Gender differences exist in the associations between precarious employment and mental health in Japan. Precarious employment increases the risk of incidence of serious psychological distress at a clinical level, but only among middle-aged men. Given the increasing numbers of precarious workers, there is an urgent need to develop more effective policies for reducing health disadvantages caused by precarious employment.

Affiliation: Department of Hygiene and Public Health, Nippon Medical School, 1-1-5 Sendagi, Bunkyo-ku, Tokyo, 113-8602, Japan. kachi@nms.ac.jp

Refers to the following texts of the Journal: 2012;38(6):537-545 2003;29(1):15-21

The following articles refer to this text: 2015;41(4):329-337; 2015;41(4):325-327; 2016;42(1):71-79; 2020;46(3):235-247

Key terms: anxiety; cohort study; depression; employment; employment contract; gender difference; Japan; longitudinal study; mental health; middle-aged worker; precarious employment; psychological distress; temporary work

This article in PubMed: www.ncbi.nlm.nih.gov/pubmed/24942557

Additional material
Please note that there is additional material available belonging to this article on the Scandinavian Journal of Work, Environment & Health -website.
Precarious employment and the risk of serious psychological distress: a population-based cohort study in Japan

by Yuko Kachi, PhD, Toshiaki Otsuka, MD, PhD, Tomoyuki Kawada, MD, PhD

Kachi Y, Otsuka T, Kawada T. Precarious employment and the risk of serious psychological distress: a population-based cohort study in Japan. Scand J Work Environ Health. 2014;40(5):465–472. doi:10.5271/sjweh.3442

Objectives This study examines whether precarious employment increases the risk of serious psychological distress (SPD) in a nationally representative cohort of Japanese middle-aged people.

Methods From 2005–2009, we followed 8486 male and 6736 female participants (aged 50–59 years) in the Longitudinal Survey of Middle-aged and Elderly Persons. All individuals were employed and free of SPD, cardiovascular disease, and cancer at baseline. The participants were classified into two groups based on their baseline employment contract: precarious and full-time permanent work. SPD was assessed at each year during the study, using the K6 scale, a self-rated 6-item scale that screens for mood or anxiety disorders. We used discrete-time survival analysis, with a complementary log-log link, to examine the effect of precarious employment on SPD incidence.

Results During a maximum follow-up period of four years, 374 men and 364 women developed SPD. Male precarious employees were more likely to develop SPD than male full-time permanent employees (hazard ratio 1.79, 95% confidence interval 1.28–2.51) in the full model, after adjusting for sociodemographic and occupational factors, cardiovascular disease risk, and K6 scores at baseline. By contrast, no significant association was observed among female employees. However, an analysis stratified by marital status revealed an association similar to that found among men but only among unmarried women.

Conclusions The findings suggest that precarious employment is associated with double the risk of SPD incidence among middle-aged Japanese men and – when stratified by marital status – among unmarried women. This highlights a major gender difference in the association between precarious employment and risk of SPD.

Key terms anxiety; depression; employment contract; gender difference; longitudinal study; mental health; middle-aged worker; temporary work.

The number of workers employed precariously has increased worldwide under the competitive pressures of the increasingly globalized economy. In Japan, precarious employment includes part-time, dispatched, and fixed-term work, and these accounted for 20% and 54% of all paid employment for males and females, respectively, in 2013 (1). Precarious employment involves numerous “bad job” characteristics (2–4), such as low income, job insecurity, lack of job training, and exposure to hazardous working conditions (eg, excessive physical strain, low job control, and more noise and air pollution). These characteristics widen the socioeconomic gradients in health between full-time permanent and precarious workers, thus stimulating public health researchers’ interest in examining the health disadvantages faced by precarious workers.

Previous evidence suggests that precarious employment is bidirectionally associated with mental health. Precarious employment can adversely affect mental health through the above-mentioned bad job characteristics (5); however, poor mental health can be a risk factor for precarious employment as well, because health problems reduce the chances of achieving a good position in the labor market (6). Several (7–12), but not all (13–15), longitudinal studies have shown that experiencing precarious employment is associated with a greater incidence of poor mental health, after controlling for the selection effects of mental health on precarious employment. In other words, these studies adjusted for baseline mental health in the multivariate analyses or excluded participants with poor mental health at baseline.

