

# Prevalence of mental health disorders and cost of medical utilization in elderly taiwan military veterans vs non-veterans.

Wei-Hao Lin<sup>1,2\*</sup> Ching-Herng Lin<sup>3</sup>, Chih Chien Lin<sup>1</sup>

<sup>1</sup>Department of Psychiatry, Taichung Veterans General Hospital, Taiwan, Province of China, ROC

<sup>2</sup>Department of Psychiatry, Puli Branch, Taichung Veterans General Hospital, Taiwan, Province of China, ROC

<sup>3</sup>Department of Medical Research, Taichung Veterans General Hospital, Taiwan, Province of China, ROC

## Abstract

**Introduction:** Previous studies have shown that older veterans may be at an increased risk of mental health disorders compared with similarly aged non-veterans. In Taiwan, there have been scarce studies discussing mental health disorders in elderly Taiwan veterans.

**Methods:** Elderly veterans were identified from the National Health Institute Research Database, with a non-veteran group being selected at a 1:1 ratio match with the veteran group in the categories of age, gender and living location. We then compared the prevalence of mental health disorders and medical utilization between the veteran and non-veteran groups.

**Results:** We identified 6,050 elderly veterans who were then matched with non-veterans. The prevalence of major and minor neurocognitive disorders, dysthymic disorder, sleep disorder, major psychiatric illness and minor psychiatric illness in the veteran's group were significantly higher than those seen in the non-veterans group. In addition, the veterans required more medical utilization than non-veterans in the year 2013.

**Discussion:** The elderly veterans experienced a higher prevalence of mental illness than non-veterans, pre-pandemic. The mental health condition of this vulnerable elderly population post-pandemic should continue to be followed and the government should create laws which face the issue positively, while considering the changes they will experience during post-pandemic life as well as in the medical system.

**Keywords:** Mental health disorders, Anxiety disorders, Post-Traumatic Stress Disorder (PTSD).

## Background

Soldiers and military officers face multiple stressors during their lifetimes, with previous studies revealing that military members are at a high risk for alcohol abuse and Post-Traumatic Stress Disorder (PTSD) [1,2]. In addition, higher rates of PTSD, anxiety disorders (excluding PTSD), depression and psychological distress were found in military personnel with a physical impairment [3]. As for older veterans, they may be at an increased risk of experiencing mental health disorders compared with similarly aged non-veterans [4]. showed that elderly U.S. military veterans had high prevalence rates of substance and alcohol abuse in their systemic review.

In Taiwan, after the period of conflict with Mainland China in the 1950s, the island has been in a relatively peaceful state [5,6], with the military personnel who had experienced that period having now become elderly veterans. However, any studies discussing the mental health disorders in those elderly

Taiwan veterans has been scarce. In this study, we utilized nationwide population-based data and selected those who were aged 65 years or older in order to compare the prevalence of mental health disorders and the cost of medical utilization between elderly Taiwan veterans and non-veterans.

## Method

### Data source

By law, Taiwan's population is covered by a National Health Insurance (NHI) program. The NHI program was launched in 1995 and includes all citizens living in Taiwan. The program covers approximately 99% of the citizens (approximately 23.75 million people), and over 98% of the hospitals nationwide are under contract with the NHI [7]. The National Health Research Institute established and maintains the National Health Institute Research Database (NHIRD), releasing data annually for research purposes. The NHIRD

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\*Correspondence to: Wei-Hao Lin, Department of Psychiatry, Taichung Veterans General Hospital, Taichung, Taiwan, Province of China, ROC, Tel: 886912649089, Email: yrbovlxh@gmail.com

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contains valuable medical information, including drug prescriptions, along with patient data revealing gender, date of birth, dates of visits and hospitalizations; and diagnoses using the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes.

