


Trends and Gender Differences in Mental Disorders in Hospitalized Patients in Thailand

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Passakorn Suanrueang, MA, MSc¹ , Karl Peltzer, PhD^{2,3} ,
Mein-Woei Suen, PhD³, Hsiao-Fang Lin, PhD⁴, and
Tze-Kiong Er, PhD⁵

Abstract

Previous studies have shown that gender differences play a substantial role in the influence of mental disorders. This study was designed to investigate gender differences in mental disorders by presenting odd ratio (OR) trends and cumulative effects over a period of 13 years in Thailand. This observational study used hospital data from the Ministry of Public Health on selected patients admitted to inpatient departments in public hospitals with mental disorders, according to ICD-10 cause groups from 2007 to 2019, counting from more than 1,90,000 cases in 2007 to more than 4,00,000 cases in 2019. Data were collected from the Thailand Ministry of Public Health website. The results indicate that compared to women, men were positively related to five mental disorders revealed by the OR and the ratio per 100,000 population (mean and SD): psychoactive alcohol use (OR = 7.31-9.07, 271.19 (59.26)), substance abuse (OR = 5.06-7.82, 59.25 (33.71)), schizophrenia (OR = 1.64-1.93, 108.32 (19.62)), mental retardation (OR = 1.15-1.58, 10.64 (1.88)), and other mental and behavioral disorders (OR = 1.10-1.55, 70.67 (22.75)). Three mental disorders in men were found to be negatively related: neurotic and related disorders (OR=.34-.46, 27.98 (3.26)), mood (affective) disorders (OR = .44-.56, 31.91 (9.59)), and dementia (OR = .78-10.82, 13.75 (2.73)). Gender can become a key biological element that contributes to the dissimilarity of mental illness. Preventive care for men and women should, therefore, be prioritized for health conditions separately. More specifically, screening and detection, and providing appropriate intervention.

Keywords

gender differences, sex differences, mental disorders, mental illness, hospitalized patients

¹Department of Healthcare Administration Specialty in Psychology, College of Medical and Health Science, Asia University, Taichung, Taiwan

²Department of Psychology, University of the Free State, Bloemfontein, South Africa

³Department of Psychology, College of Medical and Health Science, Asia University, Taichung, Taiwan

⁴Department and Graduate Institute of Early Childhood Development and Education, Chaoyang University of Technology, Taichung, Taiwan

⁵Department of Medical Laboratory Science and Biotechnology, Asia University, Taichung, Taiwan

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Corresponding Author:

Karl Peltzer, Department of Psychology, College of Medical and Health Science, Asia University, Taichung 41354, Taiwan.

Email: kfpeltzer@gmail.com



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- **What do we already know about this topic?**

Gender is one of the determinants of health that have considerable consequences for health outcomes.

- **How does your research contribute to the field?**

According to the findings of this study, men and women experience mental illness at different rates. This finding can be utilized to support and encourage appropriate early detection, prevention and promotion, treatment, and intervention for men's and women's health care.

- **What are your research's implications toward theory, practice, or policy?**

Public health interventions should prioritize mental disorders specific to gender and psychological burdens. Men's mental health should consider psychoactive alcohol use, substance abuse, schizophrenia, mental retardation, and other mental and behavioral disorders (MBDs). Women's mental health should focus on dementia, mood (affective) disorders, and neurotic and related disorders.

Introduction

The biological risk of gender differences is widely recognized as one of the issues to be considered in the healthcare delivery system.¹ Gender plays a role as a significant component of biological variables that are part of a biopsychosocial model, showing the consequences of how individuals respond to mental and physical illnesses.¹ Individuals can be susceptible to a multiplicity of health circumstances, where gender differently influences individuals experiencing specific health issues.² Women can be regularly affected by some health problems of women, while many men can be affected by some health conditions of men.² Gender influences the health of an individual in a variety of ways. For example, an individual's health risk, vulnerability to diseases, and personal health behaviors.² Furthermore, gender can shape everyone's experience of access to health care and the use of medical products.²

The biological and behavioral differences between the genders have significantly influenced research in a variety of domains in terms of health care and medicine, particularly the epidemiological manifestations of the pathophysiology and healthcare approaches of many common diseases.³ Regarding mental illness, several studies have demonstrated gender differentiation in mental disorders. Women, for example, have a higher risk of psychiatric disorders than men (odds ratio = 2.86, $P = .007$).⁴ In other research,⁵ women showed a higher risk of having mood disorders, especially anxiety and depression, compared to men. The findings of gender differences in mental disorders in many countries have been reported. For example, retrospective studies in Australia⁶ found that women had higher rates of psychiatric admission and shorter stay than men. A study in Nigeria⁷ found that women were diagnosed with depression more often than men (women 24.5%, men 14.0%). The findings of the World Mental Health Survey Japan (WMHSJ)⁸ reported that men had a higher lifetime prevalence of alcohol abuse or dependence than women in both surveys (WMHSJ1 and WMHSJ2), accounting for 13.63 and 22.76 for men, 2.75 and 8.14 for women. A cross-national study of the WHO mental health survey⁹ found that higher rates of mood disorders were found in women than in men, whereas men were found to have substance-related

disorders at a higher rate than women. In China, women have a substantially higher frequency of depression than men.¹⁰ Furthermore, Alzheimer's disease and cerebrovascular disease pathology are much more common in women than in men.¹¹ Men, compared to women, are more likely to develop schizophrenia, with estimates ranging from 1.2 to 1.5,¹² and negative symptoms are found in men rather than women.¹³

From the evidence mentioned above, plenty of research shows that gender differences are one of the significant factors that affect various diseases. In the healthcare service system, a study of gender differences may inform a viewpoint on improving precision medicine,^{14,15} encouraging interventions, and broadening the relevance of scientific research. Consequently, we need some evidence to prove that there are gender differences since they relate to mental issues separately. It also needs to suggest some appropriate individual care plans and care delivery for men and women's health in the future. Therefore, this study aims to examine and characterize the trends in mental disorders by sex in Thailand. We focused on gender differences nationwide related to mental disorders in a nationally representative sample of hospitalized male and female patients in Thailand, presenting an odd ratio of different types of gender-related health issues.

Methods

Source of Data

This observational study was designed to point out the statistical analysis of mental disorder rates by condition between genders, the trends and ratio of the probability of mental disorders occurring between genders. The ratio of mental disorders per 100,000 population by disease group and sex, as well as the trend over 13 years, were presented. There are two crucial sources of data, including the probability of the event (diseases) and non-occurrence probabilities.

