

DISSERTATION

AN INQUIRY INTO MENTAL HEALTH AND
HELP SEEKING BEHAVIORS IN JAPAN

RYOKO SUSUKIDA

2013



National Graduate Institute for Policy Studies

AN INQUIRY INTO MENTAL HEALTH AND
HELP SEEKING BEHAVIORS IN JAPAN

A Dissertation

Submitted to the Faculty of the National Graduate Institute for Policy Studies (GRIPS)

in Partial Fulfillment of the Requirements for the Degree of

DOCTOR OF PHILOSOPHY IN PUBLIC ECONOMICS

by

Ryoko Susukida

September, 2013

AN INQUIRY INTO MENTAL HEALTH AND HELP SEEKING BEHAVIORS IN JAPAN

Abstract

To prevent suicide, it is critical to provide appropriate help to those who suffer from serious mental health problems that can lead to suicide. Such individuals at risk of suicide, however, may seek no help, as they may not know that they are in grave danger. Thus, how to identify them and how to offer timely help to them are burning questions, and there is a large and growing body of literature on this issue. It is known that the male gender, joblessness, and singleness are important correlates of suicide. It is less known what kinds of mental health problems afflict high-risk persons, who are more likely to seek help for mental health problems, and from whom they seek help. This dissertation attempts to contribute to this line of research by using nationally representative data of individuals in Japan collected by the Japanese government. This study characterizes individuals prone to mental health problems and examines the associations of their help seeking behaviors with gender, job status, marital status, and other observable characteristics of individuals. Although it is well known that males are at higher risk of suicide than females in Japan, this study finds that males are significantly less likely to admit that they have mental health problems and to seek help for the problems than females. Another finding is that the perception of mental health problems is more closely associated with the incidence of suicide among males than among females. Furthermore, it is only among middle-aged males that the incidence of suicide significantly increases with unemployment and divorce, whereas unemployment and divorce are associated closely with perceived mental health problems for both females and males. The study also finds that single males and middle-aged unemployed males who suffer from mental stress seldom seek consultation about their problems, while their female counterparts do not hesitate to do so. The reason why middle-aged unemployed males fail to consult anyone is often that they do not know whom to consult, whereas such a case is very rare among females. These findings suggest that middle-aged unemployed males and single males are at higher risks and that a key to reducing the incidence of suicide in Japan is to develop a care system that pays special attention to such high risk individuals so as to provide timely responses to their perceived mental health problems and to facilitate their help seeking.

To my loved ones

Summary

It has been increasingly recognized that to prevent suicide, it is important to detect mental health problems early and to lead individuals with such problems to receive prompt treatment. Understanding what kinds of early signs are prone to occur to whom and addressing the unmet needs for mental treatment would form the basis for early detection and prompt treatment of mental health problems. The prior literature points out that the male gender, joblessness, and singleness are important correlates of fatal suicide. However, it is less known what kinds of mental health problems occur to high-risk persons with these characteristics, whether they seek help for mental health problems more than others, and from whom they seek help.

Using data sets collected nationwide by the Japanese government, this dissertation attempts to answer these questions. It analyzes how joblessness, singleness, gender, and other characteristics of individuals are associated with proneness to suicide and other mental health problems and with help seeking behaviors. By other mental health problems, we mean perceived stress and somatic symptoms, such as sleep difficulties, a sense of fatigue, and irritability, of mental disorder. By help seeking behaviors, we mean consultation with family members, friends, colleagues, public consultation services, and medical professionals.

The individual-level sample survey data available to us cover information on the perception of stress and somatic symptoms, and help seeking behaviors. This data set, however, offers only a cross section of individuals, not a panel. More importantly, it does not include information on suicide because suicide does not occur as frequently as it can be captured appropriately by the usual sample surveys. In order to look at both suicide and other perceived mental health problems, the present study uses both the

individual-level survey data and the prefecture-level data. The government provides panel data set of prefecture-level aggregates of the individual-level information on mental health problems and help seeking behaviors for the 47 prefectures every three years from 2001 (from 2004 for help seeking behaviors) to 2010. We first use this prefecture-level data set to analyze of the association between suicide, other mental health problems, and help seeking behaviors on one hand, and the labor market situation, the divorce rate, and other socioeconomic characteristics of prefectures on the other hand. To our knowledge, there has been no attempt in the existing literature to analyze suicide, other mental health problems, and help seeking behaviors in a coherent manner. We then use the individual-level data set to conduct much more detailed analysis to characterize those who are prone to mental health problems and those who are prone to fail to seek help for their problems. By using the prefecture- and individual-level data, we test some hypotheses derived from the economic theory of suicide, which emphasizes economic factors associated with suicide, and the sociological theory of suicide, which emphasizes the role of social integration, and the analogies of these theories.

The major findings of this study are as follows. We find that there are large gender differences in the perception of and help seeking behaviors against mental health problems. Although males are two to three times more likely to die by suicide than females, they are significantly less likely to admit to their mental health problems and are also less likely to seek help when they feel stress than females. Such patterns are particularly evident among middle-aged males, who are at the highest risk of death by suicide. In addition, we find that the perception of mental health problems is more strongly correlated with the incidence of suicide among males than among females. The

prefecture-level data reveal that when the number of males who perceive mental health problems increases, the number of males who die by suicide also increases. In contrast, we do not observe such a relationship among females. We also find that the incidence of suicide increases significantly with unemployment and divorce only among males, especially among middle-aged males. In contrast, the perception of mental health problems is associated with joblessness and singleness regardless of gender. As for help seeking behaviors, single males are significantly less likely to seek consultation about stress as compared with their married counterparts. Moreover, we find that middle-aged unemployed males tend to fail to consult anyone about stress, and that many of such males confess that they do not know whom to consult. In contrast, single females and middle-aged unemployed females are not much less likely to seek consultation than their married and employed counterparts.

These findings suggest that while mental care is important for those who are out of work or single regardless of gender, it is especially important to raise awareness of the early detection of and prompt treatment for mental health problems among males, particularly middle-aged unemployed males and single males. Importantly, the provision of information regarding the availability of consultation services might be a key to reducing barriers to help seeking among middle-aged unemployed males.

Table of Contents

Abstract.....	i
Dedication.....	ii
Summary.....	iii
Table of Contents.....	vi
List of Figures.....	vii
List of Tables.....	viii
Acknowledgements.....	x
CHAPTER 1: Introduction.....	1
CHAPTER 2: Literature Review	6
CHAPTER 3: A Prefecture-Level Panel Data Analysis of Mental Health Problems and Suicide	24
CHAPTER 4: An Individual-Level Analysis of the Relationship between Socioeconomic Backgrounds and the Perception of Mental Health Problems in Japan.....	47
CHAPTER 5: Socioeconomic Associates and the Gender Gap in Help Seeking.....	68
CHAPTER6: Policy Implications and Conclusions.....	90
References.....	93
Appendix Tables	126

List of Figures

Figure 3.1 Trends in the suicide rate (1960-2009), Japan and the OECD average	123
Figure 3.2 Suicide motives in Japan (1978-2011)	124
Figure 5.1 Sequential stages of the perception of stress and consultation decision.....	125

List of Tables

Table 3.1 Causes of death by age group in Japan in 2010.....	103
Table 3.2 Summary statistics of the prefecture-level panel data in Japan (2001-2010).....	104
Table 3.3 Pair-wise within-prefecture correlations between the suicide rates and the perception rates of various mental health problems (2001-2010).....	105
Table 3.4 Estimated two-way fixed effect model of suicide rates and the perception rates of various mental health problems with the prefecture-level panel data 2001-2010 (Females).....	106
Table 3.5 Estimated two-way fixed effect model of suicide rates and the perception rates of various mental health problems with the prefecture-level panel data 2001-2010 (Males)	107
Table 3.6 Estimated two-way fixed effect model of suicide rates and the perception rates of stress with the prefecture-level panel data 2001-2010 by age groups.....	108
Table 4.1 Descriptive Statistics of the individual-level data by gender in 2004.....	109
Table 4.2 Estimated logistic regression model of the perception of mental health problems (Females).....	110
Table 4.3 Estimated logistic regression model of the perception of mental health problems (Males).....	111
Table 4.4 Estimated logistic regression model of the perception of mental health problems (Females aged 35-74).....	113
Table 4.5 Estimated logistic regression model of the perception of mental health problems (Males aged 35-74).....	114

Table 5.1 Descriptive statistics of the prefecture-level data of consultation and suicide in Japan (2001-2010).....	116
Table 5.2 Estimated fixed effect model of suicide and consultation among females and males.....	117
Table 5.3 Descriptive statistics of the individual-level data in Japan by gender (2004, N=69,254).....	118
Table 5.4 Estimated sequential logistic model of consultation conditional on the perception of stress for females.....	119
Table 5.5 Estimated sequential logistic model of consultation conditional on the perception of stress for males.....	120
Table 5.6 Estimated sequential logistic model of consultation conditional on the perception of stress for females aged 35-74.....	121
Table 5.7 Estimated sequential logistic model of consultation conditional on the perception of stress for males aged 35-74.....	122

Acknowledgements

First and foremost, I would like to express my deepest gratitude to my advisor Prof. Tetsushi Sonobe for his support of my Ph.D. study, for his immense knowledge, patience, and continuous encouragement. His guidance was very helpful for me in all the time of my Ph.D. study and writing of this thesis. I am very fortunate to have a great advisor and mentor like him.

Besides my advisor, I would like to express my gratitude to Prof. Shinsuke Ikeda, and Prof. Robert Leon Gonzalez, for their encouragement, insightful comments, and hard questions. Special thanks go to Prof. Yasuyuki Sawada, who was willing to participate in my final defense committee at the last moment. I would also like to thank Dr. Paul Kandasamy for editing my thesis.

In addition, I would like to thank Dr. Tadashi Takeshima, Dr. Hisateru Tachimori, Dr. Takashi Yamauchi, Dr. Masato Akazawa, Dr. Daisuke Nishi, Dr. Toshiaki Kono and Dr. Yukan Ogawa, for the illuminating discussions at the Center for Suicide Prevention. I also thank Mr. Ken Takiwaki for giving me a valuable opportunity to look on several poverty shelters in Tokyo. This experience was very useful for me to think more deeply the issues that this dissertation attempt to address. Furthermore, I am grateful to Dr. Takafumi Kubota for his insightful comments on my presentation at Okayama University of Science.

My sincere thanks also go to Dr. Mariko Gakiya, Dr. Yumiko Aratani, and Dr. Lee Kreader, for offering me the summer internship opportunities in 2011 and leading me working on diverse exciting projects at the National Center for Children in Poverty.

I thank my friends in GRIPS: Yuki Higuchi, Francis Mwesigye, Atuhurra Julius Favourite, Kefyalew Endale Adane, Ggombe Kasim Munyegera, Huang Xianguo,

Kiprono Philemon, Yoko Oishi, Yoko Sakai, Kazuya Masuda, Jing Lan, Terrence Kairiza, Akira Shibamura, Njeru Timothy Njagi, Le Anh Xuan, Be Thi Ngoc Quyen, and Nguyen Dang Tue, for the stimulating discussions and for all the fun we have had in the last three and a half years. I would also like to thank to GRIPS for their financial support granted through predoctoral fellowship.

Last but not the least, I would like to thank my family, Nobuko Susukida, Makoto Susukida and Koichi Susukida, for their selfless support for me.

Chapter 1

Introduction

According to the World Health Organization (2009), the number of suicides across the world in a year is estimated to be one million, which is larger than the total number of deaths due to homicide and war combined, and suicide is the 14th leading cause of death worldwide.¹ Goldsmith et al. (2002) estimate the economic cost of suicides at \$ 11.8 billion annually in the United States alone. This is certainly a large sum of money. One should, however, note that this estimate does not include the cost of distress and anguish that victims have suffered for a long period before they commit suicide. It should also be noted that an enormous number of individuals suffer from mental health problems even though they do not commit suicide, and that their distress and anguish are enormously costly. It is no wonder that there has been growing interest in mental health research (Cesur et al., 2013; Green, 2011; Ludwig et al., 2009; Marcus, 2013; Stillman et al., 2009; Tefft, 2011; Van Ours and Williams, 2012).

It is known in the literature on mental health that there are considerable gender differences in various aspects of mental health issues. For example, it is well documented that suicide is predominantly a male phenomenon in many countries (WHO, 2009). According to the estimates by the World Health Organization (2011), the suicide rate (the number of deaths by suicide per 100,000 persons) in males is approximately three times higher than that in females.² Another example is that males tend to underreport their mental health problems and are less likely to seek help and receive

¹ For reference, cancer is the leading cause of death worldwide. Approximately 7.6 million people die from cancer annually, which accounts for 13% of all deaths (WHO, 2013). The number of deaths due to traffic accidents is around 1.24 million (WHO, 2013), which is slightly greater than the number of deaths due to suicide.

² There are a few important exceptions such as China and India, where suicide shows little gender difference.

mental treatment when they have mental health problems than females (Arria et al., 2011; Doherty and Kartalova-O'Doherty, 2010; Eisenberg et al., 2009; Gonzalez et al., 2011; Klineberg et al., 2011; Mendelson et al., 2013; Vogel et al., 2011). Research into such gender differences is just beginning, however.

This dissertation attempts to contribute to this line of research. It uses data sets collected nationwide by the Japanese government to analyze what characterizes individuals who suffer from mental health problems, commit suicide, and seek help. Suicide has been one of the most serious social issues in Japan, and in fact, suicide takes far more lives of people in Japan than in western countries.³ Suicide is an extreme form of mental health problems. Mental health problems include perceived stress, sleep difficulties, a sense of fatigue, and irritability, which are used as diagnostic criteria for depression by professional psychiatric treatment providers (WHO, 1992). Help seeking behaviors include consultation with family or friends and visiting psychiatric doctors. Among various characteristics, the existing studies find that gender, job status, and marital status play particularly important roles in explaining the incidence of suicide, by using the data in various developed countries. The literature on happiness economics finds that these three characteristics are also important in explaining the perception of happiness of individuals (e.g., Clark and Oswald, 1994; Di Tella et al., 2001). The existing literature, however, has not examined whether and how various types of mental health problems are related to these three characteristics. This dissertation is the first

³ The suicide rate (the number of deaths by suicide per 100,000 persons) in Japan has been constantly higher than the average suicide rate in other OECD countries. From 1960 to 2009, while the average suicide rate was 13.46 in OECD countries, the average suicide rate in Japan was around 19.23 (Cabinet Office, 2011; OECD, 2011-2012). In fact, suicide is the seventh leading cause of death in Japan as of 2009 (Cabinet Office, 2011). For a reference, the number of deaths by suicide as of 2012 in Japan was 27,858 while the number of deaths by traffic accidents as of 2012 in Japan was 4,611 (National Police Agency, 2013).

study to find that these three characteristics indeed play important roles in explaining whether an individual perceives stress and faces other mental health problems and whether and how he or she seeks help when perceiving stress.

According to the above mentioned literature on suicide, the incidence of suicide is not significantly different between females and males in China and India (WHO, 2009). In other countries, however, males are much more likely to die by suicide than females. This is also the case in Japan, which this dissertation particularly focuses on. One might think it follows that males are more likely to complain about mental health problems than females in Japan. This dissertation, however, finds that the opposite is true. Although males are two to three times more likely to die by suicide than females, they are significantly less likely to report mental health problems and are also less likely to seek help when they feel stress than females. Such patterns are particularly evident among middle-aged males, who are at the highest risk of death by suicide. In addition, we find that the perception of mental health problems is more strongly correlated with the incidence of suicide among males than among females. When the number of males who perceive mental health problems increases, the number of males who die by suicide also increase. In contrast, we do not observe such a relationship among females. We also find that suicide increases significantly with unemployment and divorce only among males, especially among middle-aged males. In contrast, joblessness and singleness are associated with the perception of several types of mental health problems regardless of gender. As for help seeking behaviors, single males are significantly less likely to consult someone about stress as compared with their married counterparts. Moreover, we find that the middle-aged unemployed males tend to fail to consult anyone about stress because they do not know whom to consult. In contrast, such

relationships are less evident among females. These findings suggest that single males and middle-aged unemployed males are at higher risk and that a key to reducing the incidence of suicide in Japan is to develop a care system that pays special attention to such high risk individuals so as to provide timely responses to their perceived mental health problems and to facilitate their help seeking.

In Japan, the survey data are tightly controlled by the Ministry of Health, Labor and Welfare and in consideration for privacy protection, access to the information on the location of residence and workplace is strictly limited and unavailable for the present study. This data set, moreover, does not contain information on suicide. This is because questionnaires are distributed to the living and samples are reselected every sample year. Thus, we are unable to know whether a respondent committed suicide and died after the survey. In fact, the occurrence of suicide is too rare, at a frequency of something near 16 out of 100,000 persons, to be captured by the usual sample surveys. Apart from such survey data, the access to detailed information of individuals who died by suicide is also highly limited.⁴ What is available is the aggregate number of such individuals in various units of local administration, such as cities and prefectures. In order to look at both suicide and other mental health problems, the present study uses two sets of data. One is the prefecture-level data set including the number of deaths by suicide, the number of individuals who perceive stress, the number of individuals who face other mental health problems, the number of individuals who seek help for stress, and the variables representing characteristics of prefectures. The other data set used is the individual level data, which lacks location information but contains rich information on

⁴ This individual-level data set of suicide victims was, unfortunately, not available when we started this study. Researchers, however, may now apply for this data set, which is used in Yamauchi et al (2012), by completing the necessary procedures required by the Statistics Act (Act No. 53 of 2007).

the types of mental health problems each individual faces and on the help seeking behaviors as well as the job status, marital status, and other characteristics of individuals.

The rest of the dissertation is organized as follows. Chapter 2 reviews the existing literature in order to identify the issues that this dissertation attempts to address. Chapter 3 uses the prefecture-level data set to show how females and males perceive mental health problems differently and to examine the relationship between socioeconomic factors, the perception of mental health problems and the incidence of suicide among females and males, respectively. Chapter 4 uses the survey data set, which we have described above, to analyze the individual-level associations between socioeconomic backgrounds and the perception of mental health problems. Chapter 5 uses the same data set in Chapter 3 and Chapter 4 to analyze how females and males seek help for stress differently and to examine the prefecture-level as well as the individual-level associations between socioeconomic factors and help seeking behaviors among females and males, respectively. Chapter 6 wraps up the findings of the empirical analyses that we conduct from Chapter 3 to Chapter 5 and discusses the implications for policies and for future studies based on the results.

Chapter 2

Literature Review

2.1 Introduction

Since Durkheim (1987), there has been an accumulation of scientific investigations into the issues of mental health in a variety of disciplines. In particular, researchers have recently been accumulating knowledge of mental health issues at an accelerated pace (Cesur et al., 2013; Green, 2011; Ludwig et al., 2009; Marcus, 2013; Stillman et al., 2009; Tefft, 2011; Van Ours and Williams, 2012). This chapter reviews this immense literature with a view to identifying the important issues that have been unaddressed so far. Since this dissertation focuses on the case of Japan, this chapter also pays special attention to the existing literature in Japan.

We start by reviewing the literature that delineates the processes in which a mental health problem escalates into suicide. There are a number of studies showing the processes in a variety of disciplines such as medicine, psychology and epidemiology. This chapter next undertakes a survey of the literature that highlights the importance of help seeking in coping with mental health problems. It also looks into the prior studies documenting what types of help seeking behaviors are useful in coping with mental health problems. It also reviews the existing studies that explore the gender differences in various aspects of mental health. Furthermore, it looks into the existing studies highlighting the socioeconomic influences on suicide and happiness. It discusses how this present study is different from the existing studies. Finally, this chapter reviews the existing literature in Japan. It also explains what kinds of data sets are available for the relevant studies in Japan.

2.2 Varying degrees of mental health problems

Psychological autopsy studies suggest that suicide occurs after individuals suffer from some mental health problems (Cavanagh et al., 2003). These studies are based on interviews with individuals, such as family members or friends of suicide victims, and the investigation of personal records of suicide victims, such as medical or criminal records. Cavanagh et al. (2003) find from a review of these studies that more than 90 percent of the fatal suicide cases are preceded by some diagnosable mental disorders.

One may wonder what specific types of mental health problems increase the risk of suicide among various problems of mental health. The existing psychological autopsy studies, however, lack enough evidence to identify what specific mental health problems are particularly likely to emerge before suicide actually takes place. This is because the psychological autopsy studies tend to target a very small sample as considerable time and ethical considerations are required in interviewing the deceased's family members or friends and in investigating the personal records of the suicide victims. According to Cavanagh et al. (2003), the sample size of the psychological autopsy studies is at most 300. Due to the small sample size, multiple psychological autopsy studies have not reached a consensus regarding what types of mental health problems tend to escalate into suicide.

Epidemiological studies, which deal with larger samples than psychological autopsy studies, suggest that perceived stress is one of the mental health problems that are likely to precede suicide. Feskanich et al. (2002) use a series of surveys tracing the same sample of female registered nurses in the United States every two years from 1982 to 1996 and show that those who have perceived severe stress are at higher risk of dying by suicide than those who have not perceived severe stress. Similarly, Fujino et al.

(2005) find an increased risk of suicide among those who have perceived strong stress compared to those with lighter stress by using a series of surveys covering those living in Fukuoka prefecture in Japan from 1986 to 1999.

Some of the studies in the field of behavioral economics suggest that perceived stress arising from future worries can particularly be an alarming sign of suicide. Loewenstein et al. (2003) construct a theoretical model in which projection bias, a tendency to make individuals overestimate the extent to which their tastes remain the same in the future, leads individuals to consume what they want at the moment beyond the optimal amount.⁵ Loewenstein et al. (2003) argue that some individuals might have such a strong projection bias that they mistakenly extrapolate gloom and doom from recent or current unhappy incidents. Moreover, apart from perceived stress due to projection bias, excessively low expected future utility may be caused by overly high discount rates with which some individuals discount their future utility (e.g., Cutler et al., 2000).

In addition to the perception of stress, sleep difficulty is found to be one of the warning signs of suicide in epidemiological studies (e.g., Benson et al., 1993; Pandey et al., 1990; Wojnar et al., 2009). A decrease in the secretion of a hormone called serotonin may play a key role in both disturbing sleep (Benson, et al, 1993) and increasing the risk of suicide (Pandey et al., 1990). Furthermore, Wojnar et al. (2009) use a nationally representative sample in the United States from 2001 to 2003 to find that the presence of sleep difficulties is associated with stronger suicide ideation, more frequent suicide planning, and suicide attempts.

⁵ There is some evidence supporting the existence of projection bias, provided mainly by psychological studies. For instance, it is shown that people who shop on an empty stomach are apt to buy more than they should (e.g., Gilbert et al., 2002).

The existing epidemiological studies also suggest that several other warning signs may emerge prior to suicide. A sense of fatigue is frequently observed among those who hold suicide ideation and attempt suicide. Using survey data covering 825 adult residents in the urban Reykjavik area of Iceland, Vilhjalmsson et al. (1998) find that a sense of chronic fatigue is significantly related to thoughts of committing suicide. Lung and Lee (2008), using a nationally representative sample in Taiwan, find that those who are irritated are more likely to hold suicide ideation than others.

In summary, the literature that we have surveyed above has offered evidence that perceived stress, difficulties in sleep, a sense of fatigue, and irritability are important signs of suicide. Note, however, that those who have these signs do not necessarily consult family members, friends, doctors, or psychiatrists. The preceding studies examine neither the characteristics of those who have these mental health problems but do not help seek nor the characteristics of those who are more prone to these problems than others.

2.3 Help seeking behaviors for mental health problems

It is widely agreed that mental disorders are treatable with the use of appropriate medication and other therapies (Centers for Disease Control and Prevention, 2011). Ludwig et al. (2009) provide supportive evidence that the diffusion of antidepressant medicines reduces deaths by suicide by 5% in a cross-country panel covering 25 years. Desai et al. (2005), using a sample of psychiatric inpatients in the United States, find that those who continue their inpatient treatment show lower risk of suicide than those who discontinue their treatment. Moreover, Appleby et al. (1999), using a sample of

those who had been in contact with mental health services before committing suicide in England and Wales, also find similar results to those of Desai et al. (2005).

Apart from professional medical treatment provided by medical doctors and psychiatrists, informal emotional support provided by family members, friends, and colleagues may be useful in reducing stress. Indeed, Fenlason and Beehr (1994) use data of 351 employees in the United States to find that their perceived stress is reduced if they communicate with supervisors, coworkers, family members or friends about their emotional difficulties.

Thus, both formal and informal mental treatments are useful for reducing the risk of suicide. Among suicide victims, however, those who received any mental treatment or sought help from others prior to death are in the minority (e.g., Owens, et al., 2004). Questions arise as to why suicide victims tend to fail to seek help for their mental health problems, what percentages of individuals who perceive stress seek help, and what types of individuals tend to seek help when they face mental health problems. Empirical research into these questions is in its infancy. The exception is the growing literature on gender differences in help seeking behaviors, to which we turn in the next section.

2.4 Gender differences in mental health problems and help seeking behaviors

It is said that females and males have different ways of facing mental health problems and seeking help for the problems. As mentioned earlier, suicide is a predominantly male phenomenon in many countries, with China and India being major exceptions. The suicide rate, i.e., the number of suicide victims per 100,000 persons, of males is approximately three times higher than that in females mostly worldwide (WHO, 2009).

One of the most common explanations for this gender gap is that males tend to choose more lethal methods that fail less often, such as the use of firearms, hanging, and carbon monoxide poisoning, than females (e.g., Beautrais, 2002). In China, where the gender difference in suicide rates is negligible, it is found that both females and males use agricultural pesticide poisoning and other lethal methods of suicide (Kong and Shang, 2010). There are counter examples, however. In Japan, for example, 66 percent and 60 percent of the completed suicides of females and males, respectively, are accounted for by hanging, which is presumably the most lethal method in this country, where ordinary persons have no access to firearms and limited access to highly toxic materials (National Center for Suicide Prevention, 2013). Thus, the cause of the gender difference in suicide rates remains an open question.

The findings of several earlier studies suggest that males have lower mental health literacy than females. For example, Kaneko and Motohashi (2007), Reavley et al. (2012), and some other studies show that males are less likely to recognize the symptoms of depression than females. Eaton et al. (2000), find that there is a larger gap between the diagnosed depressive symptoms by psychiatric professionals and the self-reported symptoms especially among males.

Furthermore, early studies show that the gender difference is evident also in help seeking behaviors. Fischer and Turner (1970) is one of the pioneering studies that attempt to document the patterns of individuals' help seeking behaviors from mental health professionals. They find that females answer in a more favorable way than males to a hypothetical question asking whether or not they would like to receive professional mental treatment if they perceive mental health problems. The presence of such gender differences in the attitude toward help seeking from mental health professionals is

replicated in multiple observational studies (e.g., McKenzie et al., 2006) In addition to the attitudinal differences, recent studies document that males are significantly less likely to actually receive either informal or formal help as compared with females (e.g., Arria et al., 2011; Mendelson et al., 2013). There is a growing body of studies accumulating evidence that males are poorer at seeking help for mental health problems than females, yet this accumulation of research is just beginning, especially within certain western countries. Therefore, it seems important to conduct further studies highlighting various aspects of the gender differences in the perception of and help seeking for mental health problems in different social, economic and cultural settings.

In summary, as several early studies show, males might be poorer at recognizing their mental health problems and at seeking help for these problems as compared with females. Despite growing interest in the gender differences in help seeking behaviors for mental health problems, the sources of the gender differences are much less well understood. Some have emphasized that males' stronger adherence to masculine beliefs, restricted expression of emotional difficulties, and stronger stoicism as the sources of poor help seeking among males (e.g., Galdas et al., 2005; Good and Wood, 1995; Leong and Zachar, 1999; Maccoby, 1990; Syzdek and Addis, 2010). There seem, however, to be multiple directions in which discussions on the gender differences in perception of mental health problems as well as help seeking behaviors can be extended. We will discuss this in relation to the roles of socioeconomic factors in mental health in the next section.

2.5 Socioeconomic factors and the gender differences in mental health

We turn now to the existing studies that link mental health problems with individuals' characteristics other than gender. To begin with, unemployment has been repeatedly argued as an important correlate of suicide. Hamermesh and Soss (1974) develop a model based on microeconomic theory in which individuals choose to end their lives when the present value of the expected lifetime utility falls below the perceived cost of living. The model predicts that the risk of suicide of an individual increases as his or her permanent income declines due to, say, unemployment. Although the relevance of the model is still under debate, the association between unemployment and the incidence of suicide has been confirmed by Yamauchi, et al., (2012), Classen et al. (2012), and many other empirical studies.

Sociologists link suicide with individuals' marriage and family relationships. The sociological study of suicide was pioneered by Durkheim (1897), who argues that the risk of suicide increases when individuals are exposed to factors that would weaken family ties and social integration. Divorce and the death of one's spouses can be regarded as factors that would weaken family ties, while having children can be considered as one of the factors that would strengthen family ties. Consistent with Durkheim's argument, recent empirical studies find that suicide rates are higher for those who are single than for those who are married (e.g., Yamauchi et al., 2012; Rodríguez, 2005), higher for those who do not have children than for those who do (e.g., Masango et al., 2008), and higher for those living in rented accommodation than for those living in owned homes (e.g., Johansson, 1997).

Distinct from these studies but related to the literature on suicide is the literature on happiness economics, which links job status to happiness (Clark and Oswald, 1994; Daly and Wilson, 2009; Di Tella et al., 2001). In the happiness economics literature,

happiness is typically measured by subjective answers to questions asked in a survey. The most typical question reads “Taken all together, how would you say things are these days – would you say that you are very happy, pretty happy, or not too happy?”⁶ A different questionnaire such as General Health Questionnaire, which is used mostly in the field of sociology and psychology, is also used by some studies in happiness economics.⁷ Although measures of happiness vary by study, this literature intends to document who are likely to report that they are happy or unhappy, but does not intend to identify what types of mental health problems, which can escalate to suicide, tend to occur to whom. Thus, this happiness economics literature differs from the literature on mental health in terms of the purposes of the study and the measures that are used in each strand of literature. This literature, however, also relates happiness not only to job status but also to other characteristics of individuals such as marital status. In this regard, the findings of this literature are relevant to this dissertation.

According to the literature of happiness economics, unemployment, divorce and living in rented housing are shown to be associated with lower mental well-being (Clark and Oswald, 1994; Daly and Wilson, 2009; Di Tella et al., 2001; Dunn, 2002). These studies use survey data sets containing the measures of happiness that we have described briefly above as well as individual characteristics such as the demographic and socioeconomic background.

⁶ This question appears in the United States General Social Survey (Inter-university Consortium for Political and Social Research, 1972-2010).

⁷ Clark and Oswald (1994) use the General Health Questionnaire (GHQ), introduced by Goldberg et al (1978). The GHQ consists of the following set of questions. Have you recently: 1. Been able to concentrate on whatever you are doing? 2. Lost much sleep over worry? 3. Felt that you are playing a useful part in things? 4. Felt capable of making decisions about things? 5. Felt constantly under strain? 6. Felt you couldn't overcome your difficulties? 7. Been able to enjoy your normal day-to-day activities? 8. Been able to face up to your problems? 9. Been feeling unhappy and depressed? 10. Been losing confidence in yourself? 11. Been thinking of yourself as a worthless person? 12. Been feeling reasonably happy all things considered?

The relationship between suicide and several other factors is suggested in the existing studies. First, poor health care accessibility is argued as one of the factors that increase the risk of suicide in epidemiological studies (Kapusta et al., 2010). Second, the recent health economics studies find that the public health expenditure intended for mental health promotion reduces suicide (e.g., Flavin and Radcliff, 2009; Minoiu et al., 2008; Ross et al., 2010). Third, alcohol use is repeatedly found to be associated with the risk of suicide (e.g, Bramness et al., 2010; Teesson et al., 2000; Sher, 2006).

Among the various socioeconomic factors that have been discussed above, some may be associated with the mental health problems for females and males differently. Some existing studies suggest that joblessness can be more closely associated with mental health problems of males than those of females. For example, Kimmel (1996) and Syzdek and Addis (2010) argue that males show a stronger feeling of obligation as a breadwinner and stronger stoicism than females. Their argument is based on one of the tools to quantify the degree of masculine norms, which is called the Conformity to Masculine Norms Inventory (CMNI), introduced by Mahalik et al. (2003).

Whether or not there is a gender difference in the relationship between joblessness and help seeking behaviors is more difficult to predict. On the one hand, stoicism may induce males to try to handle their problems on their own, and their personal relationship within their working places, which is stronger than that of females according to Campbell et al. (1988), may make it difficult for jobless males to find persons to ask for help. On the other hand, joblessness would reduce the opportunity cost of seeking help and it might be the case that jobless individuals might be more willing to seek help for mental health problems. Thus, whether joblessness increases the help seeking behaviors of males relative to those of females is an empirical issue.

Marital status affects the risk of suicide, according to sociological studies, and also the risk of other mental health problems. Are its effects on mental health problems different between females and males? Umberson et al. (1996) among others argue that divorced males are more likely to have a sense of desolation than married males because males tend to rely on their spouses in regulating their health when they are married. Hence, divorced males may be more likely to face a mental health problem than married males. A similar argument may apply to widowed males. In contrast, divorced or widowed females are more likely to be economically disadvantaged through losing the main breadwinners (Abe, 2012). Thus, the effects of marital status on mental health problems of females and males are generally unknown in the existing literature.