1 Department of Hygiene and Public Health, Nippon Medical School, Tokyo, Japan.

Correspondence to: Yuko Kachi, Department of Hygiene and Public Health, Nippon Medical School, 1-1-5 Sendagi, Bunkyo-ku, Tokyo, 113-8602, Japan. [E-mail: kachi@nms.ac.jp]
To date, most longitudinal studies on the effects of precarious employment on mental health have been conducted in Europe (7–9, 11, 13, 14) and North America (10, 12). Importantly, some of these studies relied on data collected over a decade or more (10–14). Although differences in temporal and social context (eg, gender roles, labor policies, and social security policies) might affect the association between precarious employment and poor mental health, comparable Asian longitudinal studies using updated data (15) are scarce. In addition, although most previous studies have focused only on mild-to-moderate mental health problems (7–9, 11, 13, 14), it is important to examine people with clinical levels of mental health problems because of the high rates of work disability in this population (16).

The objectives of this study were to examine the association between precarious employment and the incidence of serious psychological distress (SPD) at a clinical level over four years after controlling for the effects of mental health selection into precarious employment. To accomplish this, we used data collected from 2005–2009 from a nationally representative sample of middle-aged men and women.

Methods

Data source

We used data from the Longitudinal Survey of Mid-

dle-aged and Elderly Persons (LSMEP), an ongoing

nationally representative cohort study (17) conducted by the Ministry of Health, Labor and Welfare. The primary objective of the LSMEP is to help inform policy development by monitoring household, employment, and health status. The first wave began in November 2005, and the subsequent waves have continued every year since. We obtained permission from the Ministry of Health, Labor, and Welfare to use data from the first through fifth waves of the LSMEP (2005–2009). All waves utilized a self-administered questionnaire survey conducted by mail and included the same questions about employment and psychological distress.

Using a cluster random sampling, the LSMEP targeted a random sample of all men and women aged 50–59 years who lived in 2515 census tracts throughout Japan at the end of 2005. Of the 40 877 eligible participants, 34 240 returned the first wave (baseline) questionnaires (response rate: 83.8%), and these individuals were followed up thereafter. The retention rate through 2009 was 83.9%. Ethics approval for the present study was not required because this was a retrospective analysis of national surveillance data that is free of personally identifiable information.

Study population

We excluded participants who met the following criteria sequentially from baseline data: those who were not paid employees (N=13 876); farming, fishery, or forestry workers (N=156); those with a history or presence of stroke, heart disease, or cancer (N=921); and those with SPD (N=362) or missing data on SPD (N=1168). We also excluded participants with no follow-up survey (N=1137) and missing data on incident SPD (N=1398). Thus, a total of 15 222 employees without SPD at baseline were included in this study.

Outcome

Psychological distress was measured using the Japa-
nese version of the K6, a self-rated 6-item scale that screens for any Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) mood or anxiety disorders (18, 19). The K6 asks how often respondents have experienced symptoms of nonspecific psychological distress during the past 30 days (eg, “Did you feel nervous?”). Each item was scored on a five-point Likert scale (0=none of the time; 4=all the time). The total scores ranged from 0–24, with higher scores indicating greater psychological distress. We used a cut-off point of ≥14 to define SPD. A previous validation study showed that K6 scores of 14–24 give a positive predictive value of 85% for the diagnosis of any DSM-IV mood or anxiety disorder, under the assumption that its prevalence rate in a population is 5% (19). The incidence of SPD across testing times was defined as not having SPD at baseline and being identified as a new case of SPD at one of the four follow-ups.

Predictor

Employment contract was assessed by a question about employment status with nine response options (eg, self-employed worker). We selected four response options regarding employment and classified them into two categories: full-time permanent (full-time permanent employee) or precarious (part-time employee, dispatched employee from temporary labor agency, or contract or entrusted employee).

Although the classification of the employment con-

tract was based on self-report, generally, in Japan, only workers who meet all three of the following conditions are considered to be full-time permanent workers: (i) guaranteed lifetime employment until retirement; (ii) direct hire by their employers; and (iii) full-time employment. Workers who do not meet all three criteria are considered precarious workers. Recently, full-time permanent employment has been gaining more flexibil-
ity in terms of work hours; some employees work fewer hours per day and some fewer total hours per week (20).