The Probability of Diseases

Number of Patients by Gender and Year. Data were collected from the Ministry of Public Health website, Thailand. We selected the number and prevalence rates by gender and

year of Thai patients who had been hospitalized to public hospitals in Thailand with mental, behavioral, and neurodevelopmental disorders between 2007 and 2019. Adults and older were included. The data for each year including all disease diagnoses. This study received a total of cases for each year from 2007 to 2019, as follows: (1) 2007, 1,15,912 males, 81,721 females; (2) 2008, 1,24,544 males, 85,269 females; (3) 2009, 1,35,625 males, 89,102 females; (4) 2010, 1,62,350 males, 95,758 females; (5) 2011, 1,71,646 males, 95,079 females; (6) 2012, 1,91,530 males, 99,817 females; (7) 2013, 1,90,069 males, 98,318 females; (8) 2014, 1,77,179 males, 90,739 females; (9) 2015, 2,12,316 males, 1,07,560 females; (10) 2016, 221,521 males, 1,11,143 females; (11) 2017, 2,31,605 males, 1,14,352 females; (12) 2018, 2,47,338 males, 122,624 females; (13) 2019, 2,68,371 males, 1,33,311 females.

Handling of Diagnostic Data. This study focused on mental disorders using the International Statistical Classification of Diseases and Related Health Problems (ICD-10) and following the disease subgroups that were classified by the Health Data Centre, Ministry of Public Health of Thailand. There were eight subgroups by disease titles and diagnostic codes; (1) dementia (F00-F03), (2) mental and behavioral disorders due to use of alcohol (F10), (3) mental and behavioral disorders due to other psychoactive substance use (F11-F19), (4) schizophrenia, schizotypal and delusional disorders (F20-F29), (5) mood (affective) disorders (F30-F39), (6) neurotic, stress-related and somatoform disorders (F40-F48), (7) mental retardation (F70-F79), (8) other mental and behavioral disorders (F04-F09, F50-F69, F80-F99).

Occurrence and Non-Occurrence Probability. For each disease, the occurrence and non-occurrence probability were calculated using data on the entire target population and the number of persons affected. The target population size was calculated using data from the Bureau of Registration Administration website, Ministry of Interior, Thailand. Data were divided by gender and year between 2007 and 2019, as follows: (1) 2007, 3,10,51,920 males, 3,18,81,595 females; (2) 2008, 3,11,75,924 males, 3,20,38,098 females; (3) 2009, 3,12,74,505 males, 3,21,82,934 females; (4) 2010, 3,13,72,467 males, 3,23,29,236 females; (5) 2011, 3,15,93,316 males, 3,25,87,685 females; (6) 2012, 3,16,14,938 males, 3,26,51,427 females; (7) 2013, 3,17,73,349 males, 3,28,47,953 females; (8) 2014, 3,19,22,490 males, 3,30,32,823 females; (9) 2015, 3,19,32,092 males, 3,30,95,309 females; (10) 2016, 3,18,94,480 males, 3,31,19,015 females; (11) 2017, 3,19,66,108 males, 3,32,38,689 females; (12) 2018, 3,20,43,770 males, 3,33,62,550 females; (13) 2019, 3,20,94,943 males, 3,34,62,111 females.

Statistical Analysis

The prevalence rates of the hospitalized patient cases demonstrated gender differences and were divided according to mental disorders, consisting of eight subgroups that were analyzed

using descriptive statistics and statistical comparisons of the prevalence rates between genders using independent t-tests. Significant levels at $P \leq .05$. This study focused on the odds ratio for each disease as defined by ICD-10 criteria in the categories of mental illness, to examine the association between genders and each group of diseases, and compare the probabilities of occurrence by gender. The OR was defined as the quotient of the odds ratio for males and females as a baseline for a specific disease (ratio of occurrence to non-occurrence). The level of uncertainty around the measure of effect was indicated using the confidence interval (CI) for the 95% significance level. Furthermore, odd ratio trends over 13 years between 2007 and 2019 were calculated and demonstrated the gender dissimilarity in mental disorders by presenting a high and low occurrence of mental disorders in men (female as a baseline).

Results

The prevalence rate of mental disorders by conditions differed significantly by sex ($P < .001$). The mental disorder rates were higher in men in four groups of diseases (Figure 1). Mental and behavioral disorders due to use of alcohol were the majority of the disorders in the mental disorder ratio, the mean (SD) was 271.19 (59.26). Followed by the ratio of schizophrenia, schizotypal, and delusional disorders with a mean (SD) of 108.32 (19.62), other mental and behavioral disorders with a mean (SD) of 70.67 (22.75), and mental and behavioral disorders due to other psychoactive substance use with a mean (SD) of 59.25 (33.71) (Table 1).

In women, the mental disorders rates were higher in three groups of disease (Figure 1). Neurotic, stress-related, and somatoform disorders were the major disease, the mean (SD) was 70.81 (16.10), followed by mood (affective) disorders with a mean (SD) of 61.78 (22.24) and dementia with a mean (SD) of 17.23 (3.57) (Table 1).

The top five prevalence of mental disorders in male and female cases were found to be the same in five areas in Thailand, including Bangkok, Nakhon Ratchasima, Chiang Mai, Kon Kean, and Ubon Ratchathani, across all three time periods: (1) 2007-2010; (2) 2011-2014; and (3) 2015-2019 (Figure 2A and B).

Figure 3 demonstrates a higher odd ratio (OR) of mental disorders than 1 for males (females as baseline) during the periods of the 13 years between 2007 and 2019 for five groups of mental disorders: psychoactive alcohol use; substance abuse; schizophrenia; mental retardation; and other MBDs. The data might be divided into two groups, namely, (1) experiencing a notable upward trend and (2) experiencing a gradual upward trend.