### Participant samples

The status of each veteran was confirmed by the data registered in the NHIRD. Those aged younger than 65 years on July 1, 2010, females, and those missing information regarding age and gender, as well as those deceased prior to December 31, 2013 were excluded. A non-veteran group was selected at a 1:1 ratio match with the veteran group in regards to age, gender and living location.

### Disease diagnosis

Prevalence of mental health disorders, including major and minor neurocognitive disorders (ICD-9-CM codes 290, 294.1, 294.2, 331.0, 331.1, 331.6, 331.7, 331.82, 331.83, 331.9), schizophrenia (ICD-9-CM codes 295), major depressive disorder (ICD-9-CM codes 296.2, 296.3), bipolar disorder (ICD-9-CM codes 296, excluding 296.2 and 296.3), dysthymic disorder (ICD-9-CM codes 300.4), adjustment disorder (ICD-9-CM codes 309, excluding 309.81), post-traumatic stress disorder (ICD-9-CM codes 309.81), anxiety disorder (ICD-9-CM codes 300.0, including 300.09) and sleep disorder (ICD-9-CM codes 780.5) were all compared in this study. Patients who had been diagnosed with certain mental health disorders more than 3 times in an outpatient setting, or more than once in an inpatient setting in the year 2013, were confirmed to possess that certain mental health disorder. In addition, when patients were diagnosed with schizophrenia and affective disorders (bipolar disorder or major depressive disorder) at the same time, they were classified into the category of schizophrenia; when patients were diagnosed with bipolar disorder and major

depressive disorder at the same time, they were classified into the category of bipolar disorder.

### Statistics

We compared the prevalence of mental health disorders and medical utilization between the veteran and non-veteran groups through use of the t-test. Odds ratios surrounding the risk of mental health disorders and rate ratios of predicting medical utilization were also analyzed through multivariate logistic regression.

### Results

We identified 6,050 male veteran insurant who were more than 65 years of age, were alive on December 31, 2013 and who matched at a 1:1 ratio on age, gender and area of living with non-veteran insurants (Figure 1). Table 1 shows the characteristics of the participants. Approximately 65 % of the participants were aged 75-84 years, with about 60 % of the participants living in the northern area of Taiwan. There were more participants with a Charlson Comorbidity Index (CCI) higher than 3 in the veteran group (29.3% vs 24.9%), while more non-veterans had a CCI=0(32.0% 27.0%). The veteran group displayed a higher prevalence in all psychiatric illnesses, which remained significant even after adjustments for major and minor neurocognitive disorders, dysthymic disorder, sleep disorder, major psychiatric illness and minor psychiatric illness (Table 2). In 2013, the veteran group required the use of more medical utilization than the non-veteran group, resulting in greater total expenses for inpatient and outpatient care, total expenses for psychiatric and non-psychiatric outpatient and inpatient care, number of Out-Patient Department (OPD) visits and days spent in the In-Patient Department (IPD) (Table 3). This also remained significant after adjustments (Table 4).

