

Original Article

The incidence and risk of substance use disorder among male and female income earners aged 18-64: A population-based-10 year follow-up study

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Purpose: This study was conducted to investigate the association between low income and substance use disorders (SUDs).

Methods: Data were collected from the National Health Insurance Research Database (NHIRD). A total of 1,824,491 people were followed from 2001 to 2010. Cox proportional hazards regression models were used for analysis.

Results: The incidence rates of SUD were higher in low-income than in non-low-income earners. The hazard ratios (HRs) and 95% confidence intervals (CIs) for SUD were 1.535 (1.316-1.791) and 1.812 (1.420-2.313) in low-income men and 2.706 (2.228-3.287) and 3.512 (2.221-5.553) in women in the 18-44 and 45-64 age groups, respectively. The HRs for SUD were higher in low-income females than in low-income males.

Conclusion: Low income is a risk factor for SUD in both men and women. The incidence of substance use is higher in low-income men than in low-income women, whereas HRs are higher in women than in men aged 18-64 years.

Key words: Low income, substance abuse disorders, Taiwan's National Health Insurance Research Database

Introduction

Substance-related disorders have been categorized into alcoholic and drug psychoses. Among West African adolescents from two senior high schools in Ghana's capital city, 46.2% reported currently using alcohol while 58.3% reported using marijuana⁽¹⁾. In the United States (U.S.), 8.1% of individuals aged 12 and over report illicit drug use,

10.2% admit using marijuana, and 23.2% report binge drinking within the past months⁽²⁾. Several studies have associated a decrease in household income and personal earnings with an increased risk of substance use disorders (SUDs)⁽³⁻⁸⁾. Individuals with SUD often present with comorbid depression⁽⁹⁾. The prevalence of depression in low-income earners is higher than in above-average-income earners^(10,11). Compared with persons in the highest income category, individuals in the lowest income category demonstrate increased odds of experiencing mental disorder⁽⁴⁾. However, few studies have discussed the association between low income, drug abuse, age, and gender. In addition, few studies have evaluated substance-related disorders in Asian countries. Therefore, this study

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investigated the association between low income and drug abuse by age and gender in Taiwan.

Methods

Analytic data were collected from Taiwan's National Health Insurance Research Database (NHIRD) which consists of detailed healthcare data

from more than 25 million enrollees, representing more than 99% of Taiwan's population. This database includes 2 million individuals randomly sampled from the databases in 2005 and 2010. All individuals were sampled from 2001 to 2010.

In this study, we identified all low-income subjects from 2001 to 2003 (specifically Group Insurance Applicants, i.e., category "51" or "52").

Tab 1. Demographic characteristics of low-income and non-low-income earners from 2001-2010 (n=1,824,491)

Variables	Non-low-income households (n=1,799,480)	Low-income households (n=25,011)	p-value
Gender			< . 001
Male	886,645 (49.27)	11,515 (46.04)	
Female	912,835 (50.73)	13,496 (53.96)	
Age in 2001			< . 001
0-17	452,803 (25.16)	9,924 (39.68)	
18-44	864,312 (48.03)	10,337 (41.33)	
45-64	358,023 (19.90)	2,922 (11.68)	
≥65	124,342 (6.91)	1,828 (7.31)	
Geographical location (Missing=33)			< . 001
Taipei area	656,176 (36.47)	8,473 (33.88)	
North area	262,600 (14.59)	2,847 (11.38)	
Central area	330,025 (18.34)	3,546 (14.18)	
South area-1	249,950 (13.89)	3,106 (12.42)	
South area-2	263,031 (14.62)	4,961 (19.84)	
East area	37,665 (2.09)	2,078 (8.31)	
Urbanization level* (Missing=33)			< . 001
Level 1	557,212 (30.97)	5,994 (23.97)	
Level 2	555,498 (30.87)	7,087 (28.34)	
Level 3	304,982 (16.95)	3,830 (15.31)	
Level 4	234,001 (13.00)	3,748 (14.99)	
Level 5	30,103 (1.67)	761 (3.04)	
Level 6	62,244 (3.46)	1,960 (7.84)	
Level 7	55,407 (3.08)	1,631 (6.52)	

* Urbanization in Taiwan was measured using seven levels, from Level 1 (most urbanized) to Level 7 (least urbanized).

Substance use was identified using the ICD-9-CM codes 292.X, 304.X and 305.X. Excluded were individuals diagnosed with substance-related disorders from 2001-2003. Patients with repeated IDs were also excluded as were patients with an unknown occupation, sex and/or age. The sample included 1,844,032 individuals (907,934 males and 936,098 females). Excluded from this sample were 19,541 subjects (9,774 males and 9,767 females) identified as low income from 2004-2010. The final sample numbered 1,824,491. This study was approved by the Institutional Review Board of Chung Shan Medical University Hospital, Taichung City, Taiwan.

The sample was divided into four age groups (0-17, 18-44, 45-64, ≥ 65). The proportions of cases with SUDs were calculated according to gender, age group and income. Nominal variables were analyzed using Chi-square test. Survival analysis was used to investigate the effects of low income on SUDs. Adjustments were made for age, geographic location and urbanization level. Statistical analyses were performed using Statistical Analysis System (SAS) statistical software package, version 9.1.3. SAS Institute Inc., Cary, NC, USA.

