Published in final edited form as:
J Affect Disord. 2014 October 15; 168: 254–261. doi:10.1016/j.jad.2014.06.031.

The chronic impact of work on suicides and under-utilization of psychiatric and psychosocial services

Yik Wa Law, **Paul S.F. Yip**, **Yi Zhang**, and **Eric D. Caine**

1. Introduction

Suicide studies often focus on people who are unemployed (Lewis & Sloggett, 1998; Ostamo, Lahelma, & Lonnqvist, 2001) and who suffer clinically significant mental disorders (Blakely, Collings, & Atkinson, 2003; Chan, Yip, Wong, & Chen, 2007; Schneider et al., 2011). Available data consistently have linked an increase in unemployment rates and suicide rates (Gunnell et al., 1999; Inoue et al., 2008; Yamasaki, Araki, Sakai, Yokoyama, & Voorhees, 2008). However, recent work has underscored the difference between individual-level work status and population indicators such as the unemployment rate (Yip and Caine, 2011). This work showed that during a time of economic hardship in Hong Kong, the suicide rate among employed workers rose substantially while the rate dropped among the unemployed, the latter reflecting the migration of relatively healthier workers into the out-of-work pool. While these findings may not be applicable to all regions or nations, they serve to focus attention on employed as well as unemployed persons who kill themselves.

Employment can be associated with multiple forms of day-to-day stress, such as job strain, low decision latitude, low social support, and high job insecurity—all of which have been associated with poorer physical health as well as poorer mental health, including depression and anxiety disorders, particularly among men (Ferrie et al., 2002; Kim et al., 2006; László et al., 2010; Meltzer et al., 2010; Netterstrom et al., 2008; Stansfeld and Candy, 2006; Virtanen et al., 2011; Wang et al., 2008). Stress experienced at work appears to be strongly associated with attempted suicides and suicides in both men and women (Feskanich et al., 2002; Ostry et al., 2007; Routley and Ozanne-Smith, 2012). Those who experienced less control at work were found to have a fourfold increase in suicide risk (Tsutsumi et al., 2007). However, there is a lack of research comparing suicides among the employed with

Contributors

YWL conceived the research idea for the study and wrote the original draft of the paper, which was extracted from a chapter of her thesis entitled “Silent Suicide – studies on the non-contact group of suicide” for the degree of Doctor of Philosophy at The University of Hong Kong (HKU) in 2012. She takes full responsibility for the literature review, research design, and accuracy of data analysis, interpretation, and editing of the paper.

PY and EDC conceived the research idea; PY, YZ, and EDC contributed to the data analysis methods, interpretation, and editing of the entire paper.

Conflict of interest

None.

working controls who may be experiencing similar strains, and assessing whether mental disorders play a significant role in these deaths. While there have been studies suggesting that workers' depression plays a role in subsequent suicides (Amagasa et al., 2005; Tsutsumi, 2007), contributing factors have been difficult to disentangle. For example, several authors have suggested that published findings reflected biased (self-selected) samples (Reichenberg and MacCabe, 2007; Stansfeld and Candy, 2006).

Work stress alone may insufficient to motivate persons to seek professional psychosocial or psychiatric support services. However, work stress coupled with significant or disabling psychiatric illness has greater potential to instigate service use. As suggested by the Behavioral Model of service use, seeking access to healthcare is a rational decision process, which is mainly determined by a number of predisposing variables (e.g. age, gender), enabling resources, and level of needs (Andersen, 1995). However, our preliminary work, begun using data from the same sample of "psychological autopsies" (PAs) used for this study, suggested that those persons who killed themselves and were employed at the time of death used relatively fewer mental health services prior to death than unemployed persons who died by suicide (Law, Wong & Yip, 2010). In essence, while we found previously that employed suicides used fewer services than unemployed suicides, the former nonetheless would use more than living community controls, that they would fall into an intermediate position. We aim to examine if work stress coupled with psychiatric illness constitutes a greater demand for psychiatric and psychosocial services among employed suicides.

The data collection phase of our PA study occurred when Hong Kong had been under great financial stress following the Asian Economic Crisis of the late-1990s and the subsequent outbreak of SARS, which battered local tourism and commerce during 2002-2003 and had continuing repercussions for another two to three years. In this context, we had the opportunity to examine factors associated with suicide among employed workers compared with live controls with the same employment status at a time of community economic turmoil. We sought to elucidate whether adverse effects from work were associated with suicide, with and without the presence of psychiatric illness. We hypothesized that both stress related to work and mental illness were associated with employed suicides, and that mental illness was the mediator between these two factors. Then, based on Behavioral Model of Service use, we hypothesized a greater negative impact from work experienced by employed suicides, in comparison to the live controls, as indicated by their use of psychiatric and psychosocial support services.

2. Method

2.1 Study subjects

Data analysis was conducted on a sample of 175 employed individuals drawn from the main Hong Kong psychological autopsy (PA) dataset (63 out of 150 or 42% of suicide cases; 112 out of 150 or 74.4% of live control cases). Employed individuals included those were employed full-time (n = 134; 76.6%) and part-time (n = 18; 10.3%), and the self-employed (n = 23; 13.1%) at time of interview (control group) or at time of death (deceased group; Figure 1). The study was approved by the Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster (HKU/HA HKW IRB) and the

Ethics Committee of the Department of Health, Hong Kong SAR. Details of the data collection process, measures used, and the results have been published in a number of peer-reviewed academic journals (Chan et al., 2007; Chen et al., 2006; Chen et al., 2007; Law et al., 2010).

2.2 Measurements

The two groups were examined across four domains of variables:

Demographics and socioeconomic factors—Age, gender, marital status, living arrangement, education, income, financial debt, and other related factors.