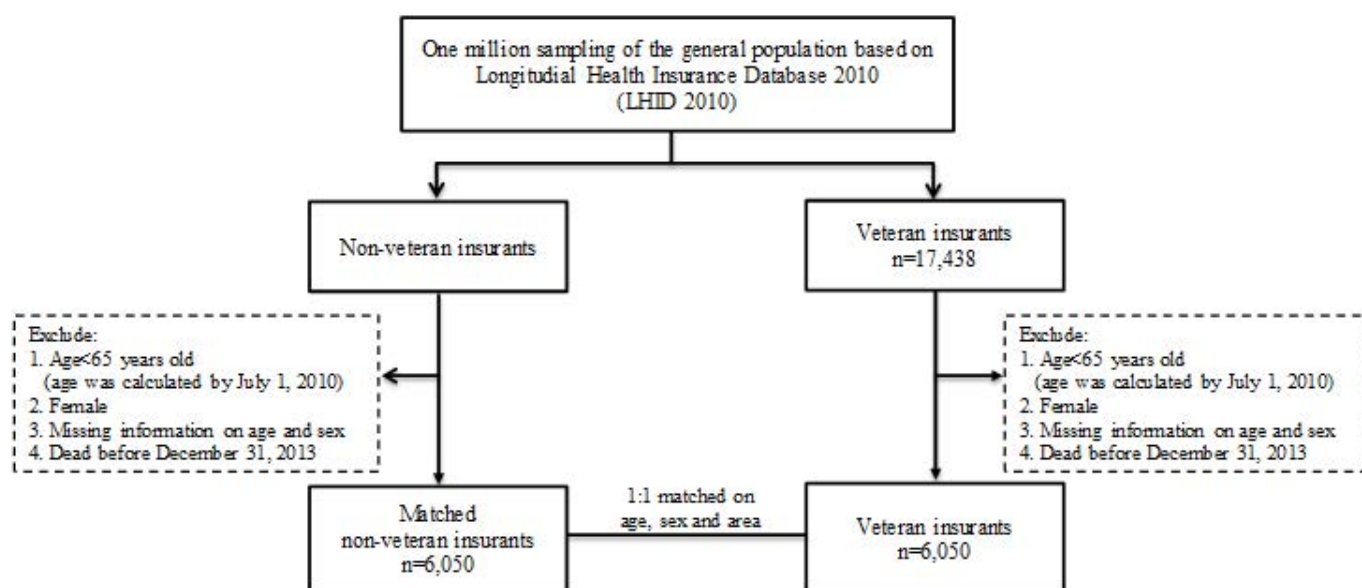


Figure 1. Flow chart showing identification of the study population.

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**Table 1.** Clinical characteristics between veterans and non-veterans (LHID2010).

Variable	Non-veterans		Veterans		P value
	(n=6,050)		(n=6,050)		
	n	(%)	n	(%)	
<b>Age (years)</b>	80.1 ± 5.9		80.4 ± 5.7		-
65-74	953	-15.8	953	-15.8	-
75-84	3,994	-66	3,994	-66	-
≥ 85	1,103	-18.2	1,103	-18.2	-
<b>Gender</b>					
Female	0	0	0	0	-
Male	6,050	100	6,050	-100	-
<b>Area</b>					
North	3,460	-58.1	3,460	-58.1	-
Central	710	-11.9	710	-11.9	-
Southern	1,589	-26.7	1,589	-26.7	-
East	194	-3.3	194	-3.3	-
<b>CCI</b>					<0.001
0	1,937	-32	1,635	-27	-
01-Feb	2,606	-43.1	2,645	-43.7	-
≥ 3	1,507	-24.9	1,770	-29.3	-
<b>Mental health disorders</b>					
Major and minor neurocognitive disorders					<0.001
	472	-7.8	581	-9.6	-
Schizophrenia					0.808
	8	-0.1	9	-0.1	-
Major depressive disorder					0.026
	27	-0.4	46	-0.8	-
Bipolar disorder					0.052
	16	-0.3	29	-0.5	-
Major psychiatric illness					<0.001
	516	-8.5	646	-10.7	-
Dysthymic disorder					<0.001
	73	-1.2	121	-2	-
Adjustment disorder					0.029
	4	-0.1	13	-0.2	-
Posttraumatic stress disorder					1
	0	0	1	0	-
Anxiety disorder					0.035
	235	-3.9	282	-4.7	-
Sleep disorder					<0.001
	476	-7.9	655	-10.8	-
Minor psychiatric illness					<0.001
	686	-1.3	919	-15.2	-

$\chi^2$  test/Fisher exact test or t-test for all P-values.

CCI: Charlson comorbidity index

Major psychiatric illness: involve major and minor neurocognitive disorders, schizophrenia, major depressive disorder, and bipolar disorder.