Turning to the relationship between marital status and help seeking behaviors, we expect that single males tend to fail to seek help when they perceive mental health problems. Several prior studies indicate that this is for divorced males, partly because divorce tends to deprive them of good relationships with their children more often than it deprives females (e.g., Umberson et al., 1996). Another reason is that males have shorter life expectancies than females, which may lead males to have lower expected returns on their help seeking behaviors. If they are married, their decision making about help seeking may be aided by their spouses (as in the case in which their spouses try to help them overcome their mental health problems), but if they are not married, they may not be very willing to seek help for their mental health problems.

2.6 Data description

The suicide rate in Japan has stayed around 25 persons per 100,000 persons in recent years, which is a relatively high rate compared with the other developed countries. The

suicide rate in Japan was lower before 1998, when the rate suddenly jumped up to the current level. This sudden increase aroused economists' interest in suicide because they learned that suicide was related to such economic phenomena like financial crises. (Chen et al., 2012a; Chen et al., 2012b; Inoue et al., 2007; Koo and Cox, 2007; Kuroki, 2010; Watanabe et al., 2006; Liu et al., 2013; Suzuki et al., 2013). Apart from economic studies, there are psychological autopsy studies (e.g., Hirokawa et al., 2012; Kameyama et al., 2011) as well as epidemiological studies (e.g., Fujino et al., 2005; Yamauchi et al., 2012) to attempt to identify the determinants of suicide. Furthermore, Ohtake (2012) is one of the few recent studies that explore the determinants of happiness in Japan⁸.

These studies draw on several different types of data sets to capture the situations of mental health problems in Japan. The most commonly used data sets are the prefecture-level as well as municipality-level panel data sets of the suicide rates as well as several socioeconomic variables. The raw number of suicides is published by the Vital Statistics, and the suicide rate (the number of suicide per 100,000 persons) can be calculated by dividing the raw number of suicides by the population, which can also be found in the Vital Statistics. Most recently, Yamauchi et al. (2012) use the individual-level data set of the suicide victims and analyze who are likely to die by suicide.⁹ Psychological autopsy studies as well as epidemiological and happiness economics studies often collect their original data sets by undertaking a survey or interview. This dissertation uses the Comprehensive Survey of Living Conditions (CSLC) data, which

⁸ There is an accumulation of relevant studies conducted in countries such as Taiwan, South Korea and some other Asian countries, where cultural and religious structures can be considered similar to those in Japan (Chen et al., 2012c; Chen et al., 2012d; Kim et al., 2011). There is also a study documenting differences in suicidal behaviors between eastern countries and western countries (e.g., Liu et al., 2009)

⁹ Researchers may apply for this data set, which is used in Yamauchi et al. (2012), by completing the necessary procedures required by the Statistics Act (Act No. 53 of 2007).

contain information with regard to the respondents' help seeking behaviors and mental health problems other than suicide. This survey has been conducted by the Ministry of Health, Labor and Welfare every three years since 1986. The raw results of this survey are partly available with the permission of the Ministry of Health, Labor and Welfare, but for the purpose of privacy protection, access to the information on the location of residence and workplace is strictly limited and unavailable for the study. This data set, moreover, does not contain information on suicide. This is because questionnaires are distributed to the living and samples are reselected every sample year. Thus, we are unable to know whether a respondent committed suicide and died after the survey. In fact, the occurrence of suicide is too rare, at a frequency of something near 16 out of 100,000 persons worldwide, to be captured by the usual sample surveys. In order to look at both suicide and other mental health problems, the present study uses two sets of data. One is the prefecture-level data including the number of deaths by suicide, the number of individuals who perceive stress, the number of individuals who face other mental health problems, the number of individuals who seek help for stress, and the variables representing characteristics of prefectures. The other data set used is the CSLC survey data, which lacks location information but contains rich information on the types of mental health problems each individual faces and on the help seeking behaviors as well as the job status, marital status, and other characteristics of individuals.

The prefecture-level panel data set covers all the 47 prefectures in Japan for ten years from 2001 to 2010. It allows us to analyze the gender-specific associations between the prefecture-level variations in socioeconomic conditions, the onset of mental health problems including suicide, and help seeking behaviors. Appendix Table A lists the definitions of the prefecture-level variables, the available years of the variables and

the sources. The raw number of the prefecture-level suicide deaths from 2001 to 2010 is taken from the Vital Statistics published by the Ministry of Health, Labor and Welfare. The suicide rate for each gender group is calculated by dividing the raw number of suicide deaths by the population of the same gender group. Note that the numbers of individuals who face mental health problems (other than suicide) and seek help in each prefecture are estimates that are calculated by the Ministry of Health, Labor and Welfare based on the CSLC.

The survey covers randomly chosen nationally representative Japanese individuals. Based on the results of the survey, the Ministry calculates the prefecture-level estimates of the selected questions in the questionnaire. For instance, how many individuals are estimated to perceive stress regarding financial matters within each prefecture is published by the Ministry every three years.

The method used by the Ministry to calculate the prefecture-level estimates of the perception of various mental health problems may be summarized as follows. Let \widehat{M}_i denote the estimate of the number of individuals who perceive a certain type of mental health problems in a prefecture i . \widehat{M}_i is given by

$$\widehat{M}_i = \frac{\sum_j X_{ij}}{\sum_j Y_{ij}} \times P_i,$$

where X_{ij} is the number of individuals who perceive a certain type of mental health problems in a surveyed region j of prefecture i . Y_{ij} is the total number of individuals in a surveyed region j of prefecture i . P_i is the total population of prefecture i .

We use the prefecture-level estimates of the perception of stress and several somatic symptoms of common mental disorders and help seeking behaviors. The perception rates of various mental health problems (the number of those who perceive

certain mental health problems per 100,000 persons) for each gender group are calculated by dividing the prefecture-level estimates of those who perceive each mental health problem by the population of the same gender group. Mental health problems other than suicide include stress (regarding financial matters, health issues, and family relations), sleep difficulties, a sense of fatigue, and irritability. Similarly, the consultation rates (the number of those who have consulted someone about their stress per 100,000 persons) for each gender group are calculated by dividing the prefecture-level estimates of those who have consulted someone by the population of the same gender group. Consultation includes talking to family members, friends, colleagues, public consultation services, hospitals, and others.

With regard to socioeconomic variables, we have taken six variables from various sources. We will later talk about the details of each socioeconomic variable: the job offer ratio, the birth rate, the divorce rate, the mental health spending per capita, the number of psychiatric hospitals per 100,000 persons and the age-group-specific population distribution. These variables are all publicly available on the Portal Site of the Official Statistics of Japan, the Ministry of Internal Affairs and Communications¹⁰. In summary, the prefecture-level panel data set contains the suicide mortality rates every year from 2001-2010, the rates of perception of various mental health problems and the rates of consultation against the perceived stress every three years from 2001-2010 and six socioeconomic variables every year from 2001-2010. Every prefecture-level variable is gender-specific except for socioeconomic variables.

The second type of data set contains the individual-level cross sectional data. These data are representative part of the result of the CSLC, and we have obtained

¹⁰ All the data are downloadable from <http://www.e-stat.go.jp/SG1/estat/eStatTopPortal.do>

permission to use those data from the Ministry of Health, Labor, and Welfare. Although we are allowed to use the data sets for 2001 and 2004, the questionnaire forms are different across year, and the data set in 2004 has much richer information of the respondents. For instance, the data set in 2001 does not contain information regarding help seeking behaviors, which is the essential information for this dissertation. Thus, we use a one-year cross sectional data set, not a repeated-cross sectional data set. The prefecture-level estimates of the perceived mental health problems and help seeking behaviors that we have described above are calculated based on this individual-data of the CSLC. Although the prefecture-level estimates may allow us to investigate how the prefecture-level variations in socioeconomic factors, the perception of mental health problems, and help seeking behaviors are associated with one another, it does not allow us to discern the individual-level associations lying between socioeconomic background, the perception of mental health problems and help seeking behaviors. To exploit the individual-level relationship, we will also use the individual-level raw survey data.

While the prefecture-level estimates calculated by the Ministry based on the CSLC are published only for the selected variables in the survey, we are allowed to use mostly all of the variables contained in the questionnaire that have richer information regarding respondents' socioeconomic backgrounds, the perception of mental health problems and help seeking behaviors. In order to provide readers with a better understanding of the CSLC, the author's English translation of an original questionnaire of CSLC is attached in Appendix Table B.

The shortcoming of using this individual-level survey data is that it does not allow us to analyze the mechanisms through which various factors affect mental health and lead to suicide because it does not contain any information on whether or not the

respondents of the survey subsequently died by suicide. It is extremely difficult not only for this study but also for other studies to collect longitudinal data sets that track the same individuals over time till we observe a certain number of individuals dying by suicide within the targeted sample because suicide is quite a rare event¹¹. Although the individual-level survey data that we use does not overcome such difficulties that prior studies have faced, these data contain rich information of the respondents' socioeconomic backgrounds, the perception of various types of mental health problems, and help seeking behaviors and such rich information allow us to analyze the relationship among them in detail.

2.7 Conclusion

This dissertation attempts to address some gaps in the existing literature that we have found in this chapter. The gaps to be addressed may be classified into three categories. First, this dissertation expands the scope of studies on suicide prevention by delineating the patterns of perceived mental health problems and help seeking behaviors from various aspects. While there is a large body of literature detailing who are likely to die by suicide, there are relatively few studies that focus on analyzing who are likely to suffer from what kinds of early signs of suicide and how they cope with them. This dissertation attempts to narrow such a gap in the existing literature.

¹¹ Exceptionally, Feskanich et al. (2002) follow up more than 90,000 American nurses for 14 years and identify 73 suicide cases. Similarly, Fujino et al. (2005) follow up approximately 13,000 people living in Fukuoka prefecture in Japan for 14 years and identify 48 suicide cases. Except for these studies, there are not many studies using such large follow-up samples probably because it is costly. While Feskanich et al. (2002) and Fujino et al. (2005) find that the perception of stress is an important sign of the incidence of suicide, they do not highlight the roles of socioeconomic backgrounds and help seeking in preventing suicide.

Second, this dissertation sheds light on the gender aspects of mental health, which has been recently attracting growing attention in the literature, especially within several western countries. Using the data in Japan, we seek new insights into how females and males differ in terms of the onset of mental health problems as well as in terms of help seeking behaviors.

Third, it also highlights the importance of the socioeconomic aspects of mental health. While certain socioeconomic characteristics such as joblessness and singleness are repeatedly found as important associates of the incidence of suicide, it is less well understood how these socioeconomic characteristics are associated with the perception of mental health problems, which would precede suicide, as well as with help seeking behaviors. This dissertation also attempts to narrow such a gap in the existing literature by examining how several socioeconomic factors are associated with various aspects of mental health.

Chapter 3

A Prefecture-Level Panel Data Analysis of Mental Health Problems and Suicide

3.1 Introduction

As discussed in the previous chapter, there are a number of studies documenting the patterns of suicide. First, it is well known that suicide is much more common among males than among females. Second, many empirical studies link suicide occurrences with economic downturns (e.g., Kuroki, 2010). Third, suicide is known to be more common among divorced individuals than among married individuals (e.g., Yamauchi, et al., 2012). These existing studies could be extended in several ways in order to find effective means of suicide prevention. First, if suicide risks are revealed when a person complains of symptoms of mental disorders such as stress and sleep difficulties, it seems important to examine how and to what extent the perception of mental health problems are associated with the incidence of suicide. Second, since stress arises from various concerns such as financial difficulties, health problems, and family relationships, it seems important to investigate what kinds of stress are more closely associated with the incidence of suicide. Third, it seems important to examine how the relationship between varying degrees of mental health problems and socioeconomic factors is particularly closer among males or females in different age groups.

Using prefecture-level panel data in Japan, this chapter attempts to analyze how suicide and other mental health problems are associated with the socioeconomic characteristics of prefectures for females and males separately. We first examine how the prefecture-level suicide rate (the number of deaths by suicide per 100,000 persons) is related to the perception rates (the number of individuals who perceive mental health

problems per 100,000 persons) for stress, sleep difficulties, fatigue, and irritability separately and for females and males separately. We then investigate how several socioeconomic factors including the job offer ratio and the divorce rate are associated with the suicide rate as well as with the symptoms of mental disorders by gender and age groups.

Based on the existing literature that we reviewed in the previous chapter, the present chapter hypothesizes that joblessness and singleness are associated with the incidence of suicide as well as with the perception of mental health problems among males and that these factors are not associated with the incidence of suicide among females, while they might be associated with the perception of mental health problems among females.

The findings of this chapter are generally consistent with these hypotheses as follows. First, the suicide rate increases with the rates of perception of various symptoms of mental disorders especially among males. Second, as the job offer ratio increases, not only the suicide rates and but also the perception rates decrease among males, but among females, only the perception rate of stress due to financial matters decreases and the suicide rate does not. Third, among males, the perception rate of somatic symptoms as well as the suicide rate increases with the divorce rate, but among females, such an association can be found only regarding the perception rate of stress due to financial issues and irritability and not regarding other types of mental health problems including suicide.

The rest of this chapter is organized as follows. Section 3.2 develops the testable hypotheses based on the literature review that we have conducted in Chapter 2. Section 3.3 describes the data for the analysis and presents the descriptive statistics of the data

highlighting the gender difference. Section 3.4 presents the pair-wise correlation analysis. Section 3.5 specifies the empirical model and reports the estimation results. Finally, Section 3.6 concludes and discusses the implications for future research.

3.2 Hypotheses

It has been increasingly recognized that males tend to be more reluctant to admit to weakness when it comes to their health issues (e.g., Galdas et al., 2005). Indeed, as will be shown by the descriptive data in the next section, the proportion of males who admit that they have mental health problems is much smaller than that of females despite the fact that the suicide rate is much higher for males than for females in Japan. If no males complained of mental health problems, there would be no clue for preventing male suicide. Some males, however, actually complain about their mental health problems, as shown by data below. It may well be that they do so because they face more difficult situations than other males. This chapter examines their characteristics and compares them with the characteristics of those who die by suicide. If they are similar, those who complain of mental health problems should be provided with mental treatment.

As pioneered by Durkheim (1897), the lack of personal relationships is recognized as one of the major risk factors of suicide. He predicts that those who are single, whether divorced, unmarried or widowed, have a higher probability of dying by suicide. The economic theory of suicide emphasizes economic welfare as an important factor for decision making concerning suicide (Hamermesh and Soss, 1974). Although Durkheim (1897) does not touch on unemployment, it is not difficult to imagine that social integration may be weakened for unemployed persons because they may lose their connections with their colleagues at the workplace, an important part of their social

network, especially for males (Campbell et al., 1988). Thus, these theories predict that singleness and joblessness are critical factors associated with the incidence of suicide. We expect that facing these factors, even males, who might be less willing to admit that they have mental health problems than females, cannot help but complain of such problems.

In contrast, the incidence of suicide among females might not be as responsive to these factors as that among males. It is often the case that females continue to live with their children after divorce and divorce may not weaken social integration among females as it does so among males (Umberson et al.,1996). Moreover, it is known that females regulate their health conditions by themselves whereas males tend to rely on their partners in regulating their health when they are married (Umberson et al.,1996). Even after divorce, females may not be necessarily worse off in terms of regulating mental health conditions as compared with males. Furthermore, even when females are unemployed, it is less likely the case that they commit suicide compared with males. We expect so because it is known that females build social networks outside of their workplace better than males (Campbell et al, 1988). Thus, the factors that would affect the incidence of suicide among males such as singleness and joblessness might not be critical risk factors of the incidence of suicide among females.

The absence of the associations between these factors and the incidence of suicide among females does not necessarily mean that these factors do not affect their mental health. Divorced females are known to be more economically disadvantaged than divorced males, and they may face mental health problems arising from financial concerns (e.g., Abe, 2012). Moreover, females with children may have to bear a greater burden of child bearing than males, and they might be more likely to perceive mental

health problems than those without children. Furthermore, unemployment would reduce economic welfare also among females and make them feel stressed even though it may be more stressful for males than for females as males usually are the breadwinners in their households. By summarizing the above argument, the testable hypothesis can be presented as follows:

Hypothesis 3.1: While singleness and joblessness are associated with the perception of mental health problem regardless of gender, among males, these factors are also associated with the incidence of suicide.

To substantiate these hypotheses, we first run regressions to examine whether these factors are significantly associated with the incidence of suicide as the above theories predict, and we then examine in the same fashion whether these factors are significantly associated also with self-reports of perceived mental health problems among females and males, respectively.

3.3 Data

3.3.1 Left-hand side variables

We use a data set taken from Japan in order to test our hypotheses. Suicide has been one of the most serious social issues in Japan as with other countries, yet the extent of seriousness of this issue seems to be much deeper in Japan than in other countries. Figure 3.1 compares the suicide rates in Japan and OECD countries (on average) from 1960 to 2009. The suicide rate in Japan has consistently been higher than the average suicide rate in OECD countries. While the suicide rate started to decline on average in OECD countries as a whole since around 1988, the suicide rate in Japan did not. On the contrary, it rose sharply from 1997 to 1998 and hovers at a high level up to 2009.

Suicide is the seventh leading cause of death in Japan (Cabinet Office, 2011). Table 3.1 shows the age and gender-breakdown of the three major causes of death. Suicide ranks in the top three as a cause of death for all age groups under 55 years old in 2009. Especially, suicide is the leading cause of death among males in their most productive age.

This chapter uses a panel data set of the 47 prefectures in Japan from 2001 to 2010. We calculate the suicide rates by dividing the number of suicides taken from the Vital Statistics (Ministry of Health, Labor and Welfare, 2001-2010) by the population in each age-gender group. The suicide rate stands for the number of suicides per 100,000 persons. The prefecture-level suicide rates are recorded every year.

As for the self-reported mental health problems, we use the prefecture-level estimates of the result of the Comprehensive Survey of Living Conditions (CSLC) (Ministry of Health, Labor and Welfare, 2001, 2004, 2007, 2010). The way the prefecture-level estimates are calculated by the Ministry of Health, Labor and Welfare was discussed in the last section of Chapter 2. The CSLC is a household survey started in 1986 that accumulates information regarding the basic living conditions of nationally representative Japanese. Questions regarding mental health conditions were first added in 1998, and since then these questions have been asked every three years. The summary count of the survey by age group and gender started from 2001; therefore, we use data for 2001, 2004, 2007 and 2010. The author's English translation of the questionnaire form of the CSLC as of 2004 is attached in Appendix Table B.

The self-reported mental health problems considered here are classified into perceived stress and somatic problems. We define the perception rate of stress as the estimated number of individuals who feel stress per 100,000 persons. Note that this

number is based on the survey data, and whether or not a survey respondent feels stress is not objectively determined but self-reported by the respondent. The same applies to the perceived somatic problems.

In addition to the perception rate of stress in general, we have data on the perception rates of specific types of stress; i.e., the perception rates of stress arising from financial, health, and family issues. We take up these three types of stress because they are often mentioned in the suicide notes written by suicide victims in Japan. According to the National Police Agency (2012), the suicide motives of 22,581 (74%) cases out of total suicide cases (30,651) in 2011 are identified. As shown in Figure 3.2, from 1978 to 2011, health issues are the most frequently-appearing contents, followed by financial issues and family issues.

The perceived somatic symptoms are defined as the number of individuals who admit that they have some somatic symptoms per 100,000 persons. We have the perception rate of all kinds of somatic symptoms as well as the perception rates of sleep difficulties, a sense of fatigue and irritability, which are common symptoms of diagnosable mental disorders (WHO, 1992).

3.3.2 Right-hand side variables

We will use six socioeconomic variables taken from various sources. The job offer ratio represents the number of job offers available per job seeker. Its larger values mean that labor market conditions are more favorable to job seekers.¹² The prefecture-level data

¹² The prefecture-level job offer ratio has the same kind of quality as the prefecture-level unemployment rate. We have chosen to use the job offer ratio as an indicator of economic conditions instead of the unemployment rate because the data for the job offer ratio are relatively reliable as compared with the data for the unemployment rate. While the unemployment rate is calculated based on the samples of only 40,000 households, the job offer ratio is calculated based on the survey covering all the public

on this variable are taken from the Job/Employment Placement Services Statistics published by the Ministry of Health, Labor and Welfare. The birth rate represents the number of live births per 1,000 persons. The divorce rate means the number of divorced individuals per 1,000 persons. The variable called mental health spending is the amount of public spending intended to be used for mental health promotion. While detailed information on the use of the spending is not officially published, according to the answers from the Ministry of Internal Affairs and Communications to our inquiry over the phone, the spending is mostly used for the compulsory hospitalization of individuals who are diagnosed as having severe mental disorders or are determined to be a threat to themselves. The variable called psychiatric hospitals is the number of psychiatric hospitals per 100,000 persons. The age-group population composition (Age 15-34, Age 35-74 and Age 75 years and older) is calculated by dividing the population of certain age groups by the whole population. The birth rate, the divorce rate, the mental health spending, the psychiatric hospitals, and age-group population composition are all taken from the Portal Site of Official Statistics of Japan, the Ministry of Internal Affairs and Communications¹³. Appendix Table A presents the definitions of the variables, the available years of the variables, and the sources.

Although we have mentioned that there are six explanatory variables, we will only use the job offer ratio, the birth rate, the divorce rate and the age-group population composition in our preferred specification. While two variables (the mental health spending per capita and the number of psychiatric hospitals per 100,000 persons) are argued as important factors that might affect the incidence of suicide in health

employment security offices nationwide in Japan. Although we do not show the results, our estimation results do not qualitatively change if we use the unemployment rate instead of the job offer ratio in the empirical analysis.

¹³ All the data are downloadable from <http://www.e-stat.go.jp/SG1/estat/eStatTopPortal.do>

economics and epidemiology (e.g., Ross et al., 2010; Kapusta et al., 2010) we excluded them from our preferred specification because we suspect that these variables are endogenous. As mentioned above, the mental health spending per capita mostly used for the compulsory hospitalization of individuals who are diagnosed as having severe mental disorders or are determined to be a threat to themselves. If there are a greater number of individuals who have severe mental disorders, the spending increases as well as the incidence of suicide increases. It might also be the case that when there are a greater number of individuals who die by suicide, the number of psychiatric hospitals might increase. Due to these potential endogeneity problems, we have excluded these two variables from our main specification. We present our preferred estimation results in Table 3.4, Table 3.5, and Table 3.6 while we present estimation results including these two variables in Table C.1, Table C.2, and Table C.3 in Appendix Table C.

3.3.3 Summary statistics

The descriptive statistics of the data are shown in Table 3.2. The top part of the table presents the average suicide rates of the 47 prefectures for females and males and those rates for the three age groups. As mentioned earlier, the large gender difference in the suicide rates is conspicuous. The male suicide rate is nearly three times as high as the female suicide rate. The difference in the means is statistically significant as shown in the rightmost column.

The male and female populations over 15 years of age are divided into three age groups: 15-34, 35-74, 75 years and older. This way of grouping is intended to highlight the contrast between male and female suicide rates which is most striking in the 35-74 year-old range. While the 75 years and older females have a higher average suicide rate

than the 35-74 year-old females, the male suicide rate peaks at the 35-74 year-old range. The economic theory of suicide would explain the suicide rate is high for the 75 years and older group because their expected present values of future incomes are low. The highest suicide rate, however, is recorded by the 35-74 year-old males, whose expected values of future incomes would be higher than older group's counterpart. Thus, there must be a non-economic factor that raises the suicide rate of the 35-74 year-old males. The next part of the table concerns the perception rate of overall stress, which is the proportion of the population who admit that they feel some stress (expressed in the number of such persons per 100,000 persons). Unlike the suicide rate, this rate is significantly higher for females than for males in all age groups, consistent with the argument by Galdas et al. (2005) and some other sociologists. While data on the suicide rate are available every year during the 2001-2010 periods, data on perceived mental health problems are available every three years only. Despite the smaller sample size, the gender difference in the perception rate of stress is statistically significant. The same applies to the perception rates of specific types of stress, i.e., stress arising from financial issues, health issues, and family issues. Although we do not present here the data on these specific types of stress recorded by age group, older cohorts complain about stress arising from health issues more than younger cohorts. Stress arising from such issues seems to be responsible for the relatively high suicide rate for the 75 years and older group.

An increase in job offers is expected to decrease the perception rate of financial stress. An increase in divorce is expected to increase the perception rate of financial stress more for females than for males, but it may increase the perception rate of stress arising from family issues more for males than for females. Note, however, that it might

well be the case that those who are sensitive and prone to stress or other mental health problems are more likely to suffer in a relationship and to be unemployed and/or divorced. Thus, we do not claim causal relations between socioeconomic factors and perceived mental health problems. The validity of these expectations about the association between socioeconomic variables and perceived mental health problems will be checked by means of regression analyses in the next sections. The summary statistics of the socioeconomic variables are shown toward the bottom of the table.

3.4 Gender-specific relationship between suicide and perceived mental health problems

Throughout this dissertation, we place death by suicide as an extreme outcome of mental health problems. In this section, we calculate the correlations between the suicide rates and the perception rates of various types of mental health problems among females and males, respectively. We present the gender-specific within-prefecture correlations between the suicide rates and the perception rates of various types of mental health problems.

Let us denote S_{git} and M_{git} as the suicide rates and the perception rates of a specific type of mental health problem of gender group g in prefecture i as of year t . Let us denote \bar{S}_{gi} and \bar{M}_{gi} as the average suicide rates and the average perception rates of gender group g in prefecture i over the sample years, which are referred to as the prefectural average. We have the 47 prefecture averages for each variable. We then calculate the demeaned suicide rates and the demeaned perception rates of mental health problems, $\Delta S_{git} = S_{git} - \bar{S}_{gi}$ and $\Delta M_{git} = M_{git} - \bar{M}_{gi}$. The correlations between ΔS_{git} and ΔM_{git} are the “within-prefecture correlations.”

Table 3.2 reports the within-prefecture correlation coefficients for each gender group. As shown in the upper row, not very close, but statistically significant correlations at least at 10% level are observed between the suicide rate and the perception rate of each type of the self-reported mental health problems for females. There is a positive association between the suicide rate and the perception rate of stress arising from financial issues and between the suicide rate and the rate of perception of stress due to family issues, yet the level of significance of the positive associations is at the 10% level.

In contrast, as the lower row shows, there exist stronger within-prefecture correlations between the suicide rate and the rate of perception of various mental health problems among males. The suicide rate is positively correlated with the perception rate of stress in general, stress arising from financial issues and family issues, somatic symptoms in general, sleep difficulties, a sense of fatigue and irritability among males. The level of the statistical significance of the within-prefecture correlation coefficients is at least at the 5% level except for the correlation between the suicide rate and the perception rate of stress due to health issues among males. In summary, the incidence of suicide is more responsive to the self-reported mental health problems among males than among females.

3.5 Regression analysis

3.5.1 Specification

We now focus on how the prefecture-level socioeconomic conditions are associated with the suicide rate as well as with the perception rates of various mental health problems among females and males, respectively. In what follows, we run the reduced-

form regressions to test our hypotheses. Using the subscripts i and t to index the prefecture and year respectively, the empirical model in our analysis is:

$$(1) \quad M_{it} = E_{it}\alpha + B_{it}\beta + D_{it}\gamma + X_{it}\varphi + \lambda_t + \Theta_i + \varepsilon_{it},$$

where M is either the prefecture-level suicide rate or the perception rates of mental health problems, E is the job offer ratio, B is the birth rate, D is the divorce rate, and X is the age-group population composition. λ_t accounts for countrywide time effects, the fixed-effect Θ_i controls for time-invariant prefecture characteristics, and ε represents the idiosyncratic error terms. The standard errors are clustered at the prefecture level. We run regressions separately for females and males. We have taken the logarithms of all the variables, except for the age-group population compositions so that an estimated coefficient represents percentage changes of M relative to percentage change of the corresponding right-hand side variables. We present estimates of fixed-effect model in the main tables that we present in this chapter. The results of random-effect model together with p-values of Hausman test are presented in Table D.1, Table D.2, and Table D.3 in Appendix Table D.

The estimation results of equation (1) are shown in Table 3.4 and Table 3.5 for females and males of the overall age group, respectively. In Table 3.4, the dependent variable is the female suicide rate in column (1), the perception rate of stress in general in column (2), the perception rate of stress due to financial issues in column (3), the perception rate of stress due to health issues in column (4), the perception rate of stress due to family issues in column (5), the perception rate of somatic symptoms in column (6), the perception rate of sleep difficulties in column (7), the perception rate of a sense of fatigue in column (8) and the perception rate of irritability in column (9).

3.5.2 Regression results

First, what should be noted from column (1) is that there are no statistically significant associations between the female suicide rate and socioeconomic factors. While unemployment and divorce have been argued and are also empirically shown as important associates of the incidence of suicide, these factors do not have significant associations with the incidence of suicide among females in our preferred specification. As shown in column (1) in Table C.1 in Appendix Table C, this result does not change if we include additional control variables. What we have found is that the number of psychiatric hospitals per 100,000 persons has a significant association with the incidence of suicide among females. A one percent increase in the number of psychiatric hospitals per 100,000 persons is associated with a decrease in the suicide rate among females by 0.16%. This is similar to the result found in Kapusta et al. (2010) showing that the better accessibility to professional psychiatric treatment is associated with a reduction of the suicide rate in Austria. The greater number of psychiatric hospitals may help females receive appropriate treatment to cope with mental disorders, and the risk of suicide may be mitigated through promoting help seeking among females.

As shown in the column (3) of Table 3.4, the rate of perception of stress arising from financial issues is negatively and significantly associated with the job offer ratio among females. A one percent decrease in the number of job offers available per job seeker is associated with an increase in the number of females perceiving stress due to financial issues by 0.06%. However, as column (6) and (9) show, the job offer ratio is rather positively associated with the perception of somatic symptoms in general and also with the perception of irritability among females. A one percent decrease in the number of job offers available per job seeker is associated with a decrease in the number of

females who perceive somatic symptoms and irritability by 0.06% and 0.1%, respectively. These findings are similar with Ruhm (2003), who has found that when the economic conditions are good, individuals engage in unhealthy life styles and the mortality rates rather increase with the suicide rate representing an exceptional case, by using data in the United States. In summary, while the decrease in the job offers is associated with the increase in the perceived stress due to financial issues, it is not necessarily associated with the increase in the incidence of suicide, somatic symptoms or irritation among females.

As column (5) and (7) show, the birth rate is positively associated with the perception of stress arising from family issues and the perception of sleep difficulties. These results indicate that females may feel stress or suffer from sleep difficulties arising from parental care. While Durkheim (1897) argues that the presence of children strengthens family ties and prevents suicide, it is not necessarily associated with mental well-being only in a positive way among females.

We find that the divorce rate is positively associated with the perception of stress due to financial issues among females as column (3) shows. Although the statistical significance is low, a one percent increase in the divorce rate is associated with an increase in the number of individuals who perceive stress due to financial issues by 0.18% at the 15% significance level. This is consistent with the findings of prior studies showing that divorced females tend to become economically disadvantaged by losing the breadwinner through divorce (e.g, Abe, 2012).

For reference, we find that the mental health spending per capita does not have a statistically significant association with all the indicators of mental health problems among females, as shown in Table C.1 in Appendix Table C. Furthermore, the number

of psychiatric hospitals per 100,000 persons is negatively associated with the female suicide rate as well as the perception of stress in general and stress arising from family issues. Although the mechanisms are only speculative, females may make good use of psychiatric treatment when the accessibility to psychiatric hospitals is improved and this may be leading to the lower perception of stress and to the lower incidence of suicide among them.

In summary of the fixed-effect estimation results of females, while unemployment and divorce are associated with the perception of some mental health problems such as the perception of stress arising from financial issues, these socioeconomic factors are not associated with the incidence of suicide among females. This result is consistent with Hypothesis 3.1.

We next pass on to the results among males shown in Table 3.5. In Table 3.5, we show the *t*-statistics for the coefficients in the parentheses and the *t*-statistics for testing if the differences in the coefficients are significantly different from zero between females and males in the brackets. First, as shown in column (1), the male suicide rate is negatively and significantly associated with the job offer ratio. A one percent decrease in the number of job offers available per job seeker is associated with an increase in the number of deaths by suicide among males by 0.11%. The statistical significance of the coefficient is large and the coefficient for males is significantly smaller than that for females at the 5% significance level. While the incidence of suicide among females is not responsive to the changes in the job offer ratio, as we have shown in Table 3.4, the incidence of suicide among males is significantly responsive to the decrease in the job offer ratio. This is consistent with Hypothesis 3.1.

Second, what should be noted in column (1) is the positive and statistically significant association between the divorce rate and the male suicide rate. A one percent increase in the divorce rate is associated with an increase in the suicide rate by 0.32% at the 5% significance level. Although the *t*-statistics in the brackets fail to reject the null hypothesis that the coefficients of the divorce rate between females and males are equal, the divorce rate is positively and significantly associated with the incidence of suicide only among males. This is also consistent with Hypothesis 3.1.

The job offer ratio is not only negatively associated with the male suicide rate but also negatively associated with the perception of various mental health problems. A one percent decrease in the job offer ratio is associated with an increase in the perception of stress in general by 0.02% at the 10% significance level, as shown in column (2). Moreover, as in the case of females, the job offer ratio is negatively associated with the perception of stress due to financial issues and the statistical significance of the association is quite high as shown in column (3). The job offer ratio is also negatively associated with the perception of somatic symptoms among males. A one percent decrease in the job offer ratio is associated with an increase in the perception of physical health problems in general by 0.05% at the 1% significance level, as shown in column (6). The differences in the coefficients of the job offer ratio on the perception of somatic symptoms between females and males are also significant. While a decrease in the job offer ratio is not associated with an increase in the perception of somatic symptoms among females, it has a significant association with it among males. Thus, a decrease in the job offer ratio is associated with increases in the perceived stress and somatic symptoms and also with the increase in the incidence of suicide among males while it is

only associated with the increase in the perceived stress arising from financial issues among females. This is consistent with our hypothesis.