Psychiatric diagnoses and use of services—Retrospective psychiatric diagnoses were assessed using the Structured Clinical Interview for DSM-IV® Axis I Disorders (SCID-I) (American Psychiatric Association, 1997). Informants were asked to recall the service utilization of the deceased and control cases in three aspects: whether the deceased or control had consulted a doctor (excluding a psychiatrist) for health problems in the six months prior to death or interview, respectively; whether the deceased or control ever received treatment for mental health problems from other professional services (e.g., clinical psychologists, social workers, and psychiatric nurses); and whether the deceased or control had visited a psychiatrist in the last six months before death or interview. In Hong Kong, the bulk of psychiatric treatment services are provided by public hospitals and clinics administered under the Hospital Authority; social and vocational rehabilitation services for mentally ill persons are offered through the Social Welfare Department and non-governmental social service providers (NGOs). In order to identify the extent to which a basic type of psychiatric treatment had been offered to deceased cases in comparison to live controls, we had specifically asked the latter, have you visited a psychiatrist in the last six months? The second question asked was whether other professional services had been sought, including those offered by psychiatric nurses, clinical psychologists, social workers, and school counselors for mental health problems. These services are considered psychosocial support or rehabilitative services. As a substantial number of informants could not recall the exact time or period of contact with services for mental health problems by other professional services, it was decided to use a yes or no criterion for this category of services.

Psychosocial factors—Psychosocial factors include impulsivity, social support (size, frequency, and content), and social problem-solving ability. Impulsive-state behavior was measured by the Impulsivity Rating Scale (IRS) (Lecrubier et al., 1995). Social support was evaluated in terms of three aspects: the size of the social support network based on the number of close family members, extended relatives, and friends upon whom subjects were able to rely when dealing with life problems; frequency of social activities within the final month before the suicide; and social support content in terms of emotional, instrumental, informational, and appraisal support. Informants were asked to rate these four areas from scenario-based questions that determined the accessibility of support within the deceased's social network. Social problem-solving ability was measured by the shortened 8-item Social Problem-Solving Inventory (SPSI) (D'Zurilla and Nezu, 1990), which was divided into four

constructs: problem orientation, generation of alternative solutions, decision-making and solution implementation, and verification.

Life events including impact from work—: With reference to the work of Phillips and colleagues (2002), life events were checked based on whether any of the incidents had happened to the subjects, the frequency, time of the occurrence, and their impact on the subjects (Phillips et al., 2002). There are five aspects, including physical health problems (i.e. hospitalized, seriously injured, seriously ill, suffering from chronic illness or disabled), relationship incidents (i.e., married, separated, divorced, had conflicts with partner or was suffering from the death of partner, pregnancy, or abortion), family problems (i.e. had suffered from parents' health problems, separation, remarriage, or arguments with parents or children), legal issues (i.e. had been arrested, prosecuted, in jail, on probation, or wanted), and work (i.e. a new job, job changes, had been fired, in danger of losing job or being demoted, had conflicts with boss or colleagues, had resigned, or had had a pay cut or pay freeze). Informants rated the impact of each of these incidents, where relevant, on a 7-point Likert scale ranging from most negative (−3) to most positive impact (+3). During data analysis, scores were re-coded and included ratings of negative impact only (i.e. −3 = 4, −2 = 3, −1 = 2, 0 = 1; 1-999 = 0). Any of these incidents experienced within 30 days prior to the time of interview (controls) or death by suicide was considered as having acute impact, while those that happened within 31 to 365 days were considered as having chronic impact. Thus, the sum of the overall impact of all the incidents in each aspect that happened is grouped as severity of acute impact (within 30 days) and severity of chronic impact (31 to 365 days) (Chen et al., 2006).

2.4 Data Analysis

The SPSS-PC software version 20.0 statistical package was used to perform the statistical analysis. A comparison was conducted between the suicide group and live control group on the independent variables described above through descriptive statistical analyses. Chi-square tests and t-tests at the .05 level of significance ($p < .05$) were used to detect differences between these two groups, and a multivariable logistic regression model was used to identify a final model of risk and protective factors.

Mediation test—To understand the mechanism by which employment related stresses may contribute to eventual suicides, a mediator analysis was conducted, by which the variable of chronic impact from work was associated with suicide deaths testing the variable of psychiatric illnesses (Yes/No) as the mediator. Following the procedures suggested by Baron and Kenny (1986), the hypothesis is that psychopathology mediates the relationship between chronic stress from work and suicide.

3. Results

3.1 Demographics, socioeconomic and clinical factors

Table 1 shows that the suicide and live control group were not significantly different in terms of gender ratio (M:F 2.31:1 and 2.29:1) or mean age (39.1 and 39.63). The percentage of the employed suicides who were married and lived with a spouse (n = 31; 49.2%), as

tested by chi-square, was significantly lower than in the control group (n = 77; 68.8%), while the percentage who were single (never married; n = 28; 44.4%) was much higher than in the control group (n = 25; 22.3%). The deceased included a significantly higher percentage of people living alone, earning an income lower than HK$7,000 (US$897), and having financial debts. The two groups did not differ in their education level or years living in Hong Kong.Thirteen of 112 controls (11.6%) and 51 of 63 suicides (81%) suffered from at least one psychiatric condition, with the majority involving non-psychotic disorders. Amongst those with a psychiatric diagnosis, 92.3% (n = 12) of the controls and 60.8% (n = 31) of the deceased group had experienced a major depressive disorder. Seventeen suicides (27.0%) and two (1.8%) cases in the control group had co-morbidity of psychiatric illnesses.

3.2 Psychosocial factors and life events

In Table 2, the deceased shows a significantly higher level of impulsivity (IRS) than that of controls (Mean = .68 vs. -.34). As for protective factors, the deceased reported significantly lower levels of social problem-solving ability (SPSI) (Mean = -.49 vs. .28) and content of social support (Mean = -.62 vs. .29). The negative impact of life events such as acute relationship problems (Mean =.27 vs. -.15) and chronic legal problems (Mean = .20 vs. -.11) were found to be significantly more common among the deceased than among the controls.

3.3 Work-related incidents

Table 3 reports the frequency, percentages, and mean scores of a number of work-related incidents and their impact on individual cases by comparing the deceased and controls. The deceased group reported a significantly higher percentage of persons in danger of losing their job/demoted with higher negative impact than the control group (31.1% and 8.3%; Mean = -.29 and .55). However, the controls had significantly higher percentages of pay cuts and pay freezes than the deceased. For other items, such as getting a new job, being fired, having conflict with boss/colleagues, experience workplace changes in their job, and resigning, the control group also reported higher percentages of affirmative responses, although these differences were not statistically significant. Though fewer instances of job alteration or resignation were reported for the deceased, they suffered a much greater negative impact than the controls (41.0% and 62.3%; Mean = -.59 and .17). In general, the deceased had experienced much more severe negative chronic impact from work than the controls (Mean =.36 and -.07).