In terms of a significant upward trend, psychoactive alcohol use and substance use showed a developing trend that increased significantly and far exceeded that of others at the end of the study period. The OR of psychoactive alcohol use peaked at over 9.07 times in 2016, over 10 years after starting at 7.59 times in 2007. Likewise, the OR of psychoactive substance abuse was approximately 5.07 in the first year of 2007. The figure fluctuated significantly and accumulated to a

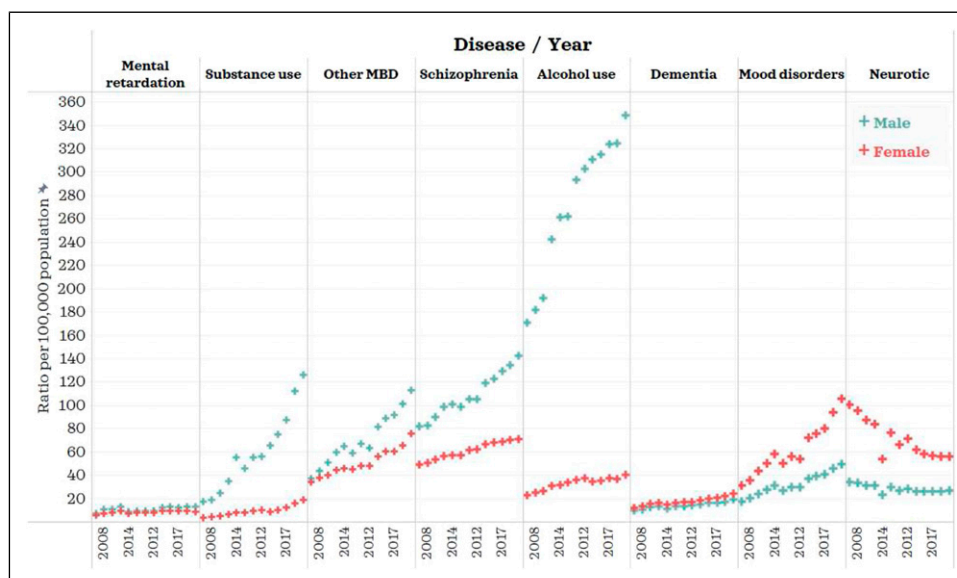


Figure 1. Ratio of mental disorders per 1,00,000 population by disease group and sex, 2007 and 2019.

Table 1. The Prevalence Rates of Mental Disorders per 1,00,000 Population by Condition and Gender Among Thais Admitted as Inpatients to Public Hospitals With Mental, Behavioral, and Neurodevelopmental Disorders, 2007-2019.

Diseases	Sex	Ratio per 1,00,000				Statistical Analysis (P-value)
		Min	Max	Mean (SD)	Median (Q1-Q3)	
Dementia	Male	9.38	19.10	13.75 (2.73)	13.41 (12.35-15.80)	2.79***
	Female	11.66	24.34	17.23 (3.57)	16.46 (15.25-20.01)	
	Both	10.53	21.77	15.52 (3.16)	14.96 (13.82-17.98)	
Mental and behavioral disorders due to use of alcohol	Male	170.32	348.60	271.19 (59.26)	293.25 (241.70-315.08)	14.45***
	Female	22.48	40.15	32.68 (5.34)	34.48 (30.71-36.52)	
	Both	95.43	191.16	149.87 (31.53)	162.17 (134.62-172.32)	
Mental and behavioral disorders due to other psychoactive substance use	Male	16.95	125.65	59.25 (33.71)	55.20 (34.82-74.72)	5.34***
	Female	3.34	18.27	8.90 (4.42)	8.38 (6.04-9.72)	
	Both	10.06	70.84	33.62 (18.72)	31.62 (20.21-41.53)	
Schizophrenia, schizotypal and delusional disorders	Male	81.42	142.38	108.32 (19.62)	104.75 (98.43-122.68)	8.17***
	Female	48.85	70.69	60.68 (7.57)	60.93 (56.46-68.15)	
	Both	64.92	105.79	84.08 (13.38)	82.63 (77.13-94.90)	
Mood (affective) disorders	Male	17.31	48.86	31.91 (9.59)	29.32 (26.96-39.11)	4.45***
	Female	30.83	105.41	61.78 (22.24)	56.12 (49.79-75.39)	
	Both	24.16	77.72	47.11 (16.05)	42.94 (38.55-57.59)	
Neurotic, stress-related and somatoform disorders	Male	22.96	33.68	27.98 (3.26)	26.30 (25.71-30.68)	9.40***
	Female	53.91	99.88	70.81 (16.10)	65.91 (56.82-83.76)	
	Both	38.70	67.22	49.75 (9.70)	46.44 (41.67-57.71)	
Mental retardation	Male	7.21	13.10	10.64 (1.88)	10.50 (9.16-12.40)	4.33
	Female	5.58	9.29	7.99 (1.15)	7.99 (7.36-9.05)	
	Both	6.39	11.16	9.29 (1.46)	8.83 (8.46-10.62)	
Other mental and behavioral disorders	Male	37.01	112.88	70.67 (22.75)	64.66 (58.78-88.27)	2.83***
	Female	33.70	75.23	50.51 (12.01)	47.61 (43.81-60.08)	
	Both	35.33	93.66	60.41 (17.24)	55.36 (51.36-73.91)	

Q1 = 25th quartile; Q3 = 75th quartile. *** P < .001.