The birth rate is only associated with the perception of stress arising from health issues among males. A one percent increase in the birth rate is associated with an increase in the rate of perception of stress arising from health issues by 0.46%.

The divorce rate is positively associated not only with the male suicide rate but also with the perception rate of stress arising from family issues and that of somatic symptoms. A one percent increase in the divorce rate is associated with an increase in the perception rate of stress arising from family issues and that of somatic symptoms by 0.29% (column (5)) and 0.18% (column (6)) at the 15% and 10% significance levels respectively. In summary, while the divorce rate is positively associated with the perception of some mental health problems both among females and males, we find that divorce has a significant association with the incidence of suicide only among males. This is consistent with our hypothesis.

In summary, while an increase in unemployment and in divorce is associated with an increase in perceived mental health problems both among females and males to varying degrees and patterns, the incidence of suicide significantly increases with unemployment and divorce only among males. This is consistent with Hypothesis 3.1.

For reference, we also explain how the estimation results change if we include the factors that we have excluded from our preferred specification. As shown in Table C.2 in Appendix Table C, the estimation results do not qualitatively and quantitatively change much. We find, however, the mental health spending per capita is positively associated with the suicide rate among males as shown in column (1) in Table C.2. A one percent increase in the mental health spending per capita is associated with an

increase in the male suicide rate by 0.01% at the 10% significance level. As mentioned earlier, significant proportions of the mental health spending are used for the compulsory hospitalization of those who are judged to be at risk of harming themselves or others because of severe mental disorders. More mental health spending may be used when there are more individuals who are at such a risk and the suicide rate is also expected to increase when there are more such individuals. This endogeneity problem seems to be present in this specification due to the omission of variables representing the prevalence of mental disorders. However, it is difficult to measure the true prevalence of mental disorders and we can only recognize the presence of mental health problems only through individuals' self-report. We believe that the self-reported mental health problems are also endogenous, thus, we avoid using the self-reported mental health problems as explanatory variables. Thus, the positive association between the suicide rate and the mental health spending per capita should be carefully interpreted. The mental health spending per capita is also positively associated with the perception of sleep difficulties. A one percent increase in the mental health spending per capita by 1% is associated with an increase in the rate of perception of sleep difficulties by 0.03% at the 1% significance level as shown in column (7) in Table C.2. Sleep difficulty is one of the most common symptoms of mental disorders. Thus, the positive association between the mental health spending per capita and the perception of sleep difficulties exists probably because a greater amount of mental health spending may be used when more individuals complain of sleep difficulties. This result should be also carefully interpreted. The number of psychiatric hospitals per 100,000 persons is negatively associated with the rate of perception of stress among males. A one percent increase in the number of psychiatric hospitals per 100, 000 persons is associated with a decrease in

the perception of stress among males by 0.06 % at the 10% significance level as column (2) in Table C.2 shows.

To analyze whether the gender-specific associations that we have observed in Table 3.4 and Table 3.5 can differ by age group, we also present the results of the regression analysis with the gender and age group-specific dependent variables in Table 3.6. In Table 3.6, the dependent variable is the female suicide rate of different age groups (Age 15-34, Age 35-74 and Age 75 years and older) from column (1) to column (3), the male suicide rate of different age groups (Age 15-34, Age 35-74 and Age 75 years and older) from column (4) to column (6), the perception rate of stress in general among females of different age groups (Age 15-34, Age 35-74 and Age 75 years and older) from column (7) to (9), and the perception rate of stress in general among males of different age groups (Age 15-34, Age 35-74 and Age 75 years and older) from column (10) to (12).

As shown from column (1) to (3), we do not find that there are significant associations between the suicide rates and socioeconomic factors among females in any age group. In contrast, as column (5) shows, a decrease in the job offer ratio as well as an increase in divorce is significantly associated with an increase in the suicide rate among males aged 35-74. A decrease in the job offer ratio by 1% is associated with an increase in the suicide rate by 0.14% at the 1% significance level, and an increase in the divorce rate by 1% is associated with an increase in the suicide rate by 0.39%.

We do not find that there are significant associations between the job offer ratio and the perception rate of stress among females in any age groups. As for the relationship between divorce and the perception of stress, we find that the divorce rate is negatively associated with the perception rate of stress among females aged 15-34 as

column (7) shows while it is positively associated with the perception rate of stress among females aged 75 years and older as column (9) shows. We find that the perception rate of stress is negatively associated with the job offer ratio among males aged 35-74. Although the statistical significance is low, a one percent decrease in the job offer ratio is associated with an increase in the perception rate of stress by 0.02% at the 15% significance level, as shown in column (11). Although the interpretation is somewhat difficult, the perception rate of stress increases with the birth rate among older males, as shown in column (12). The divorce rate, which has a significant association with the suicide rate among middle-aged males, does not have a significant association with the perception rate of stress.

As shown in Table C.3 in Appendix Table C., our estimation results are not qualitatively and quantitatively different from those shown in Table 3.6. If we include the mental health spending per capita and the number of psychiatric hospitals per 100,000 persons as control variables, the statistical significance of the associations between the job offer ratio and the perception of stress rather slightly increases.

In summary, we find that unemployment and divorce have a significant association with the incidence of suicide especially among middle-aged males while they are associated with increase in the perception of several mental health problems both among females and males. The results are consistent with our hypothesis.

3.6 Conclusion

This chapter has used the prefecture-level panel data set to examine how stress, sleep difficulties, irritation, and other common precursors of suicide are related to the variations in the socioeconomic factors such as unemployment and divorce among

females and males, respectively. While prior studies have focused mostly on the relationships between the incidence of fatal suicide and socioeconomic conditions, this chapter investigates how the onset of varying degrees of mental health problems are associated with socioeconomic conditions. Furthermore, this chapter contributes to the literature by highlighting the gender differences in the perception of mental health problems as well as the incidence of suicide.

The results of the correlation analysis indicate that there are strong positive within-prefecture correlations between the suicide rates and the perception rates of several mental health problems such as stress in general, stress due to financial issues, stress due to family issues, somatic complaints in general, sleep difficulties, a sense of fatigue, and irritability especially among males.

In addition, the results of the regression analysis show that the increase in unemployment and in divorce is associated with the increase in the perception of mental health problems both among females and males while the incidence of suicide is only responsive to the increase in unemployment and divorce only among males.

This chapter has three important implications for suicide prevention and future studies. First, the self-reported stress or other mental health problems should be regarded as important early signs of suicide especially among males according to the finding that there are stronger correlations between the incidence of suicide and the perception of mental health problems within prefectures. Making a meaningful response to males' recognition of mental health problems may be potentially one of the important keys to prevent suicide. How to detect signs of suicide early and what the cost-effective ways are to do so are the pressing matters of future research.

Second, providing mental care to individuals who experience certain socioeconomic events such as unemployment and divorce is important regardless of gender. Places such as job-placement offices and ward offices that can confirm individuals' job status or marital status readily may play important roles in detecting mental health problems and in providing useful information with regard to mental care. It is also a matter of future research to understand what kinds of roles can be played by these public institutions in promoting mental health.

Third, the finding that unemployment and divorce are associated with the incidence of suicide especially among males leaves important questions why such associations exist among males but not among females although these factors are associated with the perception of mental health problems both among females and males. We shed light on this point in Chapter 5, by highlighting the gender differences in the patterns of help seeking behaviors by job status as well as by marital status.

In this chapter, we have failed to show the individual-level relationship between socioeconomic characteristics and the perception of various mental health problems. For instance, one may ask whether unemployed individuals are more likely to perceive mental health problems than among employed individuals and whether such associations are different by gender. One may also wonder similarly for marital status and for other individual socioeconomic backgrounds. In Chapter 4, we attempt to answer these questions by exploring the individual-level survey data that were collected by the Japanese government nationwide in 2004.

Chapter 4

An Individual-Level Analysis of the Relationship between Socioeconomic Backgrounds and the Perception of Mental Health Problems in Japan

4.1 Introduction

This chapter uses the CSLC individual-level survey data to explore the association between the characteristics of individuals and their mental health problems in more detail than in the previous chapter. The same data set will be used in the next chapter to examine the help seeking behaviors of the individuals who have stress. The use of the individual-level survey data implies that we cannot include suicide in our analysis because only living individuals are sampled in the survey. Compared with the prefecture-level data, however, the individual-level data allow us to establish much clearer links between the job status, marital status, and gender among other characteristics of individuals on one hand and their perception of particular types of mental health problems on the other. With the prefecture-level data, for example, when we say an increase in job offers in a prefecture decreases the percentage of the residents in the prefecture who perceive stress, we are not sure whether those who are offered jobs feel less stressed or whether someone else feel less stressed because of the economic recovery reflected in the increase in job offers. The use of individual-level data reduces such ambiguity considerably. Moreover, the individual-level data provide more detailed information on perceived stress arising from various issues and distinguish those wishing to work but are jobless from those unwilling to work.

As is similar to the analysis in Chapter 3, this chapter develops and tests hypotheses by using the analogy of the sociology of suicide and the economics of

suicide to explain the relationship between the characteristics of individuals, especially their job, marital statuses, and gender, and their mental health problems. Since the individual-level data provide detailed information on specific types of joblessness, singleness, and mental stress, the hypotheses to be tested in this chapter are accordingly more intricate than those in the previous chapter.

The rest of this chapter is organized as follows. Section 4.2 presents the testable hypotheses based on the literature review in Chapter 2. Section 4.3 describes the data for the empirical analysis. Section 4.4 specifies the empirical model and reports the estimation results. Finally, Section 4.5 concludes and discusses the implications for future research.

4.2 Hypotheses

The individual-level data that we use in this chapter contain detailed measures of joblessness and singleness. Jobless individuals are those who are out of work and do not seek jobs. Jobless individuals are categorized into two groups: those who are not willing to work and those who are willing to work. In contrast, unemployed individuals are those who are out of work and seek jobs. Single individuals are those who are never married, those who are widowed, and those who are divorced. In the previous chapter, we have shown that the perception of stress and several other symptoms of mental disorders decreases with unemployment and divorce both among females and males. By taking advantage of the use of the individual-level data set, which contains detailed information regarding job and marital statuses, we can test the following hypothesis in this chapter:

Hypothesis 4.1: Jobless or unemployed individuals or single individuals are more likely to perceive mental health problems than their employed or married counterparts regardless of gender.

There are, however, several reasons why we expect to observe gender differences in the degrees or the patterns of the associations between job status and perceived mental health problems and between marital status and perceived mental health problems. The existing literature points out that males show stronger adherence to masculine norms such as a stronger sense of obligation as breadwinners as compared with females (e.g., Galdas et al., 2005). Losing jobs would probably threaten such norms especially among males. Jobless males who are not willing to work, however, might be more financially secure and less likely to feel stressed about financial issues than other jobless males who still wish to work. We expect that the same thing is true for jobless females who are not willing to work. Jobless males who are not willing to work, however, would be more likely to fall into poor mental health conditions than females having the same job status because such males might feel that they fail to fulfill their roles as males or breadwinners even though they are not willing to work.

Furthermore, jobless males who wish to work might fall into even worse mental conditions because although they recognize that they should work, they do not seek jobs. Jobless females who are in the same situation might also suffer from poor mental health, yet they would not suffer as much as jobless males who wish to work probably due to a weaker sense of obligation as breadwinners as compared with males (e.g., Galdas et al., 2005). Therefore, we expect to observe large gender differences in the way of perceiving mental health problems among jobless individuals who wish to work.

In contrast, we expect that there are smaller gender differences in the way of perceiving mental health problems among those who are unemployed. We expect so because being unable to find jobs despite the willingness to work would be stressful regardless of gender. Moreover, unemployed males would feel that they attempt to accomplish their duty as breadwinners by making efforts to find jobs. Therefore, unemployed males would not fall into as poor mental health conditions as jobless males who wish to work would. Accordingly, the gender differences in the perception of mental health problems are expected to be small among unemployed individuals. To substantiate the argument for the existence of masculine norms, we test the following hypothesis:

Hypothesis 4.2: Jobless males, whether willing or unwilling to work, are more likely to feel stressed and have somatic symptoms than jobless females, whereas unemployed females and males do not differ so much in the likelihood of perceiving these mental health problems.

Divorce and widowhood may affect the mental health of females and males differently. Umberson et al. (1996) and some other studies argue with some evidence that not a few males become unable to take care of themselves after being divorced or widowed, and that divorced males are less able to keep in touch with their children than divorced females. Widowed females might rather tend to become free of the difficult relationship between the mother-in-law and the daughter-in-law and, hence, they may feel less stressed about family matters. Thus, it seems reasonable to advance the following hypothesis:

Hypothesis 4.3: After being widowed or divorced, males are more likely than females to feel stressed about family matters and about whether they will be able to receive nursing care in the future.

On the other hand, it is expected that divorced or never-married females are more likely to have stress arising from uncertainty about future income than their male counterparts because single females tend to be more economically disadvantaged than single males (e.g, Abe, 2012). Thus, it also seems plausible to advance the following hypothesis:

Hypothesis 4.4: Divorced or never-married females are more likely to feel stressed about future incomes than their male counterparts.

4.3 Data

We use the CSLC data set in 2004, the detailed information of which is provided in the last section of Chapter 2. We assess 1) the perception of stress, 2) the perception of somatic symptoms of mental disorders such as sleep difficulties, and 3) respondents' various characteristics, by using the answers to a set of questions in the survey, the author's English translation of which is shown in Appendix Table B.

We have dummy variables for the perception of stress arising from six contents: 1) financial issues, 2) health issues, 3) family issues, 4) concerns about future income, 5) concerns about whether or not one can receive nursing care in the future, and 6) loss of purpose in one's life. We have dummy variables for the perception of three types of somatic symptoms of common mental disorders: 1) sleep difficulties, 2) a sense of fatigue and 3) irritability. In this chapter, we added three new categories of mental stress, which are 4) concerns about future income, 5) concerns about whether or not one can

receive nursing care in the future and 6) loss of purpose in one's life. In the previous chapter, we could not include these categories since these categories are not recorded in some sample years due to the change of the CSLC questionnaire form and we could not construct the panel data with regard to these variables. As we have discussed in Chapter 2, some researchers argue that individuals who attempt suicide, which results in an irreversible outcome, may be overly pessimistic about their future utility (Loewenstein et al., 2003). Thus, this chapter analyzes those who are prone to feel more stressed about their future issues.

The individual characteristics include 1) the job status, 2) the marital status, 3) the house ownership status, 4) the number of family members and 5) age group. The job status includes three types. The first job status is called "jobless-1," which means being out of work without willingness to work. The second job status is called "jobless-2," which means being out of work with willingness to work, but not seeking jobs. Finally, the third job status is called "unemployed," which means being out of work with willingness to work and seeking jobs.

The marital status is divided into four types, which are 1) married, 2) never-married, 3) widowed, and 4) divorced. House ownership represents whether the respondents live in housing they own or they live in rented housing. This variable becomes one when a respondent lives in rented housing. A variable called the number of family members represents how many family members a respondent lives with. Each respondent has a dummy variable indicating to which age groups (Age 15-24, Age 25-34, Age 35-44, Age 45-54, Age 55-64, Age 65-74 and Age 75 years and older) he or she belongs. All the variables are dummy variables, except for the number of family members.

As discussed earlier, the existing studies have found that alcohol use is an important predictor of the incidence of suicide (e.g., Bramness et al., 2010; Teesson et al., 2000; Sher, 2006). The CSLC questionnaire in 2004, unfortunately, does not ask whether the survey respondents consume alcohol. The CSLC questionnaire in 2001, however, asks whether the survey respondents consume alcohol. By using the CSLC data set in 2001, we consider the association between the perception of stress and alcohol use in Appendix Table E. The reason why we do not use the CSLC data set in 2001 in our main analysis is that it does not contain important information regarding the job status of the survey respondents. In the CSLC data set in 2001, we can only distinguish whether or not the survey respondents have paid jobs as of the time of the survey. Thus, we cannot distinguish whether the respondents who are out of work are still willing to work or are looking for jobs. Since the hypotheses that we have advanced above depend on individuals' willingness to work or job seeking status, we have decided to use the CSLC data set in 2004. Furthermore, the CSLC questionnaire in 2001 does not ask whether the survey respondents seek help in case they feel stressed. This is another important reason why we have chosen to use the CSLC data set in 2004 instead of the data set in 2001 as help seeking behavior is one of the important aspects that this dissertation highlights in the next chapter. Nevertheless, considering the associations found between the risk of suicide and alcohol pointed out by the existing studies, we conduct empirical analysis with the CSLC data set in 2001 and present the results in Appendix Table E.

Table 4.1 shows the summary statistics of the CSLC data set as of 2004. The total sample size is 69,254. As we have shown with the prefecture-level data in the previous chapter, females are more likely to admit that they perceive stress than males. While

56% of females reply that they feel stress in general, 46% of males do so. The *t*-statistics for the difference in the perception of stress in general is 27.65, indicating females are significantly more likely to admit that they perceive stress in general. Females are also significantly more likely to report stress in all categories of issues (financial issues, health issues, family issues, concerns over future income, concerns about whether one can receive nursing care in the future as well as loss of purpose in one's life) than males. Females are also more likely to perceive somatic symptoms than males. While 39% of females admit that they feel some somatic symptoms, 30% of males do so. The *t*-statistics for the difference is also large enough to reject the null hypothesis that females and males equally perceive these symptoms. Moreover, females are more likely to perceive the commonly observed symptoms of mental disorders such as sleep difficulties, a sense of fatigue and irritability as compared with males. In summary, as we have observed in the prefecture-level analysis conducted in the previous chapter, females are more likely to admit that they have mental health problems than males.

Appendix Table E.1 shows the summary statistics of the CSLC data set as of 2001. The total sample size is 91,419. As in the case of the CSLC data set in 2004, females are more likely to admit that they perceive stress than males. While we only show the proportion of females and males who admit stress arising from at least one issue among financial, health and family issues, we find that females are more likely than males to admit stress coming from other issues such as future concerns over future income and somatic symptoms such as sleep difficulties. As we have noted earlier, the CSLC data set in 2001 does not contain information regarding the survey respondents' willingness to work and job seeking status. As of 2001, approximately 47% of female

survey respondents are employed while 75% of male survey respondents are employed. The gender-specific proportion of the employed individuals is quite similar between the CSLC data sets in 2001 and in 2004. The same things apply to the distribution of marital status, those who live in rented housing and the number of family members that the survey respondents live with. Regarding alcohol use, the proportion of those who drink alcohol is much higher among males than among females. While only 25% of females drink alcohol, 60% of males drink alcohol.

We will next undertake a regression analytical approach to examine how the individual characteristics other than gender are associated with the perception of various types of mental health problems. In our main analysis, we will use the CSLC data set in 2004 while we will present our empirical results based on the CSLC data set in 2001 in Appendix Table E.

4.4 Regression analysis

Using the subscripts i , and g to index the individual and gender group respectively, the empirical model in our analysis is:

$$M_{ig} = X_{ig}\beta_g + \varepsilon_{ig},$$

where M is a dummy variable for the perception of mental health problems (becomes one when respondents answer that they have a certain mental health problem), X is a vector of the individual characteristics as of the time of the survey. ε represents the idiosyncratic error terms. Since the dependent variables are binary outcomes, we employ the multivariate logistic regression models. While not shown, the results of the regression analysis are not sensitive depending on the usage of alternative regression models such as the linear probability models and probit models.

The logistic regression estimation results for females are shown in Table 4.2. In Table 4.2, the dependent variable is whether a respondent perceives stress in general, stress about financial issues, health issues, family issues, future income, future nursing care and loss of purpose in life from column (1) to column (7) respectively, whether she has any somatic symptoms, difficulties in sleep, a sense of fatigue, and irritability from column (8) to column (11) respectively. Jobless females without willingness to work (jobless-1 females) are less likely to perceive stress in general than employed females as shown in column (1). This is probably because they have fewer concerns in financing their lives even without having paid jobs as the first row of column (2) and (5) show. While jobless-1 females feel less stressed about financial issues than employed females, they are more likely to perceive stress arising from health issues, concerns of their own future nursing care, loss of purpose of their lives, somatic symptoms in general and sleep difficulties as compared with their employed counterparts, as shown from column (6) to (9) respectively.

Jobless females who are willing to work (jobless-2 females) are significantly more likely to perceive all the types of mental health problems that this study focuses on as compared with employed females. For instance, jobless-2 females are 12% more likely to perceive stress in general (column (1)) and 4% more likely to perceive some somatic symptoms (column (8)) as compared with employed females.

Moreover, as the third row of Table 4.2 shows, unemployed females are also more likely to perceive all the types of mental health problems except for a sense of fatigue than employed females. These findings indicate that females who are staying out of work despite the willingness to work tend to perceive various types of mental health problems more than females who are employed. This is consistent with Hypothesis 4.1.

Never-married females are less likely to perceive stress in general and stress arising from financial issues as well as family issues than married females, as shown in column (1), (2) and (4) respectively. In contrast, never-married females tend to perceive stress due to health issues, concerns about future income and about the availability of one's own future nursing care, loss of purpose in life, sleep difficulties and a sense of fatigues than married females, as shown in column (3), (5), (6), (7), (9) and (10) respectively. Less prevalence of stress about financial and family issues among never-married females may be because marriage makes financial and family conditions more complicated. However, staying out of marital relations does not seem to offer only benefits for females. Never-married females seem to be more likely to suffer from various other types of mental health problems than married females.

Widowed females are less likely to perceive stress arising from family issues (column (4)) while they are more likely to perceive that they have lost a purpose of their lives (column (7)). The death of husbands may reduce the problems arising from marital relations and from the frequent relations with the husbands' families while the death of husbands may also induce the bereaved wives to lose their purposes in lives. However, widowed females do not seem to be significantly more likely to suffer from various types of mental health problems in general as compared with their married counterparts.

There is a strong association between divorce and the perception of various types of mental health problems among females. Divorced females are significantly more likely to admit that they have all the types of mental health problems that we focus on in our analysis except for stress arising from family issues as compared with married females. The reason why divorced females do not perceive stress arising from the family issues is probably because married females may have to bear a great burden to

deal with family issues. It may also be the case that females who are prone to mental health problems are not good at keeping their marital relations and are more likely to get divorced than those who are less prone to mental health problems. Although the interpretations of these results might vary, to summarize the relationship between marital status and the perception of mental health problems, divorce is, in particular, strongly associated with the perception of mental health problems among females. This is consistent with Hypothesis 4.1.

Females who live in rented housing are also more likely to perceive mental health problems than females who live in their own housing. While females living in rented housing and those living in their own housing have equal chances of feeling that they lose purpose in life (column 7), females living in rented housing are significantly more likely to perceive other types of stress and somatic symptoms as compared with females living in their own housing. Our results are similar to the finding of Dunn (2002) showing that individuals living in rented accommodations report lower mental well-being than those owning their own houses. The probable reason of lower mental well-being among those living in rented housing is that such individuals tend to move more frequently than those who live in their own housing may tend to have weaker attachment to their community. This may weaken social integration and lower mental well-being. Furthermore, living in rented accommodation may represent not only weak social integration but also financial instability. The close association between living in rented houses and the perception of mental health problems is consistent with economists' prediction that low economic welfare decreases expected lifetime utility.

While the number of family members is positively associated with the perception of stress arising from financial issues and family issues and of irritability (column (2),

(4), and (11) respectively), it is negatively associated with the perception of other types of mental health problems among females. By age group, we find that females aged 35-44 and females aged 45-54 are most likely to perceive stress arising from all kinds of issues other than health issues and future nursing care and a sense of fatigue. Older females tend to perceive stress due to health issues and concerns about future nursing care and sleep difficulties, as shown in column (3), (6) and (9) respectively.

The logistic estimation results for males are shown in Table 4.3. The dependent variables and the specifications are the same in Table 4.3. The z -statistics for testing whether the regression coefficients are different from zero are reported in the parentheses while the z -statistics for testing whether the differences in the regression coefficients between females and males are significantly different from zero are reported in the brackets. Jobless males who are not willing to work (jobless-1 males) are more likely to perceive all kinds of mental health problems other than stress due to financial issues and future income than employed males. The regression coefficients of jobless-1 on the perception of stress in general, stress arising from health issues, family issues, and future nursing care, somatic symptoms, a sense of fatigue and irritability for males are significantly larger than these regression coefficients for females, as shown in column (1), (3), (4), (5) (8) (10) and (11) respectively. Joblessness without willingness to work is more strongly associated with the perception of mental health problems among males than among females. This is consistent with Hypothesis 4.2.

In addition, jobless males who are willing to work (jobless-2 males) are much more likely to perceive all the types of mental health problems, except for stress arising from financial issues, as compared with employed males. The regression coefficients of jobless-2 are significantly larger for males than those for females, as shown in column

(1), (3), (4), (6), (7), (8), (10) and (11) respectively. To summarize the regression estimates so far, joblessness, whether willing or unwilling to work, is more strongly associated with the perception of mental health problems among males than among females. This is consistent with Hypothesis 4.2.

Unemployed males, however, are equally likely to perceive mental health problems as unemployed females. As shown in the third row from column (1) to (7) and (9), unemployed males are more likely to perceive stress in general, stress due to financial issues, health issues, family issues, future income, future nursing care, and loss of purpose in life as well as sleep difficulties than their employed counterparts. The regression coefficient of unemployment, however, is only slightly larger among males than that for females on the perception of stress due to financial issues, as shown in column (2). All the other regression coefficients of unemployment among males do not show statistically significant differences from those among females. Thus, when females and males are unemployed, they are equally likely to perceive mental health problems and both genders perceive mental health problems more than their employed counterparts. This is consistent with Hypothesis 4.2.

Males who are never married are less likely to perceive stress in general than males who are married, as column (1) shows. They are especially less likely to perceive stress arising from financial issues and family issues than married males, as column (2) and (4) show. In addition, they are less likely to perceive somatic symptoms in general and a sense of fatigue than married males, as shown in column (8) and (10). On the other hand, never-married males are more likely to perceive stress due to health problems, concerns about whether or not they can receive nursing care in the future, and loss of purpose in life as compared to married males as shown in column (3), (6) and (7)

respectively. In summary, males who are never married are not necessarily more likely to perceive all types of mental health problems as compared with married males, nor are they more likely to perceive mental health problems than never-married females.

Males who are widowed are more likely to perceive stress due to family problems, concerns about whether they can receive nursing care in the future and loss of purpose of their lives as shown in column (4), (6) and (7) respectively as compared with their married counterparts. These regression coefficients of the dummy variable indicating being widowed are significantly larger among males than those among females. In contrast, widowed males are less likely to perceive somatic symptoms and its regression coefficient is significantly smaller than that among widowed females. This is consistent with Hypothesis 4.3.

Divorced males are more likely to perceive stress arising from financial issues, family issues, concerns about future nursing care, and loss of purpose in their lives as well as sleep difficulties and a sense of fatigue than married males, as shown in column (2), (4), (6), (7), (9) and (10) respectively. While divorce is associated with the perception of mental health problems both among females and males, divorced males especially feel stress more from family-related issues. The regression coefficients of the dummy variable indicating being divorced are significantly larger among males than those among females on the perception of stress arising from family issues. In contrast, as shown in the *t*-statistics in brackets in column (5), divorced females are significantly more likely to perceive stress about their future income as compared with divorced males. This is consistent with Hypothesis 4.4.

To summarize the results concerning the relationships between marital status and the perception of mental health problems, while divorce is associated with perceived

mental health problems regardless of gender, divorced females are more likely to perceive concerns over future income than divorced males. In contrast, widowed or divorced males are more likely to perceive stress arising from family issues and concerns about whether they can receive nursing care in the future. These results are consistent with our hypotheses.

Compared with males who live in their own housing, males who live in rented housing are more likely to perceive all kinds of mental health problems other than stress due to family issues and concerns about whether or not they can receive nursing care in the future. The regression coefficients of living in rented housing on the perception of stress arising from financial issues and stress about future income are significantly larger among females than those among males, as shown in column (2) and (5). This might indicate that attachment to the community may play a more important role for mental well-being among females than among males.

The associations between the number of family members and the perception of mental health problems are quite similar between females and males. The number of family members is positively associated with the perception of stress due to financial issues and family issues (column (2) and (3) respectively) while it is negatively associated with the perception of stress arising from health issues, future income, future nursing care as well as loss of purpose in lives and somatic symptoms (column (3), (5), (6), (7) and (8) respectively).

The associations between age group dummies and the perception of mental health problems among males also resemble those which we have observed among females in Table 4.2. Nevertheless, while females aged 35-44 and aged 45-54 are most likely to

report stress due to family issues or loss of purpose in their lives, males aged 25-34 are most likely to report these mental health problems.

Lastly, we show the regression coefficients of the female dummy for all the specifications. All the regression coefficients of the female dummy on the perception of mental health problems except for stress about future income as well as loss of purpose in life are positively significant. This indicates that even after controlling for job status, marital status, housing ownership, the number of family members and age, females are significantly more likely to perceive mental health problems than males. These results clearly point to the importance of further investigation into the sources of the remaining gender differences that this chapter could not fully capture.

In order to examine whether the associations between socioeconomic backgrounds and the perception of mental health problems are different by age group, we have also conducted the same regression analysis by using the sub-samples divided according to age group. In Chapter 3, we have shown that the incidence of suicide is significantly associated with the job offer ratio and with the divorce rate only among males aged 35-74. We now test whether and how males in this age group perceive mental health problems differently from males in other age groups and from females aged 35-74. The results are shown in Table 4.4 and Table 4.5 for females aged 35-74 and males aged 35-74, respectively.

The results shown in Table 4.4 and Table 4.5 resemble the results shown in Table 4.2 and Table 4.3. Both females and males aged 35-74 who are out of work despite being willing to work are more likely to perceive mental health problems than their employed counterparts. Especially, jobless males aged 35-74 who are willing to work are significantly more likely to perceive several types of mental health problems than

females aged 35-74 having the same job status. The likelihood of perceiving mental health problems is not significantly different between unemployed males and unemployed females. As for marital status, both females and males aged 35-74 who are divorced are more likely to perceive mental health problems than their married counterparts, yet importantly, divorced females aged 35-74 are significantly more likely to perceive stress due to financial issues as compared with divorced males aged 35-74. On the other hand, divorced males aged 35-74 are more likely to perceive stress arising from family issues than divorced females in this age group. Furthermore, widowed males aged 35-74 are also more likely to perceive stress due to family issues, concerns about whether or not they can receive nursing care in the future, and loss of purpose in life than their married counterparts. The likelihood of perceiving these mental health problems is also significantly higher for widowed males than that for widowed females. These results are consistent with Hypothesis 4.2, Hypothesis 4.3 and Hypothesis 4.4.

Variables other than job status and marital status also show similar associations with the perception of mental health problems when we conduct the regression analysis with whole sample. These results indicate that the associations between socioeconomic characteristics and the perception of mental health problems are not especially different among males aged 35-74.

The logistic estimation results by using the CSLC data set in 2001 are shown in Appendix Table E.2. The dependent variable in Appendix Table E.2 becomes one when survey respondents admit that they feel stress arising at least one issue among financial, health and family issues. This analysis is conducted to consider the associations between alcohol use and the perception of such stress. As shown in column (1), alcohol use is positively associated with the perception of stress among females. The probability of

females who drink alcohol is significantly higher by 2% than females who do not drink alcohol. In contrast, as shown in column (2), males who drink alcohol are significantly less likely to admit that they have stress arising from at least one issue among financial, health and family issues than males who do not drink alcohol. The likelihood of males who drink alcohol is significantly lower by 2% than males who do not drink alcohol. These results can allow us to make a number of possible interpretations. It might be the case that alcohol makes females feel more stressed or stressed females tend to be dependent on alcohol. It might also be the case that alcohol is a common way of relieving stress among males or males who drink alcohol tend to have too low mental health literacy to recognize their stress in a proper manner. While the exact mechanism between alcohol use and the perception of stress is unknown from our results, we find that the association between alcohol use and the self-reported stress differs by gender. Moreover, with inclusion of alcohol use in our analysis, the regression coefficients of other variables do not qualitatively differ from those we have presented in our main analysis shown from Table 4.2 to Table 4.5.

4.5 Conclusion

This chapter has used individual-level cross sectional data to explore whether and how individual characteristics are associated with the perception of various types of mental health problems among females and males, respectively. It finds that joblessness despite willingness to work and divorce are associated with the perception of mental health problems both among females and males. It also finds that jobless males who are willing to work are significantly more likely to perceive mental health problems as compared with females having the same job status. As for marital status, it shows that

being widowed is more strongly associated with the perception of mental health problems among males than among females. Furthermore, while divorce is more closely associated with the perception of stress about future income among females, it is more closely associated with the perception of stress arising from family issues and concerns about whether one can receive nursing care in the future among males. The results are similar if we limit the samples to those aged 35-74, while Chapter 3 has found that the incidence of suicide is more responsive to socioeconomic factors only among males aged 35-74. Lastly, this chapter finds that even after controlling for several key socioeconomic backgrounds, females are still more likely to perceive mental health problems than males.

These results indicate that the provision of appropriate mental health care is important for both females and males who are jobless despite being willing to work or who are divorced. In particular, our results indicate that jobless males who are willing to work should be given various types of mental care because our results show that they tend to suffer from many types of mental health problems ranging from stress over current and future living conditions as well as several somatic symptoms. It seems important to provide such jobless males with comprehensive mental care, which responds flexibly to a variety of problems they face ranging from job availability, financial issues, life planning, and medical concerns. Similarly, widowed males and divorced males deserve special attention for receiving mental care to resolve family issues as well as issues regarding their own nursing care in the future. Divorced females also deserve special attention for receiving mental care to resolve especially the issues of future income.