Minor psychiatric illness: involve dysthymic disorder, adjustment disorder,

**Table 2.** Adjusted odds ratio and 95% confidence interval of risk of mental health disorders in veterans compared with non-veterans.

Variable	Adjusted OR	95% CI	P-value
Major and minor neurocognitive disorders			
Non-veterans	1	-	-
Veterans	1.15	(1.01-1.32)	0.043
Schizophrenia			
Non-veterans	1	-	-
Veterans	0.82	(0.20-3.32)	0.776
Major depressive disorder			
Non-veterans	1	-	-
Veterans	1.58	(0.93-2.67)	0.089

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Bipolar disorder			
Non-veterans	1	-	-
Veterans	1.81	(0.88-3.74)	0.108
Major psychiatric illness			
Non-veterans	1	-	-
Veterans	1.17	(1.03-1.34)	0.019
Dysthymic disorder			
Non-veterans	1	-	-
Veterans	1.41	(1.04-1.92)	0.026
Adjustment disorder			
Non-veterans	1	-	-
Veterans	2.71	(0.87-8.38)	0.084
Posttraumatic stress disorder			
Non-veterans	1	-	-
Veterans	-	-	-
Anxiety disorder			
Non-veterans	1	-	-
Veterans	1.05	(0.88-1.26)	0.595
Sleep disorder			
Non-veterans	1	-	-
Veterans	1.22	(1.08-1.39)	0.002
Minor psychiatric illness			
Non-veterans	1	-	-
Veterans	1.2	(1.07-1.34)	0.001

OR was adjusted for age, area, CCI and number of out-patient department visits in 2013.

**Table 3. Medical utilization between veterans and non-veterans in 2013.**

Variable	Non-veterans (n=6,050)		Veterans (n=6,050)		P value for $\chi^2$ test or t-test
	n	%	n	%	
	<b>Total expenses of inpatient and outpatient care in 2013</b>				
Mean $\pm$ SD	70,617.6 $\pm$ 149,442		85,743.4 $\pm$ 164,619		<0.001
<35,455	3,414	-56.4	2,806	-46.4	<0.001
$\geq$ 35,455	2,635	-43.6	3,244	-53.6	-
<b>Total expenses of psychiatric outpatient and inpatient care in 2013</b>					
Mean $\pm$ SD	570.6 $\pm$ 6,004.6		1,604.6 $\pm$ 16,079.0		<0.001
<5,102	5,844	-97.3	5,744	-94.9	<0.001
$\geq$ 5,102	166	-2.7	306	-5.1	-
<b>Total expenses of non-psychiatric outpatient and inpatient care in 2013</b>					
Mean $\pm$ SD	70,047.0 $\pm$ 149,302		84,138.8 $\pm$ 163,782		<0.001
<34,871	3,418	-56.5	2,807	-46.4	<0.001
$\geq$ 34,871	2,632	-43.5	3,243	-53.6	-
<b>Number of OPD visits in 2013</b>					
Mean $\pm$ SD	24.9 $\pm$ 19.3		29.7 $\pm$ 21.2		<0.001
<24	3,412	-56.4	2,749	-45.4	<0.001
$\geq$ 24	2,638	-43.6	3,301	-54.6	-
<b>Days of IPD in 2013</b>					
Mean $\pm$ SD	4.9 $\pm$ 20.5		7.2 $\pm$ 29.8		<0.001
<10	5,344	-88.3	5,177	-85.6	<0.001
$\geq$ 10	706	-11.7	873	-14.4	-
OPD: out-patient department IPD: in-patient department					

**Table 4. Adjusted odds ratio and 95% confidence interval of risk of medical utilization in veterans compared with non-veterans.**

Variable	Adjusted OR	95% CI	P-value
<b>Total expenses for inpatient and outpatient care in 2013</b>			
(<35,455, $\geq$ 35,455)			
Non-veterans	1	-	-
Veterans	1.41	(1.30-1.53)	<0.001