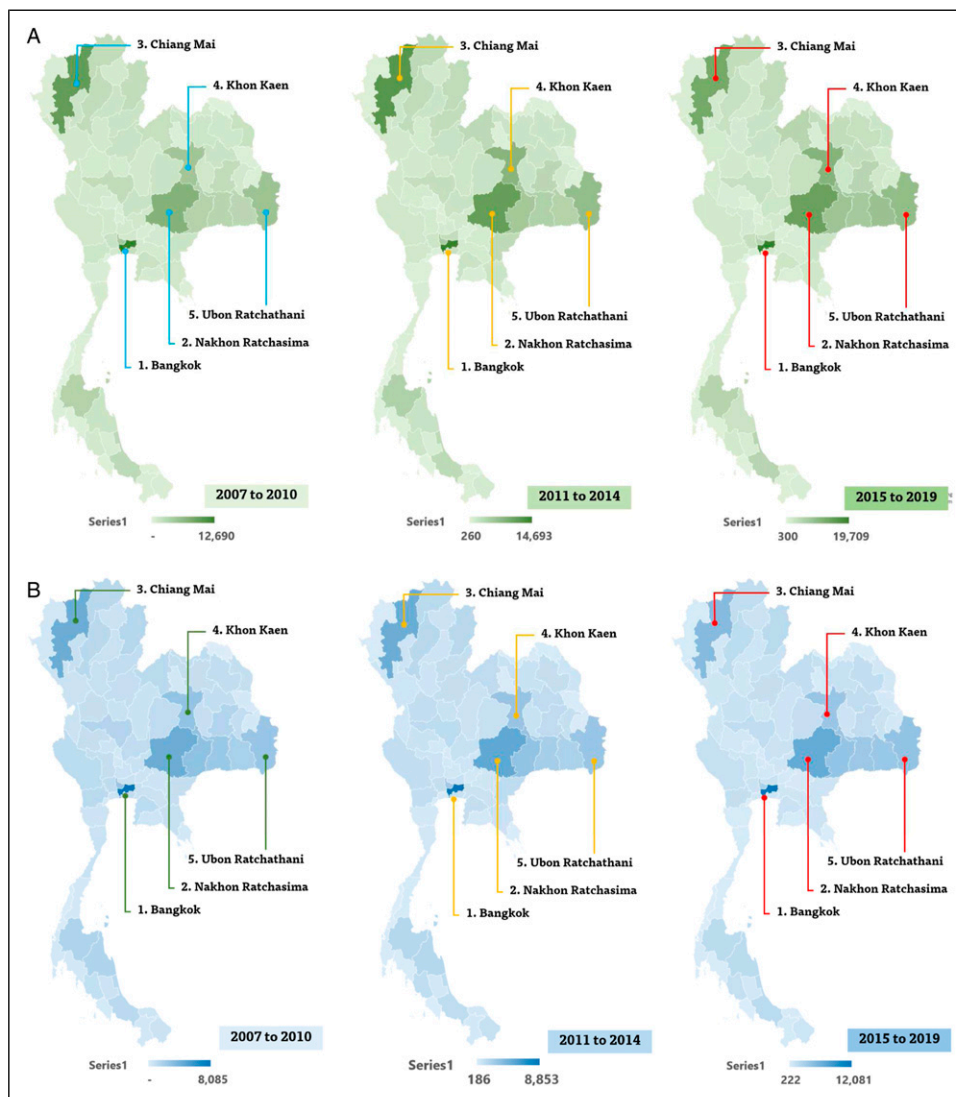


Figure 2. Thailand: prevalence of mental disorder hospitalized patients, a density map in three periods of time: (1) 2007-2010; (2) 2011-2014; and (3) 2015-2019. (A) Hospitalized male patients, (B) hospitalized female patients.

peak of 7.82 or around 1.5 times over 10 years in 2012. However, after 2016, both the OR of psychoactive alcohol use and psychoactive substance use continued to fall over the next three years.

In the event of a slight upward trend, schizophrenia, mental retardation, and other MBDs all exhibited the same positive OR number, which steadily increased throughout 13 years. Schizophrenia started at 1.67 and slightly grew, reaching a high of 1.93 in the final year. Other MBDs have steadily climbed from 1.10 and hit a peak of 1.55 in 2018. The OR of mental retardation has ranged from 1.25 to 1.39 during the last 13 years.

The highest odd ratios of mental disorders in men were for mental and behavioral disorders due to use of alcohol in 2016 (OR = 9.07, 95% CI: 8.90-9.25) (Figure 4A), followed by substance use disorders in 2016 (OR = 7.82, 95% CI: 7.53-8.11) (Figure 4B). The other three mental disorders had an OR

more than one, including schizophrenia, mental retardation, and other MBDs. The highest OR for each disorder was found, specifically, schizophrenia in 2019 (OR = 1.93, 95% CI: 1.90-1.96) (Figure 4C), mental retardation in 2008 (OR = 1.58, 95% CI: 1.49-1.67) (Figure 4D), other MBDs in 2018 (OR = 1.55, 95% CI: 1.53-1.58) (Figure 4E), respectively.

Figure 5 presents a lower odds ratio than 1 for mental disorders for men (females as baseline), during the 13 years between 2007 and 2019 for three groups of mental disorders: dementia; mood (affective) disorders; and neurotic, stress-related and somatoform disorders. Neurotic and related disorders showed a gradually decreasing trend. Neurotic had a higher OR at the start of the period, around .46 in 2007, which declined to .34 in 2019. In contrast, mood (affective) disorders should pay attention to disease surveillance. Mood disorders were on the rise, rising from .44 in 2007 to .56 in 2019.

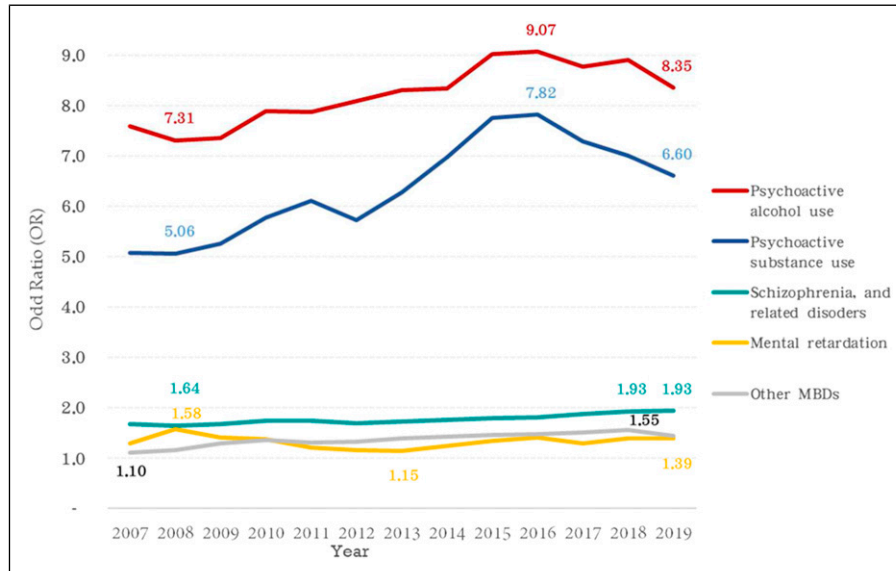


Figure 3. The odds ratios for males (females as baseline, $P < .001$) higher than 1 for the occurrence of five mental, behavioral, and neurodevelopmental disorders for the 13-year period, between 2007 and 2019. Five mental disorders are specified in separate lines. (1) The red line denotes psychoactive alcohol use, (2) the blue line denotes psychoactive substance use, (3) the green line represents schizophrenia and related disorders, (4) the gray line represents other mental and behavioral disorders, (5) the yellow line represents mental retardation.

Noticeably, the exception to this was dementia. It fluctuated between .78 and .82 throughout most of the period shown.

The highest odd ratio of mental disorders in men was for neurotic and related disorders in 2017-2018 (OR = .46, 95% CI: .45-.47) (Figure 6A), followed by mood (affective) disorders in 2007-2008 (OR = .56, 95% CI: .54-.58) (Figure 6B), and dementia in 2014 - 2015 (OR = .82, 95%CI: .74-.85) (Figure 6C), respectively.