Covariates

A broad set of baseline covariates, which could be associated with either employment contract or psychological distress, included: (i) age (continuous), (ii) marital status (married, never married, or divorced/widowed), (iii) equalized household expenditure (quartiles), (iv) hours of work (<40 or ≥40 hours/week), (v) occupation (professional/technician, manager, sales/service/clerical, security/transportation/labor, or others), (vi) company size (1–29 employees, 30–299 employees, 300–999 employees, ≥1000 employees, or civil service offices), (vii) organizational tenure (<5 years, 5–14 years, 15–29 years, or ≥30 years), (viii) cardiovascular disease (CVD) risk (none or any), and (ix) K6 scores (range 0–13; continuous).

Equalized household expenditure was calculated by dividing household expenditure during the previous month by the square root of the household size. Company size was classified with reference to the definition of small- and medium-sized companies listed in the Japan Small- and Medium-sized Enterprise Basic Act. Civil service offices were classified as a separate category, regardless of their size, because the original survey did not ask the size of civil service offices. CVD risk was identified when participants reported being diagnosed with diabetes, hyperlipidemia, or hypertension by their physicians.

Statistical analysis

We performed all analyses separately by gender due to major differences in the ways men and women responded to key variables. First, the baseline characteristics were described as either percentages or means (SD) and were compared between precarious and full-time permanent employees. Second, discrete-time survival analyses, with a complementary log-log link, were performed to examine the effect of employment contract at baseline on the risk of incident SPD (21). This approach, which is the discrete-time equivalent of the Cox proportional hazard model, is appropriate when events that occur in continuous time are recorded at yearly intervals. The models controlled for time (ie, years since baseline) in addition to baseline covariates. The participants were censored at the first SPD event, loss to follow-up, or the end of the study period.

Finally, four sensitivity analyses were performed on subgroups. The first analyzed participants without a change in employment contract during the follow-up period (ie, the majority of all participants, at 70%) to avoid a time-dependent bias (22). Participants’ employment status could change from full-time permanent or precarious employment at baseline to various options dur-

Results

Baseline characteristics

Table 1 shows the baseline characteristics of 8486 men and 6736 women who initially did not have SPD by employment contract. Precarious employees of both genders were more likely to have the following in comparison to full-time employees: a lower household expenditure; part-time work; be employed in security, transportation, or manual labor; and have shorter organizational tenure. Female precarious employees were more likely to be married than were female full-time employees, whereas male precarious employees were less likely to be married than were male full-time employees. Male precarious employees had higher K6 scores than did male full-time employees, whereas female precarious employees had lower K6 scores than did female full-time employees. Male precarious employees were more likely to work in smaller companies than were male full-time employees.

Precarious employment and incidence of SPD

During the maximum follow-up period of four years (median=4 years), 374 men and 364 women developed
Table 1. Baseline characteristics by gender and employment contract.