Moreover, the absence of stronger associations between unemployment and the perception of mental health problems as well as between divorce and the perception of mental health problems among males aged 35-74 indicates that some males in this age group who experience unemployment or divorce may commit suicide without bringing their mental health problems to light. This raises the importance of further investigation into whether and how these male cohorts facing unemployment or divorce underreport their mental health problems and what makes them do so. Furthermore, what the sources are of the gender difference remaining in the reported mental health problems after controlling for socioeconomic backgrounds should be definitely studied further in future studies.

In the next chapter, we will highlight help seeking behaviors in face of perceived stress. Even if mental care is important to promote mental health and reduce the risk of suicide, it is impossible to force someone to receive any kind of mental care unless he or she recognizes and seeks help for mental health problems in some manners. Thus, it is important to understand who seeks and does not seek help when he or she perceives mental health problems. Understanding the patterns of help seeking behaviors would facilitate more efficient allocation of resources for mental treatment and could provide useful insights into suicide prevention.

Chapter 5

Socioeconomic Associates and the Gender Gap in Help Seeking

5.1 Introduction

If an individual who suffers from a mental health problem seeks help from a family member or friend for the problem, he or she is more likely to receive appropriate mental treatment, which will substantially reduce the risk of committing suicide (Ludwig et al., 2009; Desai et al., 2005; Appleby et al., 1999). This chapter explores the characteristics of individuals who are less able or more reluctant to seek help for their mental help problems than others. In this chapter, consulting a family member, a friend, a colleague, or a medical professional is regarded as help seeking. The individual-level data contain rich information on whether or not an individual suffering stress consults someone, and if he or she does not, what the reason for not consulting is. We take advantage of such information to analyze help seeking behaviors.

As the summary statistics tables in Chapters 3 and 4 indicate, while the suicide rate of males is much higher than that of females, there are fewer males than females who admit having mental health problems. Probably, this is not just because there are fewer males than females who perceive mental health problems, but also because there are more males than females who are reluctant to admit to having mental health problems even though they actually perceive such a problem. Consider the latter type of individuals, i.e., those who do not tell the truth about their mental health problems in an anonymous survey. They will be even more reluctant to tell the truth to their colleagues because they may fear losing opportunities for career advancement. They may be reluctant to tell the truth even to their parents if their parents are expected to be upset, to accuse them of being lazy, or to worry about the mental health problems.

Indeed, according to the summary statistics shown below, 31 percent of females in the sample admit perceiving some stress in the anonymous survey, and only 82 percent of them consult someone (including a family member, friend, colleague, public consultation services and medical professional and others) about stress. Moreover, the numbers are smaller in the case of males: only 24 percent of males in the sample admit perceiving some stress, and only 71 percent of them consult someone about the stress, as shown in the descriptive table (Table 5.1). The differences in these numbers between females and males are statistically significant. This chapter explores what characterize those females and males who are less able or more reluctant to seek help for their mental health problems.

This chapter finds that males aged 35-74 are less likely to consult someone when they perceive stress than any other age group of females and males. Within this group of males, those who are 45-54 years old, unemployed or jobless but wishing to work are the least able to find someone to consult about the stress that they perceive. Those males who are 55-74 years old who are divorced, widowed or never married are found to be most reluctant to consult someone about stress. In contrast, the ability and willingness of females to consult someone about their stress are less related to their job status and marital status than those of males.

The rest of this chapter is organized as follows. The next section advances the hypotheses to be tested in this chapter. Section 3 uses the prefecture-level data set to give an overview of the gender differences in suicide, perceived stress, and help seeking behaviors. Section 4 describes the individual-level data set and presents the empirical results concerning the associations between individual-level socioeconomic

characteristics and help seeking behaviors. Section 5 discusses the implications for policies and future research.

5.2 Hypotheses

As mentioned above, those individuals who perceive mental health problems do not necessarily admit that they do when they are asked about their mental health conditions in an anonymous survey. Even those who tell the truth in the survey may not consult someone about their mental health. To capture such tendencies, the CSLC questionnaire asks a sequence of questions, starting with the question of whether a respondent perceives specific types of stress listed in Table 4.1. If the respondent gives an affirmative answer to any type of stress, the questionnaire asks the next question of whether the respondent has consulted someone about the stress, whether the respondent has been unable to consult because the respondent does not know whom to consult, or whether the respondent does not want to consult anyone. For an unknown reason, the questionnaire does not have such a sequence of questions for the somatic symptoms of mental disorders and, hence, there are no data on the help seeking behaviors of those who admit that they have such symptoms. Thus, we can deal with only the help seeking behaviors of those who admit feeling stressed. Moreover, we focus on the three major types of stress, i.e., stress arising from financial issues, health issues, and family issue, because they are the most frequently mentioned by the suicide notes written by suicide victims, as shown in Figure 3.2.

In this chapter, we develop hypotheses that can be tested by using the data on help-seeking behaviors obtained through these questions. As will be shown below, there are fewer males than females who seek help when they perceive the types of stress as

defined above. We are interested in examining how the job status, marital status, and other characteristics are closely associated with the reluctance or inability to seek help among females and males, respectively. As mentioned in the previous chapter, the individual-level data that we use in this chapter contain detailed measures of joblessness and singleness. Jobless individuals are those who are out of work and do not seek jobs. Jobless individuals are categorized into two groups: those who are not willing to work and those who are willing to work. In contrast, unemployed individuals are those who are out of work and seek jobs. Single individuals are those who are never married, those who are widowed, and those who are divorced.

Several existing studies find that males tend to build stronger personal relationships within their working places than females (e.g., Campbell et al., 1988). Such arguments make us expect that jobless or unemployed males are less able to seek help from someone in face of mental health problems than jobless or unemployed females. It may be also the case that individuals who are not good at receiving help from others are more likely to be jobless or unemployed. On the other hand, jobless or unemployed individuals would face lower opportunity cost of time as compared with employed individuals. The opportunity cost of time would be particularly low for jobless males because they do not seek jobs. In contrast, unemployed males may not face very low opportunity cost since they are looking for jobs. Thus, it is an empirical question whether males, in face of joblessness or unemployment, are more or less likely to seek help for their mental health problems than their employed counterparts and females facing the same job status.

It might be the case that males are unable or reluctant to seek help from others about their mental health problems especially when they are single. Some earlier studies

have shown that divorced males tend to feel that they have fewer individuals who take care of their health as compared with married males (e.g., Umberson et al., 1996). This implies that married males tend to rely on their spouses to regulate their health conditions. Married males might be able to talk to their spouses when they recognize their mental health problems, while single males, including those never married, widowed and divorced males, might fail to seek help for their mental health problems because they do not have reliable health regulators close by. Some other observational studies find that divorce tends to result in less frequent and poorer relationships with children among males than among females (e.g., Umberson et al., 1996), and divorced males may have limited access to the support from their children. Furthermore, males have shorter life expectancies than females, which may lead males to have lower expected returns on their help seeking behaviors. If they are married, their decision making about help seeking may be intervened in by their spouses (as in the case in which their spouses try to help them overcome their mental health problems), but if they are not married, they may not be very willing to seek help for their mental health problems. Thus, we present the following hypothesis:

Hypothesis 5.1: Among males, single ones especially tend to fail to seek help when they have mental health problems.

5.3 Prefecture-level analysis of help seeking behaviors

In this section, we use the prefecture-level data set to give an overview of the gender differences in suicide, perceived stress, and help seeking behaviors. We also analyze the associations between the prefecture-level socioeconomic conditions and help seeking behaviors. The data set of socioeconomic variables is the same one that we have used in

Chapter 3. Appendix Table A lists the definitions of the variables, available years of the variables and the sources.

We use the prefecture-level estimates of the number of individuals who have consulted someone about their stress, which are calculated by the Ministry of Health, Labor and Welfare based on the results of the CSLC and are published for the year of 2004, 2007 and 2010. The method of calculating the prefecture-level estimates is described in the last section of Chapter 2. The consultation rates (the number of those who have consulted someone about their stress per 100,000 persons) for a specific gender-age group are calculated by dividing the prefecture-level estimates of those who have consulted someone about stress by the population of the same gender-age group. The consultation includes talking to family members, friends, colleagues, public consultation services, hospitals, and others.

The summary statistics of the prefecture-level data set are shown in Table 5.1. There are large gender differences in the consultation rates. While 39,556 females consult someone about their stress per 100,000 persons, a significantly fewer males (26,519 per 100,000 persons) do so. Since those who do not admit that they have stress need not consult anyone, some may wonder whether the higher consultation rate among females may only reflect the higher perception rate of stress among them. In fact, in the previous chapters, we have shown that females are more likely to report their mental health problems than males. As shown in Table 5.1, the prefecture-level perception rate of stress is 51,311 and 43,083 (per 100,000 persons) for females and males, respectively. Certainly females admit that they have stress more than males; however, while approximately 77% (the consultation rate divided by the perception rate of stress) of stressed females consult someone, only around 62% of stressed males do so. According

to age cohorts, older cohorts tend to consult less. What is especially notable is that while males aged 35-74 are most likely to perceive stress than other male cohorts, the consultation rate among them is not very high. Thus, this descriptive analysis indicates that males are less likely to consult someone when they have mental health problems.

We next examine how help seeking behaviors are associated with several prefecture-level characteristics. For this analysis, we employ the fixed-effect regression models, which capture how the within-prefecture variations in several conditions are associated with the within-prefecture variations in help seeking behaviors, controlling for the time-invariant prefecture-specific characteristics.

Using the subscripts i and t to index of the prefecture and year respectively, the empirical model in our analysis is:

$$(1) \quad C_{it} = E_{it}\alpha + B_{it}\beta + D_{it}\gamma + X_{it}\varphi + \lambda_t + \Theta_i + \varepsilon_{it},$$

where C is the consultation rate of stress, E is the job offer ratio, B is the birth rate, D is the divorce rate, and X is the age-group population composition. While the dependent variables are gender-age group specific variables, the independent variables are common to every gender-age group. λ_t accounts for the countrywide time effects, the fixed-effect Θ_i controls for the time-invariant prefecture characteristics, and ε_{it} represents the idiosyncratic error terms. We cluster standard errors at the prefecture level. We have taken the logarithms of all the variables, except for the population composition by age group. As in the case of Chapter 3, we also present results of fixed-effect model in main tables in this chapter. The results of random-effect model are presented in Table D.4 in Appendix Table D.

Table 5.2 presents the estimates of the fixed-effects model linking the suicide rate with socioeconomic characteristics, which we have presented in Table 3.6 in Chapter 3,

in order to compare the results. In Table 5.2, the dependent variable is the suicide rate among females aged 15-34, females aged 35-74 and females aged 75 years and older from column (1) to (3) respectively, the suicide rate among males aged 15-34, males aged 35-74 and males aged 75 years and older from column (4) to (6) respectively, the consultation rate among females aged 15-34, females aged 35-74 and females aged 75 years and older from column (7) to (9) respectively and the consultation rate among males aged 15-34, males aged 35-74 and males aged 75 years and older from column (10) to (12) respectively. The explanatory variables are the job offer ratio, the birth rate, the divorce rate and the age-group population composition. As mentioned earlier, the other two variables (the mental health spending per capita and the number of psychiatric hospitals per 100,000 persons) are excluded from our preferred specification because they might be highly endogenous. The estimation results including these two variables are shown in Table C.4 in Appendix Table C.

First, we quickly review the estimation results of the associations between the suicide rates and socioeconomic variables. As shown from column (1) to (3), the within-prefecture variations in neither the job offer ratio nor the divorce rate are associated with the suicide rate among females. In contrast, as shown in column (5), the job offer ratio is significantly associated with the suicide rate only among males aged 35-74. A one percent decrease in the job offer ratio is associated with an increase in the suicide rate among males aged 35-74 by 0.14% at the 1% significance level. In addition, the divorce rate is positively and significantly associated with the suicide rate only among males aged 35-74. A one percent increase in the divorce rate is associated with an increase in the suicide rate among males aged 35-74 by 0.39% at the 5% significance level.

We now turn on to the estimation results of the associations between the consultation rates and socioeconomic variables. We find that the consultation rate of females aged 35-74 is rather responsive to a decrease in the job offer ratio. Although the statistical significance is low, a one percent decrease in the job offer ratio is associated with an increase in the consultation rate of females aged 35-74 by 0.03% at the 15% significance level. In addition, there is a marginally positive association between the birth rate and the consultation rate among females aged 35-74. A one percent increase in the birth rate is associated with an increase in the consultation rate among females aged 35-74 by 0.37 % at the 15% significance level.

Although we have observed that there is a significant negative association between the job offer ratio and the suicide rate of males aged 35-74, we do not have a significant association between the job offer ratio and the consultation rate among males aged 35-74, as shown in column (11). This indicates that while there are more males in this age group who commit suicide when the job offer ratio decreases, the number of males who seek consultation about their stress does not increase accordingly. We have found similar results with regard to the divorce rate. While an increase in the divorce rate is associated with an increase in the suicide rate among males aged 35-74, it is not associated with the consultation rate among males in this age group.

Interestingly, however, the consultation rates among males in all age groups increase when the birth rate increases, as shown in the second row from column (10) to (12). A one percent increase in the birth rate is associated with an increase in the consultation rates of males aged 15-34, 35-74 and 75 years and older by 0.74% (10% significance level), 0.63% (5% significance level), and 1.43% (5% significance level),

respectively. Although it is only speculative, this result implies that the presence of family might facilitate consultation about stress among males.

To summarize the results shown in Table 5.2, the incidence of suicide among middle-aged males seems more responsive to socioeconomic factors such as the decrease in job offers and the increase in divorce as compared to suicide among females. In contrast, consultation among middle-aged males is not as responsive as the incidence of suicide to these socioeconomic factors. In order to discern the direct relationship between the individual backgrounds and help seeking behaviors, we next explore the individual-level cross sectional data set.

5.4 Individual-level data analysis of help seeking behaviors

The data that we use in this section are from the CSLC in 2004. This is the same data set that we used in Chapter 4. Consultation follows a sequential pattern, with the perception of stress at the initial stage followed by consultation with someone. In the first step, we look into what factors are associated with the likelihood of admitting that respondents have stress which particularly arises among at least one issue from financial, health or family issues. In the next step, we analyze what factors are associated with the likelihood of consultation about such stress. We categorize those who fail to consult anyone although they perceive such stress into two groups: (1) unable to consult someone because of not knowing whom to consult and (2) reluctant to consult. These sequential stages are illustrated in Figure 5.1.

Because of the sequential structure of the survey questions about stress and help seeking behaviors, our analysis has a sequential structure accordingly, as illustrated by Figure 5.1, and it estimates a sequential logistic regression model (Kahn and Morimune,

1979). In the first stage, the respondent answers either perceiving stress (i.e., B in Figure 5.1) or not (i.e., A). We assume that the probability with which B is chosen is a logistic function of X , a vector of variables representing socioeconomic backgrounds, i.e., $P(B|X) = \Lambda(\gamma_1 + X\delta_1 + \kappa_1)$ where $\Lambda(z) = \frac{\exp(z)}{1+\exp(z)}$. The first stage of the sequential logistic regression estimates the parameters of this logistic function, especially δ_j . If the respondent's answer is B , then he or she goes to the next question of whether to consult someone about stress (i.e., C), unable to consult because of not knowing whom to consult (i.e., D) or reluctant to consult (i.e., E). The second stage of this regression approach is to estimate the parameters of the logistic function which is assumed to represent the conditional probability, i.e., $P(D|B, X) = \Lambda(\gamma_2 + X\delta_2 + \kappa_2)$, $P(E|B, X) = \Lambda(\gamma_2 + X\delta_2 + \kappa_2)$. Note that all the observations, including those who have answered A , must be included in this second-stage regression because this regression is concerned with a conditional probability, and hence this estimation procedure mitigates the possible bias due to sample selection. Note also that we have chosen to use the sequential logistic regression model because it does not require assumptions regarding the independence of irrelevant alternatives (IIA)¹⁴.

In the initial stage of estimation in this analysis, we focus on the perception of stress arising from at least one issue among financial, health and family issues, which are the most commonly identified motives of suicide in Japan, as we have already shown in Figure 3.1. Summary statistics for the perception of stress and consultation, together with the survey respondents' backgrounds are presented in Table 5.3. Panel (1) reports the percentages of those who admit that they have stress at the time of the CSLC

¹⁴ The assumption of the IIA is that the relative likelihood of selecting between two alternatives is not influenced by the existence of additional alternatives.

survey among females and males, respectively. While approximately 32% of the females admit that they feel stressed about at least one issue among financial, health or family issues, only 24% of males admit that they feel stressed about these issues.

Males are not only less likely to admit that they have stress arising from at least one issue among financial, health or family issues but are also less likely to consult someone when they perceive such stress as compared with females. Among those who have admitted that they perceive stress arising from at least one issue among financial, health or family issues, the percentage of those who consult with someone is significantly lower among males than among females. While only 71% of stressed males consult someone, 82% of stressed females do so. Among males who fail to consult anyone, 4.4% of males are unable to consult anyone and 27 % of males are reluctant to consult someone.

Panel (2) presents the individual backgrounds of the samples. The same sets of the individual backgrounds that were used in Chapter 4 are used for the analysis of help seeking behaviors. We categorize the job status by willingness to work and by the job seeking activities. We divide the samples into four job status categories: (1) employed, (2) jobless-1 (out of work without willingness to work and not seeking jobs), (3) jobless-2 (out of work with willingness to work, but not looking for jobs) and (4) unemployed (out of work with willingness to work and looking for jobs)¹⁵. In addition

¹⁵ The detailed categorization of the job status in our study contributes to the existing literature at least in Japan. Yamauchi et al (2012) is the first study to document the individual-level associations between socioeconomic backgrounds and the risk of suicide in Japan. Although they have concluded that “unemployed” people are at higher risk of suicide, their definition of unemployment, which includes homemakers and students who do not intend to work and look for jobs, fails to meet the standard definition of unemployment, which stands for people who are jobless, but willing to work, able to work and looking for jobs. Kaneko and Motohashi (2007) have documented the relationship between socioeconomic backgrounds and help seeking behavior in Japan. They have also failed to meet the standard definition of unemployment by including retired people and full-time housewives among unemployed people.

to the job status, we have information of marital status (married, never-married, widowed and divorced), housing ownership, and the number of family members with whom the respondents live. A more detailed description of these variables is provided in Section 3 in Chapter 4.

As shown in Panel (2) in Table 5.3, there are large gender differences in various individual characteristics. While females and males seem to have different socioeconomic as well as demographic characteristics, what should be noted here is that males are not disproportionately likely to be exposed to certain socioeconomic disadvantages. For example, the proportion of unemployed individuals is rather lower among males (3.54%) than among females (3.97%). The same thing can be said for being widowed or being divorced. Therefore, it is less likely the case that the gender difference in help seeking reflects directly the gender differences in the distribution of socioeconomic status.

Employing the sequential logistic regression model described above to the data of the CSLC in 2004, we investigate the associations between socioeconomic backgrounds and help seeking behaviors among females and males, respectively. First, we present the regression estimates for females in Table 5.4. The estimation results of the first stage of the sequential logistic regression, which are shown in column (1), resemble the estimation results that we presented in Chapter 4. Jobless females without willingness to work and never-married females are less likely to perceive stress than their employed and married counterparts. In contrast, jobless females who are willing to work, divorced females, as well as females living in rented housing are more likely to perceive stress as compared with their employed, married counterparts and females living in housing of their own. The likelihood of perceiving stress increases with age.

We now present the estimation results with regard to help seeking behaviors. Column (2) in Table 5.4 shows the results of those who are less able to consult someone because of not knowing whom to consult. We have found that single females are less able to consult someone about stress as compared with married females. Middle-aged females (aged 35-74) are least able to consult someone about stress. Column (3) in Table 5.4 shows those who are more reluctant to consult someone. Jobless females, regardless of willingness to work, are significantly less reluctant to consult someone than employed females. This is probably because such females face lower opportunity cost of time than employed females, and therefore, they can consult someone when they perceive stress. On the other hand, divorced females are more reluctant to consult someone about stress than married females, although the statistical significance level of the coefficient is low. By age group, as in the case of column (2), middle-aged females (aged 35-74) are the most reluctant to consult someone about stress. In summary, single females are more unwilling to consult someone about stress than married females.

Table 5.5 presents the estimation results of the sequential logistic regression model for males. We also present the z -statistics in brackets for testing whether the regression coefficients are statistically different between females and males. The estimation results of the first stage of the sequential logistic regression model for males, which are shown in column (1), are also similar to the estimation results that we have presented in Chapter 4. Joblessness, the death of a spouse, divorce as well as living in rented housing are positively associated with the likelihood of perceiving stress arising from at least one issue among financial, health, or family issues among males. Older males are more likely to perceive stress as compared to younger males. In the last row, we also show the estimation results for the female dummy variable, and as shown in

column (1), even after controlling for several socioeconomic characteristics, females are still more likely to admit that they have stress than males. We have observed the same results in Chapter 4.

Column (2) of Table 5.5 shows those who are less able to consult someone about stress because they do not know whom to consult. We have found that never-married males as well as divorced males are less able to consult someone when they perceive stress arising from at least one issue among financial, health or family issues as compared with married males. By age group, males aged 35-74 are most likely to be unable to consult anyone when they perceive such stress because they do not know whom to consult. These patterns are also found among females in Table 5.4.

Column (3) of Table 5.5 shows those who are more reluctant to consult someone about stress. Jobless males, regardless of willingness to work, are less reluctant to consult someone about stress than employed males. Similar patterns are observed among jobless females in Table 5.4. Presumably, these jobless individuals might face a lower opportunity cost of time than employed males, and it would be easier for them to consult someone when they perceive stress. This is consistent with Hypothesis 5.1. As for marital status, we have found that never-married, widowed and divorced males are significantly more reluctant to consult someone when they perceive stress arising from at least one issue among financial, health or family issues, as compared with their married counterparts as well as with single females. Moreover, by age group, males aged 35-74 are most likely to fail to consult someone when they perceive stress. In the last row of column (3), even after controlling for several socioeconomic characteristics, females are still more likely to consult someone about stress than males. This negative significant coefficient of female dummy variable indicates that there are some factors

other than socioeconomic factors, which may contribute to the gender differences in help seeking behaviors.

We next focus on the subsamples of those aged 35-74. As we have shown in Table 5.2., we have found that the suicide rates among males aged 35-74 are most responsive to socioeconomic factors. Furthermore, we have just found that those in this age group are least likely to consult someone about stress in Table 5.4. and Table 5.5. In order to check whether we have hidden important associations between the individual socioeconomic characteristics and help seeking behaviors, which are specific for those aged 35-74, we conduct the sequential logistic regression analysis separately for those aged 35-44, 45-54 and 55-74.

We first present the regression estimates for females aged 35-74 in Table 5.6. The first stage regression estimates of the sequential logistic regression model are shown in column (1), (4) and (7). These columns show the patterns of who are likely to admit that they have stress arising from at least one issue among financial, health or family issues. These patterns are quite similar to those that we have observed in Table 5.4. Jobless females, especially those who are wishing to work, are more likely to perceive such stress than employed females. Divorced females are more likely to perceive such stress than married females. Moreover, females living in rented housing are also more likely to perceive stress than those living in housing of their own. The likelihood of perceiving stress increases as the number of family members increases. In summary, we do not find any anomalous patterns of the associations between socioeconomic backgrounds and the perception of stress among females aged 35-74.

Column (2), (5) and (8) show the patterns of those who are less able to consult someone about stress arising from at least one issue among financial, health or family

issues because of not knowing whom to consult. We have found females aged 45-74 living in rented housing are less able to consult someone about stress as compared with females living in housing of their own. Females living in rented accommodations might have difficulty in finding individuals whom they can consult when they perceive stress because they are less attached to the community as compared to females living in housing of their own. Other than housing conditions, however, we do not find any specific factors, which are associated with a higher probability of failing to consult someone when stress is perceived among females aged 35-74.

Column (3), (6) and (9) show the patterns of those who are more reluctant to consult someone about stress. We have also found that there are no specific factors which are associated with the higher likelihood of being reluctant to consult someone about stress among females aged 35-74. Jobless females without willingness to work are rather less reluctant to consult someone about stress than employed females. This is probably due to the lower opportunity cost of time that these jobless females are facing than employed females.

We now turn to the estimation results of males aged 35-74, which are shown in Table 5.7. In this table, we also show the z -statistics in the brackets for testing whether the regression coefficients of females and males are significantly different. As in the case of Table 5.6, the first stage regression estimates of the sequential logistic regression model are shown in column (1), (4) and (7). These columns show the patterns of those who are likely to admit that they have stress arising from at least one issue among financial, health or family issues. Joblessness, regardless of willingness to work, divorce as well as living in rented accommodation is important associates of the higher probability of admitting that stress is perceived for males aged 35-74. This is similar to

the pattern that we have observed in Table 5.5, which shows the estimation results for males in all age groups.

The patterns of help seeking behaviors, however, seem to differ significantly by age group. First, as column (2) shows, jobless males aged 35-44 without willingness to work are less able to consult someone than their employed counterparts because they do not know whom to consult about stress. The regression coefficients are significantly larger for males as compared with those for females. This might be because males tend to have a stronger connection within their work places than females (Campbell et al., 1988), and jobless males may tend to have a weaker personal connection than jobless females. In contrast, as shown in column (3), jobless males aged 35-44 are less reluctant to consult someone about stress. The probable reason of this association is the lower opportunity cost of time among jobless individuals as compared with employed individuals. Similar patterns are found among jobless males aged 55-74. As shown in column (9), jobless males aged 55-74 are less reluctant to consult someone about stress than their employed counterparts.

Poor help seeking because of not knowing about whom to consult can be observed especially among jobless males aged 45-54 who are still wishing to work. As column (5) shows, jobless males who are willing to work ("jobless-2" males) are less able to consult anyone about stress because they do not know whom to consult as compared with employed males in this age group. Similarly, unemployed males aged 45-54 are also more likely to fail to consult anyone about stress than their employed counterparts. The regression coefficient of the unemployment dummy variable is significantly larger for males than for females, as shown in the z -statistics in the brackets (-2.05) in column (5). In summary, while jobless middle-aged males without

willingness to work seek help from someone when they perceive stress probably due to the low opportunity cost of time, jobless males who are wishing to work tend to fail to consult someone especially because they do not know whom to consult. This is consistent with Hypothesis 5.1.

By marital status, we have also found consistent results with our hypothesis. As column (3) shows, never-married as well as widowed males who are aged 35-44, are more reluctant to consult someone about stress arising from at least one issue among financial, health or family issues. Especially, the probability of being reluctant to consult someone about stress is significantly higher when males aged 35-44 are widowed than when females in the same age group are widowed. Similar patterns can be found among never-married and widowed males aged 45-54, as column (6) shows. Moreover, never-married males aged 45-54 are less able to consult someone about stress particularly because they do not know whom to consult as compared with their married counterparts, as shown in column (5). As for males aged 55-74, we have also found similar results with the males in the other age groups. In addition, divorced males are significantly less able and more reluctant to consult someone about stress, as shown in column (8) and (9). The regression coefficient of the divorce dummy variable is significantly larger for males aged 55-74 than for females aged 55-74. In summary, single middle-aged males tend to fail to seek help from anyone when they perceive stress as compared to their married counterparts, and poor help seeking behaviors are more prominent among single males than among single females in some age groups.

Living in rented housing is slightly associated with a higher probability of being reluctant to consult anyone among males aged 55-74. As shown in column (9), the likelihood of being reluctant to consult anyone about stress increases 3% (at the 10%

significance level) when males aged 55-74 are living in rented housing. The number of family members does not have statistically significant associations with help seeking behaviors.

Lastly, even after controlling for several socioeconomic characteristics, the female dummy variable is still negatively significant in column (3), (6), (8) and (9). This indicates that even when we control for several individual background characteristics, males are still more likely to fail to consult someone when they have stress. While we have found that unemployment or singleness is an important associate of poor help seeking behavior among middle-aged males, our results also indicate that these socioeconomic background features do not fully explain the gender gap in help seeking behaviors.

5.5 Conclusion

This chapter highlights the gender difference in help seeking behaviors in face of stress, which is known as one of the important early signs of suicide. Since suicide is predominantly a male phenomenon, it is important to look into how females and males seek help differently when they perceive stress. As in the case of the recent relevant studies documenting gender differences in help seeking in western countries, we show, using a data set collected from nationally representative Japanese citizens, that males are significantly less likely to seek help in face of stress as compared with females.

In addition to the documentation of the gender difference in help seeking behaviors in level, this chapter examines the associations between several individual background features and help seeking behaviors. We find that unemployment and singleness are associated with middle-aged males' higher likelihood of failing to consult

someone about stress, although it is known that these two individual background features are important associates of suicide among them. In contrast, such associations are less evident among females.

Another remarkable finding of this chapter is that unemployed individuals under stress are less able to consult someone because they do not know whom to consult as compared with their employed counterparts. This pattern is prominent only among males aged 45-54. In contrast, jobless individuals are more likely to consult someone when they perceive stress regardless of gender and age, except for some exceptions.

Despite our contribution to narrow down those who fail to seek help for stress, we should also note several limitations of this study. Most importantly, due to the data limitations, it is practically impossible for us to uncover a causal relationship between socioeconomic backgrounds, help seeking and suicide. It still remains unclear whether socioeconomic disadvantages are the cause of poor help seeking or whether poor help seeking is the cause of socioeconomic disadvantages and how these relationships would lead to suicide. In order to gain further detailed insights, it would be ideal to conduct a prospective study tracking the same individuals over time on a broad scale.

Our findings, however, lend support to the importance of raising awareness of help seeking among males, particularly among unemployed or single males and creating a suitable environment where they are able to readily seek help for stress. Especially, our findings suggest that unemployed middle-aged males fail to seek help because of a lack of information about whom they should obtain help from. This suggests that facilitation for help seeking especially targeted at the socioeconomically disadvantaged males, at public agencies such as at unemployment offices, could be helpful in encouraging help seeking and possibly reducing the risk of suicide. To understand how

these implications should be effectively reflected in actual policies is a pressing matter for future research.

Chapter 6

Policy Implications and Conclusions

According to research in the medical field, mental disorders are treatable with appropriate care. To increase the likelihood that those who are prone to mental health problems are detected and receive appropriate care, it is important to understand what characterize such individuals. To our knowledge, this dissertation is the first attempt to examine the characteristics of those who complain of mental health problems and those who are less able or more reluctant to seek help for perceived stress and compare them with the characteristics of those who die by suicide. This dissertation is also one of the few studies about mental health using data in Japan, where suicide is one of the major causes of death.

Several findings emerge from this study. First, although males are much more likely to die by suicide than females, they are significantly less likely to admit that they have mental health problems than females. Such a gender contrast is more prominent among those aged 35-74. Second, the incidence of suicide is more closely associated with the perception of mental health problems among males than among females. These findings suggest that males might admit their mental health problems only in later stages, in which their problems have progressed so far that they can even induce suicide, while females might admit to their mental health problems in earlier stages, in which their problems are not serious enough to trigger suicide.

Third, the incidence of suicide is significantly responsive to a decrease in the job offer ratio and an increase in the divorce rate only among males aged 35-74. Fourth, and in contrast, both females and males regardless of age who are unemployed or divorced are more likely to perceive various mental health problems as compared with their

employed or married counterparts. Fifth, the perception of mental health problems considerably differs depending on the willingness to work as well as on the types of singleness. For example, it is shown that jobless males who still wish to work but do not look for jobs are more likely to perceive mental health problems than females having the same job status. Additionally, widowed males feel more stressed about future issues than widowed females. These results are consistent with the predictions implied in the existing social science research such as males' stronger adherence to masculine norms and their overly high discount rates with which one discounts one's future utility in face of stressful events.

Sixth, females and males differ not only in the way of admitting to mental health problems but also in the way of seeking help for the problems. We find that males are significantly less likely to seek consultation when they have stress as compared with females. Seventh, single males are significantly less likely to seek help for perceived stress than their married counterparts. Furthermore, we also find that males aged 45-54 who are jobless despite their willingness to work and who are unemployed are less able to seek help for perceived stress than females facing the same job status.

These findings point to the importance of developing a mental care system, which can make response in a timely manner to the complaint of mental health problems among those who are unemployed or who are divorced, regardless of gender. Our results also suggest that it is critical to facilitate help seeking for mental health problems especially among males. Furthermore, our results indicate that it is important to provide information with regard to available consultation services particularly to males who are single and males aged 45-54 who are out of work despite their willingness to work. Public institutions such as job placement offices might play important roles as the hubs

of disseminating information regarding available consultation services to reduce barriers of help seeking behaviors among those who lack outlets for help seeking for mental health problems.

This study, however, suffers from the paucity of suitable micro-level data. We have studied suicide only at the prefecture-level. The availability of more disaggregate data would have helped us link suicide with mental health and characteristics of individuals more directly. It is a pressing matter of future studies to develop effective ways to collect suitable data for analysis. It is also important to analyze the supply side of mental care. This dissertation has focused on the demand side of mental care (i.e., individuals who admit that they have mental health problems and who seek help for mental health problems) and points to the importance of facilitating help seeking. Few attempts, however, have been made to assess if mental care providers such as psychiatric hospitals have sufficient capability to respond to the needs of mental care. Thus, the results of this study warrant a considerable compilation of studies in the future.