Discussion

According to the findings, male and female prevalence rates have followed the same increasing pattern over the last 13 years, growing every year from 2007 to 2019. These findings are consistent with those of some Asian countries. In Japan, for example, there has been a high disease burden of mental disorders, and in the last 10-15 years, the prevalence of mental healthcare services has grown by roughly 1.2-1.6 times (Japan National database between 2000 and 2010).⁸ The prevalence rate of schizophrenia and related disorders has progressively increased over the last 12 months, increasing from .40% in 2008 to .45% in 2017 (The Korea's national health insurance service claims database).¹⁶ Some points of view could be the reason behind this increasing trend, such as more diagnoses, mental health policies, the economic crisis, and mental health facilities.

In terms of generalization to other populations, our findings can be generalized to other populations by considering four dimensions such as psychiatric capacity, national population survey data, mental healthcare utilization data, and health insurance and healthcare provision data.

Psychiatric Capacity

According to the data from the Thailand Department of Mental Health website, between 2016 and 2019, the psychiatric beds in the hospitals belonging to the Department of Mental Health were approximately 4288-4438 beds. The average rate of bed occupancy between 2013 and 2019 was around 84.91. The bed occupancy rate increased from 40.72 in 2013 to 87.06 in 2019.¹⁷ In the same period (2013-2019), the Health Data center of the Ministry of Public Health, Thailand reported number of visits of the inpatient department of people who were diagnosed with ICD-10 code F00-F99 mental disorders. There is an increasing number of visits every year, from 8586 visits in 2013 to nearly 513,000 in 2019.¹⁸ The bed occupancy rate and number of visits mentioned above can inform the increase in prevalence and show similar evidence with our findings.

Comparison With National Population Survey Data

Compared to Thai national mental health survey data in two-point time in 2003 (11,685 samples)¹⁹ and 2013 (4727 samples),²⁰ our findings show the same results in particular mental disorders due to alcohol use and psychoactive substance use, and mood (affective) disorders. In 2003, the prevalence of alcohol use disorders was higher in men that was 46.1%, while in women it was 10%. Mood disorders were found to have a higher prevalence in women, such as major depressive disorders and generalized anxiety disorders, accounting for 4.0 and 2.4 in women and 2.5 and 1.4 in men.¹⁹ In 2013, the lifetime prevalence of substance use disorders (SUD), alcohol use disorders, and drug use disorders was higher in men,

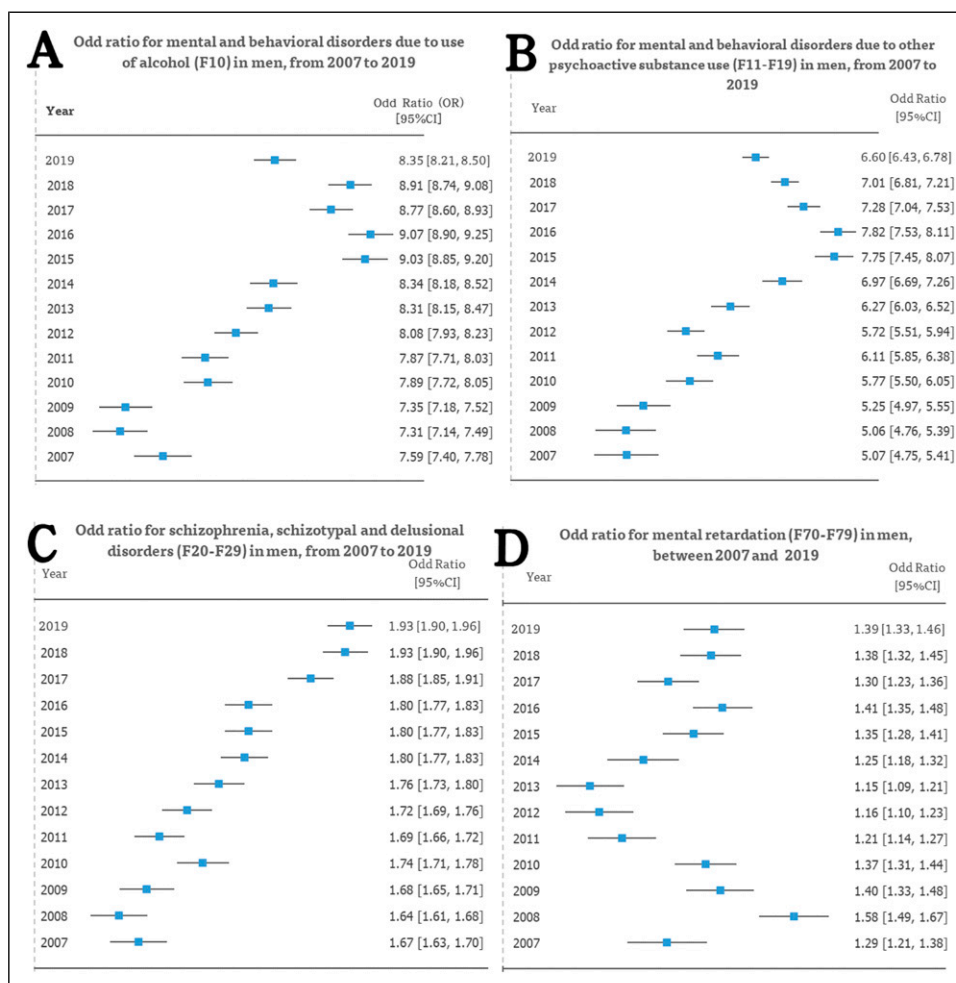


Figure 4. The odd ratio for five mental disorders in men between 2007 and 2019. Horizontal lines indicate corresponding 95% confidence intervals around odd ratio: (A) mental and behavioral disorders due to use of alcohol; (B) mental and behavioral disorders due to use of substance abuse; (C) schizophrenia and related disorders; (D) mental retardation; (E) other mental and behavioral disorders.

accounting for 48.5, 33.0, and 7.6 in men, and 6.0, 4.1, and .8 in women. Whereas, anxiety disorders and affective disorders were found to have a higher lifetime prevalence in women than in men, accounting for 4.4 and 2.8 in women, and 1.7 and 1.0 in men.²⁰