3.4 Multiple logistic regression analysis

Multivariate analysis (one-step) includes all significant variables (11 in total) identified in univariate analysis: psychiatric illness, never married, unmanageable debts, low income, living alone, IRS, SPSI, content of social support, chronic impact from work, impact of acute relationship problems, and chronic legal problems. Three variables are found to have significant independent relationships with the employed individuals among the deceased: having at least one psychiatric illness (OR = 25.88, CI: 6.27–106.87), unmanageable debts or bankruptcy (OR = 7.25, CI: 1.19–44.13), and higher levels of impulsivity (OR = 5.15, CI: 1.42–18.73). Among the controls, having a better quality of social support was found to be protective (OR = 0.27, CI: 0.12–0.59). The model using these four variables explained

79.2% of the variance between the controls and the deceased (Nagelkerke $R^2 = 0.792$; Table 4).

3.5 Psychiatric illness as a mediator of the relationship between chronic impact from work and suicide

Figure 2 shows that, after controlling for employment status, chronic impact from work was associated with suicide (*B* = 0.38, *SE* = 0.17, *p* = 0.028, OR = 1.46, CI: 1.04, 2.05), and having a psychiatric illness (*B* = 0.34; *SE* = 0.17, *p* = 0.045, OR = 1.40, CI: 1.01, 1.94). Psychiatric illness was also associated with suicide (regression coefficient *B* = 3.48, *SE* = 0.44, *p* < .001, OR = 32.37, CI: 13.78, 76.05). When psychiatric illness was entered into the logistic regression model, the coefficient of chronic impact from work on suicide became non-significant (*B* = 0.29, *SE* = 0.25, *p* = 0.237, OR = 1.34. CI: 0.83, 2.17). This confirms that psychiatric illness has a full mediation effect on the relationship between chronic impact from work and suicide.

3.6 Negative impact from work and use of services

Table 5 reports the difference in the chronic impact from work between subjects in the control and deceased groups who had and those who had not used services. Since psychiatric illness is an important “demand” factor for using healthcare services, the analysis was controlled for psychiatric background. That is, we were exploring whether there was a difference between the groups in seeking care, controlling for diagnosis; for this analysis, subjects in both groups were required to have at least one psychiatric diagnosis in order to be entered into the analysis. Results indicated that 70.6% and 58.0% of cases (non-contact group) did not have contact with a psychiatrist or other professional, respectively. Rather, 64.5% of them had sought help from general physicians. In general, the deceased had higher scores on chronic negative impact from work than the control group, although some had not reached significant level, which was possibly due to the small sample size. Noticeably, among those non-contact cases with psychiatrists, the deceased (*n* = 36) had a significantly higher level of chronic negative work impact compared to controls (n = 10) (Mean = .58 vs -.22), but not among those who had consulted psychiatrists (deceased *n* = 15; control *n* = 3; Mean = -.26 vs -.40). This is similar to the results for non-contact of other professional services for mental health problems (deceased *n* = 29; control *n* = 8; Mean = .57 vs -.26), but not among those who had made contact (deceased *n* = 21; control *n* = 5; Mean = -.02 vs -.27). There was also significant result found in the analysis of those who had and seen a doctor (Mean = .37 vs -.29) which suggested that the suicide no-contact group suffered from a more chronic negative impact from work than the controls and tended not to seek specialized services for their mental health problems. They would rather seek help from general physicians.

4. Discussion

4.1 Profiles of employed suicides

The most prominent finding in this study, similar to many other psychological autopsy reports (Cavanagh et al., 2003), was the potent effect of psychiatric morbidity increasing the risk of suicide when comparing the deceased with controls. Being employed did not alter

many of the basic findings regarding the powerful influence of psychopathology. It is notable that a substantial proportion of psychiatric diagnoses given to both controls (14 out of 15) and the deceased (46 out of 71) were mood, anxiety, and adjustment disorders. None of the controls had suffered from any psychotic disorders, while 19.6% (10 out of 51) of the deceased had suffered a psychotic disorder. Overall, our findings concurred with the few other studies on suicides among employed persons, which also found that psychiatric illness was a central factor (Amagasa et al., 2005; Melchior et al., 2007).

Similar to unemployed persons, the employed deceased were often found to live alone, to have lower problem-solving abilities, and poorer social support, in addition to the frequent occurrence of psychiatric illnesses—although, as noted, employed suicides had a lower prevalence of psychotic disorders than unemployed suicides in Hong Kong (Chan et al., 2007). This finding is consistent with the many functional challenges faced by persons suffering psychoses, which interfere with vocational activities. Low social support has been shown to be associated with individuals experiencing work-related stress prior to suicide attempts (Ostry et al., 2007) and suicides (Amagasa, 2005), likely exacerbating the central role of psychopathology.

4.2 Chronic impact from work

The deceased group had significantly higher negative chronic work stress. It is important to note, however, that job stress was a modest risk factor. This is not surprising, considering the frequency of such concerns. Our samples were collected in 2003, a time of high unemployment in Hong Kong, which had been buffeted during the late 1990s by the East Asian economic crisis and deeply affected by the SARS epidemic. Many people in the region had been affected financially; the local unemployment rate was high and there were concerns about lost real estate values (Yip and Caine, 2011). In such a context of unstable employment and financial markets, we expect accentuated vulnerability for persons with interpersonal and functional difficulties, heavy financial burdens, and uncertain social network support. In their longitudinal studies of British civil servants aged 33-55 during the 1990s, Ferrie and colleagues (Ferrie et al., 2002; Ferrie et al., 2005) found that those exposed to chronic job insecurity had the highest self-reported physical and psychiatric morbidity, for example, depression.