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Total expenses for psychiatric outpatient and inpatient care in 2013 (<5,102, ≥5,102)			
Non-veterans	1	-0	-
Veterans	1.65	(1.32-2.05)	<0.001
Total expenses for non-psychiatric outpatient and inpatient care in 2013 (<34,871, ≥ 34,871)			
Non-veterans	1	-	-
Veterans	1.41	(1.30-1.54)	<0.001
Number of OPD visits in 2013 (<24, ≥ 24)			
Non-veterans	1	-	-
Veterans	1.47	(1.36-1.59)	<0.001
Days of IPD in 2013 (<10, ≥ 10)			
Non-veterans	1	-	-
Veterans	1.13	(1.01-1.27)	0.04
OR was adjusted for age, area, CCI and psychiatric disorders.			

## Discussion

The aim of the study was to compare the prevalence of mental health disorders and costs of medical utilization in elderly Taiwanese veterans and non-veterans.

### Major and minor neurocognitive disorder

In Taiwan, the prevalence rate of major neurocognitive disorder in men aged over 65 years in 2010 was 7.3% [7], which was consistent with our findings. In the U.S., a study performed by [8] revealed that the prevalence of major neurocognitive disorder in older veterans in the U.S. was higher when compared with elderly veterans in Taiwan (10.7% vs 9.6%).

### Schizophrenia

Our study showed that the prevalence of schizophrenia in both elderly veterans and non-veterans was 0.1% in 2010, almost the same as it was in Taiwan in 1996 [9]. The reason why the prevalence of schizophrenia in elderly veterans was lower in Taiwan compared with that in the U.S. (0.1% vs 0.3~12.2%) requires further study. Disease progression and a decreased life expectancy in veterans diagnosed with schizophrenia must be considered.

### Major depressive disorder and dysthymic disorder

Although the prevalence of major depressive disorder was not significant between veterans and non-veterans after adjustment (OR=1.58, 95% CI=0.93-2.67, p=0.089), veterans experienced a significantly high prevalence of dysthymic disorder (OR=1.41, 95% CI=1.04-1.92, p=0.026). The prevalence of major depressive disorder and dysthymic disorder in veterans was 0.8% and 2.0% respectively, which was low compared with the veteran depression prevalence in the U.S. report put out by Williamson V et al. (3-19%) (8).

### Bipolar disorder

In our study, the prevalence of bipolar disorder in elderly veterans was 0.5%. This is consistent with the prevalence seen in U.S. veterans, where elderly bipolar veterans ranged between 0.2% and 2.9%.

### Adjustment disorder

The prevalence of adjustment disorder in veterans and non-

veterans was relatively low in our study compared with what revealed (3.7%) [10]. This result may reflect on the study's population because geriatric adjustment disorder is more common in primary care and mental health care patients.

### Post-Traumatic Stress Disorder (PTSD)

Only one veteran in our study was diagnosed with PTSD, which was inconsistent with the results from a previous study [11]. Showed a significant dose-dependent association between PTSD and its severity, and an increased risk of developing dementia later in life. In addition, patients with PTSD had a high comorbidity with depressive disorder rate (77.3%). This may explain the low prevalence of PTSD and high prevalence of major and minor neurocognitive disorder and depression in elderly veterans.

### Anxiety disorder

The prevalence of anxiety disorder in elderly male veterans was 4.7% in our study. According to [12], in 2010, the prevalence of anxiety disorder in the general population was 6.09% in Taiwan. Why our study had a relatively low prevalence rate may be due to the study population, in that females are at a greater risk for anxiety disorder [12]. In the U.S., the prevalence rates for veterans experiencing non-PTSD anxiety disorder is estimated to range between 2.4% and 7.2% [13].