|                          | Men                                  | Women                                |
|--------------------------|--------------------------------------|--------------------------------------|
|                          | Full-time permanent employment (N=7770) | Precarious employment (N=716)       |
|                          | N % Mean SD                           | N % Mean SD                           |
| Age (years)              | 54.4 2.7                              | 55.2 2.7                              |
| Marital status           |                                      |                                      |
| Married                  | 7068 91.0 573 80.0                    | 2016 75.7 183 6.9                    |
| Never married            | 376 4.8 77 10.8                       | 457 17.2 6.9                         |
| Divorced/widowed         | 313 4.0 64 8.9                       | 96 2.4                               |
| Data missing             | 13 0.2 2 0.3                          | 436 10.7                             |
| Equivalized household expenditure a |                                      |                                      |
| Quartile 1 (lowest)     | 1711 22.0 328 45.8                    | 798 30.0 1384 34.0                   |
| Quartile 2               | 1428 18.4 129 18.0                    | 411 15.4 2140 52.6                   |
| Quartile 3               | 1264 16.3 87 12.2                     | 397 14.9 813 20.0                    |
| Quartile 4 (highest)     | 2596 33.4 87 12.2                     | 768 28.8 855 21.0                    |
| Data missing             | 771 9.9 85 11.9                       | 290 10.9 408 10.0                    |
| Hours of work (hours/week) |                                      |                                      |
| <40                      | 594 7.6 204 28.5                      | 429 16.1 3216 79.0                   |
| ≥40                      | 7107 91.5 495 69.1                    | 2204 82.7 806 19.8                   |
| Data missing             | 69 0.9 17 2.4                         | 31 1.2 50 1.2                        |
| Occupation               |                                      |                                      |
| Professional/technician  | 1953 25.1 113 15.8                    | 735 27.6 412 10.1                    |
| Manager                  | 1694 21.8 41 5.7                      | 130 4.9 25 0.6                       |
| Sales/service/clerical   | 1830 23.6 180 25.1                    | 1265 47.5 2140 52.6                  |
| Security/transportation/labor | 1956 25.2 279 39.0                  | 367 13.8 813 20.0                    |
| Others                   | 298 3.8 97 13.6                       | 150 5.6 640 15.7                    |
| Data missing             | 39 0.5 6 0.8                          | 17 0.6 42 1.0                        |
| Company size (number of employees) |                                      |                                      |
| 1–29                     | 2003 25.8 235 32.8                    | 892 33.5 1431 35.1                   |
| 30–299                   | 2223 28.6 264 36.9                    | 980 36.8 1446 35.5                   |
| 300–999                  | 974 12.5 87 12.2                      | 267 10.0 367 9.0                     |
| ≥1000                    | 1737 22.4 81 11.3                     | 240 9.0 451 11.1                     |
| Civil service office     | 722 9.3 24 3.4                        | 244 9.2 154 3.8                      |
| Data missing             | 111 1.4 25 3.5                        | 41 1.5 223 5.5                       |
| Organizational tenure (years) |                                      |                                      |
| <5                       | 948 12.2 444 62.0                      | 322 12.1 1616 39.7                   |
| 5–14                     | 971 12.5 133 18.6                      | 686 25.8 1537 37.8                   |
| 15–29                    | 2045 26.3 50 7.0                       | 946 35.5 641 15.7                    |
| ≥30                      | 3426 44.1 33 4.6                       | 598 22.5 49 1.2                      |
| Data missing             | 380 4.9 56 7.8                        | 112 4.2 229 5.6                      |
| Cardiovascular disease risks |                                      |                                      |
| None                     | 5358 69.0 512 71.5                     | 75.2 77.6                            |
| Any                      | 2412 31.0 204 28.5                     | 24.8 22.4                            |
| K6 score (range 0–13) b  | 2.4 3.1                                | 2.7 3.3                               |

a Monthly household expenditure divided by the square root of the number of household members.

b A self-rated 6-item scale that screens for any mood or anxiety disorder.

SPD, and 440 men and 271 women were lost to follow-up. Table 2 shows the hazard ratios (HR) and 95% confidence intervals (95% CI) of incident SPD for both genders, as computed with discrete-time survival analyses. Among men, precarious employees were more likely than full-time permanent employees to develop SPD (HR 2.00, 95% CI 1.50–2.67). The HR remained significant after adjustment for age (HR 2.12, 95% CI 1.60–2.82) and after additional adjustments for marital status, equalized household expenditures, hours of work, occupation, company size, organizational tenure, CVD risks, and K6 scores at baseline (HR 1.79, 95% CI 1.28–2.51). In contrast for women, no significant associations were observed between employment contract and incident SPD.

Sensitivity analysis

Furthermore, sensitivity analyses confirmed the robustness of the results. In the analyses restricted to the participants without changes in their employment contracts
(table 3), precarious employment was significantly associated with incident SPD among men (fully adjusted HR 2.32, 95% CI 1.59–3.40).

In the analyses stratified by work hours (table 4), precarious employment was significantly associated with incident SPD among men, whether they worked <40 hours (fully adjusted HR 2.82, 95% CI 1.02–7.81) or ≥40 hours per week (fully adjusted HR 1.77, 95% CI 1.20–2.60).