The deceased were found to include a significantly higher percentage of persons in danger of losing their job or being demoted, and they were described as suffering from significantly higher negative chronic effects. In this context, our data appear to provide important insights. Members of the control group experienced relatively more incidents of work-related distress than the deceased, with more frequent pay cuts, pay freezes, and resignation. However, they did not experience a greater negative impact. In the face of these stresses, controls experienced substantially greater social support, which served as a protective factor in our model. Our methods did not allow us to disaggregate different factors in a causal fashion—whether the higher levels of psychopathology contributed to lower levels of social support, or vice versa. Whatever the nature of these relationships, it was evident that those who killed themselves seem to have been more susceptible to the day-to-day stresses in the workplace and in their lives.

4.3 Psychiatric illness as mediator

Our study provides further evidence regarding the influence of negative work impact on suicide among individuals likely to be vulnerable. Clearly there were many control participants who faced substantial workplace stresses who did not kill themselves. We know that work stress has been strongly associated with attempted suicide and suicide (Feskanich et al., 2002; Ostry et al., 2007), and persons who experienced less control at work have been found to present increased risk of suicide (Ostry et al., 2007; Tsutsumi et al., 2007). However, these factors alone are not sufficient to explain what we found.

Put simply, while work stress has a modest effect when viewed in the absence of other factors, the presence of a psychiatric diagnosis accounts for this effect when considered in a multivariate analysis. This does not mean that work stress or other economic challenges were not important in the decedents' lives. Rather, we suggest that persons with mental distress and disorders are more likely to be susceptible to changes in the local economic environment. In turn, less social support and an absence of professional care would serve to further exacerbate—or not mitigate—their condition as they struggle with personal adversities. The unemployment rate in Hong Kong reached its historical peak within a 24-month period from 2001 to 2003, rising from 4.8% to 8.8% (Census and Statistics Department, 2011). Our previous work (Yip and Caine, 2011) indicated that the greatest proportion in the rise in suicide in Hong Kong came from the employed population, which outnumbered the unemployed 20-to-1 in 2001. While a much lower percentage of the employed population suffers from severe psychiatric conditions, the employed so greatly outnumber the unemployed that they add more to the overall pool of suicides in a place such as Hong Kong—in keeping with what is expected from Rose's theorem.

4.4 Service utilization and chronic impact from work

Among the deceased group, majority of deceased subjects ended up with no usage of specialized services for their mental health problems, and they appeared to suffer from a more chronic negative impact from work than the controls. Chronic stressors has been found a strong predictor of depressive symptoms than acute stressors (McGonagle and Kessler, 1990) and increasing duration of stress was evident to cause detrimental changes in cellular immunity and immune function (Segerstrom and Miller, 2004). In our study, employed suicides appeared to have more obvious and persistent needs for specialized services for mental health problems. Their low service-use pattern is consistent with the findings of Amagasa and colleagues (2005), who found that none of their suicide cases had consulted psychiatric services prior to their death (Amagasa et al., 2005). They appeared to confront problems alone, with less social support and less professional assistance. Employed individuals might be particularly resistant to using the available mental health services, even when they were at risk, because they fear it might cause them to lose their job (Hamdi et al., 2008; Takahashi, 2008). Noticeably, those deceased cases who consulted physicians showed a much higher level of work stress suggesting that they might find physicians more relevant in helping with their mental health problems. This is consistent with the existing body of knowledge about physician's crucial role in assessment and treatment of suicidal people (Pirkis & Burgess, 1998; Luoma, Martin & Pearson, 2002).

5. Limitations

The field work of the PA study was conducted in 2003-2005 and the findings might not relevant to current Hong Kong context. Employed suicides has been constantly constituted a substantial proportion ranging from 28.9% (2002) to 34.7% (2006) and then back to 28.5% (2010). With an approximately 3 million strong employed population in Hong Kong, the suicide rate among employed people has been relatively stable (from 8.4 per 100, 000 persons in 2002 to 7.3 in 2010), except its peak of 11.5 in 2003 (Yip and Caine, 201; Centre for Suicide Research and Prevention, 2014). These figures suggest that there is no major contextual change in Hong Kong over the past ten years which may make this paper untimely and irrelevant in understanding the relationship between work impact and suicides. Any PA study involves a post-hoc cross-sectional comparison between suicides and live controls, using proxy interviews for the former and directly assessing participants for the latter. Conner and colleagues (Conner et al., 2003, a, b) explored the potential vulnerabilities of informant-based diagnoses and assessments of life events and social support. We appreciate that there are limitations to these methods even as they have proven very useful for exploring the last days and months of people's lives. PA studies, by their nature, cannot prove causality, and one must not confuse statistically defined differences between suicides and controls and prospectively assessed factors that have demonstrated predictive validity. Additionally, our sample size was small, which limited the conclusiveness of our mediation analysis. While we could not conclude that there is a sequential relationship between chronic impact from work and the emergence of psychiatric disorders, the commonality of stress amongst both controls and suicides argues that a degree of significant vulnerability was present at times of economic crisis. Finally, due to the limitations of the proxy information used in PA studies, details regarding job design and workplace characteristics could not be captured, and it was impossible to establish the duration and severity of impact perceived by both deceased and control cases (Hawton et al., 1998).

Future studies should prospectively examine individuals whose employment situation is stress-filled, unstable, or associated with a fear of underemployment or unemployment. In order to engage employers in facilitating such investigations—especially among those who may not see suicide as a pressing problem due to its relatively low population base rate—it may be important to emphasize the costly effects of depression, other psychiatric disorders, and substance misuse on productivity, absenteeism, and disability (Chang et al., 2012; Hu, 2004; Lepine and Briley, 2011; Okumura and Higuchi, 2011; Thomas and Morris, 2003; Wickizer, 2013). Such an approach would allow for the studies required, even as they may not be specifically labeled as suicide-prevention research.

6. Conclusion

For employed suicides, work-related distress coupled with low levels of social support and a lack of professional care serve as the context for their mental health problems. Our findings point to a need to develop preventive interventions that precede times of economic crisis. We see several compelling reasons for this: (1) Once a community is overtaken by financial concerns and economic turmoil, it is difficult for its members to develop new initiatives, however well intentioned they may be; (2) the most vulnerable persons are likely those

already suffering from or particularly susceptible to disturbances of mental health and in need of interventions—even before the onset of an economic disturbance; (3) those in need of care during times of economic uncertainty are unlikely to ask for or seek help at times of their greatest need.

