupp AE, Schoenbaum M, Wang PS, Zaslavsky AM (2008) Individual and societal effects of mental disorders on earnings in the United States: results from the national comorbidity survey replication. *Am J Psychiatry* **165**, 703–11.