Mental Healthcare Utilization Data

In the cases of alcohol use disorders, some studies indicated that women face greater obstacles than males in seeking treatment for alcoholism.^{21,22} In Thailand, it may be influenced by there is no specific intervention for women with alcoholism.²² The healthcare service was provided in general services more than gender-specific services.²² Obviously, low prevalence of hospital admission rates for alcohol use disorders among women. Therefore, women's healthcare services, including gender-appropriate services and specific treatment approaches, must be established to ensure respectful treatment from healthcare practitioners. Also, women with alcohol addiction should be more encouraged to seek therapeutic interventions. However, worldwide women

tend to seek health services more than men.²³ Depression, for example, was found that overall mental health service utilization was higher in women than in men.²⁴ This evidence can be supported by the finding of the Canadian Community Health Survey (2000-2001) in around 25,000 cases. This survey found that the usage of mental health services by women was nearly 10% greater than the rate among men. Furthermore, the data from 988 public hospitals in Thailand in a study in a previous phase (2002-2005), had a similar finding to our study. The number of women diagnosed with depression was higher than the number of men diagnosed with depression. Hospitalized patients with depression were women that were around 60-70%.²⁵

Change in Health Insurance and Healthcare Provision Data

Seeking healthcare services in mental health sections of psychiatric hospitals is still a stigma for people with mental disorders in Thailand.²⁶ To address these difficulties, the Department of

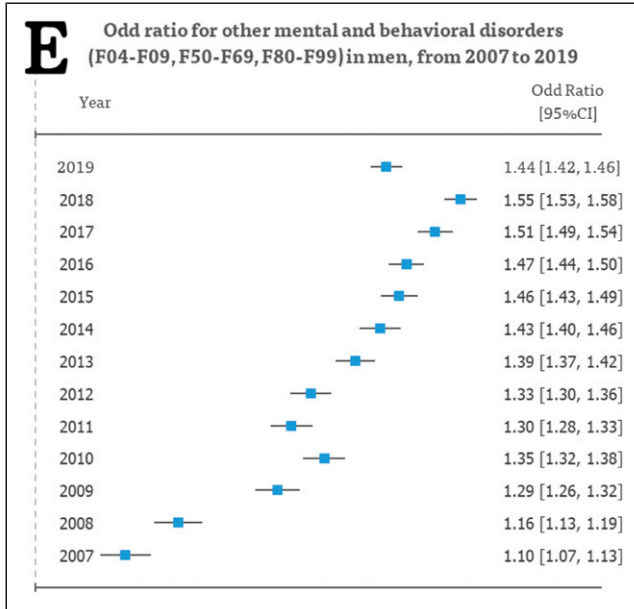


Figure 4. Continued.

Mental Health has taken actions to minimize stigmatization by using the mass media to increase understanding of mental health and access to care.²⁶ However, the stigmatization is still persisting and the number of people with mental disorders particularly in the community is growing continuously, the primary care level is an important setting that can provide mental health care closer to people in the community and can reduce stigma.²⁶ Therefore, mental health outpatient facilities and community-based psychiatric inpatient units

are provided at many levels such as regional and provincial hospitals.²⁷ Moreover, Thailand’s universal coverage scheme (UC), which covers health benefits and healthcare finances for all Thais in the scheme over 80% of the population, can help in improving healthcare-seeking behavior.²⁸ In 2010, approximately 70,000 persons were diagnosed with F00-F99 mental and behavioral disorders admitted in hospitals and most of them were UC health schemes that were 85% of all hospitalized patients.²⁹

High Occurrence of Experiencing Mental Disorders in Males

It is very clear from the current findings that during a period of 13 years, Thai men are at risk for five types of mental illness (alcohol use disorder (AUD), substance use disorder (SUD), schizophrenia and related disorders, mental retardation, and other MBDs). Compared to females, males have a higher disease occurrence of alcohol and substance use disorders. Gender behavior influences the increasing number of mental illnesses. Cigarette smoking and substance abuse risks, for example, are significantly influenced by gender differences. Research studies in Asian regions show that more men smoke than women.³⁰ In the case of alcohol consumption, a study reports that male binge drinkers have an 80% risk of having alcohol harm use, while females have about a 44% risk of alcohol use. The threshold for the average number of drinks per day considered high alcohol consumption is 3.56 for women and 7.05 for men.³¹ Interestingly, social and health sanctions play an important role in inhibiting women from

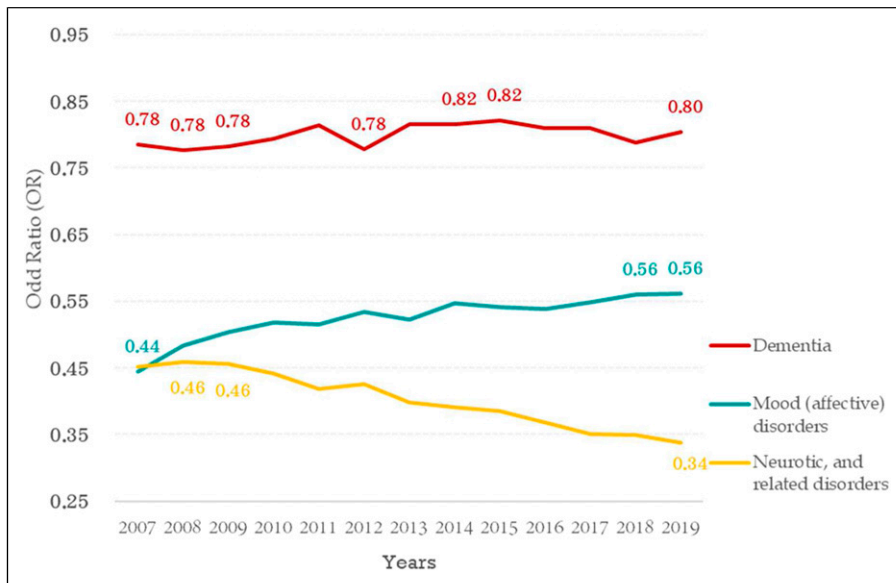


Figure 5. The odds ratios for males (females as baseline) less than 1 for the occurrence of three mental, behavioral, and neurodevelopmental disorders over a 13-year period, from 2007 to 2019. Three mental disorders are specified in separate lines. (1) The red line denotes dementia, (2) the green line denotes mood (affective) disorders, (3) the yellow line represents neurotic and related disorders.