Vulnerable persons may seek to maintain their status as employed workers in part by avoiding contact with mental health professionals, however much stress they experience or perceive. The suicide of these persons, generally in the middle and most productive years of their lives exacts considerable social and economic losses from their communities and society. It is highly desirable to set in place plans for rapid implementation when future economic crises begin to unfold. It is also particularly relevant to develop occupational mental health programs focusing on awareness of depression and mental well-being, as well as financial planning and better management of financial debts (Gunnell et al., 2009) Additionally, it is important to strengthen social support and make psychosocial services available for individual employees experiencing distress and their families as measures to enhance mental health among employees.

Acknowledgments

The authors would like to thank the assistance of the Coroner's Court and the public mortuaries of the Department of Health, HKSAR in facilitating case recruitment and data collection. We gratefully acknowledge the research team at the HKJC Centre for Suicide Research & Prevention of the University of Hong Kong, who assisted with case recruitment and interviewing informants. We are particularly indebted to all the informants, who gave so generously of their time and shared memories of their loved ones.

Role of funding source

This work was supported, in part, by the Hong Kong Jockey Club Charities Trust (2002/CP04). Professor Yip was supported, in part, by General Research Fund (GRF) for the study of “Suicide and employment” (HKU784012M). Dr. Caine was supported, in part, by US Centers for Disease Control and Prevention Grant R49 CE002093 and US National Institutes of Health Grant D43 TW009101.

References

Amagasa T, Nakayama T, Takahashi Y. Karojisatsu in Japan: characteristics of 22 cases of work-related suicide. Journal of Occupational Health. 2005; 47:157–164. PubMed: 15824481. [PubMed: 15824481]

American Psychiatric Association. Clinician Version, Administration Booklet. American Psychiatric Association; Washington, DC.: 1997. Structured Clinical Interview for DSM-IV® Axis I Disorders (SCID-I)..

Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? J Health Soc Behav. 1995; 36(1):1–10. [PubMed: 7738325]

Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. Journal of Personality and Social Psychology. 1986; 51:1173–1182. [PubMed: 3806354]

Blakely TA, Collings SC, Atkinson J. Unemployment and suicide. Evidence for a causal association? Journal of Epidemiology and Community Health. 2003; 57:594–600. [PubMed: 12883065]

Cavanagh JT, Carson AJ, Sharpe M, Lawrie SM. Psychological autopsy studies of suicide: a systematic review. Psychological Medicine. 2003; 33:395–405. [PubMed: 12701661]

Census and Statistics Department. [4 November 2013] Statistics on labour force, unemployment and underemployment [online]. 2011. Available: http://www.censtatd.gov.hk/hong_kong_statistics/statistical_tables/index.jsp?charsetID=1&tableID=006&subjectID=2

Centre for Suicide Research and Prevention. Hong Kong suicide deaths by employment status, 2002 – 2010. The University of Hong Kong; 2014. Unpublished document

Chan WS, Yip PS, Wong PW, Chen EY. Suicide and unemployment: what are the missing links? Archives of Suicide Research. 2007; 11:327–335. [PubMed: 17882620]

Chang SM, Hong JP, Cho MJ. Economic burden of depression in South Korea. Social Psychiatry and Psychiatric Epidemiology. 2012; 47:683–689. [PubMed: 21526429]

Chen EY, Chan WS, Chan SS, Liu KY, Chan CL, Wong PW, Law YW, Yip PS. A cluster analysis of the circumstances of death in suicides in Hong Kong. Suicide and Life-Threatening Behavior. 2007; 37:576–584. [PubMed: 17967124]

Chen EY, Chan WS, Wong PW, Chan SS, Chan CL, Law YW, Beh PS, Chan KK, Cheng JW, Liu KY, Yip PS. Suicide in Hong Kong: a case-control psychological autopsy study. Psychological Medicine. 2006; 36:815–825. [PubMed: 16704748]

Conner KR, Beautrais AL, Conwell Y. Moderators of the relationship between alcohol dependence and suicide and medically serious suicide attempts: analyses of Canterbury Suicide Project data. Alcoholism: Clinical and Experimental Research. 2003a; 27:1156–1161.

Conner KR, Beautrais AL, Conwell Y. Risk factors for suicide and medically serious suicide attempts among alcoholics: analyses of Canterbury Suicide Project data. Journal of Studies on Alcohol. 2003b; 64:551–554. [PubMed: 12921197]

D'Zurilla T, Nezu A. Development and preliminary evaluation of the Social Problem-Solving Inventory (SPSI). Psychological Assessment: A Journal of Consulting and Clinical Psychology. 1990; 2:156–163.

Ferrie JE, Shipley MJ, Newman K, Stansfeld SA, Marmot M. Self-reported job insecurity and health in the Whitehall II study: potential explanations of the relationship. Social Science & Medicine. 2005; 60:1593–1602. [PubMed: 15652690]

Ferrie JE, Shipley MJ, Stansfeld SA, Marmot MG. Effects of chronic job insecurity and change in job security on self reported health, minor psychiatric morbidity, physiological measures, and health related behaviours in British civil servants: the Whitehall II study. Journal of Epidemiology and Community Health. 2002; 56:450–454. [PubMed: 12011203]

Feskanich D, Hastrup JL, Marshall JR, Colditz GA, Stampfer MJ, Willett WC, Kawachi I. Stress and suicide in the Nurses' Health Study. Journal of Epidemiology and Community Health. 2002; 56:95–98. [PubMed: 11812806]

Gunnell D, Lopatatzidis A, Dorling D, Wehner H, Southall H, Frankel S. Suicide and unemployment in young people. Analysis of trends in England and Wales, 1921-1995. British Journal of Psychiatry. 1999; 175:263–270. [PubMed: 10645329]

Gunnell D, Platt S, Hawton K. The economic crisis and suicide. BMJ. 2009; 338:b1891. [PubMed: 19447829]

Hamdi E, Price S, Qassem T, Amin Y, Jones D. Suicides not in contact with mental health services: risk indicators and determinants of referral. Journal of Mental Health. 2008; 17:398–409.