In the analyses presenting precarious employment as three categories (see Appendix, table A, www.sjweh.fi/data_repository.php), all three types were positively associated with SPD incidence among men, although the association for dispatched employees did not reach the level of significance probably due to the small sample size. In these three sensitivity analyses, no significant associations between employment contract and incident SPD were observed among the female employees. However, in the analyses stratified by marital status, an association similar to that found among men was observed only among the unmarried women (fully adjusted HR 6.27, 95% CI 1.80–21.76) (Appendix, table B, www.sjweh.fi/data_repository.php).

### Discussion

After adjusting for sociodemographic and occupational factors and CVD risks in middle-aged Japanese men, this four-year longitudinal study showed that precarious employment was associated with double the risk of SPD incidence. However, no such significant association was observed for Japanese women.

Our results among men are consistent with the findings of previous longitudinal studies conducted in Europe and North America, which indicate that precarious employment is associated with mental health indicators such as psychological distress (7–9, 11), depressive symptoms (10), and attempted suicide (12). Although, to the best of our knowledge, similar longitudinal studies conducted in Japan have not been published so far, our results are also consistent with the findings of several (23, 24), but not all (25) cross-sectional studies conducted in Japan indicating that precarious employment is associated with mental health indicators such as fatigue (24) and SPD (23). Cross-sectional approaches are limited in their ability to assess causality; thus, in order to minimize the possibility of reverse causality – that

### Table 2. Hazard ratios (HR) and 95% confidence intervals (95% CI) for the incidence of serious psychological distress during the 4-year follow-up period, according to employment contract (N=15 222).

| Employment contract | Cases / non-cases (N) | Crude model | Age-adjusted model | Fully adjusted model a |
|---------------------|-----------------------|-------------|--------------------|------------------------|
|                     | HR 95% CI             | Age-adjusted model | Fully adjusted model a |
|                     | HR 95% CI             | HR 95% CI | HR 95% CI |
| Men (N=8486)        |                       |             |                   |
| Full-time permanent | 318/7452              | 1.00        | 1.00              | 1.00                   |
| Precarious          | 56/660                | 2.00        | 1.50–2.67 b       | 2.12                   |
|                     |                       |             | 1.60–2.82 b       | 1.79                   |
| Women (N=6736)      |                       |             |                   |
| Full-time permanent | 144/2520              | 1.00        | 1.00              | 1.00                   |
| Precarious          | 220/3852              | 1.00        | 0.81–1.24         | 1.01                   |
|                     |                       |             | 0.82–1.24         | 0.96                   |
|                     |                       |             |                   | 0.72–1.29              |

a Adjusted for age, marital status, equivalized household expenditure, hours of work, occupation, company size, organizational tenure, cardiovascular disease risk, and K6 scores (all covariates measured at baseline). K6 is a self-rated 6-item scale that screens for any mood or anxiety disorder.

b P<0.05.

### Table 3. Hazard ratios (HR) and 95% confidence intervals (95% CI) for the incidence of serious psychological distress during the 4-year follow-up period according to employment contract, among participants with no change in employment contract (N=10 688).

| Employment contract | Cases / non-cases (N) | Crude model | Age-adjusted model | Fully adjusted model a |
|---------------------|-----------------------|-------------|--------------------|------------------------|
|                     |                       |             |                   |
| Men (N=6047)        |                       |             |                   |
| Full-time permanent | 275/5372              | 1.00        | 1.00              | 1.00                   |
| Precarious          | 47/353                | 2.68        | 1.96–3.67 b       | 2.93                   |
|                     |                       |             | 2.15–4.00 b       | 2.32                   |
| Women (N=4641)      |                       |             |                   |
| Full-time permanent | 115/1635              | 1.00        | 1.00              | 1.00                   |
| Precarious          | 181/2710              | 0.95        | 0.75–1.20         | 0.98                   |
|                     |                       |             | 0.78–1.24         | 0.85                   |
|                     |                       |             |                   | 0.61–1.19              |

a Adjusted for age, marital status, equivalized household expenditure, hours of work, occupation, company size, organizational tenure, cardiovascular disease risk, and K6 scores (all covariates measured at baseline). K6 is a self-rated 6-item scale that screens for any mood or anxiety disorder.