References

- Abe, K.A., 2012. Poverty and social exclusion of women in Japan. *Japanese Journal of Social Security Policy* 9(1), 61-82.
- Appleby, L., Shaw, J., Amos, T., McDonnell, R., Harris, C., McCann, K., Kiernan, K., Davies, S., Bickley, H., and Parsons, R., 1999. Suicide within 12 months of contact with mental health services: National clinical survey. *British Medical Journal* 318(7193), 1235-1239.
- Arria, A.M., Winick, E.R., Garnier-Dykstra, L.M., Vincent, K.B., Caldeira, K.M., Wilcox, H.C., O'Grady, K.E., 2011. Help seeking and mental health service utilization among college students with a history of suicide ideation. *Psychiatric Services* 62(12), 1510-1513.
- Beautrais, A.L., 2002. Gender issues in youth suicidal behaviors. *Emergency Medicine* 14(1), 35-42.
- Benson, K.L., Faull, K., and Zarcone, V.P., 1993. The effects of age and serotonergic activity on slow wave sleep in depressive illness. *Biological Psychiatry* 33(11-12), 842-844.
- Bramness, J. G., Walby, F. A., Hjellvik, V., Selmer, R., and Tverdal, A. 2010. Self-reported mental health and its gender differences as a predictor of suicide in the middle-aged. *American Journal of Epidemiology*, 172(2), 160-166.
- Cabinet Office, 2011. *Whitepaper on suicide prevention policies 2011*. Tokyo. Cabinet Office.
- Campbell, E. K., 1988. Gender differences in job-related networks. *Work and Occupations* 15(2), 179-200.
- Cavanagh, J., Carson, A.J., Shapre, M., and Lawrie, S.M., 2003. Psychological autopsy studies of suicide: A systematic review. *Psychological Medicine* 33(3), 395-405.
- Centers for Disease Control and Prevention, 2011. *IERH scientific publications: Mental health in conflict-affected populations: Fact sheet*. Retrieved June 13, 2013 from http://www.cdc.gov/globalhealth/gdder/ierh/Publications/mentalhealth_affectedpopulations_pib.htm

- Cesur, R., Sabia, J.J., and Tekin, E., 2013. The psychological costs of war: Military combat and mental health. *Journal of Health Economics* 32(1), 51-65.
- Chen, J., Choi, Y.J., Mori, K., Sawada, Y., and Sugano, S., 2012a. Socio-economic studies on suicide: A survey. *Journal of Economic Surveys* 26 (2), 271-306.
- Chen, J., Choi, Y. J., Mori, K., Sawada, Y., and Sugano, S., 2012b. Recession, unemployment, and suicide in Japan. *Japan Labor Review* 9(2), 75-92.
- Chen, Y.-Y., Kwok, R., and Yip, P.S. 2012c. Decomposing the widening suicide gender gap: An experience in Taipei City, Taiwan. *Journal of Affective Disorders* 136(3), 868–874.
- Chen, Y-Y, Wu, K.C., Yousuf, S., and Yip, P.S.F. 2012d. Suicide in Asia: opportunities and challenges. *Epidemiologic Review* 34(1), 129–44.
- Clark, A. E., and Oswald, A. J., 1994. Unhappiness and unemployment. *The Economic Journal* 104(424), 648–59.
- Classen, T.J., and Dunn, R.A., 2012. The effect of job loss and unemployment duration on suicide risk in the United States: A new look using mass-layoffs and unemployment insurance claims. *Health Economics* 21(3), 338-350.
- Cutler, D.M., Glaeser, E. and Norberg, K., 2000. Explaining the rise in youth suicide. NBER Working Paper 7713 (Cambridge: National Bureau of Economic Research).
- Daly, M. C., and Wilson, D. J., 2009. Happiness, unhappiness, and suicide: An empirical assessment. *Journal of European Economic Association* 7(2-3), 539-49.
- Desai, R.A., Dausey, D.J., and Rosenheck, R.A., 2005. Mental health service delivery and suicide risk: The role of individual and facility factors. *American Journal of Psychiatry*, 162(2), 311-318.
- Di Tella, R., MacCulloch, J. R., and Oswald J. A., 2001. Preferences over inflation and unemployment: Evidence from surveys of happiness. *American Economic Review* 91(1), 335–41.

- Doherty, D.T., Kartalova-O'Doherty, Y., 2010. Gender and self-reported mental health problems: Predictors of help seeking from a general practitioner. *British Journal of Health Psychology* 15(1), 213–28.
- Dunn, J. R., 2002. Housing and inequalities in health: A study of socioeconomic dimensions of housing and self reported health from a survey of Vancouver residents. *Journal of Epidemiology and Community Health* 56(9), 671–681.
- Durkheim, E., 1897. *Suicide: a study in sociology*. New York: The Free Press.
- Eaton, W.W., Neufeld, K., Chen, L.S. and Cai, G., 2000. A comparison of self-report and clinical diagnostic interviews for depression: Diagnostic interview schedule for clinical assessment in neuropsychiatry in the Baltimore epidemiologic catchment area follow-up. *Archives of General Psychiatry* 57(3), 217-22.
- Eisenberg D, Downs, M. F., Golberstein, E., Zivin., K., 2009. Stigma and help seeking for mental health among college students. *Medical Care Research and Review* 66(5), 522-541.
- Fenlason, K. J., and Beehr, T. A., 1994. Social support and occupational stress: Effects of talking to others. *Journal of Organizational Behavior* 15(2), 157-175.
- Feskanich, D., Hastrup, J.L., Marshall, J.R., Colditz, G.A., Stampfer, M.J., Willett, W.C. and Kawachi, I., 2002. Stress and suicide in the nurses' health study. *Journal of Epidemiology and Community Health* 56(2), 95-98.
- Fischer, E. H., and Turner, J. L., 1970. Orientations to seeking professional help: Development and research utility of an attitude scale. *Journal of Consulting and Clinical Psychology* 35(1),79-90.
- Flavin, P., Radcliff, B., 2009. Public policies and suicide rates in the American States. *Social Indicators Research* 90(2), 195–209.
- Fujino Y., Mizoue T., Tokui N., and Yoshimura, T., 2005. Prospective cohort study of stress, life satisfaction, self-rated health, insomnia, and suicide death in Japan. *Suicide and Life-Threatening Behavior* 35(2), 227–237.

- Galdas, P.M., Cheater, F., Marshall, P., 2005. Men and health help-seeking behaviour: Literature review. *Journal of Advanced Nursing* 49(6), 616-623.
- Gilbert, T. D., Gill, J. M. and Wilson, D. T., 2002. The future is now: Temporal correction in affective forecasting. *Organizational Behavior and Human Decision Processes* 88(1), 430-444.
- Goldberg, D. 1978. *Manual of the General Health Questionnaire*. Windsor: NFER Publishing Co.
- Goldsmith, S.K., Pellmar, T.C., Kleinman, A.M., and Bunney, W.E., (eds.). 2002. Reducing suicide: A national imperative. Washington, DC: The National Academics Press.
- Gonzalez, J.M., Alegria, M., Prihoda, T.J., Copeland, L.A., Zeber, J.E., 2011. How the relationship of attitudes toward mental health treatment and service use differs by age, gender, ethnicity/race and education. *Social Psychiatry and Psychiatric Epidemiology* 46(1), 45-57.
- Good, G. E., and Wood, P. K., 1995. Male gender role conflict, depression, and help seeking: Do college men face double jeopardy? *Journal of Counseling and Development* 74 (1), 70-75.
- Green, F., 2011. Unpacking the misery multiplier: How employability modifies the impacts of unemployment and job insecurity on life satisfaction and mental health. *Journal of Health Economics*, 30(2), 265-276.
- Hamermesh, D.S., and Soss, N.M., 1974. An economic theory of suicide. *Journal of Political Economy* 82(1), 83-98.
- Hirokawa, S., Matsumoto, T., Katsumata, Y., Kitani, M., Akazawa, M., Takahashi, Y., Kawakami, N., Watanabe, N., Hirayama, M., Kameyama, A., and Takeshima, T., 2012. Psychosocial and psychiatric characteristics of suicide completers with psychiatric treatment before death: A psychological autopsy study of 76 cases. *Psychiatry Clinical Neurosciences* 66(4), 292-302.

- Inoue, K., Tanii, H., Kaiya, H., Abe, S., Nishimura, Y. Masaki, M., Okazaki, Y., Nata, M., and Fukunaga, T., 2007. The correlation between unemployment and suicide rates in Japan between 1978 and 2004. *Legal Medicine* 9(3), 139-42.
- Inter-university Consortium for Political and Social Research, 1972-2010. *General Social Survey, 1972-2010*. Retrieved on August 9th, 2013 from <http://www.icpsr.umich.edu/icpsrweb/ICPSR/studies/31521>
- Johansson, L.M., Sundqvist, J., Johansson, S.E., Qvist, J., Bergman, B. 1997. The influence of ethnicity and social and demographic factors on Swedish suicide rates. A four year follow-up study. *Social Psychiatry and Psychiatric Epidemiology* 32(3), 165–170.
- Kahn, L. M., and Morimune, K. 1979. Unions and employment stability: A sequential logit approach. *International Economic Review* 20(1), 217-236.
- Kameyama, A., Matsumoto, T., Katsumata, Y., Akazawa, M., Kitani, M., Hirokawa, S., and Takeshima, T., 2011. Psychosocial and psychiatric aspects of suicide completers with unmanageable debt: A psychological autopsy study, *Psychiatry Clinical Neurosciences* 65(6), 592-595.
- Kaneko, Y, and Motohashi, Y. 2007. Male gender and low education with poor mental health literacy: A population-based study. *Journal of Epidemiology* 17(4), 114-119.
- Kapusta, N.D., Posch, M., Niederkrotenthaler, T., Fischer-Kern, M., Etzersdorfer, E., Sonneck, G., 2010. Availability of mental health service providers and suicide rates in Austria: A nationwide study. *Psychiatric Service* 61(12), 1198–203.
- Kim, S.Y., Kim, M.H., Kawachi, I., and Cho, Y. 2011. Comparative epidemiology of suicide in South Korea and Japan: effects of age, gender and suicide methods. *The Journal of Crisis Intervention and Suicide Prevention* 32(1), 5–14.
- Kimmel, M., 1996. *Manhood in America: A cultural history*. New York: Free Press.

- Klineberg, E., Biddle, L., Donovan, J., and Gunnell, D., 2011. Symptom recognition and help seeking for depression in young adults: A vignette study. *Social Psychiatry and Psychiatric Epidemiology* 46(6), 1–11.
- Kong, Y., and Zhang, J., 2010. Access to farming pesticides and risk for suicide in Chinese rural young people. *Psychiatry Research* 179(2), 217-221.
- Koo, J. and Cox, W.M., 2008. An economic interpretation of suicide cycles in Japan. *Contemporary Economic Policy* 26 (1), 162–174.
- Kuroki, M., 2010. Suicide and unemployment in Japan: Evidence from municipal level suicide rates and age-specific suicide rates *Journal of Socio-Economics* 39(6), 683–691.
- Leong, F. T. L., and Zachar, P., 1999. Gender and opinions about mental illness as predictors of attitudes toward seeking professional psychological help. *British Journal of Guidance and Counseling*, 27(1), 123-132.
- Liu, K. Y., Chen, E.Y., Cheung, A.S., and Yip, P.S. 2009 Psychiatric history modifies the gender ratio of suicide: an East and West comparison. *Social Psychiatry and Psychiatric Epidemiology* 44(2), 130–134.
- Liu, Y., Zhang, Y., Cho, Y. T., Obayashi, Y., Arai, A. and Tamashiro, H. 2013. Gender differences of suicide in Japan, 1947–2010. *Journal of Affective Disorders* pii: S0165-0327(13)00494-1. doi: 10.1016/j.jad.2013.05.100.
- Ludwig J., Marcotte, D.E., and Norberg, K., 2009. Anti-depressants and suicide. *Journal of Health Economics* 28(3), 659-676.
- Lung, F.W, and Lee, M.B., 2008. The five-item Brief-Symptom Rating Scale as a suicide ideation screening instrument for psychiatric inpatients and community residents. *BMC Psychiatry*. 8, 53.
- Loewenstein, G., O'Donoghue, T., and Rabin, M., 2003. Projection bias in predicting future utility. *Quarterly Journal of Economics*, 118(4), 1209–1248.

- Maccoby, E. E., 1990. Gender and relationships: A developmental account. *American Psychologist* 45(4), 513–520.
- Mahalik, J. R., Locke, B. D., Ludlow, L. H., Diemer, M. A., Scott, R. P. J., Gottfried, M., et al., 2003. Development of the conformity to masculine norms inventory. *Psychology of Men & Masculinity* 4(1), 3–25.
- Marcus, J., 2013. The effect of unemployment on the mental health of spouses-Evidence from plant closures in Germany. *Journal of Health Economics* 32(3), 546-558.
- Masango, S.M., Rataemane, S.T., and Motojesi, A.A., 2008. Suicide and suicide risk factors: A literature review. *South African Family Practice* 50(6), 25-29.
- McKenzie, C.S., Gekoski, W.L., Knox, V.J., 2006. Age, gender, and the underutilization of mental health services: The influence of help-seeking attitudes. *Aging and Mental Health* 10(6), 574-82.
- Mendelson, T., Dariotis, J.K., and Agus, D., 2013. Psychological strengths and needs of low-income substance abusers in recovery. *Journal of Community Psychology* 41(1), 19-34.
- Ministry of Health, Labor and Welfare, 2001-2010. *Vital statistics of Japan*. Tokyo. Ministry of Health, Labor and Welfare.
- Ministry of Health, Labor and Welfare, 2001, 2004, 2007, 2010. *Comprehensive survey of living conditions of the people on health and welfare*. Tokyo. Ministry of Health, Labor and Welfare.
- National Center for Suicide Prevention, 2013 *Statistics of suicide by method*. Retrieved June 13, 2013 from <http://ikiru.ncnp.go.jp/ikiru-hp/genjo/toukei/index2.html>
- Minoiu, C., and Rodríguez Andres, A., 2008. The effect of public spending on suicide: Evidence from U.S. state data. *The Journal of Socio-Economics* 37 (1), 237–261.
- National Police Agency, 2012. *Statistics of suicide*. Tokyo. National Police Agency.
- National Police Agency, 2013. *Statistics of traffic accidents*. Tokyo. National Police Agency.

- OECD, 2012. *OECD Factbook 2011-2012: Economic, Environmental and Social Statistics*, OECD Publishing.
- Ohtake, F., 2012. Unemployment and happiness. *Japan Labor Review*, 9(2), 59-74.
- Owens, C., Lloyd, K., and Campbell, J. 2004. Access to health care prior to suicide: Findings from a psychological autopsy study. *British Journal of General Practice* 54(501), 279–281.
- Pandey, G.N., Pandey, S.C., Janicak, P.G., Marks, R.C., Davis, J.M., 1990. Platelet serotonin-2 receptor binding sites in depression and suicide. *Biological Psychiatry* 28(3), 215–222.
- Reavley, N.J., MacCann, T.V., and Jorm, A.F., 2012. Actions taken to deal with mental health problems in Australian higher education students. *Early Intervention in Psychiatry* 6(2), 159-165.
- Rodríguez, A., 2005. Income inequality, unemployment, and suicide: A panel data analysis of 15 European countries. *Applied Economics* 37(4), 439-51.
- Ross, J.M., Yakovlev, P.A., and Carson, F., 2010. Does state spending on mental health lower suicide rates? *Journal of Socio-Economics* 41(4), 408-417.
- Ruhm, C. J., 2003. Are recessions good for your health? *Quarterly Journal of Economics* 115(2), 617-50.
- Sher, L. 2006. Alcohol consumption and suicide. *Quarterly Journal of Medicine* 99 (1), 57–61.
- Stillman, S., McKenzie, D., Gibson, J., 2009. Migration and mental health: Evidence from a natural experiment. *Journal of Health Economics* 28(3), 677–87.
- Suzuki, E., Kashima, S., Kawachi, I., and Subramanian, S.V. 2013. Social and geographical inequalities in suicide in Japan from 1975 through 2005: a census-based longitudinal analysis. *PLoS one*, 8(5), e63443.
- Syzdek, M. R. and Addis, M. E., 2010. Adherence to masculine norms and attributional processes predict depressive symptoms in recently unemployed men. *Cognitive Therapy and Research* 34(6), 533-543.

- Teesson M, Hall W, Lynskey M, Degenhardt L. 2000. Alcohol- and drug-use disorders in Australia: implications of the National Survey of Mental Health and Wellbeing. *Australian and New Zealand Journal of Psychiatry* 34(2), 206-213.
- Tefft, N., 2011. Insights on unemployment, unemployment insurance, and mental health. *Journal of Health Economics* 30(2), 258-264.
- Umberson, D., Chen, M. D., House, J. S., Hopkins, K., and Slaten, E. 1996. The effect of social relationships on psychological well-being: Are men and women really so different? *American Sociological Review* 61(5), 837-857.
- Van Ours, J.C. and Williams, J., 2012. The effects of cannabis use on physical and mental health, *Journal of Health Economics* 31(4), 564 -577.
- Vilhjalmsson, R., Kristjansdottir, G. and Sveinbjarnardottir, E., 1998. Factors associated with suicide ideation in adults. *Social Psychiatry and Psychiatric Epidemiology* 33(3), 97-103.
- Vogel, D. L., Heimerdinger-Edwards, S., Hammer, J. H., and Hubbard, A., 2011. “Boys don’t cry”: Examination of the links between endorsement of masculine norms, self-stigma and help-seeking attitudes for men from diverse backgrounds. *Journal of Counseling Psychology* 58(3), 368-382.
- Watanabe, R., Furukawa, M., Nakamura, R., and Ogura, Y., 2006. Analysis of the socioeconomic difficulties affecting the suicide rate in Japan. Kyoto Institute of Economic Research Discussion Paper No. 626.
- Wojnar, M., Ilgen, M.A., Wojnar, J., McCammon, R.J., Valenstein, M., Brower, K.J., 2009. Sleep problems and suicidality in the national comorbidity survey replication. *Journal of Psychiatric Research* 43 (5), 526–531.
- World Health Organization, 1992. International statistical classification of diseases and related health problems. Tenth revision. Vol. 1: Tabular list. Vol. 2: Instruction manual. Vol. 3: Index. Geneva. World Health Organization.

- World Health Organization, 2009. *Data and statistics: Causes of death*. Retrieved October 16th, 2012 from <http://www.who.int/healthinfo/statistics/bodgbdeathdalyestimates.xls>.
- World Health Organization, 2011. *Country reports and charts available*. Retrieved October 16th, 2012 from http://www.who.int/mental_health/prevention/suicide/country_reports/en/
- World Health Organization, 2013. *Media centre: Cancer*. Retrieved October 16th, 2012 from <http://www.who.int/mediacentre/factsheets/fs297/en/>
- World Health Organization, 2013. *Media centre: Road traffic injuries*. Retrieved October 16th, 2012 from <http://www.who.int/mediacentre/factsheets/fs358/en/>
- Yamauchi, T., Fujita, T., Tachimori, H., Takeshima, T., Inagaki, M., and Sudo, A., 2012. Age-adjusted relative suicide risk by marital and employment status over the past 25 years in Japan. *Journal of Public Health (Oxford)* 35(1), 49-56.

Table 3.1 Causes of death by age group in Japan in 2010

Rank	Male			Female		
	1	2	3	1	2	3
Age group						
15-19	Accident	Suicide	Cancer	Suicide	Accident	Cancer
20-24	Suicide	Accident	Heart disease	Suicide	Accident	Cancer
25-29	Suicide	Accident	Heart disease	Suicide	Cancer	Accident
30-34	Suicide	Accident	Cancer	Suicide	Cancer	Accident
35-39	Suicide	Cancer	Heart disease	Cancer	Suicide	Heart disease
40-44	Suicide	Cancer	Heart disease	Cancer	Suicide	Heart disease
45-49	Cancer	Suicide	Heart disease	Cancer	Suicide	Brain disease
50-54	Cancer	Heart disease	Suicide	Cancer	Brain disease	Suicide
55-59	Cancer	Heart disease	Brain disease	Cancer	Heart disease	Brain disease
60-64	Cancer	Heart disease	Brain disease	Cancer	Heart disease	Brain disease
65 over	Cancer	Heart disease	Brain disease	Cancer	Heart disease	Brain disease

Source: Cabinet Office (2011)

Table 3.2 Summary statistics of the prefecture-level panel data in Japan (2001-2010)

	Mean	S.D.	<i>t</i> -stat for difference
Suicide rate ^a			
Female, All ages	13.22	2.50	-67.03***
Male, All ages	37.52	7.45	
Female, 15-34	10.05	2.99	-15.12***
Male, 15-34	12.96	2.91	
Female, 35-74	15.29	0.12	-69.97***
Male, 35-74	52.20	0.51	
Female, 75 years and older	23.67	0.43	-30.77***
Male, 75 years and older	47.33	0.64	
Perception rate of stress ^a (Overall)			
Female, All ages	51,311	187.24	32.07***
Male, All ages	43,083	175.45	
Female, 15-34	54,083	213.48	38.86***
Male, 15-34	42,659	202.15	
Female, 35-74	52,707	206.55	27.99***
Male, 35-74	44,796	192.87	
Female, 75 years and older	43,034	332.72	11.95***
Male, 75 years and older	37,958	263.89	
Perception rate of stress ^a (Financial issues)			
Female	13,034	151.20	6.23***
Male	11,778	133.09	
Perception rate of stress ^a (Health issues)			
Female	13,625	268.89	10.12***
Male	10,148	213.79	
Perception rate of stress ^a (Family issues)			
Female	8,844	87.29	43.71***
Male	4,571	44.06	
Perception rate of somatic symptoms ^a			
Female	35,939	177.10	36.79***
Male	27,509	145.39	
Perception rate of sleep difficulties ^a			
Female	3,707	40.13	32.27***
Male	2,127	28.06	
Perception rate of fatigue ^a			
Female	5,920	62.31	22.22***
Male	4,141	50.32	
Perception rate of irritability ^a			
Female	3,849	38.99	35.55***
Male	2,140	28.10	
Job offer ^b	0.63	0.28	
Crude birth rate ^c	8.57	0.84	
Divorce rate ^c	2.00	0.26	
Per capita MH spending ^d	1.06	0.49	
Number of psychiatric hospitals ^a	998.4	727.4	
% Population 15-34	0.24	0.02	
% Population 35-74	0.52	0.01	
% Population 75 years and older	0.11	0.02	

Notes: *** indicates statistical significance at the 1% level. The number of observations is 470 for the suicide rate and socioeconomic variables. The number of observations is 188 for the perception rate of each mental health problem. a. The numbers per 100,000 persons. b. The number of job offers available per one job seeker. c. The numbers per 1,000 persons. d. The amount of money (yen) spent on mental health promotion per capita.

Table 3.3 Pair-wise within-prefecture correlations between the suicide rates and the perception rates of various mental health problems (2001-2010)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Stress overall	Stress financial	Stress health	Stress family	Somatic complaint	Sleep difficulties	Fatigue	Irritability
Female	0.02	0.12*	-0.10	0.13*	-0.07	0.01	0.11	0.07
Male	0.23***	0.19***	0.05	0.16**	0.37***	0.34***	0.27***	0.30***

Note: *** and * indicate statistical significance at the 1% and 10% level, respectively. Within-prefecture correlation = $corr(\Delta S_{git}, \Delta M_{git})$, where $\Delta S_{git} = S_{git} - \bar{S}_{gi}$ and $\Delta M_{git} = M_{git} - \bar{M}_{gi}$ (S_{git}, M_{git} : the suicide rates and the perception rates of a specific type of mental health problem of gender group g in prefecture i as of year t , $\bar{S}_{gi}, \bar{M}_{gi}$: the average suicide rates and the average perception rates of gender group g in prefecture i over the sample years)

Table 3.4 Estimated Two-way fixed effect model of suicide rates and the perception rates of various mental health problems with prefecture-level panel data 2001-2010 (Females)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Suicide	Stress Overall	Stress Financial	Stress Health	Stress Family	Somatic Symptoms	Sleep Difficulties	Fatigue	Irritability
ln (job offer)	-0.01 (-0.27)	-0.00 (-0.24)	-0.06*** (-2.75)	0.01 (0.45)	0.03 (0.87)	0.06*** (3.98)	0.00 (0.05)	0.04 (1.13)	0.10** (2.44)
ln (birth)	0.19 (0.71)	-0.07 (-1.01)	-0.27 (-1.51)	0.00 (0.00)	0.53*** (3.02)	0.15 ⁺ (1.60)	0.56* (1.90)	-0.06 (-0.26)	0.04 (0.13)
ln (divorce)	0.08 (0.39)	-0.00 (-0.07)	0.18 ⁺ (1.61)	-0.04 (-0.41)	0.13 (0.81)	-0.04 (-0.41)	-0.10 (-0.43)	-0.00 (-0.01)	0.42* (1.74)
Age 15-34 (%)	4.02 (1.23)	2.16*** (2.82)	-0.54 (-0.33)	0.24 (0.16)	0.79 (0.51)	1.29 (1.35)	3.98 ⁺ (1.52)	4.10** (2.63)	1.79 (0.70)
Age 35-74 (%)	6.12* (1.90)	-0.05 (-0.08)	-2.26 ⁺ (-1.55)	-3.64** (-2.68)	3.00* (1.66)	-0.15 (-0.17)	3.61* (1.67)	2.78 ⁺ (1.50)	1.10 (0.38)
Age 75over (%)	2.08 (0.47)	-1.55 (-1.47)	-2.20 (-0.80)	-2.79* (-1.68)	5.35** (2.29)	1.07 (0.95)	7.33** (2.48)	5.30* (1.98)	1.67 (0.46)
Constant	-2.24 (-0.78)	10.74*** (18.05)	11.57*** (9.21)	11.46*** (9.37)	5.50*** (3.50)	9.94*** (13.18)	3.48* (1.76)	5.85*** (3.37)	6.78** (2.57)
No. obs.	470	188	188	188	188	188	188	188	188
R-squared	0.05	0.64	0.90	0.98	0.74	0.69	0.52	0.28	0.30

Notes: Each specification includes the prefecture fixed effects and time effects, which account for the time-invariant prefecture specific characteristics and the nationwide time effects. *t*-statistics are reported in the parentheses. Standard errors are clustered at prefecture level. ***, **, * and ⁺ indicate statistical significance at 1%, 5%, 10%, and 15% respectively.

Table 3.5 Estimated Two-way fixed effect model of suicide rates and the perception rates of various mental health problems with prefecture-level panel data 2001-2010 (Males)

	(1) Suicide	(2) Stress Overall	(3) Stress Financial	(4) Stress Health	(5) Stress Family	(6) Somatic Symptom	(7) Sleep Difficulties	(8) Fatigue	(9) Irritability
ln (job offer)	-0.11*** (-4.04) [2.15]	-0.02* (-1.76) [1.44]	-0.09*** (-3.22) [0.69]	0.05* (1.82) [-1.03]	0.04 (0.99) [-0.24]	-0.05*** (-2.88) [3.94]	-0.08 (-1.43) [1.00]	-0.06 (-1.36) [1.96]	-0.03 (-0.87) [2.03]
ln (birth)	0.02 (0.11) [0.60]	0.04 (0.60) [-1.52]	-0.19 (-0.85) [-0.37]	0.46** (2.67) [-1.55]	0.37 (1.26) [0.37]	-0.15 (-1.28) [1.97]	-0.41 (-1.26) [1.84]	-0.14 (-0.44) [0.18]	-0.39 (-0.79) [0.76]
ln (divorce)	0.32** (2.31) [-0.97]	-0.03 (-0.58) [0.40]	0.16 (1.09) [0.10]	0.12 (0.90) [-0.96]	0.29 ⁺ (1.48) [-0.51]	0.18* (1.99) [-1.55]	0.12 (0.37) [-0.50]	-0.02 (-0.09) [0.06]	0.28 (0.98) [0.39]
Age 15-34 (%)	-0.52 (-0.28) [1.26]	2.15** (2.49) [0.02]	0.70 (0.38) [-0.48]	0.88 (0.58) [-0.36]	4.82* (1.89) [-1.61]	0.31 (0.28) [0.89]	4.50 (1.47) [-0.12]	5.10 ⁺ (1.58) [-0.27]	0.71 (0.28) [0.30]
Age 35-74 (%)	-0.10 (-0.05) [1.83]	0.21 (0.26) [-0.32]	-0.99 (-0.48) [-0.56]	-2.94** (-2.05) [-0.35]	1.00 (0.32) [0.60]	1.22 (1.02) [-0.97]	4.78 ⁺ (1.62) [-0.26]	4.57 (1.36) [-0.48]	1.30 (0.37) [-0.05]
Age 75over (%)	-2.46 (-0.89) [0.98]	-1.55* (-1.79) [-0.00]	-3.11 (-1.09) [0.27]	-2.01 (-0.74) [-0.29]	-2.15 (-0.57) [1.55]	-3.17** (-2.09) [2.15]	-5.96 (-1.26) [2.00]	-2.61 (-0.75) [1.71]	-7.22 (-1.42) [1.37]
Constant	3.77* (1.94) [-2.04]	10.19** (15.41) [0.73]	10.46*** (5.91) [0.67]	9.51*** (7.01) [1.07]	6.20** (2.26) [-0.08]	10.03*** (9.41) [0.09]	5.66** (2.12) [-0.32]	5.32* (1.96) [0.29]	8.21** (2.45) [-0.29]
No. obs.	470	188	188	188	188	188	188	188	188
R-squared	0.31	0.69	0.91	0.98	0.52	0.68	0.57	0.59	0.61

Notes: Each specification includes the prefecture fixed effects and time effects, which account for the time-invariant prefecture specific characteristics and the nationwide time effects. *t*-statistics are reported in the parentheses. *t*-statistics for the difference in the coefficients between females and males are reported in the brackets. Standard errors are clustered at prefecture level. ***, **, * and ⁺ indicate statistical significance at 1%, 5%, 10%, and 15% respectively.

Table 3.6 Estimated Two-way fixed effect model of suicide rates and the perception rates of stress with prefecture-level panel data 2001-2010 by age groups

	Suicide						Stress					
	Female			Male			Female			Male		
	15-34	35-74	75+	15-34	35-74	75+	15-34	35-74	75+	15-34	35-74	75+
ln (job offer)	0.01 (0.12)	-0.02 (-0.43)	0.07 (0.75)	-0.01 (-0.12)	-0.14*** (-4.30)	-0.06 (-1.04)	-0.02 (-1.39)	-0.00 (-0.10)	0.02 (0.48)	-0.03 (-0.92)	-0.02 ⁺ (-1.64)	-0.01 (-0.23)
				[0.15]	[2.04]	[1.43]				[0.24]	[1.07]	[0.51]
ln (birth)	0.58 (0.56)	-0.07 (-0.20)	0.67 (1.28)	-0.11 (-0.25)	-0.04 (-0.18)	0.76 (1.45)	-0.14 (-0.89)	-0.02 (-0.28)	-0.12 (-0.64)	0.11 (0.67)	-0.08 (-0.96)	0.88*** (2.73)
				[0.56]	[-0.07]	[-0.11]				[-1.07]	[0.54]	[-3.04]
ln (divorce)	0.36 (0.70)	0.19 (0.71)	-0.08 (-0.17)	0.30 (1.00)	0.39** (2.24)	-0.33 (-0.76)	-0.20 ⁺ (-1.56)	0.03 (0.45)	0.31* (1.88)	-0.11 (-0.76)	-0.03 (-0.45)	0.11 (0.53)
				[0.11]	[-0.60]	[0.40]				[-0.33]	[0.74]	[0.70]
Age 15-34 (%)	-3.34 (-0.46)	1.86 (0.55)	12.59* (1.89)	-3.66 (-1.01)	-1.63 (-0.77)	8.92 (1.25)	1.76* (1.71)	1.71** (2.09)	-0.30 (-0.16)	1.21 (0.87)	1.62* (1.67)	4.96 ⁺ (1.53)
				[0.04]	[0.94]	[0.45]				[0.39]	[0.09]	[-1.86]
Age 35-74 (%)	-6.92 (-0.83)	2.78 (0.76)	14.67** (2.49)	-3.19 (-1.08)	-1.64 (-0.53)	3.41 (0.47)	-0.57 (-0.62)	-0.35 (-0.43)	-0.96 (-0.54)	0.27 (0.18)	-0.69 (-0.71)	4.54 (1.39)
				[-0.39]	[0.96]	[1.36]				[-0.54]	[0.30]	[-1.78]
Age 75over (%)	14.08 (1.19)	-3.53 (-0.63)	9.38 (1.14)	-5.25 (-1.07)	-3.12 (-0.79)	5.93 (0.83)	-2.81* (-1.77)	-0.38 (-0.35)	-2.83 (-1.32)	0.19 (0.12)	-2.42** (-2.36)	5.56 ⁺ (1.46)
				[1.32]	[-0.06]	[0.31]				[-1.36]	[1.37]	[-1.97]
Constant	3.65 (0.44)	1.23 (0.36)	-10.26* (-1.97)	5.69* (1.94)	5.30* (1.96)	-2.65 (-0.42)	11.59*** (13.08)	10.73*** (15.70)	11.61*** (7.56)	10.05*** (8.23)	11.17*** (13.94)	4.40 (1.55)
				[-0.14]	[-0.98]	[-1.04]				[1.01]	[-0.38]	[2.64]
No. obs.	470	470	470	470	470	470	188	188	188	188	188	188
R-squared	0.24	0.05	0.16	0.34	0.43	0.07	0.46	0.72	0.56	0.34	0.71	0.57

Notes: Each specification includes the prefecture fixed effects and time effects, which account for the time-invariant prefecture specific characteristics and the nationwide time effects. *t*-statistics are reported in the parentheses. *t*-statistics for the difference in the coefficients between females and males are reported in the brackets. Standard errors are clustered at prefecture level. ***, **, * and ⁺ indicate statistical significance at 1%, 5%, 10%, and 15% respectively.