Hawton K, Appleby L, Platt S, Foster T, Cooper J, Malmberg A, Simkin S. The psychological autopsy approach to studying suicide: a review of methodological issues. J. Affect. Disord. 1998; 50:269–276. [PubMed: 9858086]

Hu TW. The economic burden of depression and reimbursement policy in the Asia Pacific region. Australas Psychiatry. 2004; 12(Suppl):S11–15. [PubMed: 15715825]

Inoue K, Tanii H, Abe S, Nishimura Y, Kaiya H, Nata M, Okazaki Y, Fukunaga T. The report in the correlation between the factor of unemployment and suicide in Japan. The American Journal of Forensic Medicine and Pathology. 2008; 29:202–203. [PubMed: 18520495]

Kim IH, Muntaner C, Khang YH, Paek D, Cho SI. The relationship between nonstandard working and mental health in a representative sample of the South Korean population. Social Science & Medicine. 2006; 63:566–574. [PubMed: 16580108]

László KD, Pikhart H, Kopp MS, Bobak M, Pajak A, Malyutina S, Salavecz G, Marmot M. Job insecurity and health: A study of 16 European countries. Social Science & Medicine. 2010; 70:867–874. [PubMed: 20060634]

Law YW, Wong PW, Yip PS. Suicide with psychiatric diagnosis and without utilization of psychiatric service. BMC Public Health. 2010; 10:431. [PubMed: 20649996]

Lecrubier Y, Braconnier A, Said S, Payan C. The impulsivity rating scale (IRS): preliminary results. European Psychiatry. 1995; 10:331–338. [PubMed: 19698364]

Lepine JP, Briley M. The increasing burden of depression. Neuropsychiatric Disease Treatment. 2011; 7:3–7. [PubMed: 21750622]

Lewis G, Sloggett A. Suicide, deprivation, and unemployment: record linkage study. British Medical Journal. 1998; 317:1283–1286. [PubMed: 9804714]

Luoma JB, Martin CE, Pearson JL. Contact with mental health and primary care providers before suicide: a review of the evidence. Am J Psychiatry. 2002; 159(6):909–916. [PubMed: 12042175]

McGonagle KA, Kessler RC. Chronic stress, acute stress, and depressive symptoms. Am J Community Psychol. 1990; 18(5):681–706. [PubMed: 2075897]

Melchior M, Caspi A, Milne BJ, Danese A, Poulton R, Moffitt TE. Work stress precipitates depression and anxiety in young, working women and men. Psychological Medicine. 2007; 37:1119–1129. [PubMed: 17407618]

Meltzer H, Bebbington P, Brugha T, Jenkins R, McManus S, Stansfeld S. Job insecurity, socio-economic circumstances and depression. Psychological Medicine. 2010; 40:1401–1407. [PubMed: 19903366]

Netterstrom B, Conrad N, Bech P, Fink P, Olsen O, Rugulies R, Stansfeld S. The relation between work-related psychosocial factors and the development of depression. Epidemiologic Reviews. 2008; 30:118–132. [PubMed: 18587142]

Okumura Y, Higuchi T. Cost of depression among adults in Japan. The Primary Care Companion for CNS Disorders. 2011; 13(3):e1–e9.

Ostamo A, Lahelma E, Lonnqvist J. Transitions of employment status among suicide attempters during a severe economic recession. Social Science & Medicine. 2001; 52:1741–1750. [PubMed: 11327145]

Ostry A, Maggi S, Tansey J, Dunn J, Hershler R, Chen L, Louie AM, Hertzman C. The impact of psychosocial work conditions on attempted and completed suicide among western Canadian sawmill workers. Scandinavian Journal of Public Health. 2007; 35:265–271. [PubMed: 17530548]

Pirkis J, Burgess P. Suicide and recency of health care contacts. A systematic review. Br J Psychiatry. 1998; 173:462–474. [PubMed: 9926074]

Phillips MR, Yang G, Zhang Y, Wang L, Ji H, Zhou M. Risk factors for suicide in China: a national case-control psychological autopsy study. Lancet. 2002; 360:1728–1736. [PubMed: 12480425]

Reichenberg A, MacCabe JH. Feeling the pressure: work stress and mental health. Psychological Medicine. 2007; 37:1073–1074. [PubMed: 17537286]

Routley VH, Ozanne-Smith JE. Work-related suicide in Victoria, Australia: a broad perspective. International Journal of Injury Control and Safety Promotion. 2012; 19:131–134. [PubMed: 22132703]

Segerstrom SC, Miller GE. Psychological stress and the human immune system: a meta-analytic study of 30 years of inquiry. Psychol Bull. 2004; 130(4):601–630. doi: 10.1037/0033-2909.130.4.601. [PubMed: 15250815]

Stansfeld S, Candy B. Psychosocial work environment and mental health--a meta-analytic review. Scand J Work Environ Health. 2006; 32:443–462. [PubMed: 17173201]

Takahashi, Y. Japan.. In: Yip, PSF., editor. Suicide in Asia - Causes and Prevention. Hong Kong University Press; Hong Kong: 2008.

Thomas CM, Morris S. Cost of depression among adults in England in 2000. British Journal of Psychiatry. 2003; 183:514–519. [PubMed: 14645022]

Tsutsumi A, Kayaba K, Ojima T, Ishikawa S, Kawakami N. Low control at work and the risk of suicide in Japanese men: a prospective cohort study. Psychotherapy and Psychosomatics. 2007; 76:177–185. [PubMed: 17426417]

Virtanen P, Janlert U, Hammarstrom A. Exposure to temporary employment and job insecurity: a longitudinal study of the health effects. Occupational & Environmental Medicine. 2011; 68:570–574. [PubMed: 21081513]

Wang JL, Lesage A, Schmitz N, Drapeau A. The relationship between work stress and mental disorders in men and women: findings from a population-based study. Journal of Epidemiology and Community Health. 2008; 62:42–7. [PubMed: 18079332]

Wickizer TM. State-level estimates of the economic costs of alcohol and drug abuse. Journal of Health Care Finance. 2013; 39:71–84. [PubMed: 23614269]

Yamasaki A, Araki S, Sakai R, Yokoyama K, Voorhees AS. Suicide mortality of young, middle-aged and elderly males and females in Japan for the years 1953-96: time series analysis for the effects of unemployment, female labour force, young and aged population, primary industry and population density. Industrial Health. 2008; 46:541–549. [PubMed: 19088406]