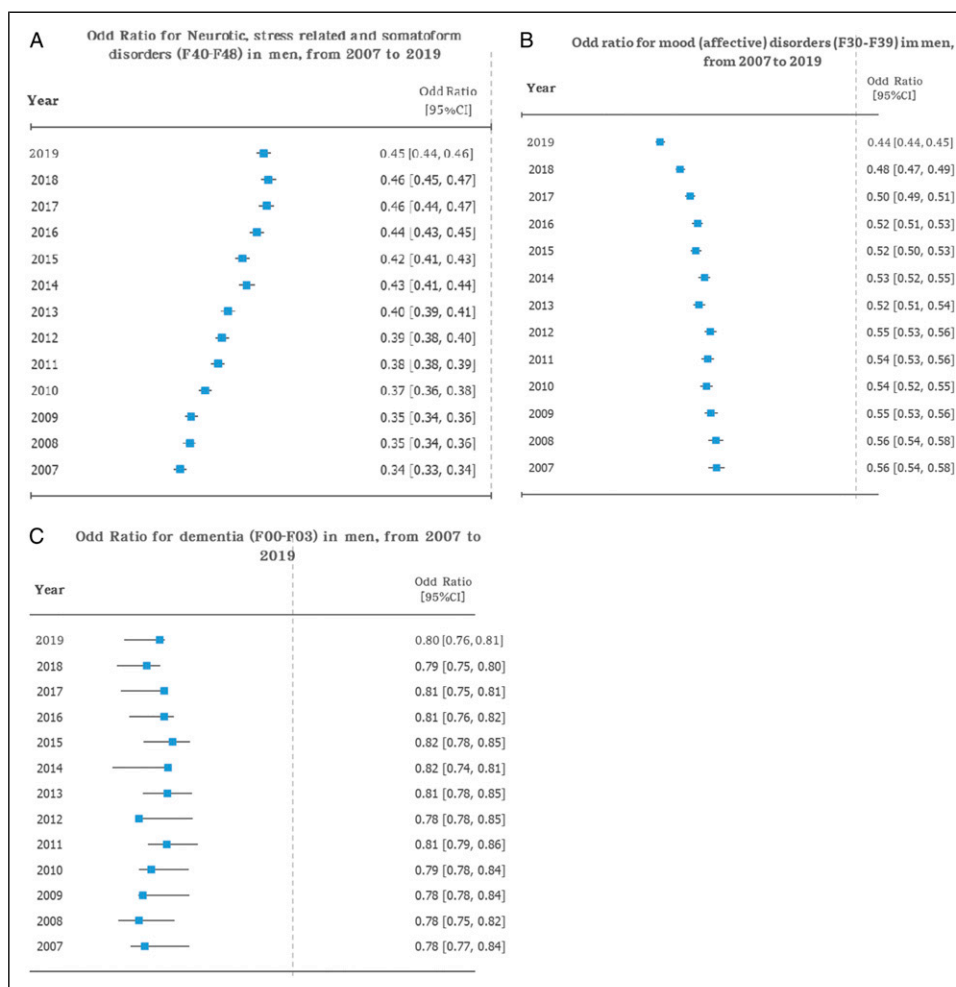


Figure 6. The odds ratios for three mental disorders in men between 2007 and 2019. Horizontal lines indicate corresponding 95% confidence intervals around odd ratio: (A) neurotic and related disorders; (B) mood (affective) disorders; (C) dementia.

becoming alcohol drinkers.³² In terms of the pharmacodynamic response to alcohol, many studies indicated that men can have active detoxification activity in the liver involving alcohol dehydrogenase (ADH) and aldehyde dehydrogenase (ALDH2), while women can negatively produce these two enzymes.^{21,32–34} Women who consumed 10% or 40% ethanol had lower gastric metabolism than men.³³ Three factors contribute to the development of substance abuse disorders in the use of substances in children, such as social, family, and individual issues.³⁵ Bullying and lack of peer support are examples of social risk factors that have a strong correlation with arousing substance use in adolescents.^{36,37} Bullying in schools is a social problem that causes mental health problems. Data from Thailand's national school-based survey on bullying in Thai primary schools found that male students were slightly less likely than female students to have been bullied, accounting for 58% and 42%, respectively.³⁸ Similar to the Global School-Based Student Health Survey of Schoolchildren aged 12-17 years (317,869 adolescents studied), indicated that male students were 1.21 times more

likely than female students to be associated with bullying victimization.³⁹ The relationship between family members and parenting styles can be family risk factors that can prevent or contribute to their children having a higher risk of substance abuse.^{40,41} Furthermore, the socioeconomic status and educational level of the family are the most common factors. Individual risk factors include the development of the psychological function, emotional development, and mental health difficulties, especially depressive symptoms and attention deficit hyperactivity disorder (ADHD).⁴² As to schizophrenia and related disorders, genetic predisposition was found in a study of human monozygotic studies as a significant risk factor correlated to schizophrenia. A schizophrenia patient, who is a twin, shares 40-50% of the same inherited genome sequence. Furthermore, schizophrenia is correlated with neurochemical and brain activity.⁴³ For example, it involves dopaminergic neurons.⁴⁴ Moreover, it involves hormones and sex chromosomes.⁴⁵ One of the theories that explain gender differences in schizophrenia is the differentiation of the neuroprotective process of estrogen hormones. This action is linked

to the antidopaminergic effect of antipsychotics in women. Estrogen is a female hormone that can be a protective agent to slow down the onset of schizophrenia. In other words, women with low estrogen levels may experience exacerbated mental disorders.⁴⁶ On the other hand, male hormones called testosterone play an important role in contributing to the severity of schizophrenia. Low testosterone exacerbates more negative symptoms of schizophrenia.⁴⁵ In studies examining gender differences in schizophrenia, men are shown to have a higher incidence and age of onset than women.⁴⁷ Males, compared to females, have the earliest disease detection, and the incidence rate of schizophrenia peaks around 22 years of age. In addition, men are more likely to have a higher rate of hospitalizations.⁴⁸ Regardless of the clinical presentation, men are more prone to suffering from negative symptoms of schizophrenia, while women are more likely to have emotional problems such as depressive symptoms and mood disturbances.⁴⁵ Mental retardation is the terminology used in ICD-10 codes, while intellectual disability is the terminology used in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5 codes).⁴⁹ Mental retardation is one of the mental disorders that have a higher prevalence and risk in men than in women. The findings of the current study are consistent with studies in some countries, such as India (studied groups around 5300 cases)⁵⁰ and Turkey (over 1900 children with mental retardation).⁵¹ These studies indicate that males have a greater prevalence of the disease. The factors influencing mental retardation are found that genetic factors, socioeconomic status, the quality of care related to the environment after birth, are causal interlinks with this disease.