Table 4.1 Descriptive Statistics of the individual-level data by gender in 2004

	Female	Male	<i>t</i> -stat for difference
(1) Stress (%)			
Overall	56.18	45.73	27.65***
Financial issues	13.33	11.85	5.89***
Health issues	18.77	14.38	15.55***
Family issues	8.83	4.40	23.43***
Future income	15.50	14.09	5.20***
Future nursing care	9.92	6.67	15.46***
Loss of purpose in life	5.78	5.23	3.18***
(2) Somatic symptoms (%)			
Overall	38.60	29.85	24.33***
Sleep difficulties	4.06	2.35	12.71***
A sense of fatigue	6.78	4.82	10.98***
Irritability	4.52	2.48	14.53***
(2) Socioeconomic backgrounds			
Age group (%)			
15-24	12.15	12.76	-2.42**
25-34	16.27	16.56	-1.05
35-44	15.94	16.33	-1.41
45-54	17.17	17.83	-2.27**
55-64	16.77	17.69	-3.20***
65-74	12.10	12.04	0.26
75 over	9.59	6.78	13.46***
Job status (%)			
Employed	50.63	73.63	-64.05***
Jobless1 (not willing to work)	38.66	20.78	52.28***
Jobless 2 (willing to work but not seeking job)	6.74	2.05	30.01***
Unemployed (seeking job)	3.97	3.54	3.01***
Marital status (%)			
Married	61.34	67.11	-15.82***
Never-married	22.35	27.66	-16.20***
Widowed	11.65	2.74	45.56***
Divorced	4.67	2.50	15.30***
Living in a rented house (%)	61.34	67.11	-15.82***
Number of family members	3.33	3.33	0.18
Number of observations	35,878	33,376	

Note: *** and ** indicate statistical significance at the 1% and 5% levels, respectively.

Table 4.2 Estimated logistic regression model of the perception of mental health problems (Females)

	(1) Stress Overall	(2) Stress Financial	(3) Stress Health	(4) Stress Family	(5) Stress Future income	(6) Stress Future care	(7) Stress Purpose of life	(8) Somatic Symptoms	(9) Sleep Difficulties	(10) Fatigue	(11) Irritability
Jobless 1	-0.03*** (-4.96)	-0.07*** (-16.99)	0.03*** (6.12)	-0.00 (-1.06)	-0.04*** (-9.23)	0.01** (2.48)	0.01** (1.99)	0.02** (2.28)	0.01*** (6.00)	0.00 (1.09)	0.00 (0.44)
Jobless 2	0.12*** (10.99)	0.02*** (2.72)	0.11*** (9.71)	0.03*** (4.87)	0.04*** (5.26)	0.03*** (4.19)	0.04*** (5.37)	0.10*** (8.62)	0.03*** (4.76)	0.04*** (5.86)	0.03*** (5.72)
Unemployed	0.08*** (6.22)	0.05*** (5.68)	0.06*** (4.60)	0.03*** (3.02)	0.06*** (5.99)	0.03*** (3.25)	0.04*** (5.16)	0.04*** (2.60)	0.02** (2.48)	-0.01 (-1.47)	0.02*** (2.78)
Never-married	-0.02** (-2.52)	-0.05*** (-10.99)	0.04*** (4.53)	-0.02*** (-4.46)	0.03*** (3.93)	0.03*** (5.65)	0.04*** (7.71)	-0.00 (-0.03)	0.01* (1.68)	0.01** (2.53)	-0.00 (-1.10)
Widowed	-0.02 (-1.50)	-0.01 (-1.03)	0.01 (1.27)	-0.02*** (-2.80)	-0.01 (-1.56)	0.00 (1.10)	0.03*** (4.50)	0.00 (0.41)	0.00 (1.50)	0.00 (0.61)	-0.01** (-2.57)
Divorced	0.08*** (6.07)	0.07*** (7.56)	0.05*** (4.96)	0.01 (1.03)	0.08*** (8.40)	0.03*** (4.93)	0.02*** (3.39)	0.02* (1.81)	0.01** (2.54)	0.02*** (2.89)	0.01** (2.53)
Rented house	0.05*** (7.69)	0.05*** (11.33)	0.02*** (4.57)	0.01** (2.53)	0.04*** (8.77)	0.01** (2.47)	0.00 (1.43)	0.03*** (4.60)	0.01*** (3.71)	0.02*** (4.96)	0.01*** (4.04)
Number of family	-0.01*** (-3.82)	0.01*** (4.38)	-0.01*** (-4.74)	0.01*** (12.89)	-0.01*** (-7.30)	-0.01*** (-10.58)	-0.00*** (-4.11)	-0.00** (-2.09)	-0.00*** (-3.41)	-0.00 (-0.89)	0.00** (2.20)
Age 25-34	0.03*** (3.08)	0.05*** (5.05)	0.09*** (5.85)	0.03*** (3.17)	0.10*** (8.19)	0.10*** (4.54)	0.00 (0.93)	0.06*** (4.96)	0.02*** (2.70)	0.02*** (3.33)	0.01 (1.33)
Age 35-44	0.07*** (5.89)	0.07*** (6.60)	0.18*** (10.41)	0.05*** (4.62)	0.19*** (12.26)	0.25*** (7.67)	0.02*** (3.01)	0.07*** (5.39)	0.02** (2.09)	0.03*** (4.23)	-0.00 (-0.40)
Age 45-54	0.06*** (4.91)	0.05*** (4.69)	0.29*** (14.90)	0.05*** (4.43)	0.24*** (14.27)	0.40*** (10.81)	0.03*** (4.27)	0.13*** (8.76)	0.04*** (4.29)	0.03*** (3.67)	-0.00 (-0.84)
Age 55-64	0.02 (1.48)	-0.00 (-0.20)	0.34*** (17.38)	0.04*** (3.41)	0.24*** (13.94)	0.51*** (13.97)	0.01 (1.10)	0.18*** (12.66)	0.07*** (5.80)	0.01 (1.08)	-0.00 (-0.53)
Age 65-74	0.01 (0.39)	-0.03*** (-3.18)	0.40*** (19.54)	0.01 (1.39)	0.15*** (8.49)	0.61*** (16.80)	-0.01** (-2.32)	0.29*** (20.08)	0.10*** (6.08)	0.01 (1.18)	0.00 (0.32)
Age 75over	0.02 (1.37)	-0.07*** (-9.11)	0.45*** (21.09)	0.01 (1.24)	0.04** (2.51)	0.62*** (16.86)	-0.01 (-1.06)	0.37*** (26.18)	0.10*** (5.65)	0.04*** (3.62)	-0.01 (-1.58)

Notes: The numbers in the parentheses are z-statistics for the coefficients. ***, **, and * stand for 1%, 5% and 10% statistical significance levels, respectively. Sample size is 35,878.

Table 4.3 Estimated logistic regression model of the perception of mental health problems (Males)

	(1) Stress Overall	(2) Stress Financial	(3) Stress Health	(4) Stress Family	(5) Stress Future income	(6) Stress Future care	(7) Stress Purpose of life	(8) Somatic Symptoms	(9) Sleep Difficulties	(10) Fatigue	(11) Irritability
Jobless 1	0.02* (1.96) [-4.54]	-0.06*** (-10.90) [0.39]	0.05*** (7.23) [-2.74]	0.01** (2.10) [-2.60]	-0.04*** (-6.49) [0.12]	0.02*** (5.97) [-4.14]	0.01** (2.00) [-0.51]	0.07*** (8.05) [-5.50]	0.02*** (4.36) [-1.10]	0.01** (2.51) [-1.73]	0.01*** (2.72) [-2.55]
Jobless 2	0.18*** (10.52) [-3.03]	0.02 (1.59) [-0.29]	0.19*** (9.11) [-4.69]	0.07*** (4.14) [-3.40]	0.06*** (4.18) [-1.35]	0.05*** (4.76) [-2.73]	0.07*** (5.63) [-3.24]	0.17*** (8.36) [-3.43]	0.04*** (3.60) [-1.61]	0.07*** (4.77) [-2.86]	0.06*** (4.22) [-3.21]
Unemployed	0.11*** (7.46) [-1.11]	0.07*** (6.12) [-1.47]	0.06*** (4.58) [-0.58]	0.04*** (3.43) [-1.74]	0.07*** (5.64) [-0.39]	0.03*** (3.48) [-0.56]	0.04*** (4.57) [0.01]	0.00 (0.20) [1.49]	0.01* (1.95) [-0.02]	-0.00 (-0.53) [-0.44]	0.01 (1.12) [0.56]
Never-married	-0.04*** (-4.26) [1.08]	-0.02*** (-4.81) [-4.41]	0.02** (2.18) [1.60]	-0.01** (-2.04) [-1.28]	-0.00 (-0.29) [2.90]	0.04*** (7.55) [-2.60]	0.03*** (6.34) [1.21]	-0.04*** (-4.49) [3.11]	0.00 (1.10) [0.22]	-0.01*** (-2.80) [3.28]	-0.01 (-1.53) [0.48]
Widowed	0.03 (1.57) [-2.12]	-0.01 (-0.43) [-0.13]	0.01 (0.95) [-0.20]	0.02* (1.95) [-3.98]	-0.01 (-1.01) [0.11]	0.02*** (2.88) [-2.46]	0.05*** (4.40) [-2.17]	-0.04** (-2.54) [2.29]	0.00 (0.16) [0.51]	-0.00 (-0.05) [0.32]	-0.00 (-0.77) [-0.49]
Divorced	0.03 (1.48) [2.41]	0.04*** (3.65) [1.34]	0.02 (1.39) [1.76]	0.03*** (2.61) [-2.55]	-0.01 (-1.19) [5.07]	0.03*** (3.86) [-0.50]	0.03*** (3.12) [-0.71]	0.01 (0.44) [0.69]	0.02*** (2.64) [-1.19]	0.02* (1.70) [0.17]	0.00 (0.38) [0.87]
Rented house	0.04*** (5.72) [1.33]	0.03*** (6.03) [3.60]	0.01* (1.87) [1.60]	0.00 (0.55) [1.01]	0.02*** (4.93) [2.51]	0.00 (0.04) [1.50]	0.01*** (2.98) [-1.28]	0.02** (2.35) [1.36]	0.01** (2.45) [0.30]	0.02*** (4.12) [-0.03]	0.01*** (2.67) [0.26]
Number of family	-0.00 (-1.64) [-1.44]	0.00** (2.34) [1.27]	-0.01*** (-3.26) [-0.57]	0.01*** (7.00) [1.47]	-0.01*** (-5.73) [-0.68]	-0.01*** (-6.47) [-1.46]	-0.00*** (-3.25) [-0.26]	-0.00** (-2.21) [0.28]	-0.00 (-0.16) [-1.95]	0.00 (1.18) [-1.48]	0.00 (1.25) [0.30]
Age 25-34	0.06***	0.06***	0.16***	0.04***	0.08***	0.13***	0.02***	0.07***	0.02***	0.03***	0.01**

	(5.05)	(5.73)	(8.43)	(3.83)	(6.45)	(4.55)	(2.99)	(4.89)	(2.72)	(3.74)	(2.08)
	[-1.44]	[-1.16]	[-4.34]	[-1.71]	[1.03]	[-1.37]	[-1.90]	[-0.49]	[-0.93]	[-1.32]	[-1.32]
Age 35-44	0.09***	0.09***	0.24***	0.03***	0.13***	0.27***	0.02***	0.10***	0.05***	0.04***	0.02**
	(6.80)	(7.00)	(11.06)	(3.27)	(8.59)	(6.76)	(2.66)	(6.86)	(3.76)	(3.81)	(2.30)
	[-0.61]	[-0.95]	[-3.08]	[0.22]	[2.55]	[-1.12]	[0.09]	[-1.68]	[-3.73]	[-0.59]	[-2.98]
Age 45-54	0.09***	0.07***	0.32***	0.03***	0.17***	0.40***	0.02***	0.12***	0.05***	0.02**	0.01*
	(6.62)	(5.76)	(14.25)	(3.07)	(10.58)	(9.09)	(2.60)	(8.02)	(3.77)	(2.41)	(1.77)
	[-1.15]	[-1.35]	[-2.29]	[0.30]	[2.50]	[-0.95]	[1.22]	[-0.23]	[-1.10]	[0.44]	[-2.51]
Age 55-64	0.06***	0.04***	0.39***	0.02*	0.20***	0.50***	0.01*	0.18***	0.06***	0.01*	0.01
	(4.29)	(3.40)	(16.74)	(1.76)	(11.68)	(11.11)	(1.71)	(11.21)	(4.12)	(1.70)	(1.11)
	[-1.97]	[-3.25]	[-2.72]	[0.74]	[1.24]	[-0.68]	[-0.55]	[-0.13]	[0.10]	[-0.75]	[-1.42]
Age 65-74	0.01	0.01	0.43***	0.02*	0.14***	0.60***	-0.00	0.26***	0.08***	0.01	0.01
	(0.71)	(0.76)	(17.74)	(1.66)	(7.74)	(13.08)	(-0.74)	(16.02)	(4.35)	(0.80)	(1.42)
	[-0.23]	[-2.99]	[-1.90]	[-0.55]	[0.31]	[-0.57]	[-1.02]	[0.96]	[0.07]	[0.13]	[-1.21]
Age 75over	0.04**	-0.04***	0.50***	0.01	0.01	0.65***	-0.00	0.37***	0.09***	0.02*	0.02*
	(2.14)	(-3.76)	(19.82)	(0.94)	(0.72)	(14.71)	(-0.68)	(22.31)	(4.28)	(1.83)	(1.68)
	[-0.59]	[-2.52]	[-2.19]	[-0.01]	[1.18]	[-1.14]	[-0.17]	[0.17]	[-0.42]	[0.97]	[-3.28]
Female	0.14***	0.03**	0.07***	0.04***	-0.01	0.04***	0.01	0.08***	0.02**	0.02**	0.03***
	(6.20)	(2.04)	(3.63)	(3.33)	(-0.65)	(2.61)	(0.74)	(3.24)	(2.42)	(1.96)	(3.25)

Notes: The numbers in the parentheses are z-statistics for the coefficients while those in the brackets are z-statistics for the difference between coefficients for males and those for females shown in Table 4.2.***, **, and * stand for 1%, 5% and 10% statistical significance levels, respectively. Sample size is 69,254.

Table 4.4 Estimated logistic regression model of the perception of mental health problems (Females aged 35-74)

	(1) Stress Overall	(2) Stress Financial	(3) Stress Health	(4) Stress Family	(5) Stress Future income	(6) Stress Future care	(7) Stress Purpose of life	(8) Somatic Symptoms	(9) Sleep Difficulties	(10) Fatigue	(11) Irritability
Jobless 1	-0.03*** (-3.73)	-0.07*** (-12.92)	0.05*** (6.84)	-0.00 (-0.65)	-0.05*** (-7.99)	0.01** (2.31)	0.02*** (3.90)	0.03*** (4.11)	0.02*** (6.19)	0.00 (0.80)	-0.00 (-0.49)
Jobless 2	0.11*** (6.65)	0.07*** (5.17)	0.08*** (4.71)	0.03** (2.30)	0.09*** (5.67)	0.04*** (2.92)	0.06*** (5.47)	0.06*** (3.45)	0.02** (2.31)	-0.01 (-1.64)	0.02*** (2.75)
Unemployed	0.17*** (11.92)	0.03*** (2.80)	0.17*** (10.62)	0.04*** (4.31)	0.05*** (4.31)	0.05*** (4.17)	0.06*** (5.82)	0.14*** (8.88)	0.04*** (4.14)	0.04*** (5.86)	0.03*** (5.90)
Never-married	-0.01 (-0.75)	-0.03*** (-4.17)	0.04*** (3.32)	-0.01 (-1.01)	0.02* (1.93)	0.06*** (5.13)	0.02** (2.46)	-0.01 (-0.97)	-0.00 (-0.30)	0.00 (1.07)	-0.00 (-1.64)
Widowed	-0.01 (-1.09)	-0.00 (-0.17)	0.01 (1.42)	-0.02*** (-2.99)	-0.01 (-1.38)	0.01 (1.08)	0.02*** (3.23)	0.00 (0.39)	0.01* (1.86)	0.01** (2.05)	-0.02*** (-4.64)
Divorced	0.07*** (5.08)	0.07*** (6.60)	0.05*** (4.14)	0.01 (0.81)	0.09*** (7.10)	0.05*** (4.40)	0.02*** (3.05)	0.01 (0.83)	0.01* (1.88)	0.02*** (2.87)	0.01** (2.39)
Rented house	0.06*** (6.48)	0.06*** (9.44)	0.04*** (5.24)	0.01* (1.67)	0.06*** (8.33)	0.02*** (3.20)	0.00 (1.17)	0.04*** (4.52)	0.01*** (3.43)	0.02*** (5.07)	0.01*** (4.55)
Number of family	-0.00 (-0.96)	0.01*** (6.13)	-0.01*** (-3.84)	0.02*** (11.32)	-0.01*** (-6.83)	-0.01*** (-8.68)	-0.01*** (-4.35)	-0.01** (-2.46)	-0.00*** (-3.14)	-0.00 (-1.37)	0.00** (2.38)
Age 35-44	0.06*** (4.69)	0.13*** (10.15)	-0.13*** (-17.68)	0.03*** (3.75)	0.04*** (3.73)	-0.11*** (-24.38)	0.04*** (5.21)	-0.19*** (-18.27)	-0.03*** (-10.39)	0.01*** (3.17)	-0.00 (-1.64)
Age 45-54	0.05*** (4.71)	0.10*** (8.99)	-0.06*** (-8.21)	0.03*** (3.99)	0.08*** (7.50)	-0.07*** (-13.47)	0.05*** (6.72)	-0.14*** (-14.11)	-0.02*** (-5.91)	0.01** (2.20)	-0.01** (-2.22)
Age 55-64	0.01 (1.28)	0.04*** (3.91)	-0.03*** (-4.11)	0.02*** (2.85)	0.08*** (8.00)	-0.02*** (-5.15)	0.02*** (3.79)	-0.10*** (-10.07)	-0.01* (-1.82)	-0.01*** (-2.61)	-0.00 (-1.45)

Notes: The numbers in the parentheses are z-statistics for the coefficients. ***, **, and * stand for 1%, 5% and 10% statistical significance levels, respectively. Sample size is 22,240.

Table 4.5 Estimated logistic regression model of the perception of mental health problems (Males aged 35-74)

	(1) Stress Overall	(2) Stress Financial	(3) Stress Health	(4) Stress Family	(5) Stress Future income	(6) Stress Future care care	(7) Stress Purpose of life	(8) Somatic Symptoms	(9) Sleep Difficulties	(10) Fatigue	(11) Irritability
Jobless 1	-0.01 (-0.56) [-1.63]	-0.05*** (-5.72) [-1.27]	0.06*** (6.29) [-1.65]	0.01 (1.51) [-1.82]	-0.05*** (-5.90) [0.55]	0.03*** (4.83) [-3.24]	0.03*** (4.08) [-1.65]	0.09*** (7.67) [-4.30]	0.03*** (4.49) [-1.42]	0.02** (2.56) [-0.74]	0.01** (2.04) [-0.85]
Jobless 2	0.21*** (9.19) [-1.24]	0.06*** (3.01) [-1.76]	0.20*** (7.76) [-1.59]	0.07*** (3.24) [-2.37]	0.09*** (4.06) [-1.64]	0.09*** (4.85) [-2.73]	0.09*** (4.69) [-1.83]	0.22*** (8.55) [-3.08]	0.05*** (3.31) [-1.34]	0.10*** (4.89) [-3.34]	0.08*** (3.96) [-1.87]
Unemployed	0.11*** (5.73) [0.34]	0.11*** (6.45) [-2.41]	0.07*** (3.99) [0.17]	0.04*** (2.61) [-1.48]	0.09*** (4.99) [-0.06]	0.05*** (3.71) [-1.06]	0.03*** (2.95) [1.45]	0.01 (0.53) [1.82]	0.01 (1.28) [0.51]	-0.01 (-0.87) [0.75]	0.01 (1.32) [0.18]
Never-married	-0.04*** (-3.13) [1.46]	-0.02** (-2.21) [-1.58]	0.03*** (2.65) [0.61]	-0.02*** (-3.19) [1.44]	0.01 (0.83) [0.88]	0.08*** (7.51) [-3.02]	0.01** (2.47) [0.24]	-0.03** (-2.29) [0.81]	0.01* (1.67) [-1.77]	-0.01** (-2.37) [1.37]	-0.00 (-1.00) [0.52]
Widowed	0.03 (1.24) [-1.60]	0.01 (0.53) [-0.58]	0.01 (0.51) [0.21]	0.03* (1.94) [-4.53]	-0.00 (-0.10) [-0.59]	0.03** (2.38) [-2.10]	0.05*** (3.32) [-1.92]	-0.03 (-1.52) [1.47]	0.00 (0.17) [0.53]	0.01 (0.64) [-0.31]	0.00 (0.30) [-0.56]
Divorced	0.02 (1.24) [2.14]	0.05*** (3.54) [1.07]	0.03* (1.81) [1.01]	0.03** (2.04) [-1.84]	-0.01 (-1.04) [4.49]	0.05*** (3.93) [-0.98]	0.02** (2.40) [-0.08]	0.01 (0.28) [0.27]	0.03*** (2.93) [-2.30]	0.02* (1.68) [-0.04]	0.01 (0.67) [0.63]
Rented house	0.04*** (4.40) [1.61]	0.04*** (5.95) [2.51]	0.01* (1.66) [2.28]	0.00 (0.59) [0.48]	0.03*** (4.58) [2.53]	0.00 (0.21) [1.83]	0.01*** (2.96) [-1.51]	0.01 (1.28) [2.19]	0.01 (1.46) [0.96]	0.02*** (3.84) [0.34]	0.01** (2.21) [0.30]
Number of family	-0.00 (-0.30) [-0.45]	0.01*** (3.81) [1.44]	-0.01** (-2.43) [-0.70]	0.01*** (5.63) [1.57]	-0.01*** (-3.85) [-1.93]	-0.01*** (-4.88) [-1.58]	-0.00*** (-2.85) [-0.79]	-0.01** (-2.43) [0.15]	0.00 (1.17) [-2.93]	0.00 (0.66) [-0.87]	0.00 (1.12) [0.25]

Age 35-44	0.06*** (4.63) [-0.20]	0.10*** (7.55) [1.60]	-0.11*** (-12.71) [-1.22]	0.02* (1.92) [0.47]	-0.01 (-1.04) [3.14]	-0.09*** (-17.41) [-0.66]	0.04*** (4.44) [0.16]	-0.13*** (-11.38) [-3.24]	-0.01** (-2.18) [-4.46]	0.03*** (3.73) [-0.75]	0.01 (1.09) [-1.06]
Age 45-54	0.06*** (4.90) [-0.43]	0.08*** (6.72) [1.39]	-0.06*** (-6.68) [-0.12]	0.01* (1.72) [0.77]	0.03*** (2.62) [3.29]	-0.05*** (-9.74) [-0.44]	0.03*** (4.48) [1.24]	-0.11*** (-10.17) [-1.59]	-0.01** (-1.99) [-1.55]	0.02** (2.34) [0.42]	0.00 (0.43) [-0.58]
Age 55-64	0.04*** (3.23) [-1.51]	0.04*** (4.17) [-0.28]	-0.02** (-2.10) [-1.03]	0.00 (0.08) [1.50]	0.06*** (5.65) [1.54]	-0.02*** (-4.03) [-0.00]	0.02*** (3.72) [-0.28]	-0.07*** (-6.62) [-1.73]	-0.00 (-1.08) [-0.07]	0.01 (1.50) [-1.06]	-0.00 (-0.57) [0.24]
Female	0.11*** (5.88)	-0.00 (-0.27)	0.04*** (2.95)	0.04*** (3.32)	0.00 (0.09)	0.05*** (5.48)	0.01 (0.65)	0.09*** (5.18)	0.03*** (4.45)	0.02** (2.03)	0.02** (2.21)

Notes: The numbers in the parentheses are z-statistics for the coefficients while those in the brackets are z-statistics for the difference between coefficients for males and those for females shown in Table 4.4. ***, **, and * stand for 1%, 5% and 10% statistical significance levels, respectively. Sample size is 43,465.

Table 5.1 Descriptive statistics of the prefecture-level data of consultation and suicide in Japan (2001-2010)

		Mean	S.D.	Number of observations	t-stat for difference (H ₀ : F=M)
Perception rate of stress (Any kinds of issues) ^a					
All age groups	Female	51,311	187.24	188	32.07***
	Male	43,083	175.45	188	
Consultation rate					
All age groups	Female	39,556	132.87	141	58.16***
	Male	26,519	180.52	141	
Suicide rate ^a					
All age groups	Female	13.22	2.50	470	-67.03***
	Male	37.52	7.45	470	
Perception rate of stress (Any kinds of issues) ^a					
Age 15-34	Female	54,083	213.48	188	38.86***
	Male	42,659	202.15	188	
Age 35-74	Female	52,707	206.55	188	27.99***
	Male	44,796	192.87	188	
Age 75 over	Female	43,034	332.72	188	11.95***
	Male	37,958	263.89	188	
Consultation rate ^a					
Age 15-34	Female	46,053	259.54	141	52.53***
	Male	29,376	182.80	141	
Age 35-74	Female	39,241	201.87	138	50.57***
	Male	25,900	165.33	126	
Age 75 over	Female	31,712	254.55	140	14.26***
	Male	25,722	335.62	137	
Suicide rate ^a					
Age 15-34	Female	10.05	2.99	470	-15.12***
	Male	12.96	2.91	470	
Age 35-74	Female	15.29	2.64	470	-69.97***
	Male	52.20	11.13	470	
Age 75 over	Female	23.67	9.38	470	-30.77***
	Male	47.33	13.78	470	
Job offer ratio ^b		0.63	0.28	470	
Birth rate ^c		8.57	0.84	470	
Divorce rate ^c		2.01	0.26	470	
Per capita mental health spending ^d		998	727	470	
Number of psychiatric hospitals ^a		1.06	0.49	470	
% Population 15-34		0.24	0.02	470	
% Population 35-74		0.52	0.01	470	
% Population 75 years and older		0.11	0.02	470	

Notes: *** indicates statistical significance at the 1% level.

a. The numbers per 100,000 persons.

b. The number of job offers available per one job seeker.

c. The numbers per 1,000 persons.

d. The amount of money (yen) spent on mental health promotion per capita.

Table 5.2 Estimated fixed effect model of suicide and consultation among females and males

	Suicide						Consultation					
	Female			Male			Female			Male		
	15-34 (1)	35-74 (2)	75over over (3)	15-34 (4)	35-74 (5)	75 over (6)	15-34 (7)	35-74 (8)	75 over (9)	15-34 (10)	35-74 (11)	75 over (12)
ln(job offer)	0.01 (0.12)	-0.02 (-0.43)	0.07 (0.75)	-0.01 (-0.12)	-0.14*** (-4.30)	-0.06 (-1.04)	0.01 (0.38)	-0.03 ⁺ (-1.61)	-0.00 (-0.09)	-0.04 (-0.90)	-0.02 (-0.71)	-0.08 (-0.98)
				[0.15]	[2.04]	[1.43]				[0.97]	[0.66]	[0.69]
ln(birth)	0.58 (0.56)	-0.07 (-0.20)	0.67 (1.28)	-0.11 (-0.25)	-0.04 (-0.18)	0.76 (1.45)	0.38 (1.18)	0.37 ⁺ (1.46)	-0.07 (-0.14)	0.74* (1.89)	0.63** (2.28)	1.43** (2.39)
				[0.56]	[-0.07]	[-0.11]				[-0.70]	[-2.11]	[-1.82]
ln(divorce)	0.36 (0.70)	0.19 (0.71)	-0.08 (-0.17)	0.30 (1.00)	0.39** (2.24)	-0.33 (-0.76)	-0.20 (-0.93)	-0.07 (-0.56)	0.35 (1.07)	-0.16 (-0.56)	0.08 (0.37)	0.32 (0.64)
				[0.11]	[-0.60]	[0.40]				[-0.09]	[-0.35]	[0.03]
Age 15-34 (%)	-3.34 (-0.46)	1.86 (0.55)	12.59* (1.89)	-3.66 (-1.01)	-1.63 (-0.77)	8.92 (1.25)	1.62 (0.73)	2.28 (1.14)	3.10 (0.57)	-4.42 ⁺ (-1.49)	-7.84** (-2.46)	-5.46 (-1.16)
				[0.04]	[0.94]	[0.45]				[1.51]	[2.28]	[1.19]
Age 35-74 (%)	-6.92 (-0.83)	2.78 (0.76)	14.67** (2.49)	-3.19 (-1.08)	-1.64 (-0.53)	3.41 (0.47)	-2.85 ⁺ (-1.64)	-0.63 (-0.56)	-0.81 (-0.24)	-6.48*** (-2.83)	-6.19** (-2.56)	-8.08 ⁺ (-1.58)
				[-0.39]	[0.96]	[1.36]				[1.00]	[2.37]	[1.12]
Age 75over (%)	14.08 (1.19)	-3.53 (-0.63)	9.38 (1.14)	-5.25 (-1.07)	-3.12 (-0.79)	5.93 (0.83)	-3.18 (-1.07)	0.34 (0.20)	-4.91 (-1.13)	-1.34 (-0.35)	-4.45 ⁺ (-1.54)	2.06 (0.28)
				[1.32]	[-0.06]	[0.31]				[-0.33]	[1.43]	[-0.62]
Constant	3.65 (0.44)	1.23 (0.36)	-10.26* (-1.97)	5.69* (1.94)	5.30* (1.96)	-2.65 (-0.42)	11.56*** (6.41)	9.62*** (7.56)	10.64*** (3.24)	13.32*** (5.73)	14.26*** (6.47)	11.93*** (2.69)
				[-0.14]	[-0.98]	[-1.04]				[0.92]	[1.26]	[1.00]
No. obs.	470	470	470	470	470	470	141	138	140	141	126	137
R-squared	0.24	0.05	0.16	0.34	0.43	0.07	0.52	0.38	0.32	0.35	0.57	0.52

Notes: Each specification includes the prefecture fixed effects and time effects, which account for the time-invariant prefecture specific characteristics and the nationwide time effects. The numbers in the parentheses are *t*-statistics for the coefficients and the numbers in the brackets are *t*-statistics for the coefficients of the interaction terms between female dummies and the variables. Standard errors are clustered at prefecture level. ***, **, * and ⁺ indicate statistical significance at 1%, 5%, 10%, and 15% respectively.

Table 5.3 Descriptive statistics of the individual-level data in Japan among females and males (2004, N= 69,254)

	Female	Male	<i>t</i> -stat for difference
(1) Stress and consultation (%)			
A. Not perceiving stress	68.39	75.81	-21.79***
B. Perceiving stress (financial, health, or family issues)	31.61	24.19	21.79***
C. Consulting someone	82.19	70.98	18.60***
D. Not knowing whom to consult	3.02	4.40	-5.10***
E. Failing to consult	16.56	27.21	-18.11***
(2) Socioeconomic backgrounds			
Age group (%)			
15-34	28.42	29.32	-2.63***
35-74	61.99	63.89	-5.19***
75over	9.59	6.78	13.46***
Job status (%)			
Employed	50.63	73.63	-64.05***
Jobless1 (not willing to work)	38.66	20.78	52.28***
Jobless 2 (willing to work but not seeking job)	6.74	2.05	30.01***
Unemployed (seeking job)	3.97	3.54	3.01***
Marital status (%)			
Married	61.20	64.07	-16.15***
Never-married	22.44	27.70	-16.05***
Widowed	11.68	2.74	45.79***
Divorced	4.67	2.49	15.46***
Living in a rented house (%)	23.80	25.39	-4.86***
Number of family members	3.33	3.33	0.18
Number of observations	35,878	33,376	

Note: *** indicates statistical significance at the 1% level.

Table 5.4 Estimated sequential logistic model of consultation conditional on the perception of stress for females

	B (1)	D (2)	E (3)
Jobless 1	-0.02*** (-3.62)	-0.00 (-0.04)	-0.02*** (-2.47)
Jobless 2	0.09*** (8.80)	0.00 (0.37)	-0.03*** (-2.78)
Unemployed	0.09*** (7.41)	0.00 (0.56)	-0.02 (-1.15)
Never-married	-0.06*** (-5.94)	0.02*** (3.51)	0.00 (0.07)
Widowed	0.00 (0.21)	0.01* (1.75)	-0.01 (-0.90)
Divorced	0.09*** (7.80)	0.01* (1.93)	0.02* (1.73)
Rented house	0.06*** (9.66)	0.00 (0.82)	-0.00 (-0.31)
Number of family	0.00** (2.03)	0.00 (0.64)	-0.00 (-1.56)
Age 25-34	0.10*** (7.87)	0.003 (0.35)	-0.00 (0.00)
Age 35-44	0.17*** (13.00)	0.02*** (2.60)	0.04** (1.81)
Age 45-54	0.19*** (13.70)	0.03*** (3.29)	0.07*** (3.49)
Age 55-64	0.18*** (12.90)	0.02*** (2.84)	0.06*** (2.96)
Age 65-74	0.21*** (14.20)	0.03*** (3.68)	0.05*** (2.46)
Age 75over	0.23*** (14.70)	0.02 (1.53)	0.01 (0.48)

Notes: The numbers in the parentheses are z-statistics for the coefficients. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. B, D, and E correspond to the statuses with regard to the perception of and consultation for stress, as we have noted in Figure 5.1. Columns D and E concern the probabilities of D and E, respectively, conditional on B. Sample size is 35,878.