b P<0.05.
Precarious employment and serious psychological distress

Table 4. Hazard ratios (HR) and 95% confidence intervals (95% CI) for the incidence of serious psychological distress during the 4-year follow-up period according to employment contract, stratified by hours of work, among participants without missing data on hours of work (N=15 055).

| Hours of work, employment contract | Cases / non-cases (N) | Crude model | Age-adjusted model | Fully adjusted model a |
|-----------------------------------|-----------------------|-------------|--------------------|-----------------------|
|                                   |                       | HR 95% CI   | HR 95% CI          | HR 95% CI            |
| Men (N=8400)                      |                       |             |                    |                       |
| <40 hours/week                    | Precarious            | 17/187      | 1.21–4.30 b       | 1.00                  |
|                                   | Full-time permanent   | 23/571      | 1.00               | 1.00                  |
| ≥40 hours/week                    | Precarious            | 36/459      | 1.86               | 1.00                  |
|                                   | Full-time permanent   | 290/6817    | 1.00               | 1.00                  |
| Women (N=6655)                    |                       |             |                    |                       |
| <40 hours/week                    | Precarious            | 15/414      | 1.00               | 1.00                  |
|                                   | Full-time permanent   | 167/3049    | 1.49               | 1.00                  |
| ≥40 hours/week                    | Precarious            | 48/758      | 1.04               | 1.00                  |
|                                   | Full-time permanent   | 127/2077    | 1.00               | 1.00                  |

a Adjusted for age, marital status, equalized household expenditure, hours of work, occupation, company size, organizational tenure, cardiovascular disease risk, and K6 scores (all covariates measured at baseline). K6 is a self-rated 6-item scale that screens for any mood or anxiety disorder.

b P<0.05.

is, poor mental health leads to precarious employment status – we used longitudinal data, excluded participants with CVD, cancer, or SPD at baseline, and adjusted the analyses for baseline CVD risks and mild to moderate self-reported psychological distress (K6 score).

Unlike our study, a recent Korean longitudinal study (15) did not show any significant associations between maintaining precarious employment and new-onset depressive symptoms among either men [odds ratio (OR) 1.59, 95% CI 0.90–2.81] or women (OR 1.50, 95% CI 0.69–3.25), using one-year follow-up data from a nationally representative study. However, the trend of association in the Korean study (15) was shown to be in the same direction as the association among men in our study. The lack of significant results in the Korean study may be attributed to the shorter follow-up period and smaller sample size; thus, maintaining precarious employment may have an adverse effect on mental health in both Asian countries.

Our results suggest that a gender difference exists in the effect of precarious employment on SPD incidence. This gender difference may be due to a combination of gender roles (26, 27) and gender-oriented segregation in the labor market. Traditional Japanese gender roles – in which men are the breadwinners and women are the homemakers – are still prevalent, especially in the middle-aged and older generations (28). Regarding gender segregation, female workers form the majority of precarious employees (70% of the precarious workforce) (1). Most of the female workers who are married and whose partner is the main breadwinner voluntarily choose part-time precarious employment to balance their work and family responsibilities (29); thus, those workers may not be at a higher risk for developing SPD. However, most of the male workers who are the main breadwinners, regardless of marital status, involuntarily choose full-time precarious employment to earn a living for their families (29). The responsibility of earning a living and having no choice but to choose precarious work may put these men at a higher risk for developing SPD. The results of stratified analyses by marital status showed that precarious employment increased the risk of SPD incidence not only among men but also unmarried women who play the role of the main breadwinner (Appendix, table B, www.sjweh.fi/data_repository.php).

The mechanisms underlying the associations between precarious employment and mental health are not well understood; however, previous studies have suggested that several factors associated with precarious employment, including job insecurity, low income, and hazardous working conditions, may increase the risk of developing negative health-related behaviors, as well as that of producing detrimental psychological and physiopathological changes leading to poorer mental health (2, 5). Previous studies have also suggested that mental health problems, some of which have already been exhibited early in life, may lead to precarious employment as well, because health problems reduce the chance of achieving a good position in the labor market (6, 30).

