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Research paper

Occupational differences in suicide mortality among Japanese men of working age

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ABSTRACT

Background: Although suicide rates among Japanese men of working-age have steadily increased over the past two decades, the distribution by occupation and industry is not uniform. Little is known regarding occupation and industry differences in relation to suicide risk. This study examined differences in suicide risk among Japanese men of working age (25–59 years) during 2010.

Methods: We analysed the Japanese government's 2010 national survey data regarding occupation and industry-specific death rates. Poisson regression models were formulated for each occupation and industry to estimate the relative risk of death by suicide. Potential interactions between age and occupation/industry were also examined.

Results: Suicide incidence was highest among workers in the fields of agriculture and mining. When compared with referent groups (sales for occupation and wholesale and retail for industry), the age-adjusted relative risk of suicide was highest for administrative and managerial workers (Incident Relative Risk [IRR]: 3.91, 95% Confidence Interval [95%CI]: 3.16–4.85), service industries (IRR: 3.63, 95%CI: 2.93–4.51) and agriculture (IRR: 3.53, 95%CI: 2.84–4.38) occupations, and for mining (IRR: 23.9, 95%CI: 19.4–29.4), fisheries (IRR: 6.26, 95%CI: 5.03–7.80), electricity and gas (IRR: 5.86, 95%CI: 4.71–7.30) and agricultural industries (IRR: 4.73, 95%CI: 3.78–5.91).

Limitations: Bias resulting from misclassification of deceased individuals' occupation or industry was a potential limitation of this study. Furthermore, detailed information regarding occupation-related factors, such as employment status, had not been recorded in the initial survey.

Conclusions: These findings help elucidate Japanese occupations and industries with a higher suicide risk, most likely due to economic changes or workplace factors relating to stress and depression.

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1. Introduction

Suicide is a significant public health concern for Japanese men of working-age (Wada et al., 2012). Deaths due to suicide began to exceed 30,000 per year in 1998, when Japan faced an economic downturn, and remained this high every year up to 2011. These figures include over 10,000 deaths per year among men of working-age (Cabinet Office, 2013; Motohashi, 2012). In 2006, the Japanese government legislated the Basic Law on Suicide Countermeasures and instigated various campaigns to help prevent suicide at a national level (McCurry, 2008; World Health Organisation, 2014).

Occupation is an important determinant of health with many facets, including the prevention of suicide (Chan et al., 2014;

Milner et al., 2013). Suicide mortality rates increased around the year 2000 among working-age Japanese men as the number of suicide deaths increased in the total population, particularly among those working in administrative and management, and professional workers (Wada et al., 2012). Japan experienced major economic stagnation following the 2008 global financial crisis; which influenced working conditions, work-related stress and even suicide (Coope et al., 2015). Long-term economic stagnation in Japan also heralded the end of lifetime employment (Kato, 2001) and subsequently increased job insecurity among workers, especially in the manufacturing and construction industries. Lack of demand in these sectors resulted in many worker redundancies and a general reduction in business (Ministry

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of Internal Affairs and Communications, 2005–2010; Wada et al., 2015).

It is reasonable to hypothesise that identifying occupations and industries with a higher risk of suicide will help more effectively target suicide interventions. In this regard, the Japanese Ministry of Health, Labour and Welfare has implemented an occupation-specific Vital Statistics survey every 5 years (Ministry of Health Labour and Welfare, 2010). The survey takes place in the same year as the national population census; with the government collecting information on the occupation and industry to which deceased persons belonged at their time of death and records the cause of death from death certificates. Such data can potentially elucidate the magnitude of occupation and industry on health-related outcomes among working-age populations. One previous study has shown that not employed people in Japan have a greater risk of suicide than employed people (Yamauchi et al., 2013). However, no studies have addressed the occupational and industrial differences in suicide risks in Japan. The present study aimed to examine occupation and industry differences in suicide mortality rates among employed Japanese men aged 25–59 years.

2. Methods

2.1. Data sources

We analysed occupation and industry-specific vital statistics from the 2010 Japanese Ministry of Health, Labour and Welfare dataset. The data is for the year of 2010 only. To calculate occupation and industry specific death rates, occupation and industry data was extracted from the national population census, which is implemented at 5-year intervals on the 1st of October each year.