### Sleep disorder

There is a wide variation in reports regarding the prevalence of sleep disorder in elderly populations from different parts of the world (from 6% in Taiwan to 62.1% in Egypt) [14]. As with anxiety disorder, rates of sleep disorder are generally found to be higher in woman than in men. In addition, sleep problems can also be related to symptoms surrounding many psychiatric illnesses, such as major and minor neurocognitive disorder, depressive disorder, anxiety disorder and other known disorders. In our study, the prevalence of sleep disorder was significantly higher in veterans than in non-veterans (OR=1.22, 95% CI=1.08-1.39, p=0.002), which remained consistent with our findings that veterans experience a high prevalence of major and minor psychiatric illness.

### Major and minor psychiatric illness

The prevalence of major and minor psychiatric illness was

10.7% and 15.2% in elderly veterans and 8.5% and 11.3 % in elderly non-veterans. These data rates are consistent with what [15,16]. Discovered, showing that almost 20% of people without dementia aged 65 years and older did have mental disorders. In veterans, the prevalence of mental disorders was even higher, as shown in our study (Table 2).

### **Medical utilization**

As revealed in the study performed by Lu WH [17-19], elderly people required higher medical utilization than the general population, with our study showing that the elderly veterans required significantly more medical utilization in both psychiatric and non-psychiatric events when compared with elderly non-veterans in Taiwan. Although this suggested that elderly veterans have more health problems than the elderly non-veterans, it also showed that the availability of health services provided to elderly veterans in Taiwan is good.

### **Conclusion**

In 1949, approximately 500,000 military personnel came to Taiwan with the central government of Mainland China. As time went by, they integrated and became a part of Taiwan's people and landscape, with many of them remaining single while living in a Veterans Home after having left the army. In addition to the daily life care of elderly veterans, the Veterans Home also paid attention to their health problems and provided them with medical care through the Veterans Medical System of the Veterans Affairs Council. This is the reason as to why the elderly veterans in Taiwan are able to participate in the country's sound health care services.

However, as the Covid-19 pandemic continued to spread across the world, Taiwan announced a nationwide level 3 epidemic alerts on May 19, 2021, then lowering to level 2 on July 27, 2021. Through October 2021, the total number of coronavirus cases in Taiwan was less than 20,000, with fewer than 1,000 deaths (most of whom were older than 60 years). hypothesized that there would be a considerable increase in anxiety and depressive symptoms among people who do not have any pre-existing mental health conditions, with some experiencing post-traumatic stress disorder in due course. As previous studies have shown, quarantine periods during Covid-19 are associated with an acute worsening of clinical symptoms in patients diagnosed with dementia. The quarantined respondents also experienced higher incidences of both depression and anxiety. In addition, the side-effects of vaccinations may also cause anxiety in the general population. During this Covid-19 period and afterwards, the mental health condition of the elderly, vulnerable population must be considered, while the government should enact laws which positively effect change during post-pandemic life, as well as changes in the medical systems.

### **Limitations**

The study examined the prevalence of mental health disorder in elderly Taiwanese veterans and non-veterans, and subsequently compared the results with previous studies. However, there are some limitations to the study. First, although the study used

data from the NHI program which represented nationwide population, it did not represent the prevalence of mental health illness within the Taiwan community. For instance, alcohol and substance abuse were not included in our study because the NHI program doesn't include these disorders, thus their prevalence would be underestimated. The number of alcohol and substance abuse cases may be diagnosed as co-morbid mental health disorders such as depressive disorder, anxiety disorder or sleep disorder. Second, both the CCI and medical utilization were significantly higher in the elderly veteran group than in the non-veteran group, as well as in the odds ratio for risk of mental health disorders. For veterans compared with non-veterans, was adjusted for age, living location, CCI and number of out-patient departments. We did not have any data regarding the usage of pharmacological treatments or the residual confounding factors associated with personal characteristics such as education, socioeconomic status and supportive systems, along with others. These may also have been confounding factors. Further studies are still required in order to better investigate the prevalence of mental health disorders that can be seen in various settings.

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