In addition, our results showed that precarious employees were more likely to be employed in security, transportation, or manual labor compared to full-time permanent employees. Lower socioeconomic occupations are known to be associated with some dimensions of adverse psychosocial working conditions, such as lower job control and fewer rewards, which may lead
to poor mental health (31). Thus, such adverse working conditions may mediate the effect of precarious employment on poorer mental health.

Furthermore, the length of time spent in a precarious labor market position might play an important role in poorer mental health (7, 9). We could not examine the effect of prolonged exposure to precarious employment before baseline because this variable was not measured by the LSMEP; however, such a cumulative effect may have contributed to the high SPD incidence among our male participants, considering the lower levels of employment mobility in Japan. Precarious employees cannot easily transition to becoming full-time permanent employees (32).

The strengths of the present study include its: (i) longitudinal design; (ii) large population-based sample; (iii) high retention rate; (iv) focus on the clinical level of psychological distress; (v) use of a well-known, highly validated scale for psychological distress; and (vi) adjustment for various potential confounders. Nevertheless, our study has some limitations.

First, our findings in a Japanese context should be generalized with caution because the definitions of precarious employment in this country may differ from those of other countries. Similarly, our study population was restricted to middle-aged employees, and this limits the generalizability of our findings to other age groups in Japan.

Second, the selection bias caused by participant attrition or missing data on incident SPD could have influenced our results, although our retention and response rates were relatively high. The participants with no follow-up or missing data on incident SPD were more likely to be precarious workers at baseline (Appendix, table C, www.sjweh.fi/data_repository.php), and they may have been more likely to develop SPD as a result; therefore, such a selection bias would underestimated the association between precarious employment and SPD incidence.

Finally, unmeasured factors may affect the associations between precarious employment and SPD incidence although we considered a range of confounders. One example of such a factor may be the underlying voluntary or involuntary basis for precarious employment. Previous studies have shown that employees who work in temporary positions involuntarily have higher mortality risk than permanent employees (33). Another possible confounding variable that we did not take into consideration in this study is educational attainment although we considered other socioeconomic factors (ie, household expenditure and occupation) as confounders. Further studies are needed to more thoroughly examine the effects of such factors on this revealed association (34).

In conclusion, the results of this longitudinal study suggest that precarious employment is associated with a higher risk of SPD incidence among middle-aged Japa-
10. Quesnel-Vallee A, DeHaney S, Ciampi A. Temporary work and depressive symptoms: a propensity score analysis. Soc Sci Med 2010;70(12):1982–7. http://dx.doi.org/10.1016/j.socscimed.2010.02.008.

11. Virtanen P, Vahtera J, Kivimäki M, Liukkonen V, Virtanen M, Ferrie J. Labor market trajectories and health: a four-year follow-up study of initially fixed-term employees. Am J Epidemiol. 2005;161(9):840–6. http://dx.doi.org/10.1093/aje/kwi107.

12. Kraut A, Walld R. Influence of lack of full-time employment on attempted suicide in Manitoba, Canada. Scand J Work Environ Health. 2003;29(1):15–21. http://dx.doi.org/10.5271/sjweh.699.

13. Liukkonen V, Virtanen P, Kivimäki M, Pentti J, Vahtera J. Social capital in working life and the health of employees. Soc Sci Med. 2004;59(12):2447–58. http://dx.doi.org/10.1016/j.socscimed.2004.04.013.

14. Bardasi E, Francesconi M. The impact of atypical employment on individual wellbeing: evidence from a panel of British workers. Soc Sci Med. 2004;58(9):1671–88. http://dx.doi.org/10.1016/S0277-9536(03)00400-3.

15. Kim SS, Subramanian S, Sorensen G, Perry MJ, Christiani DC. Association between change in employment status and new-onset depressive symptoms in South Korea - a gender analysis. Scand J Work Environ Health. 2012;38(6):537–45. http://dx.doi.org/10.5271/sjweh.3286.

16. Rytasa HJ, Melartin TK, Leskela US, Sokeru TP, Lestela-Mielonen PS, Isometsa ET. Predictors of long-term work disability in Major Depressive Disorder: a prospective study. Acta Psychiatr scand. 2007;115(3):206–13. http://dx.doi.org/10.1111/j.1600-0447.2006.00878.x.