2.2. Measurements

Death certificate data, including the underlying cause of death, is completed by physicians based on the sequence of events leading to death and coded according to the International Classification of Diseases, 10th Revision (World Health Organisation, 1992). In the years in which occupation and industry-specific vital statistics are recorded, family members of the deceased are required to select one occupational category from a list of 11 occupations, as follows: administrative and managerial; professional; clerical; sales; services; security; agriculture; manufacturing; transport; construction and mining; and carrying, cleaning, packaging. They also select one industry from 19 options: agriculture; fisheries; mining; construction; manufacturing; electricity and gas; information; transport; wholesale and retail; finance; real estate and rental; research and professional services; accommodation and dining services; amusement services; education; medical and welfare; compound services; other service industries; and government.

Families of the deceased are given these lists, together with descriptions and definitions of the occupation and industry categories based on the International Standard Classification of Occupations (International Labour Organisation, 2010; Ministry of Internal Affairs and Communications, 1997). Supplementary file 1 contains detailed lists of occupations and industries, with examples of jobs.

2.3. Statistical analysis

We examined data for Japanese men aged 25–59 years in 2010 when the retirement age for majority of workers was 60 years old. With data based on 5-year age intervals, a suicide incidence rate was calculated for each of the same occupation or industry

categories as the national census (as the denominator), with the number of deaths from suicide (as the numerator). A Poisson distribution was assumed for the outcome. For each occupational category, a separate regression model was created to estimate the Incident Relative Risk (IRR) of suicide with reference to the sales group (occupation). For each industry, a separate model was also created to estimate the IRR of suicide with reference to wholesale and retail trade industries (wholesale and retail). As the sales group (occupation) and the wholesale and retail (industries) share common similarities between occupation and industry, they were selected as the reference category for this study.

All models included age and the interaction between occupation (or industry) and age, to allow for possible modifications of the effect of occupation (or industry) at different ages. The equation below represents an example of one of the models in which the logarithm of the expected number of suicide deaths (Y) is a linear function of the logarithm of the exposed individuals (N) and the occupation being tested (X_i), the age, and the interaction between age and occupation, where X_i takes a value of 0 for the reference category. In all Poisson models, the categories 'aged 25–29 years', 'sales' for occupation and 'retail sales' for industry were selected as reference categories:

$$\text{Log}(E(Y)) = \log(N) + \beta_0 + \beta_{1i} * X_i + \beta_{2j} * \text{Age}_j + \beta_{3i} * X_i * \text{Age}$$

In this equation, $\exp(\beta_0)$ estimates the rate in the reference group and $\exp(\beta_{1i} + \beta_{3i} * \text{Age})$ estimates the effect of being in the occupation (or industry) being tested when compared with the reference occupation (or industry). The interaction coefficient β_{3i} allows modelling of a different effect of occupation (industry) by age. Where the coefficient was not found to be significant, we re-estimated the model without the interaction term and the effect of occupation (or industry) was captured by $\exp(\beta_{1i})$. All data were analysed using STATA version 14 (StataCorp LP; College Station, TX, USA).

2.4. Ethics

The Statistics Act of Japan permits the Japanese Ministry of Health, Labour and Welfare to provide de-identified data for research purposes. The first author obtained approval from the Japanese Ministry of Health, Labour and Welfare to extract the data and undertake the analysis. All records/information had been anonymized and de-identified prior to analysis. The research was conducted in accordance with the Helsinki Declaration (as revised 1989).

3. Results

Suicide was responsible for 11,551 deaths among Japanese men aged 25–59 years in 2010. We excluded from the analysis 4356 cases who were not employed at the time of death, 2297 without occupational data, and 2507 without industry data. The total number of cases analysed was 4898 for occupations and 4688 for industries. Table 1 indicates the distribution of suicide cases by occupations and industries. Although manufacturing contained the greatest proportion of workers, overall (representing 19.4% of the total); the largest number of deaths was observed in the professional category of occupations (16.9% of all deaths). The incidence of suicide-related deaths per 100,000 was highest in agriculture (54.7 deaths/100,000 workers). Regarding specific industries, manufacturing contained both the greatest proportion of workers (22.4% of the total) and the greatest proportion of deaths (18.2% of all deaths). However, the highest incidence of suicide was observed in the mining industry (326.9 deaths/100,000 workers).

The age-adjusted Incident Relative Risk (IRR) of suicide by occupation is shown in Table 2. Administrative and managerial,

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