Table 5.5 Estimated sequential logistic model of consultation conditional on the perception of stress for males

	B (1)	D (2)	E (3)
Jobless 1	0.02*** (2.35) [-3.98]	-0.01 (-1.17) [0.93]	-0.06*** (-4.08) [1.70]
Jobless 2	0.15*** (9.29) [-3.76]	0.01 (0.92) [-0.43]	-0.06*** (-2.31) [0.36]
Unemployed	0.09*** (6.95) [-0.49]	0.01 (1.23) [-0.39]	-0.01 (-0.73) [-0.31]
Never-married	-0.03*** (-3.19) [-1.90]	0.02*** (4.18) [-0.13]	0.06*** (4.93) [-3.11]
Widowed	0.03* (1.69) [-1.37]	0.01 (0.87) [0.19]	0.09*** (4.00) [-3.82]
Divorced	0.05*** (3.31) [1.72]	0.02** (2.18) [-0.50]	0.08*** (4.33) [-2.40]
Rented house	0.03*** (4.87) [2.85]	0.00 (0.58) [0.18]	0.01 (1.03) [-0.94]
Number of family	0.00 (0.09) [1.26]	-0.00 (-0.10) [0.54]	-0.01* (-1.76) [0.11]
Age 25-34	0.14*** (10.70) [-2.98]	0.00 (0.32) [0.03]	-0.00 (-0.13) [0.08]
Age 35-44	0.19*** (13.60) [-1.63]	0.03*** (2.81) [-0.09]	0.05*** (2.51) [-0.30]
Age 45-54	0.20*** (14.20) [-1.42]	0.02*** (2.62) [0.42]	0.06*** (2.98) [0.62]
Age 55-64	0.21*** (14.40) [-2.16]	0.03*** (2.99) [-0.09]	0.05** (2.14) [0.76]
Age 65-74	0.22*** (14.50) [-1.27]	0.03*** (2.59) [0.60]	0.01 (0.48) [1.43]
Age 75over	0.25*** (15.30) [-1.60]	0.01 (1.15) [0.21]	-0.03 (-1.21) [1.16]
Female	0.10*** (4.26)	-0.02 (-1.15)	-0.09*** (-2.39)

Notes: The numbers in the parentheses are z-statistics for the coefficients while those in brackets are z-statistics for the difference between coefficients for males and those for females shown in Table 5.4. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. B, D, and E correspond to the statuses with regard to the perception of and consultation for stress, as we have noted in Figure 5.1. Columns D and E concern the probabilities of D and E, respectively, conditional on B. Sample size is 33,376.

Table 5.6 Estimated sequential logistic model of consultation conditional on the perception of stress for females aged 35 - 74

	35-44			45-54			55-74		
	B (1)	D (2)	E (3)	B (4)	D (5)	E (6)	B (7)	D (8)	E (9)
Jobless 1	-0.09*** (-4.89)	0.01 (0.55)	-0.02 (-0.72)	-0.02 (-1.20)	0.01 (1.49)	-0.01 (-0.55)	0.02*** (2.44)	0.00 (0.54)	-0.03*** (-2.36)
Jobless 2	0.06*** (3.09)	0.00 (0.43)	-0.05 (-2.00)	0.17*** (5.90)	0.00 (0.14)	-0.03 (-0.75)	0.18*** (8.88)	0.01 (0.67)	-0.04* (-1.70)
Unemployed	0.10*** (3.81)	-0.01 (-0.59)	-0.07 (-1.88)	0.11*** (3.72)	-0.02 (-1.00)	-0.06 (-1.40)	0.12*** (5.57)	0.00 (0.05)	-0.01 (-0.42)
Never-married	-0.06*** (-2.69)	0.01 (0.61)	0.01 (0.23)	-0.03 (-1.00)	0.00 (0.19)	-0.02 (-0.44)	-0.01 (-0.51)	0.00 (0.33)	-0.02 (-0.87)
Widowed	-0.04 (-0.44)	-0.36*** (-6.95)	-0.01 (-0.06)	0.01 (0.25)	0.01 (0.28)	-0.06 (-1.11)	-0.01 (-0.37)	0.01 (0.89)	-0.03 (-1.67)
Divorced	0.11*** (3.84)	-0.01 (-0.52)	0.04 (1.02)	0.07*** (2.23)	-0.02 (-1.00)	-0.03 (-0.66)	0.05*** (2.59)	0.00 (0.47)	-0.00 (-0.22)
Rented house	0.07*** (4.69)	-0.02*** (-3.07)	0.00 (0.03)	0.07*** (4.42)	0.02*** (2.25)	0.00 (0.18)	0.08*** (7.59)	0.02** (2.75)	-0.01 (-0.40)
Number of family members	0.01*** (2.14)	-0.01*** (-2.05)	0.00 (0.50)	0.02*** (3.97)	0.00 (1.23)	-0.01 (-1.19)	0.01*** (3.27)	0.00** (1.98)	-0.00 (-1.08)
No. obs.	5,718	5,718	5,718	6,161	6,161	6,161	10,361	10,361	10,361

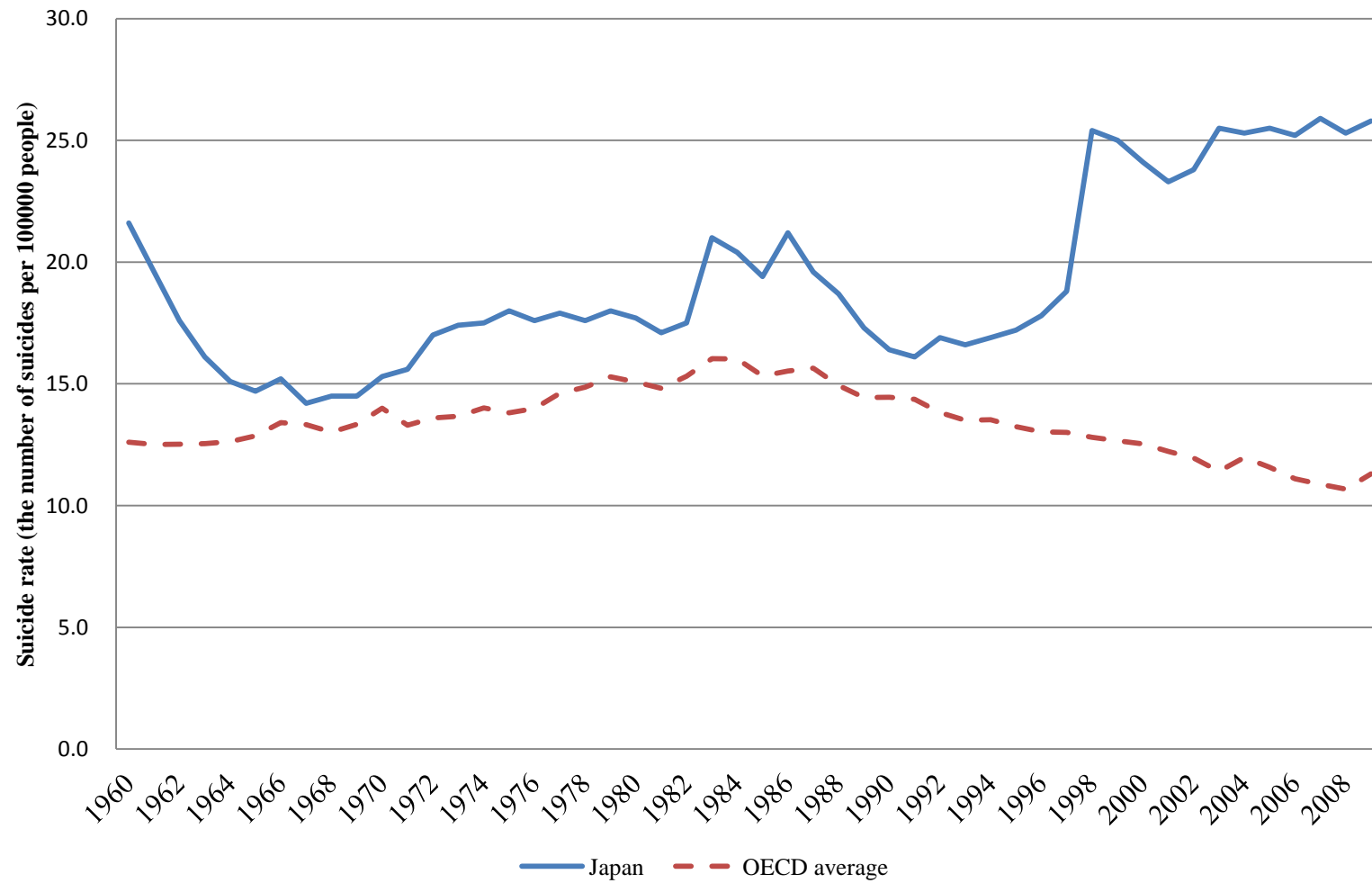
Notes: The numbers in the parentheses are z-statistics for the coefficients. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. B, D, and E correspond to the statuses with regard to the perception of and consultation for stress, as we have noted in Figure 5.1. Columns D and E concern the probabilities of D and E, respectively, conditional on B.

Table 5.7 Estimated sequential logistic model of consultation conditional on the perception of stress for males aged 35 - 74

	B (1)	35-44		B (4)	45-54		B (7)	55-74	
		D (2)	E (3)		D (5)	E (6)		D (8)	E (9)
Jobless 1	0.10 (1.36) [-2.44]	0.11*** (2.93) [-2.55]	-2.66*** (-28.40) [26.10]	0.08 (1.45) [-1.70]	-0.01 (-0.28) [0.68]	-0.09 (-0.99) [0.80]	0.04*** (4.34) [-2.02]	-0.00 (-0.48) [0.74]	-0.08*** (-4.93) [2.42]
Jobless 2	0.32*** (5.32) [-4.16]	-0.00 (-0.14) [0.34]	-0.11 (-1.44) [0.49]	0.18*** (3.48) [-0.38]	0.04** (2.20) [-1.52]	-0.10 (-1.20) [0.75]	0.18*** (7.34) [-0.42]	0.02 (1.43) [-0.53]	-0.06* (-1.78) [0.29]
Unemployed	0.11** (2.52) [-0.27]	0.01 (0.50) [-0.73]	-0.11 (-1.66) [0.34]	0.07* (1.85) [0.72]	0.04*** (2.39) [-2.05]	0.03 (0.58) [-1.33]	0.12*** (5.98) [-0.28]	0.01 (1.02) [-0.60]	-0.00 (-0.04) [-0.28]
Never-married	-0.05** (-2.12) [-0.38]	0.01 (1.04) [-0.28]	0.09*** (2.76) [-1.63]	-0.00 (-0.19) [-0.66]	0.03** (2.10) [-1.12]	0.07* (1.77) [-1.40]	-0.00 (-0.00) [-0.38]	0.03*** (3.71) [-1.81]	0.08*** (3.26) [-2.66]
Widowed	-0.03 (-0.19) [-0.02]	- - -	3.07*** (20.70) [-13.60]	0.03 (0.38) [-0.22]	- - -	0.27 (2.75***) [-2.91]	0.04 (1.60) [-1.57]	0.02 (1.39) [-0.61]	0.09*** (3.23) [-3.61]
Divorced	0.01 (0.21) [1.97]	-0.00 (-0.13) [-0.20]	0.10* (1.81) [-0.78]	0.06* (1.74) [0.105]	0.03 (1.57) [-1.79]	0.07 (1.43) [-1.49]	0.06*** (3.15) [-0.715]	0.02*** (2.25) [-1.22]	0.09*** (3.39) [-2.57]
Rented house	0.03*** (2.22) [1.54]	-0.00 (-0.17) [-2.17]	-0.01 (-0.26) [0.27]	0.01 (0.90) [2.36]	0.01 (0.74) [0.94]	-0.00 (-0.14) [0.21]	0.04*** (3.50) [2.69]	0.00 (0.60) [1.44]	0.03* (1.89) [-1.63]
Number of family members	-0.01 (-1.19) [2.31]	-0.00 (-1.25) [-0.73]	0.00 (0.34) [0.17]	0.00 (0.88) [2.01]	0.00 (1.08) [0.07]	-0.00 (-0.42) [-0.56]	0.00 (1.40) [1.10]	0.00 (1.39) [0.34]	0.00 (0.12) [-0.87]
Female	0.03 (0.84)	0.02 (0.69)	-0.13** (-2.21)	0.04 (1.44)	-0.01 (-0.45)	-0.08 (-1.64)	0.06*** (3.99)	-0.02 (-1.64)	-0.06*** (-2.21)
No. obs.	11,169	11,169	11,169	12,111	12,111	12,111	20,285	20,285	20,285

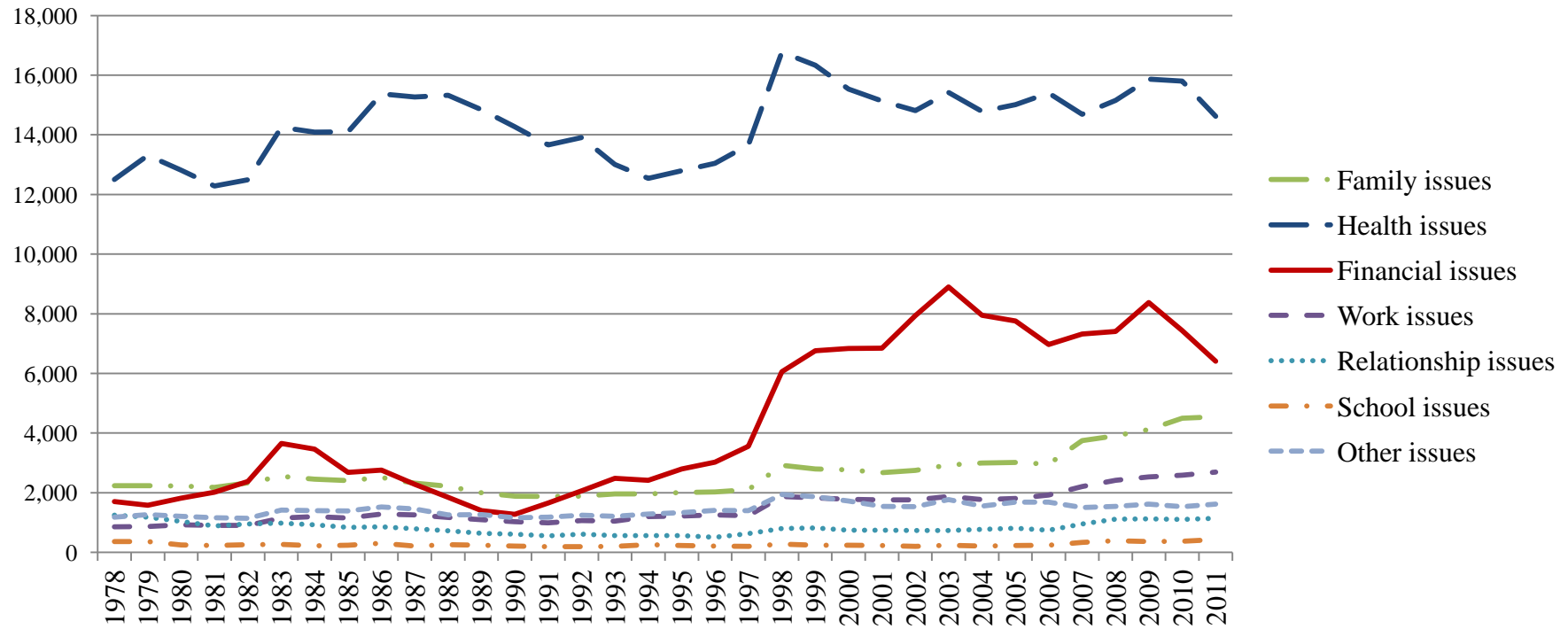
Notes: The numbers in the parentheses are z-statistics for the coefficients while those in the brackets are z-statistics for the difference between coefficients for males and those for females shown in Table 5.6. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. B, D, and E correspond to the statuses with regard to the perception of and consultation for stress, as we have noted in Figure 5.1. Columns D and E concern the probabilities of D and E, respectively, conditional on B. We fail to estimate the probabilities of D for widowed males aged 35-44 and 45-54 due to the small sample sizes of widowed males in these age groups.

Figure 3.1 Trends in the suicide rate (1960-2009), Japan and the OECD average



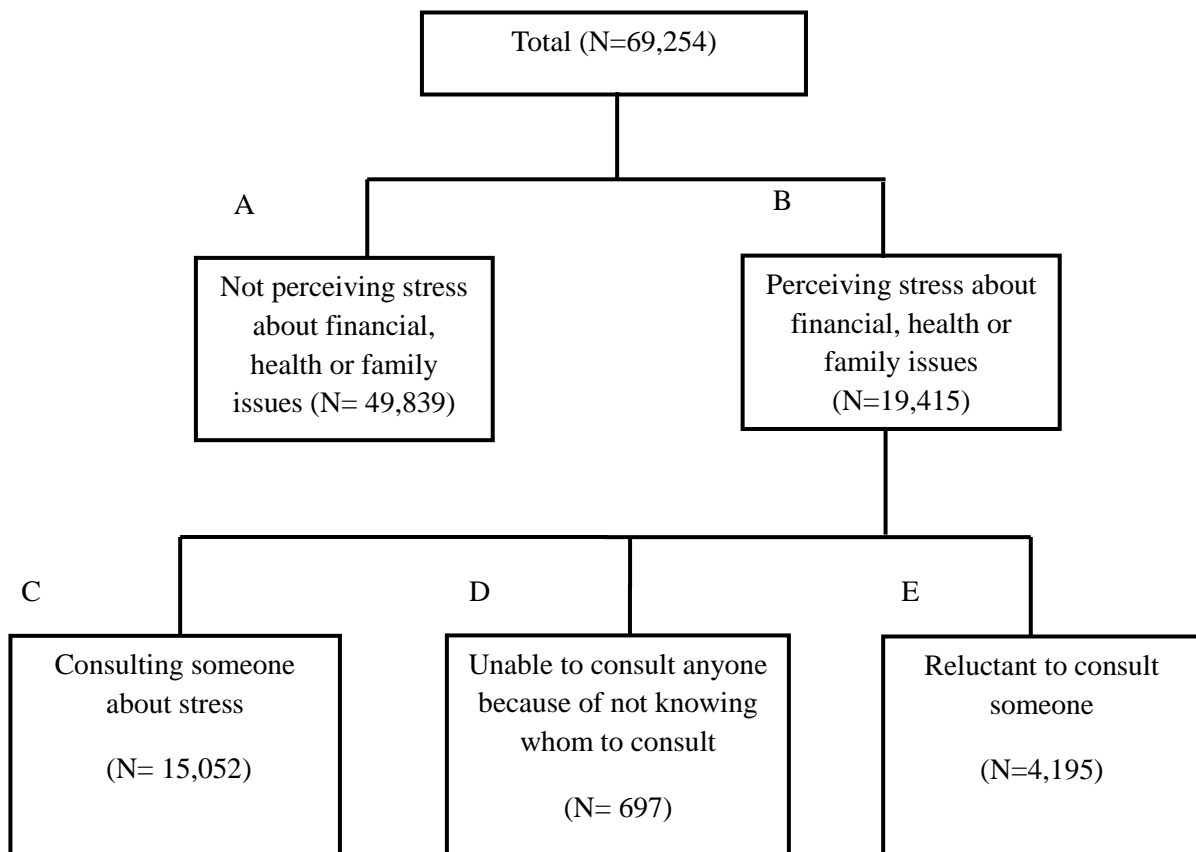
Source: Cabinet Office (2011), OECD Factbook 2011-2012

Figure 3.2 Suicide motives in Japan (1978-2011)



Source: Cabinet Office (2011)

Figure 5.1 Sequential stages of the perception of stress and consultation decisions



Appendix Table A: Variable definitions, available years and the sources

Variables	Definition	Data year	Sources
Suicide rate	The number of suicide deaths per 100,000 persons	2001-2010	Vital statistics, Ministry of Health, Labor and Welfare
Rate of perception	The number of individuals who perceive various stress and somatic symptoms	2001, 2004, 2007, 2010	Comprehensive Survey of Living Conditions (prefecture estimates), Ministry of Health, Labor and Welfare
Rate of consultation	The number of individuals who have consulted someone about their stress	2004, 2007, 2010	Comprehensive Survey of Living Conditions (prefecture estimates), Ministry of Health, Labor and Welfare
Job offer ratio	The number of job offers available per job seeker	2001-2010	Job/employment Placement Services Statistics, Ministry of Health, Labor and Welfare
Birth rate	The number of births per 1,000 persons	2001-2010	Portal Site of Official Statistics of Japan, Ministry of Internal Affairs and Communications
Divorce rate	The number of divorced individuals per 1,000 persons	2001-2010	Portal Site of Official Statistics of Japan, Ministry of Internal Affairs and Communications
Mental health spending	The amount of money spent on mental health promotion	2001-2010	Portal Site of Official Statistics of Japan, Ministry of Internal Affairs and Communications
Psychiatric hospitals	The number of psychiatric hospitals per 100,000 persons	2001-2010	Portal Site of Official Statistics of Japan, Ministry of Internal Affairs and Communications
Age group population distribution	The percentage of total population	2001-2010	Vital statistics, Ministry of Health, Labor and Welfare

Appendix Table B: Author's translation of the CSLS survey questionnaire in 2004

PART 1: GENERAL HOUSEHOLD INFORMATION

Accommodations		(2) Number of rooms	(3) Type of one-person household (If a respondent has a one-person household)	(4) Type of households with out-migrants	(5) Amount of allowances to children or parents living elsewhere	(6) Household head Copy Household member ID from (9) ()
(1) Housing types						
1. On your own	1. Single-family house 2. Apartment house	() rooms	1. Live-in employee	1. Job transfer	Total household expenditure () yen	
2. Privately-rented			2. Other one-person household	2. Elderly care facility		
3. Publicly-rented		Floor area	3. Job transfer without family	3. Other social facility	Allowances for parents () yen	
				1 In prison, or hospitalization		
				2. Other		
4. Other		() m ²	4. Non-job transfer without family	4. Long hospitalization	Allowances for children () yen	
					1 Study	
					2. Other	

Please answer if you have children born after October, 1998						
(7) Childcare during daytime					(8) Expenses of childcare within May, 2004	
Children's household member ID from (9)	Person in charge of childcare 1. Parents 2. Grandparents 3. Registered nursery center 4. Non-registered nursery center 5. Kindergarten 6. Other					
()	1	2	3	4	5	6
()	1	2	3	4	5	6
()	1	2	3	4	5	6

(9) ID	(10) Relation with household head	(11) Sex	(12) Month of birth (year, month)	(13) Marital status	(14) Health insurance		(15) Public pension	Please answer if you are older than 6 years old	
								(16) Need for nursing care	Please answer if you are older than 40 years old
									(17) Certification of care need
01	1. Household head 2. Spouse 3. Child 4. Child's spouse 5. Grandchild 6. Grandchild's spouse 7. Parent 8. Spouse's parent 9. Grandparent 10. Sibling 11. Other relative 12. Other	1. M 2. F	(,)	1. Married 2. Unmarried 3. Widowed 4. Divorced	1. National health insurance 2. Employee's health insurance 3. Other	1. Municipality 2. Association 1. Employee himself/herself 2. His/her family	1. Basic 2. Basic + Employee 3. Basic + Mutual 4. National 5. Welfare annuity 6. Employee 7. Mutual 8. Governmental pension 9. Not receiving any	1. Yes 2. No	1. Yes 2. No

(9) ID	(18) Job status & Willingness to work			
01	1. paid job 2. housework and paid job 3. studying and paid job 4. other and paid job 5. Studying 6. Homemaker 7. Other	Secondary job 1. Yes 2. No Willingness to work 1. Yes---1. Able to work 2. No 2. Unable to work		1. Looking for jobs 2. Not looking for jobs Types of jobs 1. Full-time, regular 2. Part-time 3. Contingent worker 4. Contract worker 5. Self-employee 6. Other

(9) ID	(19) Ascendance to public pension system	(20) Presence of children who live separately	(21) Occupation	
01	1. First insured person of national pension 2. Second insured person of national pension (employee pension and mutual pension) 3. Third insured person of national pension (Spouse is insured by either employee pension or mutual pension) 4. Not ascended to any pension system	1. Yes, I have children living separately How many? () children Places where children live 1. Same house 2. Same property 3. Neighborhood 4. Same municipality 5. Other 2. No, I do not have children living separately	1. Self-employee (with employees) 2. Self-employee (without employees) 3. Family worker 4. Executive officer 5. Employee 6. Contract worker (more than one month and less than one year) 7. Contract worker (less than one month) 8. Homeworker 9. Other → Address term in companies 1. Regular worker 2. Part-time 3. "Arbeit" 4. Contingent worker 5. Contract worker 6. Other	→ Company size/Civil service 1. 1-4 2. 5-29 3. 30-99 4. 100-299 5. 300-499 6. 500-999 7. 1000-4999 8. 5000- 9. Civil service

(9) ID	(22) Beginning period of engaging in paid jobs, working hours, and commuting time	(23) Ascendance to employment insurance	(24) ID of a person who needs nursing care (Copy from (9))	(25) Extent of independence of living conditions of (24)	(26) Relationship with (24)
01	<p>Beginning period of current jobs (,) (year, month)</p> <p>Number of days and hours of working from May 24th to 30th (,) (days, hours)</p> <p>Commuting time (single trip) () minutes</p>	<p>1. Yes 2. No</p>		<p>Living conditions</p> <ol style="list-style-type: none"> 1. Able to go out on his/her own despite some physical disabilities 2. Unable to go out on his/her own without help while there is no problem leading his/her life indoors 3. Need help indoors and spend most of the time on bed during daytime, but keep seated position on bed 4. Stay in bed all day and need help in egesting, eating and changing clothes <p>Period of the living conditions above</p> <ol style="list-style-type: none"> 1. Less than one month 2. One month to three months 3. Three months to six months 4. Six months to one year 5. One year to three years 6. Three years to five years 7. Five years to ten years 8. Ten years to twenty years 9. More than twenty years 	<ol style="list-style-type: none"> 1. Spouse 2. Child 3. Child's spouse 4. Parent 5. Other relative 6. Business operator 7. Other

(9) Household member ID	(27) Whether (24) lives with you or not	(28) Gender of (24)
01	1. Yes 2. No	1. Male 2. Female

Please continue to answer the questions (10) to (28) for all the household members.

Thank you for your cooperation.

PART2: HEALTH INFORMATION

1. Male 2. Female	Month of birth () (year, month)
----------------------	----------------------------------

Q.1 Are you currently in hospital or in care insurance facility?

1. Yes	Go to the question 4
2. No	Go to the question 2

Q. 2 Do you recognize any symptoms due to illness or injury within a few days?

1. Yes	Go to the question 2-1
2. No	Go to the question 3

Q. 2-1 What kinds of symptoms do you have? Check all that apply. Amongst the symptoms you perceive, please answer which symptom is the most concerned one?

01 Fever	15 Coughing and sputum	29 Shoulder stiffness
02 Fatigue	16 Blocked nose ad runny nose	30 Backache
03 Sleep difficulties	17 Pant	31 Aching joints of hands and feet
04 Irritability	18 Heartburn	32 Lack of movement in hands and legs
05 Memory loss	19 Diarrhea	33 Numbness in hands and feet
06 Headache	20 Constipation	34 Cold limbs
07 Dizziness	21 Loss of appetite	35 Edema
08 Blurred vision	22 Stomachache	36 Micturition pain
09 Impairment of vision	23 Hemorrhoid	37 Frequent micturition
10 Buzzing in the ear	24 Toothache	38 Acraturesis
11 Hearing impairment	25 Swollen gum	39 Irregular menstruation
12 Palpitation	26 Difficulties in chewing	40 Broken bones, sprain or abarticulation
13 Breath shortness	27 Hives	41 Cut or burn injury
14 Chest pain	28 Itchiness	42 Other

Most concerned ()

Q. 2-2 Do you receive any treatment against the most concerned symptom? Check all that apply.

1 Go to hospitals or clinics (including home visit)	4 Other treatment
2 Go to acupuncture clinics	5 Do not receive any treatment
3 Over-the-counter remedy	

Q. 3 Are you currently receiving any treatment (including hospital, clinic, acupuncture clinic visits and home visit)?

1. Yes	Go to the question 3-1
2. No	Go to the question 4

Q. 3-1 What kinds of diseases or injuries make you have to receive some treatment? Amongst the diseases you have, please answer which disease is the most concerned one? Please answer the disease that requires you the longest treatment.

01 Diabetes	17 Cold	33 Rheumatism
02 Obesity	18 Allergy	34 Joint pain
03 Hypercholesteremia	19 Asthma	35 Stiff shoulder
04 Thyroid diseases	20 Other respiratory disorders	36 Backache
05 Dementia	21 Gastric inflammation	37 Osteoporosis
06 Mental disorders (Depression, Schizophrenia and others)	22 Gastric ulcer	38 Renal diseases
07 Neurotic diseases	23 Hepatic inflammation	39 Prostatic hyperplasia
08 Autonomic ataxia	24 Gallstone	40 Climacteric disorder
09 Cataracta	25 Other digestive diseases	41 Broken bones
10 Retinal diseases	26 Cavities	42 Injury or burn other than broken bones
11 Tympanitis	27 Gingivitis	43 Anemia
12 Hypacusia	28 Atopic disease	44 Cancer
13 Hypertension	29 Irritated skin	45 Pregnancy
14 Cerebral stroke	30 Rash	46 Atocia
15 Cardiac infarct	31 Alopecia	47 Other
16 Other circulatory system disorders	32 Gout	48 Unspecified

Most concerned () Longest treatment ()

Q. 3-2 How long has it passed since you started receiving treatment for the illness for which you have been treated for longest period? (Choose one)

1. Less than one week	4. Three months to six months	7. Five years to ten years
2. One week to one month	5. Six months to one year	8. Ten years to twenty years
3. One month to three months	6. One year to five years	9. More than twenty years

Q.4 How much did you spend for medical expense during this May?

() yen

Please answer the following questions if you are six years and older.

Q.5 Do you have any health problems that interfere with your daily life?

1. Yes	Go to the question 5-1
2. No	Go to the question 6

Q. 5-1 What kinds of things are interfered with by your health problems?

1 Activities of daily living	4 Physical exercise
2 Outing	5 Other
3 Paid job, housework, or study	

Q.6 How many days did you have to stay in bed due to your health problems?

1 None	4 Seven to fourteen days
2 One to three days	5 More than fifteen days
3 Four to six days	

Q.7 How is your current health condition?

1 Good	4 Not very good
2 Fairy good	5 Bad
3 Normal	

Please answer the following questions if you are twelve years and older.

Q.8 Do you feel any concerns or stress?

1. Yes	Go to the question 8-1
2. No	Go to the question 9

Q. 8-1 What are the sources of your concerns or stress? Please check all that apply.

01 Family relations	11 Nursing care (families living separately)	21 Employment issues(yourself and your spouse)
02 Non-family relations	12 Love affairs	22 Other employment issues
03 Purpose of life	13 Marriage	23 Study or entrance exam
04 No free time	14 Divorce	24 School bullying
05 Future income	15 Sexual matters	25 Sexual harassment
06 Future nursing care	16 Pregnancy and delivery	26 Financial matters
07 Health matters (yourself)	17 Child bearing	27 Living conditions
08 Health matters (families living together)	18 Child's education	28 Other
09 Health matters (families living separately)	19 Child's job	29 Unspecified
10 Nursing care (families living together)	20 Housework	

Most concerned ()

Q.8-2 To whom do you consult about your concerns or stress? Please check all that apply.

01 Family	06Hospitals or clinics
02 Friends	07 Consulting corner in IV program, radio, or newspapers
03 Supervisor, colleague or teacher	08 Other than 01-07
04 Public consultation services (Health care center, Welfare office, etc)	09 Unable to consult because not knowing whom to consult
05 Private consultation services	10 Do not want consult anyone
	11 Do not feel need to consult anyone

Consultation status for the most concerned issue ()

Q. 9 Do you smoke?

1 No	
2 Yes, I smoke everyday	
3 Yes, I smoke sometimes	
4 I used to, but I have not smoked for more than a month	



How many cigarettes do you smoke per day?

1 Less than ten
2 11-20
3 21-30
4 More than 31

Please answer the following questions if you are 20 years old and older. End of the questionnaire for those who are 19 years old and younger.

Q.10 Have you taken any medical checkups within a year?

1. Yes	Go to the question 10-1, 10-2, and 10-3
2. No	Go to the question 10-4

Q. 10-1 What kinds of medical checkups did you take? Please check all that apply.

1 Recommended by municipality offices
2 Recommended by workplace
3 Recommended by schools
4 Complete medical checkups (other than 1-3)
5 Other

Most recent one ()

The following two questions are about your most recent medical checkup you took.

Q. 10-2 Did you receive any medical advice based on the results of your checkup?

1. Yes
2. No

If yes, did the doctor recommend you to receive any medical treatment?

1. Yes
2. No

If yes, did you actually receive treatment?

1. Yes
2. No

Q.10-3 Do you start paying any attention to your health management?