Results

The demographic characteristics of the study subjects are shown in Table 1. From 2001-2003, 25,011 individuals comprising 11,515 males and 13,496 females, were from low-income households. The proportion of females from low-income households was significantly higher than the proportion of males (53.96% vs. 46.04%). There were differences in age distribution among low-income and non-low-income individuals. In 2001, the highest proportion of low-income individuals was in the 18-44 age group (41.33%). Geographical distribution and urbanization level significantly differed among low-income and non-low-income individuals.

Table 2 shows the proportions of low-income men and women with SUD. In general, male low-income earners aged 18-64 had the highest incidence of SUD when compared with females

of the same age group. The incidence of SUD was higher in low-income earners than in non-low-income earners. Among non-low-income earners, the highest rate of SUD was in the 18-44 age group (2.62% in males and 0.60% in females). However, among low-income earners, the highest rates of SUD were in males aged 45-64 (4.19%) and females aged 18-44 (1.74%).

The HRs of SUD at 95% confidence interval were higher in low-income females aged 18-44 and 45-64 than in low-income males (Table 3) (2.706 (2.228-3.287) and 3.512 (2.221-5.553) for females and 1.535 (1.316-1.791) and 1.812 (1.420-2.313) for males in the 18-44 and 45-64 age groups, respectively).

Discussion

This is the first study to use a 10-year longitudinal follow-up database to investigate the association between low-income and SUD by age and gender. In general, there was a higher incidence of substance use in low-income men than in low-income women. The highest rates of SUD were in low-income women aged 18-44 and low-income men aged 45-64 years. In addition, HRs were higher in low-income females than in low-income males. These findings suggested that low-income females are more susceptible to SUD. The attributable risks (AR) were 34.9 and 44.8% in males and 63.0 and 71.5% in females aged 18-44 and 45-64, respectively.

One study identified an increased risk of substance use among adults exposed to economic crises ⁽¹²⁾. In another study, it was demonstrated that macroeconomic environment during infancy can have serious long-term effects in terms of substance use ⁽¹³⁾. However, the risks of SUD for specific gender and age groups have not been clearly defined. A previous study estimated sex and age-specific incidence rates, as well as cumulative incidences of mental and behavioral disorders, for psychoactive substance abuse ⁽¹⁴⁾. Results showed higher cumulative incidence and lifetime risk in men, consistent with the findings of this study. Low income is a significant risk factor for SUD. It

Tab 2. Proportions of male and female patients from low-income and non-low-income households

Disease	primary diagnosis time point	Age							
		0-17	18-44	45-64	≥65	low-income households n (%)	non low-income households n (%)		
Substance use disorder (Females)	None	223,769 (99.87)	5,197 (99.69)	439,698 (99.4)	6,058 (98.26)	182,825 (99.63)	1,310 (98.57)	62,291 (99.78)	752 (99.21)
	2004-2010	292 (0.13)	16 (0.31)	2,672 (0.60)	107 (1.74)	670 (0.37)	19 (1.43)	139 (0.22)	6 (0.79)
Substance use disorder (Males)	None	228,07 (99.72)	4,663 (99.13)	409,418 (97.38)	3,937 (95.98)	170,062 (97.7)	1,511 (95.81)	60,811 (98.5)	1,048 (98.5)
	2004-2010	635 (0.28)	41 (0.87)	11,027 (2.62)	165 (4.02)	3,995 (2.30)	66 (4.19)	925 (1.50)	925 (1.50)

Subjects were drawn from 2,000,000 individuals listed in the NHIRD databases in 2005 and 2010. The final sample included 1,844,032 individuals (907,934 males and 936,098 females). Subjects who were in low-income households were identified by the claims data that was randomly sampled from the Registry for Beneficiaries (specifically, Group Insurance Applicants categories "51" and "52") from 2001 to 2003. In all, 25,011 subjects were identified as low-income households (11,515 males and 13,496 females) and 1,799,480 were identified as non-low-income households (886,645 males and 912,835 females). Patients initially diagnosed with substance use disorder from 2001 and 2003 were excluded (n=1,7665).

Tab 3. Hazard ratios for substance use disorders in low-income males and females

	Age			
	0-17	18-44	45-64	≥65
Substance use disorder (Females)				
Non-low-income households	-	-	-	-
low-income households	1.744 (1.050-2.896)	2.706 (2.228-3.287)	3.512 (2.221-5.553)	3.466 (1.520-7.907)
Substance use disorder (Males)				
Non-low-income households	-	-	-	-
low-income households	2.304 (1.675-3.168)	1.535 (1.316-1.791)	1.812 (1.420-2.313)	1.076 (0.656-1.766)

Adjustments were made for age, geographical location and urbanization level.

is worth noting that previous investigations on the associations between low income and substance use have revealed inconsistent results. In the US, low-income earners show no observable differences in drug use⁽⁴⁾.

This study made use of a large population-based database. However, there are some limitations, hence the results should be interpreted with caution. First, all of the diagnoses were from an administrative database and may have been less accurate than those established individually through standardized procedures. Moreover, doctors may have had varied understanding of the diseases of interest and may have used different criteria for diagnoses between 2004 and 2010. Second, precise ascertainment and diagnosis of a disease can be challenging and patients may go for years before a definitive diagnosis is made. Our data dates back only to 2001. The period of time between disease onset and diagnosis may have been longer. Therefore, it is possible that some incidental cases included in this study may have been prevalent cases.

Low income was found to be a risk factor for SUD in men and women. The incidence of substance use was higher in low-income men than in low-income women, whereas the HRs were higher in women than in men aged 18-64 years.

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