Yip PS, Caine ED. Employment status and suicide: the complex relationships between changing unemployment rates and death rates. Journal of Epidemiology and Community Health. 2011; 65:733–736. [PubMed: 21115474]

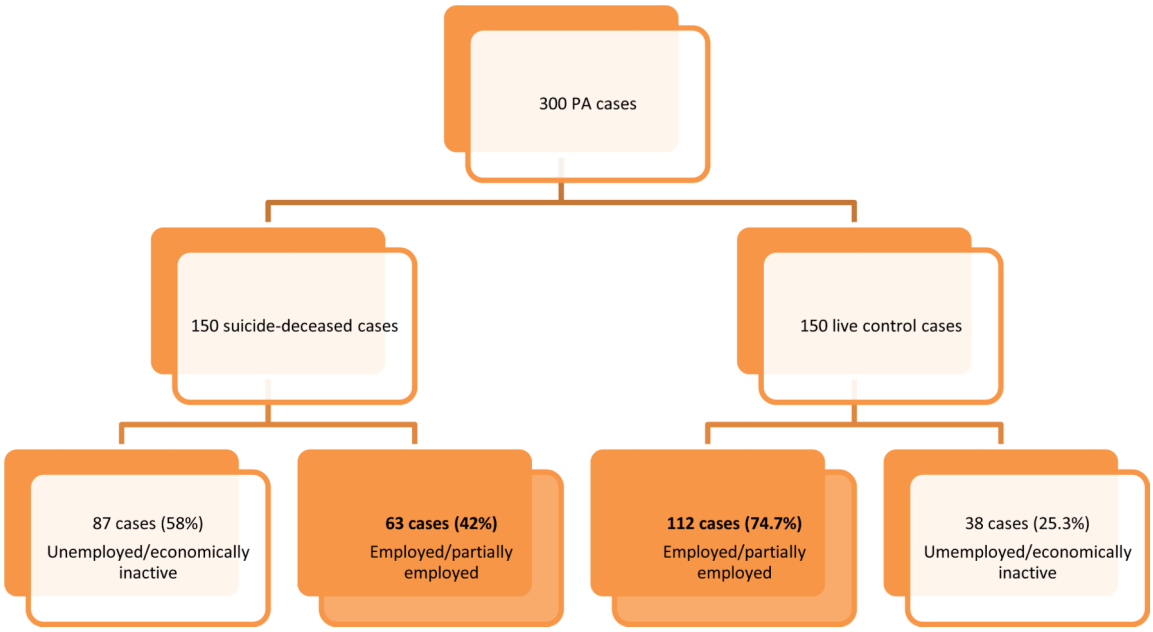
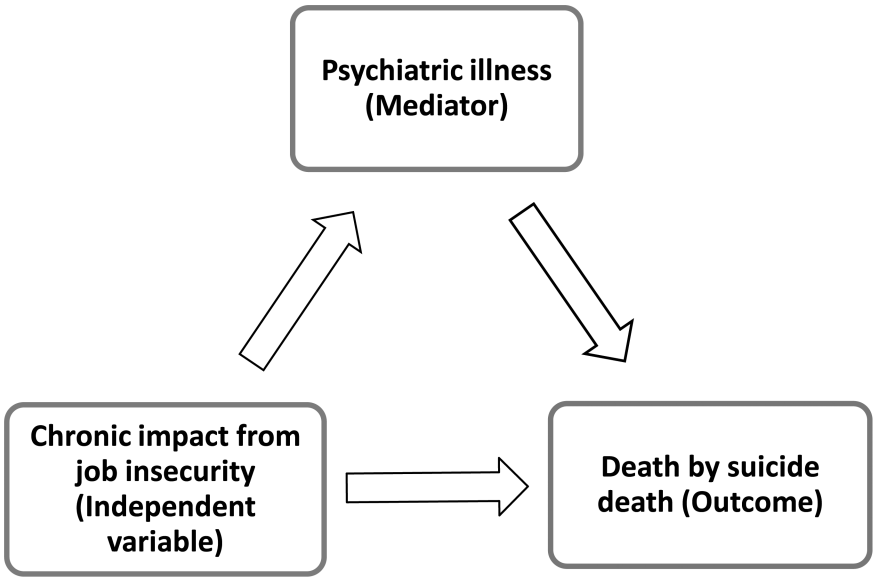


Figure 1.
The number of cases who were employed in the suicide-deceased and live control groups



Before controlling for psychiatric illness $B = 0.38$, $SE = 0.17$, $p = 0.028$*, OR = 1.46

After controlling for psychiatric illness $B = 0.29$, $SE = 0.25$, $p = 0.237$, OR = 1.34

Figure 2.

Mechanism of chronic impact from work on suicide among employed individuals through the mediator of psychiatric illness

Before controlling for psychiatric illness $B = 0.38$, $SE = 0.17$, $p = 0.028$*, OR = 1.46 After controlling for psychiatric illness $B = 0.29$, $SE = 0.25$, $p = 0.237$, OR = 1.34

Table 1

A comparison between the control and suicide-deceased groups by predisposing variables

Predisposing variables	Control (*n* = 112)	Deceased (*n* = 63)	*p*-value
Gender			.978
Male	78 (69.6%)	44 (69.8%)	
Female	34 (30.4%)	19 (30.2%)	
Age group			.789
15-24	10 (8.9%)	6 (9.5%)	
25-34	21 (18.8%)	15 (23.8%)	
35-44	47 (42.0%)	24 (38.1%)	
45-54	27 (24.1%)	12 (19.0%)	
55+	7 (6.3%)	6 (9.5%)	
Marital status			.009*
Single (never married)	25 (22.3%)	28 (44.4%)	
Married	77 (68.8%)	31 (49.2%)	
Divorced/widowed/defacto	10 (8.9%)	4 (6.3%)	
Education level			.140
Post-secondary or above	28 (25.5%)	9 (14.3%)	
Secondary	61 (55.5%)	44 (69.8%)	
Primary or below	21 (19.1%)	10 (15.9%)	
Years living in Hong Kong			.933
Less than 7 years	2 (1.8%)	1 (1.6%)	
More than 7 years	110 (98.2%)	61 (98.4%)	
Living arrangement			.009*
Living alone	6 (5.4%)	11 (17.5%)	
Living with others	106 (94.6%)	52 (82.5%)	
Income level			.007*
Less than HK$7,000	23 (22.8%)	25 (43.1%)	
HK$7,000 or more	78 (77.2%)	33 (56.9%)	
Financial debts/bankruptcy			< .001*
Debts/bankrupt	8 (7.2%)	19 (30.2%)	
No debts/not bankrupt	103 (92.8%)	44 (69.8%)	