1. Yes
2. No
3. Do not know

Q. 10-4 What reasons prevented you from taking medical checkups?

01 Did not know	07 Did not think I had to
02 Did not have time	08 I was confident of my health conditions and I did not feel necessary
03 Far from the checkup place	09 I thought I could receive treatment whenever I have health concerns
04 High medical expenses	10 Worried about the checkup results, so I do not want to
05 Fear against the checkup	11 Too much of a bother
06 Hospitalized on the day of the checkup	12 Other

Q. 11 Did you receive cancer screenings within a year?

1 Stomach cancer screening	4 Breast cancer screening
2 Lung cancer screening	5 Bowel cancer screening
3 Uterus cancer screening	6 Did not receive any listed from 1 to 5

END OF SURVEY

Appendix Table C: Estimated two-way fixed effect model of suicide rates and the rates of perception of various mental health problems with prefecture-level panel data 2001-2010 including additional variables

Table C.1 Estimated Two-way fixed effect model of suicide rates and the rates of perception of various mental health problems with prefecture-level panel data 2001-2010 (Females)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Suicide	Stress Overall	Stress Financial	Stress Health	Stress Family	Somatic Symptoms	Sleep Difficulties	Fatigue	Irritability
ln (job offer)	-0.02 (-0.48)	-0.00 (-0.43)	-0.06*** (-2.75)	0.01 (0.52)	0.02 (0.73)	0.06*** (3.82)	0.01 (0.23)	0.04 (1.17)	0.10** (2.37)
ln (birth)	0.16 (0.56)	-0.09 (-1.13)	-0.28 (-1.47)	0.01 (0.06)	0.48** (2.67)	0.15 (1.45)	0.61** (2.20)	-0.07 (-0.30)	0.03 (0.09)
ln (divorce)	0.06 (0.31)	0.00 (0.05)	0.19* (1.77)	-0.04 (-0.37)	0.16 (1.01)	-0.04 (-0.37)	-0.13 (-0.52)	0.02 (0.12)	0.42 (1.61)
ln (MH spending)	0.00 (0.23)	-0.00 (-0.37)	-0.00 (-0.18)	-0.00 (-0.26)	-0.00 (-0.67)	0.00 (0.12)	0.00 (0.23)	-0.01 (-0.72)	0.00 (0.24)
ln (hospitals)	-0.16* (-2.01)	-0.05* (-1.72)	-0.02 (-0.22)	0.04 (0.69)	-0.15** (-2.44)	-0.03 (-0.89)	0.19 (1.60)	-0.02 (-0.34)	-0.05 (-0.40)
Age 15-34 (%)	3.92 (1.20)	2.20*** (2.92)	-0.50 (-0.31)	0.23 (0.15)	0.91 (0.60)	1.30 (1.35)	3.86 (1.41)	4.19*** (2.69)	1.78 (0.67)
Age 35-74 (%)	5.93* (1.81)	0.07 (0.10)	-2.13 (-1.47)	-3.61** (-2.48)	3.39* (1.76)	-0.13 (-0.14)	3.26 (1.46)	3.14 (1.67)	1.03 (0.33)
Age 75over (%)	2.63 (0.60)	-1.22 (-1.19)	-2.03 (-0.72)	-2.98* (-1.73)	6.27** (2.67)	1.21 (1.10)	6.27** (2.13)	5.65** (2.14)	1.83 (0.48)
Constant	-2.12 (-0.72)	10.60*** (17.79)	11.23*** (9.02)	11.89*** (9.44)	5.32*** (3.29)	9.81*** (13.00)	3.69* (1.79)	5.64*** (3.38)	6.71** (2.46)
No. obs.	470	188	188	188	188	188	188	188	188
R-squared	0.06	0.65	0.90	0.98	0.75	0.69	0.53	0.29	0.30

Notes: Note: Each specification includes the prefecture fixed effects and time effects, which account for the time-invariant prefecture specific characteristics and the nationwide time effects. *t*-statistics are reported in the parentheses. Standard errors are clustered at prefecture level. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

Table C.2 Estimated Two-way fixed effect model of suicide rates and the rates of perception of various mental health problems with prefecture-level panel data 2001-2010 (Males)

	(1) Suicide	(2) Stress Overall	(3) Stress Financial	(4) Stress Health	(5) Stress Family	(6) Somatic Symptom	(7) Sleep Difficulties	(8) Fatigue	(9) Irritability
ln (job offer)	-0.11*** (-4.03) [2.05]	-0.02** (-2.03) [1.48]	-0.09*** (-3.26) [0.70]	0.05* (1.74) [-0.88]	0.03 (0.92) [-0.27]	-0.05*** (-2.76) [3.84]	-0.10* (-1.79) [1.31]	-0.05 (-1.18) [1.81]	-0.03 (-0.87) [1.96]
ln (birth)	0.06 (0.28) [0.33]	0.02 (0.33) [-1.52]	-0.20 (-0.88) [-0.34]	0.46*** (2.77) [-1.53]	0.38 (1.29) [0.24]	-0.17 (-1.33) [1.93]	-0.43 (-1.21) [2.02]	-0.13 (-0.41) [0.13]	-0.36 (-0.74) [0.68]
ln (divorce)	0.31** (2.26) [-0.97]	-0.03 (-0.55) [0.46]	0.17 (1.10) [0.09]	0.11 (0.79) [-0.84]	0.26 (1.37) [-0.34]	0.20** (2.13) [-1.61]	0.03 (0.10) [-0.36]	0.00 (0.01) [0.06]	0.25 (0.86) [0.46]
ln (MH spending)	0.01* (1.87) [-0.74]	0.00 (0.28) [-0.60]	-0.00 (-0.28) [0.02]	0.01 (0.83) [-0.81]	0.01 (0.83) [-1.12]	-0.00 (-0.59) [0.55]	0.03*** (3.38) [-2.37]	-0.01 (-1.02) [0.15]	0.01 (0.63) [-0.35]
ln (hospitals)	-0.01 (-0.15) [-1.43]	-0.06* (-1.72) [0.11]	-0.04 (-0.54) [0.31]	0.01 (0.07) [0.39]	0.03 (0.29) [-1.48]	-0.04 (-0.94) [0.23]	-0.12 (-0.71) [1.44]	0.05 (0.49) [-0.51]	0.08 (0.54) [-0.53]
Age 15-34 (%)	-0.70 (-0.37) [1.31]	2.17** (2.59) [0.05]	0.75 (0.42) [-0.49]	0.82 (0.53) [-0.32]	4.71* (1.83) [-1.51]	0.36 (0.32) [0.85]	4.22 (1.36) [-0.09]	5.18 (1.59) [-0.27]	0.57 (0.22) [0.32]
Age 35-74 (%)	-0.54 (-0.24) [1.97]	0.26 (0.30) [-0.22]	-0.83 (-0.40) [-0.57]	-3.20** (-2.04) [-0.19]	0.57 (0.18) [0.85]	1.39 (1.16) [-1.06]	3.54 (1.19) [-0.06]	4.93 (1.42) [-0.49]	0.79 (0.22) [0.05]
Age 75over (%)	-2.50 (-0.92) [1.11]	-1.25 (-1.38) [0.03]	-2.81 (-0.95) [0.22]	-2.21 (-0.78) [-0.27]	-2.56 (-0.69) [1.93]	-2.86* (-1.92) [2.09]	-6.24 (-1.29) [1.80]	-2.60 (-0.73) [1.81]	-7.90 (-1.50) [1.45]
Constant	3.89** (2.02) [-2.03]	10.10** (14.67) [0.68]	10.10*** (5.78) [0.67]	10.09** (7.32) [0.95]	6.11** (2.27) [-0.22]	9.92*** (9.56) [0.15]	6.01** (2.22) [-0.42]	5.08* (1.85) [0.30]	8.43** (2.51) [-0.33]
No. obs.	470	188	188	188	188	188	188	188	188
R-squared	0.31	0.69	0.91	0.98	0.52	0.68	0.58	0.59	0.61

Notes: Each specification includes the prefecture fixed effects and time effects, which account for the time-invariant prefecture specific characteristics and the nationwide time effects. *t*-statistics are reported in the parentheses. *t*-statistics for the difference in the coefficients between females and males are reported in the brackets. Standard errors are clustered at prefecture level. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

Table C.3 Estimated Two-way fixed effect model of suicide rates and the rates of perception of stress with prefecture-level panel data 2001-2010 by age groups

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Suicide						Stress					
	Female			Male			Female			Male		
	15-34	35-74	75+	15-34	35-74	75+	15-34	35-74	75+	15-34	35-74	75+
ln (job offer)	-0.02 (-0.20)	-0.02 (-0.52)	0.07 (0.75)	-0.02 [-0.02]	-0.15*** [-4.22]	-0.07 [-1.14]	-0.02* (-1.82)	0.00 (0.03)	0.01 (0.19)	-0.02 (-0.81)	-0.02** (-2.02)	-0.02 (-0.39)
ln (birth)	0.43 (0.44)	-0.09 (-0.26)	0.63 (1.17)	-0.09 [0.46]	0.02 [-0.27]	0.67 [-0.05]	-0.16 (-0.99)	-0.03 (-0.37)	-0.16 (-0.84)	0.11 (0.67)	-0.10 (-1.08)	0.85** (2.58)
ln (divorce)	0.29 (0.58)	0.18 (0.68)	-0.08 (-0.18)	0.28 [0.02]	0.38** [-0.60]	-0.34 [0.40]	-0.21* (-1.71)	0.05 (0.66)	0.31* (1.87)	-0.10 (-0.67)	-0.03 (-0.48)	0.10 (0.44)
ln (MH spending)	0.01 (0.37)	0.00 (0.11)	-0.00 (-0.17)	0.02 [-0.14]	0.02* [-0.89]	-0.01 [0.27]	0.01 (1.23)	-0.00 (-1.07)	0.01 (1.04)	-0.01 (-0.88)	0.00 (0.75)	0.01 (0.97)
ln (hospitals)	-0.67** (-2.21)	-0.09 (-0.91)	-0.10 (-0.44)	-0.14 [-1.69]	0.04 [-0.95]	-0.16 [0.25]	-0.07 (-1.11)	-0.02 (-0.66)	-0.16** (-2.06)	0.02 (0.28)	-0.05 (-1.31)	-0.12 (-0.98)
Age 15-34 (%)	-3.79 (-0.51)	1.81 (0.53)	12.61* (1.89)	-3.99 [0.02]	-1.85 [0.99]	9.02 [0.44]	1.74* (1.71)	1.77** (2.18)	-0.29 (-0.16)	1.27 (0.90)	1.62* (1.69)	4.92 (1.51)
Age 35-74 (%)	-7.77 (-0.83)	2.68 (0.73)	14.74** (2.44)	-3.92 [-0.36]	-2.18 [1.07]	3.71 [1.28]	-0.73 (-0.73)	-0.11 (-0.14)	-1.05 (-0.60)	0.52 (0.33)	-0.71 (-0.70)	4.31 (1.24)
Age 75over (%)	16.33 (1.38)	-3.23 (-0.57)	9.73 (1.16)	-4.90 [1.46]	-3.36 [0.02]	6.57 [0.28]	-2.62 (-1.63)	-0.13 (-0.11)	-2.18 (-1.05)	0.28 (0.16)	-2.20** (-2.10)	5.93 (1.60)
Constant	4.32 (0.49)	1.26 (0.37)	-10.17* (-1.94)	5.92** (2.02)	5.43** (2.04)	-2.65 (-0.42)	11.50*** (12.81)	10.61*** (15.70)	11.63*** (7.84)	9.88*** (7.79)	11.12*** (13.46)	4.64 (1.59)
No. obs.	470	470	470	470	470	470	188	188	188	188	188	188
R-squared	0.25	0.05	0.16	0.34	0.43	0.07	0.47	0.73	0.57	0.35	0.71	0.57

Notes: Each specification includes the prefecture fixed effects and time effects, which account for the time-invariant prefecture specific characteristics and the nationwide time effects. *t*-statistics are reported in the parentheses. *t*-statistics for the difference in the coefficients between females and males are reported in the brackets. Standard errors are clustered at prefecture level. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

Table C.4 Estimated fixed effect model of suicide and consultation among females and males

	Suicide						Consultation					
	Female			Male			Female			Male		
	15-34 (1)	35-74 (2)	75over over (3)	15-34 (4)	35-74 (5)	75 over (6)	15-34 (7)	35-74 (8)	75 over (9)	15-34 (10)	35-74 (11)	75 over (12)
ln(job offer)	-0.02 (-0.20)	-0.02 (-0.52)	0.07 (0.75)	-0.02 (-0.29) [-0.02]	-0.15*** (-4.22) [1.98]	-0.07 (-1.14) [1.50]	0.01 (0.37)	-0.02 (-1.25)	-0.01 (-0.20)	-0.05 (-0.91) [0.91]	-0.03 (-0.80) [0.10]	-0.12 (-1.34) [0.92]
ln(birth)	0.43 (0.44)	-0.09 (-0.26)	0.63 (1.17)	-0.09 (-0.21) [0.46]	0.02 (0.07) [-0.27]	0.67 (1.26) [-0.05]	0.39 (1.22)	0.36 (1.39)	-0.09 (-0.17)	0.71* (1.80) [-0.61]	0.62** (2.12) [-1.02]	1.38** (2.38) [-1.78]
ln(divorce)	0.29 (0.58)	0.18 (0.68)	-0.08 (-0.18)	0.28 (0.94) [0.02]	0.38** (2.23) [-0.60]	-0.34 (-0.80) [0.40]	-0.21 (-0.93)	-0.05 (-0.37)	0.34 (0.98)	-0.16 (-0.51) [-0.12]	0.05 (0.24) [-0.33]	0.20 (0.41) [0.20]
ln(MH spending)	0.01 (0.37)	0.00 (0.11)	-0.00 (-0.17)	0.02 (1.22) [-0.14]	0.02* (1.81) [-0.89]	-0.01 (-0.52) [0.27]	0.00 (0.42)	-0.01 (-0.91)	0.00 (0.09)	-0.00 (-0.25) [0.33]	0.00 (0.05) [-0.56]	0.02 (1.26) [-1.03]
ln(Hostpitals)	-0.67** (-2.21)	-0.09 (-0.91)	-0.10 (-0.44)	-0.14 (-0.90) [-1.69]	0.04 (0.51) [-0.95]	-0.16 (-0.87) [0.25]	0.04 (0.49)	-0.02 (-0.43)	-0.10 (-0.73)	-0.11 (-1.09) [1.04]	-0.07 (-0.89) [0.42]	-0.35 (-1.22) [0.63]
Age 15-34 (%)	-3.79 (-0.51)	1.81 (0.53)	12.61* (1.89)	-3.99 (-1.11) [0.02]	-1.85 (-0.87) [0.99]	9.02 (1.27) [0.44]	1.66 (0.75)	2.21 (1.10)	3.02 (0.55)	-4.51 (-1.52) [1.56]	-7.71** (-2.40) [2.71]	-6.15 (-1.41) [1.25]
Age 35-74 (%)	-7.77 (-0.83)	2.68 (0.73)	14.74** (2.44)	-3.92 (-1.30) [-0.36]	-2.18 (-0.71) [1.07]	3.71 (0.50) [1.28]	-2.98* (-1.69)	-0.42 (-0.37)	-0.85 (-0.25)	-6.34*** (-2.69) [0.91]	-6.17** (-2.52) [2.04]	-9.19* (-1.77) [1.24]
Age 75over (%)	16.33 (1.38)	-3.23 (-0.57)	9.73 (1.16)	-4.90 (-1.06) [1.46]	-3.36 (-0.85) [0.02]	6.57 (0.88) [0.28]	-3.41 (-1.12)	0.48 (0.27)	-4.50 (-1.01)	-0.81 (-0.20) [-0.47]	-4.20 (-1.42) [1.27]	3.16 (0.44) [-0.71]
Constant	4.32 (0.49)	1.26 (0.37)	-10.17* (-1.94)	5.92** (2.02) [-0.09]	5.43** (2.04) [-0.98]	-2.65 (-0.42) [-1.02]	11.71*** (6.40)	9.57*** (7.43)	10.66*** (3.26)	13.26*** (5.61) [-0.53]	14.31*** (6.31) [-1.98]	12.53*** (2.83) [-0.47]
No. obs.	470	470	470	470	470	470	141	138	140	141	126	137
R-squared	0.25	0.05	0.16	0.34	0.43	0.07	0.52	0.38	0.32	0.35	0.57	0.52

Notes: Each specification includes the prefecture fixed effects and time effects, which account for the time-invariant prefecture specific characteristics and the nationwide time effects. The numbers in parentheses are *t*-statistics for the coefficients and the numbers in the brackets are *t*-statistics for the coefficients of the interaction terms between female dummies and the variables. Standard errors are clustered at prefecture level. ***, **, and * indicate statistical significance at the 1%, 5% and 10%, respectively.

Appendix Table D: Estimated random effect model of suicide rates and the rates of perception of various mental health problems with prefecture-level panel data 2001-2010 including additional variables

Table D.1 Estimated random effect model of suicide rates and the rates of perception of various mental health problems with prefecture-level panel data 2001-2010 (Females)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Suicide	Stress Overall	Stress Financial	Stress Health	Stress Family	Somatic Symptoms	Sleep Difficulties	Fatigue	Irritability
ln (job offer)	-0.05*	-0.00	-0.08***	0.02	0.03	0.05***	0.02	0.06*	0.08**
	(-1.77)	(-0.21)	(-4.08)	(0.97)	(1.17)	(4.35)	(0.69)	(1.78)	(2.37)
ln (birth)	0.05	0.02	-0.32***	-0.01	0.21	0.14*	0.53**	0.25	0.01
	(0.16)	(0.30)	(-2.77)	(-0.05)	(1.43)	(1.65)	(2.47)	(1.41)	(0.02)
ln (divorce)	-0.10	-0.04	0.15	0.04	-0.32***	0.00	0.31**	0.37***	0.37***
	(-0.73)	(-1.11)	(1.63)	(0.55)	(-2.78)	(0.03)	(2.43)	(3.01)	(2.63)
Age 15-34 (%)	2.89	2.11***	-0.29	2.34**	3.17**	2.38***	5.20***	3.80***	3.08
	(1.57)	(3.77)	(-0.27)	(1.98)	(2.49)	(2.89)	(2.84)	(3.08)	(1.50)
Age 35-74 (%)	6.68***	0.95	-1.92*	1.59	3.20**	1.98**	5.55***	2.43**	3.15
	(3.07)	(1.47)	(-1.77)	(1.26)	(2.22)	(2.09)	(3.01)	(1.98)	(1.38)
Age 75over (%)	4.58**	0.84	-1.75	3.51***	2.05*	3.29***	8.63***	5.58***	3.82*
	(2.17)	(1.40)	(-1.47)	(2.72)	(1.69)	(4.13)	(4.80)	(4.40)	(1.76)
Constant	-2.20	9.76***	11.40***	7.45***	6.26***	8.32***	1.87	5.18***	5.26**
	(-0.96)	(16.19)	(10.81)	(5.57)	(4.59)	(9.58)	(0.98)	(4.19)	(2.29)
No. obs.	470	188	188	188	188	188	188	188	188
R-squared	0.30	0.37	0.35	0.92	0.47	0.38	0.39	0.28	0.17
P value of Hausman test	N.A.	0.28	0.99	0.01	N.A.	0.00	0.50	0.00	0.95

Notes: Note: Each specification includes the prefecture fixed effects and time effects, which account for the time-invariant prefecture specific characteristics and the nationwide time effects. *t*-statistics are reported in the parentheses. Standard errors are clustered at prefecture level. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively. N.A. means “not applicable.” Since the variance of prefecture-specific effect was estimated to be zero, the random-effects estimator degenerated to Hausman’s specification test could not be carried out.

Table D.2 Estimated random effect model of suicide rates and the rates of perception of various mental health problems with prefecture-level panel data 2001-2010 (Males)

	(1) Suicide	(2) Stress Overall	(3) Stress Financial	(4) Stress Health	(5) Stress Family	(6) Somatic Symptom	(7) Sleep Difficulties	(8) Fatigu	(9) Irritability
ln (job offer)	-0.16*** (-5.62) [3.65]	-0.01 (-0.72) [-0.88]	-0.07*** (-2.81) [-1.64]	0.04* (1.88) [-1.38]	0.03 (1.02) [-0.39]	-0.00 (-0.17) [1.56]	0.03 (0.68) [-2.00]	0.02 (0.51) [-0.73]	0.04 (0.90) [-0.36]
ln (birth)	0.06 (0.30) [0.19]	0.05 (0.84) [-0.30]	-0.26* (-1.71) [0.17]	0.29* (1.72) [-1.31]	0.35* (1.85) [-0.49]	0.12 (1.30) [-0.75]	0.53** (2.03) [-1.07]	0.38* (1.73) [-1.26]	-0.02 (-0.07) [-0.04]
ln (divorce)	0.21* (1.82) [-2.02]	-0.08** (-1.99) [2.79]	-0.09 (-1.02) [6.12]	0.01 (0.08) [1.17]	-0.12 (-1.25) [-2.59]	-0.05 (-0.90) [4.43]	0.15 (0.87) [1.17]	0.10 (0.66) [2.46]	0.20 (1.15) [1.44]
Age 15-34 (%)	-2.40 (-1.46) [2.85]	2.58*** (3.36) [-1.91]	1.51 (1.36) [-1.75]	3.28** (2.27) [-1.97]	5.06*** (3.57) [-1.74]	0.74 (0.63) [1.43]	4.18 (1.63) [-0.44]	4.18** (2.00) [-0.65]	1.35 (0.54) [0.13]
Age 35-74 (%)	0.28 (0.16) [3.46]	1.46 (1.56) [-1.59]	-0.03 (-0.03) [-1.23]	2.38 (1.56) [-1.53]	3.82** (2.31) [-0.42]	2.08 (1.39) [-0.19]	7.07** (2.33) [-1.17]	5.47** (2.13) [-1.53]	2.70 (0.86) [0.14]
Age 75over (%)	3.04 (1.61) [0.81]	0.78 (1.10) [-0.73]	-0.45 (-0.34) [-1.21]	4.82*** (3.44) [-2.04]	4.25** (2.52) [-2.02]	0.72 (0.62) [2.09]	5.16* (1.93) [0.13]	4.55** (2.26) [-0.30]	0.90 (0.33) [0.34]
Constant	3.17* (1.75) [-2.70]	9.17*** (11.60) [1.73]	9.78*** (7.75) [0.97]	5.79*** (4.00) [1.90]	4.16** (2.51) [1.34]	8.60*** (6.80) [0.02]	1.19 (0.42) [1.07]	3.02 (1.34) [1.33]	5.66* (1.88) [0.04]
No. obs.	470	188	188	188	188	188	188	188	188
R-squared	0.54	0.47	0.70	0.92	0.36	0.24	0.20	0.26	0.24
P value of Hausman test	0.00	0.00	0.37	0.00	0.00	0.00	0.00	0.00	0.11

Notes: Each specification includes the prefecture fixed effects and time effects, which account for the time-invariant prefecture specific characteristics and the nationwide time effects. *t*-statistics are reported in the parentheses. *t*-statistics for the difference in the coefficients between females and males are reported in the brackets. Standard errors are clustered at prefecture level. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively. N.A. means “not applicable.” Since the variance of prefecture-specific effect was estimated to be zero, the random-effects estimator degenerated to Hausman’s specification test could not be carried out.

Table D.3 Estimated random effect model of suicide rates and the rates of perception of stress with prefecture-level panel data 2001-2010 by age groups

	Suicide						Stress					
	Female			Male			Female			Male		
	15-34	35-74	75+	15-34	35-74	75+	15-34	35-74	75+	15-34	35-74	75+
ln (job offer)	0.03 (0.41)	-0.06** (-2.26)	-0.03 (-0.45)	-0.08** (-2.01)	-0.22*** (-5.98)	-0.14** (-2.07)	-0.00 (-0.25)	0.00 (0.05)	0.01 (0.29)	0.00 (0.19)	-0.01 (-0.59)	0.00 (0.06)
ln (birth)	-0.52 (-0.79)	-0.11 (-0.36)	0.28 (0.51)	-0.60 (-1.55)	-0.21 (-0.76)	1.23*** (2.73)	-0.00 (-0.05)	0.03 (0.44)	0.03 (0.19)	0.05 (0.53)	-0.02 (-0.34)	0.61*** (2.58)
ln (divorce)	0.11 (0.78)	0.10 (0.77)	-0.78*** (-2.71)	-0.15 (-1.13)	0.22 (1.57)	-0.20 (-0.75)	-0.14*** (-3.01)	-0.03 (-0.64)	0.11 (1.53)	-0.11** (-2.07)	-0.09** (-2.07)	0.02 (0.21)
Age 15-34 (%)	9.07* (1.90)	-0.24 (-0.13)	5.03 (1.05)	-4.89* (-1.68)	-5.22*** (-2.95)	8.16** (2.03)	1.96*** (2.93)	1.97*** (3.51)	0.71 (0.64)	3.12*** (3.66)	1.92** (2.44)	4.86*** (2.80)
Age 35-74 (%)	2.85 (0.52)	3.08 (1.41)	10.22** (2.35)	-5.00* (-1.68)	-3.47* (-1.74)	8.83** (2.19)	1.09 (1.50)	0.54 (0.91)	0.54 (0.45)	2.41*** (2.66)	0.44 (0.44)	4.48** (2.44)
Age 75over (%)	4.46 (0.80)	0.78 (0.36)	9.12* (1.81)	-3.15 (-0.92)	0.01 (0.00)	16.80*** (4.23)	0.83 (1.04)	1.14* (1.93)	0.24 (0.20)	1.33 (1.52)	0.31 (0.43)	5.01** (2.57)
Constant	-0.55 (-0.09)	1.17 (0.50)	-5.11 (-1.07)	8.02** (2.48)	6.92*** (3.25)	-7.76* (-1.87)	9.91*** (12.96)	9.96*** (17.08)	10.04*** (8.04)	8.53*** (9.68)	10.10*** (11.75)	5.17*** (2.62)
No. obs.	470	470	470	470	470	470	188	188	188	188	188	188
R-squared	0.24	0.17	0.32	0.31	0.56	0.32	0.36	0.38	0.30	0.43	0.46	0.41
P value of Hausman test	N.A.	N.A.	0.55	0.50	N.A.	N.A.	0.43	0.76	0.37	0.59	0.03	0.99

Notes: Each specification includes the prefecture fixed effects and time effects, which account for the time-invariant prefecture specific characteristics and the nationwide time effects. *t*-statistics are reported in the parentheses. *t*-statistics for the difference in the coefficients between females and males are reported in the brackets. Standard errors are clustered at prefecture level. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively. N.A. means “not applicable.” Since the variance of prefecture-specific effect was estimated to be zero, the random-effects estimator degenerated to Hausman’s specification test could not be carried out.

Table D.4 Estimated random effect model of suicide and consultation among females and males

	Suicide						Consultation					
	Female			Male			Female			Male		
	15-34 (1)	35-74 (2)	75over over (3)	15-34 (4)	35-74 (5)	75 over (6)	15-34 (7)	35-74 (8)	75 over (9)	15-34 (10)	35-74 (11)	75 over (12)
ln(job offer)	0.03 (0.41)	-0.06** (-2.26)	-0.03 (-0.45)	-0.08** (-2.01)	-0.22*** (-5.98)	-0.14** (-2.07)	0.02 (1.04)	-0.02 (-1.33)	-0.06* (-1.91)	0.02 (0.79)	-0.01 (-0.60)	0.03 (0.67)
				[1.74]	[3.89]	[2.48]				[-0.06]	[0.57]	[-2.81]
ln(birth)	-0.52 (-0.79)	-0.11 (-0.36)	0.28 (0.51)	-0.60 (-1.55)	-0.21 (-0.76)	1.23*** (2.73)	0.08 (0.54)	0.28** (2.13)	0.21 (0.86)	-0.01 (-0.06)	0.27** (2.08)	0.86*** (2.59)
				[0.39]	[0.92]	[-2.60]				[0.37]	[-1.97]	[-3.18]
ln(divorce)	0.11 (0.78)	0.10 (0.77)	-0.78*** (-2.71)	-0.15 (-1.13)	0.22 (1.57)	-0.20 (-0.75)	-0.15** (-2.08)	-0.12 (-1.59)	0.10 (1.19)	0.06 (0.82)	-0.08 (-1.01)	-0.05 (-0.30)
				[1.64]	[-0.43]	[-3.38]				[-3.14]	[0.99]	[1.10]
Age 15-34 (%)	9.07* (1.90)	-0.24 (-0.13)	5.03 (1.05)	-4.89* (-1.68)	-5.22*** (-2.95)	8.16** (2.03)	2.88** (2.24)	2.49* (1.82)	1.59 (0.83)	2.08 (1.57)	2.89** (2.57)	5.19** (2.41)
				[2.93]	[2.83]	[-1.50]				[0.49]	[-2.77]	[-2.35]
Age 35-74 (%)	2.85 (0.52)	3.08 (1.41)	10.22** (2.35)	-5.00* (-1.68)	-3.47* (-1.74)	8.83** (2.19)	0.95 (0.92)	0.91 (0.94)	0.59 (0.32)	0.63 (0.52)	1.28 (1.10)	4.59* (1.93)
				[1.74]	[3.58]	[-0.51]				[0.04]	[-1.10]	[-2.71]
Age 75over (%)	4.46 (0.80)	0.78 (0.36)	9.12* (1.81)	-3.15 (-0.92)	0.01 (0.00)	16.80*** (4.23)	1.93 (1.56)	1.85 (1.57)	1.62 (0.84)	0.98 (0.79)	2.62** (2.24)	6.38*** (2.68)
				[1.52]	[0.91]	[-2.73]				[0.50]	[-2.31]	[-2.73]
Constant	-0.55 (-0.09)	1.17 (0.50)	-5.11 (-1.07)	8.02** (2.48)	6.92*** (3.25)	-7.76* (-1.87)	9.35*** (7.86)	8.80*** (7.71)	8.95*** (4.47)	9.40*** (7.13)	8.00*** (6.81)	3.99 (1.60)
				[-1.75]	[-3.09]	[1.61]				[0.12]	[-6.76]	[3.14]
No. obs.	470	470	470	470	470	470	141	138	140	141	126	137
R-squared	0.24	0.17	0.32	0.31	0.56	0.32	0.34	0.20	0.23	0.02	0.33	0.14
P value of Hausman test	N.A.	N.A.	0.55	0.50	N.A.	N.A.	0.61	0.90	N.A.	0.05	0.02	0.15

Notes: Each specification includes the prefecture fixed effects and time effects, which account for the time-invariant prefecture specific characteristics and the nationwide time effects. The numbers in parentheses are *t*-statistics for the coefficients and the numbers in the brackets are *t*-statistics for the coefficients of the interaction terms between female dummies and the variables. Standard errors are clustered at prefecture level. ***, **, and * indicate statistical significance at the 1%, 5% and 10%, respectively. N.A. means “not applicable.” Since the variance of prefecture-specific effect was estimated to be zero, the random-effects estimator degenerated to Hausman’s specification test could not be carried out.

Appendix Table E: Estimated logistic regression model of the perception of stress arising from at least one issue of financial, health and family issues, controlling on alcohol consumption status with the CSLC data set in 2001

Table E.1 Descriptive Statistics of the CSLC data by gender in 2001

	Female	Male	<i>t</i> -stat for difference
(1) Stress (%)			
Financial, Health or Family issues	29.80	22.23	26.09***
(2) Socioeconomic backgrounds			
Age group (%)			
15-24	13.78	14.91	-4.89***
25-34	16.06	16.88	-3.35***
35-44	14.93	15.29	-1.52*
45-54	18.80	19.68	-3.37***
55-64	15.06	15.54	-2.01**
65-74	12.57	11.86	3.27***
75 over	8.81	5.84	17.16***
Job status (%)			
Employed	46.81	75.20	-91.33***
Out of work	53.09	24.80	91.33***
Marital status (%)			
Married	60.98	65.72	-14.87***
Never-married	23.04	29.37	-21.85***
Widowed	12.02	2.70	54.19***
Divorced	3.96	2.20	15.25***
Living in a rented house (%)	25.46	27.43	-6.76***
Number of family members	3.38	3.38	0.22
Drinking alcohol	24.99	59.80	-113.95***
Number of observations	47,468	43,951	

Note: ***, ** and * indicate statistical significance at the 1%, 5% and 1% levels, respectively.

Table E.2 Estimated logistic regression model of the perception of stress arising from at least one issue of financial, health and family issues, controlling on alcohol consumption status

	(1) Female	(2) Male
Out of work	0.01*** (2.94)	0.03*** (5.15)
Never-married	-0.07*** (-9.63)	-0.02** (-2.24)
Widowed	-0.01 (-1.48)	0.03** (2.44)
Divorced	0.06*** (5.17)	0.03** (2.11)
Rented house	0.06*** (10.07)	0.04*** (7.47)
Number of family members	0.01*** (4.11)	-0.00 (-0.49)
Drinking alcohol	0.02*** (3.97)	-0.02*** (-3.24)
Age 25-34	0.11*** (9.93)	0.13*** (10.62)
Age 35-44	0.19*** (14.74)	0.20*** (14.28)
Age 45-54	0.19*** (14.69)	0.23*** (16.69)
Age 55-64	0.17*** (12.40)	0.23*** (15.42)
Age 65-74	0.18*** (12.55)	0.23*** (14.80)
Age 75over	0.20*** (12.60)	0.26*** (14.38)
Female	-	0.08*** (4.40)
Observations	47,468	91,419

Notes: The numbers in the parentheses are z -statistics for the coefficients while those in the brackets are z -statistics for the difference between coefficients for males and those for females. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.