Low Occurrence for Experiencing Mental Disorder in Males

For data analysis of 13 years of data, we found that males have a lower probability of three mental disorders compared to females for having neurotic and related disorders, mood (affective) disorders, and suffering from dementia. There is evidence to emphasize what factors contribute to gender differences. Some research indicates that people have some physical diseases that are associated with mood disorders, stress, and anxiety disorders. A study of emotional disorders in patients suffering from a physical disease, such as cardiovascular disease, found that having anxiety and depression disorders increases the risk of elevated health hazards in women compared to men. A higher depression score is associated with physical inactivity in women.⁴ Interestingly, the greatest risk for mental stress-persuaded ischemia is being female and living alone.⁵² Bullying is another concern of psychological distress in girls and women. In the context of bullying, girls were substantially more likely than boys to self-harm and being bullied has a link with depression and anxiety.⁵³ Bullying has a significant impact on females, such as beauty bullying⁵⁴ and cyber-bullying^{55,56} Role of family dynamic was linked depression.⁵⁷ Depressive symptoms have been linked to family

dysfunction in adolescent and adult women. Women who had negative family perceptions were more likely to be diagnosed with depressive symptoms.⁵⁸ Regarding dementia, for 13 years, in this current study, a statistically significant odds ratio of dementia diagnosis was found in men in a lower proportion than in women. In other words, dementia is one of the mental illnesses that significantly affect more women than men. Our findings are consistent with a Japanese National Survey, which discovered that females are 2.15 times more likely than males to suffer from dementia.⁵⁹ Research evidence reports that depression is a hazardous component of Alzheimer's disease (AD) dementia in both women and men.⁶⁰ 90% of patients with dementia had a comorbidity of mental and behavioral disorders, including depressive symptoms.⁶¹ However, women have twice the chance of suffering from depression, compared to men. In addition, depression over the course of a lifetime is more prevalent in women. Consequently, women may have a higher diagnosis rate of AD dementia compared to men.⁶² Additionally, the biomarker levels in the brain (amyloid- β 42 (A β -42)) are associated with contributing cognitive impairment. These biomarker levels are positively found in females rather than males.^{63,64} Moreover, physical health outcomes such as hypertension, hyperlipoproteinemia, and high blood sugar, which are found at a higher rate in women, have been correlated as a risk factor for developing Alzheimer's disease-related to dementia disorders.⁶⁵⁻⁶⁷ Neurotic, stress-related, and somatoform disorders, one of the factors that influence mental health outcomes for women is the social determinant of mental health. Females' mental health difficulties are exacerbated by a lower socioeconomic status,⁶⁸ lack of education, poverty, and gender discrimination.⁶⁹ Some evidence points out that the power of social support can assist in diminishing the emotional negativity and psychological consequences of the sexual violence of female victims.⁷⁰ Therefore, the lack of social support and the social determinants of mental health could be factors that contribute to an increase in mental health problems in women. Another factor to consider is the psychological perspective. In the progress ongoing of depressive symptoms and post-traumatic stress disorders in women, traumatic experiences, such as domestic violence and sexual abuse, are underrecognized as risk factors.⁷¹ Moreover, women are more likely to have a higher number of traumatic events than males did, the evidence presented by exploring differences in racial and ethnic groups.⁷²

Limitations

The purpose of this study is to estimate the magnitude of the effect size of odd ratio for mental disorders on gender differences through a retrospective study of data over 13 years, by evaluating the number of mental disorders divided by the number of non-mental disorders of each gender. However, additional research on testing while adjusting for confounders is required as a suggestion for further investigation.

Conclusions

The findings of this study are specifically evidence-based and show gender differences in overall mental disorders in Thailand. Our findings presented new evidence of the trend and gender differences in mental disorders in all ages by investigating national historical data over a 13-year study period. The findings are similar to previous studies. We highlighted the gender-specific at-risk mental disorders by conditions that are supported by relevant evidence to describe the phenomenon. Our findings can be used to support and promote proper early identification, prevention and promotion, treatment, and intervention for men and women's health care. Moreover, these data can serve as preliminary fundamental information for researchers or academicians to conduct future research in this domain.

Gender is one of the determinants of health that have considerable consequences for health outcomes. The results of this study highlight that males and females have a different occurrence ratio of experiencing mental disorders. The evidence mentioned above may be summarized as indicating the factors that can be associated with the increased occurrence of mental disorders in men and women. Public health interventions should prioritize mental disorders specific to gender and psychological burdens. Preventive healthcare planning and appropriate interventions should be promoted by considering the three aspects of the biopsychosocial perspective to minimize the number of new emerging cases of mental illnesses in men and women.

Men's mental health should consider five mental disorders: psychoactive alcohol use, substance abuse, schizophrenia, mental retardation, and other MBD. The first mental health challenge is biological risk factors. Genetic predisposition is a considerable factor contributing to several mental disorders, especially schizophrenia, mental retardation, and so on. Furthermore, social determinants of mental health, socioeconomic status, bullying, and relationships within the family must be considered when planning and providing the appropriate intervention to prevent mental health problems in male adults.

Women's mental health should focus on three mental disorders, such as dementia, mood (affective) disorders, and neurotic and related disorders. Biological risk factors for women's health should take into account biomarker levels, chemical activities in the brain, chronic physical health problems, physical inactivity, metabolic factors, etc. Psychological risk factors need to think about traumatic experiences and comorbidities in mental illness. In adolescent girls, they need to consider parenting practices or rules. Social risk factors are needed to provide supportive care intervention or support to develop psychological resilience in the cases of individuals who have lower socioeconomic status, mental health social determinants such as lacking social support, bullying, lower level of literacy, perceived discrimination, and so on. Furthermore, to adequately provide mental healthcare plans, psychiatric prevention programs, and interventions for men

and women, psychiatric care programs can use the findings of this study, which presents gender differences in mental disorders, to identify some of the determinants of mental health.

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Ethical Approval

This study used publicly available data from the website of the Thailand Ministry of Public Health, such as the number and prevalence rates by gender and year, which contains anonymous individual information; hence institutional review board approval was not obtained.

Declaration of Conflicting Interests

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ORCID iDs

Passakorn Suanrueang  <https://orcid.org/0000-0002-1345-068X>
Karl Peltzer  <https://orcid.org/0000-0002-5980-0876>

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