17. Ministry of Health, Labour and Welfare. Longitudinal Survey of Middle-aged and Elderly Persons. 2013 [cited 2013 December 20]; Available from: http://www.mhlw.go.jp/english/database/db-ls/ls.html.

18. Kessler RC, Andrews G, Colpe LJ, Hiripi E, Mroczek DK, Normand SL, et al. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. Psychol Med. 2002;32(6):959–76. http://dx.doi.org/10.1017/S0033291702006074.

19. Furukawa TA, Kawakami N, Saitoh M, Ono Y, Nakane Y, Nakamura Y, et al. The performance of the Japanese version of the K6 and K10 in the World Mental Health Survey Japan. Int J Methods Psychiatr Res. 2008;17(3):152–8. http://dx.doi.org/10.1002/mpr.257.

20. Asao Y. Overview of non-regular employment in Japan. In: JILPT, editor. Non-regular employment: issues and challenges common to the major developed countries, JILPT Report No 10. Tokyo: The Japan Institute for Labor Policy and Training; 2011.

21. Singer JD, Willett JB. Applied longitudinal data analysis: modeling change and event occurrence. Oxford, England: Oxford University Press; 2004.

22. Wolkeiwitz M, Allignol A, Harbarth S, de Angelis G, Schumacher M, Beyersmann J. Time-dependent study entries and exposures in cohort studies can easily be sources of different and avoidable types of bias. J Clin Epidemiol. 2012;65(11):1171–80. http://dx.doi.org/10.1016/j.jclinepi.2012.04.008.

23. Tsurugano S, Inoue M, Yano E. Precarious employment and health: analysis of the Comprehensive National Survey in Japan. Ind Health. 2012;50(3):223–35. http://dx.doi.org/10.1084/indhealth.MS1260.

24. Nakao M, Yano E. A comparative study of behavioural, physical and mental health status between term-limited and tenure-tracking employees in a population of Japanese male researchers. Public Health. 2006;120(4):373–9. http://dx.doi.org/10.1016/j.puhe.2005.10.012.

25. Inoue M, Tsurugano S, Yano E. Job stress and mental health of permanent and fixed-term workers measured by effort-reward imbalance model, depressive complaints, and clinic utilization. J Occup Health. 2011;53(2):93–101. http://dx.doi.org/10.1539/joh.L10098.

26. Hapsels P, Majurin E. Work, income and gender inequality in East Asia. 2008 [cited 2013 December 20]; Available from: http://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/documents/publication/wcms_101719.pdf.

27. Ministry of Health, Labour and Welfare. White Paper on working women 2011. Tokyo: Japan Institute of Workers' Evolution; 2012.

28. National Institute of Population and Social Security Research. The fourth national survey on family in Japan, 2008. Tokyo: National Institute of Population and Social Security Research; 2008.

29. Ministry of Health, Labour and Welfare. General Survey on Diversified Types of Employment. Tokyo: National Printing Bureau; 2010.

30. Virtanen M1, Kivimäki M, Elovainio M, Vahtera J, Kokko K, Pulkkinnen L. Mental health and hostility as predictors of temporary employment: evidence from two prospective studies. Soc Sci Med. 2005;61(10):2084–95. http://dx.doi.org/10.1016/j.socscimed.2005.04.028.

31. Siegrist J. Reducing social inequalities in health: work-related strategies. Scand J Public Health Suppl. 2002;59:49–53. http://dx.doi.org/10.1111/j.1600-0447.2006.00878.x.

32. Auer P, Cazes S. Employment stability in an age of flexibility. Soc Sci Med. 2005;61(12):2447–58. http://dx.doi.org/10.1016/j.socscimed.2005.04.028.

33. Natti J, Kinnunen U, Makikangas A, Mauno S. Type of employment relationship and mortality: prospective study among Finnish employees in 1984–2000. Eur J Public Health. 2009;19(2):150–6. http://dx.doi.org/10.1093/eurpub/ckp002.

34. Kawada T. Occupational class as the indicator of socioeconomic position. Occup Environ Med. 2012;69(8):606–7. http://dx.doi.org/10.1136/oemed-2011-100565.

Received for publication: 14 January 2014