$p < .05$

Table 2

A comparison between the control and suicide-deceased groups by psycho-social conditions

	Control		Deceased		*t*	*p*-value
	n	***Mean (SD)***	***n***	***Mean (SD)***		
Impulsivity (IRS)	110	−.34 (.46)	55	.68 (1.38)	−7.06	< .001*
Social Problem Solving (SPSI)	112	.28 (.83)	63	−.49 (1.09)	5.24	< .001*
Size of social support	102	.05 (1.21)	50	−.09 (.18)	.82	.415
Frequency of social support	104	−.07 (.86)	45	.16 (1.26)	−1.27	.205
Content of social support	109	.29 (.58)	51	−.62 (1.37)	5.95	< .001*

Life events	**n = 112**	**Mean (SD)**	**n = 63**	**Mean (SD)**		
Relationship problems: acute		−.15 (.14)		.27 (1.63)	−2.73	.007*
Relationship problems: chronic		−.10 (.47)		.17 (1.54)	−1.74	.084
Family problems: acute		−.10 (.32)		.17 (1.60)	−1.71	.090
Family problems: chronic		.11 (1.21)		−.19 (.33)	1.93	.055
Legal problems–chronic		−.11 (.06)		.20 (1.65)	−2.00	.048*
Physical problems– acute		−.08 (.21)		.15 (1.64)	−1.44	.150
Physical problems– chronic		−.11 (.87)		.19 (1.18)	−1.87	.063

Note: All scores are standardized.

* p < .05

Table 3

A comparison between the control and suicide-deceased group by impact from work

Work-related incidents	Control (*n* = 112)	Deceased (*n* = 63)	*p*-value
New Job			
Had it happened? (Yes)	107 95.5%	61 96.8%	.676
Number of occurrences			
Mean (*SD*)	3.25 (1.94)	3.07 (2.33)	.624
Impact			
Mean (*SD*)	.01 (.95)	−.02 (1.12)	.892
Fired			
Had it happened? (Yes)	16 15%	12 20.3%	.375
Number of occurrences			
Mean (SD)	2.00 (1.57)	2.25 (2.44)	.772
Impact			
Mean (SD)	.20 (1.06)	−.35 (.83)	.199
In danger of losing job/demotion			
Had it happened? (Yes)	9 8.3%	19 31.1 %	< .001*
Number of occurrences			
Mean (*SD*)	1.29 (.49)	1.09 (.30)	.307
Impact			
Mean (*SD*)	.55 (1.10)	−.29 (.83)	.037*
Conflict with boss/colleagues			
Had it happened? (Yes)	41 38.3%	22 36.7%	.833
Number of occurrences			.333
Mean (*SD*)	4.55 (4.47)	3.00 (4.42)	
Impact			
Mean (*SD*)	.10 (.95)	−.23 (1.10)	.247
Changes in workplaces			
Had it happened? (Yes)	43 39.4%	24 38.7%	.924
Number of occurrences			
Mean (*SD*)	2.02 (1.28)	2.25 (2.27)	.636
Impact			
Mean (*SD*)	.29 (.92)	−.55 (.94)	.001*
Pay cut			
Had it happened? (Yes)	31 29.0%	7 11.5%	.009*
Number of occurrences			.719

Work-related incidents	**Control (*n* = 112)**	**Deceased (*n* = 63)**	***p*-value**
Mean (*SD*)	1.67(1.80)	1.00 (N.A.)	
Impact			
Mean (*SD*)	.15 (.83)	−.65 (1.46)	.055
Pay freeze			
Had it happened? (Yes)	29 26.9%	5 8.2%	.004*
Number of occurrences			
Mean (*SD*)	1.17 (.60)	1.00 (.00)	.693
Impact			
Mean (*SD*)	.05 (.80)	−.27 (1.91)	.524
Resigning from job			
Had it happened? (Yes)	66 62.3%	25 41.0%	.008*
Number of occurrences			
Mean (*SD*)	2.67 (1.43)	2.83 (2.50)	.721
Impact			
Mean (*SD*)	.17 (.96)	−.59 (.94)	.004*
Overall acute impact			
Mean (*SD*)	.07 (1.12)	−.13 (.31)	.169
Overall chronic impact			
Mean (*SD*)	−.07 (.73)	.36 (1.58)	.016*

Note: Impact scores are standardized.

* $p < .05$

Table 4

Multivariate model of associated factors comparing the control and suicide-deceased groups among employed individual cases

	O.R.	*p*	95% CI	
			Lower	Upper
Psychiatric illness (SCID-I)	25.88	< .001*	6.27	106.870
Unmanageable debts/bankrupt	7.25	.032*	1.19	44.13
Impulsivity (IRS)	5.15	.013*	1.42	18.73
Social support (quality)	.27	.001*	.12	.59

*p < .05

Table 5

Use of service and chronic impact from work between the control and suicide-deceased groups among subjects with psychiatric illness

	Control		Deceased		*T*	*p*-value
Chronic impact from work	***n***	***Mean (SD)***	***n***	***Mean (SD)***		
Had the case consulted a doctor in the last six months?						
Yes	7	−.29 (.17)	31	.37 (1.40)	−2.54	.016*
No	6	−.23 (.42)	17	.01(1.47)	−.39	.698
Had the case been treated for mental health problems in any setting, E.g. clinical psychology or social services?						
Yes	5	−.27 (.20)	21	−.02(.85)	−.63	.538
No	8	−.26 (.36)	29	.57(1.86)	−2.26	.030*
Had the case visited a psychiatrist in the last six months?						
Yes	3	−.40 (.00)	15	−.26 (.36)	−.66	.516
No	10	−.22 (.31)	36	.58(1.75)	−2.59	.013*

Note: Impact scores are standardized.

* $p < .05$