

The Effect of Employment, Education Level, and English Proficiency on the Association Between Race/Ethnicity and Major Depression Among U.S. Adults Aged 18 - 49 Years: A Cross-Sectional Analysis of 2021 NSDUH

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Abstract. This study hypothesized that employment, education, and English proficiency serve as protective factors against depression, and the risk of depression for Asian Americans would be similar to that of White Americans after controlling for those potential mediators. The sample population included non-Hispanic Asians and non-Hispanic whites aged 18-49 years in the United States (N = 23,426). Using the 2021 National Survey on Drug Use and Health (NSDUH), the association between race/ethnicity and major depressive episode (MDE) was assessed. The results revealed that adjusting for each covariate increased the risk of Asians having MDE. However, the increase was not statistically significant which indicates that these covariates cannot explain the distinct lower prevalence of depression among Asians in the U.S. Other factors such as the influence of cultural differences should be considered in future researches.

Keywords: Depression, Socioeconomic factors, Asian American.

1. Introduction

There were approximately 280 million people with depression globally in 2019[1]. A study conducted by Kessler and Wang [2] stated that major depressive disorder (MDD) is the most common mood disorder and the third most common mental disorder in the US, with a slightly lower 12-month prevalence (6.7%) than specific phobia (6.8%) and social phobia (8.7%). Among those people with MDD, 30.4% are severe cases, 50.1% are moderate cases, and 19.5% are mild cases, meaning that the majority of MDD patients are experiencing mild or severe symptoms such as significant loss of weight, fatigue, low self-esteem, inability to think or concentrate, and suicidal attempts or thoughts, in which therapeutic interventions or medication are required [2, 3]. A meta-analysis conducted by Dong et al [4] in 2022 indicates that the pooled 12-month and lifetime prevalence of suicide attempts was 8% and 31% for people living with MDD. Meanwhile, the DSM-V [3] also mentions that people living with MDD have worse physical health compared to other people in a medical setting, which can be attributed to their inability to seek basic healthcare services caused by their poor mental health. The prevalence of major depression increased significantly by 27.6% after the COVID-19 pandemic, which was associated with an increase of 137.1 per 100,000 disability-adjusted life years (DALYs) around the world [5].

Racial discrimination against minority groups has always been a large issue in the US. In 2020, East Asians in the US had the highest prevalence of ever experiencing discrimination (22.57%) compared to Black Americans (19.72%), Hispanic Americans (15.72%), and White Americans (2.73%) [6]. Asians were also the second-highest ethnic group receiving perception bias due to racial reasons with a prevalence of 17.15% [6]. Unfortunately, anti-Asian racism was intensified by the COVID-19 pandemic, as the number of anti-Asian hate crimes increased by 70% during and after the pandemic [7]. According to Strassle and colleagues [8], Asian Americans who experienced COVID-related discrimination were three times more likely to develop depressive symptoms compared to those who did not. In contrast with the startling risk of Asian Americans developing depressive symptoms, study showed that the lifetime prevalence of mood disorders for Asian, Black, Latino, and White individuals in the US were 23.5%, 37.0%, 38.8%, and 45.6%, respectively [9]. Unlike other racial minority groups such as Black and Hispanic Americans who have been studied because of their

high burden of mental illnesses, few current studies focus on the mental health of Asian communities in the US, or the reason for their low prevalence when compared to other racial groups [6, 10, 11].

From previous literature, there were several protective factors proposed as effective against depression, such as education. The study by Kondirolli and Sunder [12] showed that one additional year of education can reduce the risk of depressive symptoms by 11.3%, and it can decrease the severity of depressive symptoms by 6.1%. In addition, employment was also considered to act as a protective factor for mental illness as working can be one way for patients to stay connected with other people and society [13]. On top of these, over half of the immigrant population in the U.S. have limited English proficiency (LEP), and LEP has been used in previous studies as an immigration-related variable [14, 15]. Therefore, it is reasonable to use English proficiency as an proxy for immigration status in this study, as immigrants born outside of the U.S. have been discovered to have a significantly lower risk of developing mental illness compared with their U.S.-born peers [16].

Thus, using the data from the 2021 National Survey on Drug Use and Health (NSDUH) [17], this study aims to investigate the association between race/ethnicity, specifically comparing Asians to Whites, and the presence of MDE among US adults aged 18-49 years. Demographic variables such as age, gender, marital status, sexual orientation, poverty level, and health insurance status will be analyzed to test if they serve as potential effect measure modifiers or confounders in this relationship. Additionally, employment status, education level, and English proficiency were added to the final model to reveal the true risk of MDE for Asian Americans after accounting for these protective factors and potential mediators, as well as to identify the strongest protective factor against MDE for Asian Americans. The hypothesis for this study is that compared with the unadjusted association, the adjusted risk of MDE for Asian Americans will be closer to the risk of MDE for White Americans after accounting for the effects of these potential mediators.

2. Methods

2.1 Data source and study design

The data for the proposed study was collected from the 2021 National Survey on Drug Use and Health (NSDUH) [17], which is a cross-sectional survey used to estimate the burden and correlates of substance use and mental health issues in the US. The survey was conducted annually since 1971 by the Substance Abuse and Mental Health Services Administration (SAMHSA) and it served as a tool for public health researchers and workers to better understand the behavioral and mental health of US citizens [17].

2.2 Sample population

In the year 2021, a total number of 69,850 noninstitutionalized civilians aged 12 or older in the US was recorded by NSDUH, while data from 58,034 participants were available for the public use file [17]. Participants give their informed consent before receiving the interview, and the data-collecting protocols were approved by the Institutional Review Board (IRB) of the Research Triangle Institute (RTI) [18]. The missing data in the survey were replaced by statistical imputation using predictive mean neighborhood (PMN) and modified predictive mean neighborhood (modPMN), therefore this study will be using the imputed data to avoid potential selection bias [17].

This study will only use data from participants aged 18-49 years who have also responded to the questions on MDE. In addition, participants who self-reported to be any race/ethnicity other than Non-Hispanic White or Non-Hispanic Asian were excluded from the sample population, which then gives a final sample size of 23,426.

2.3 Covariates

2.3.1 Race/Ethnicity

Information about Race/Ethnicity was collected by self-reported questionnaire, participants were asked the question: “which of these groups describes you?”, and they were required to report their race/ethnicity while groups of different race/ethnicity were provided on a showcard. The groups provided were: “White”, “Black or African American”, “American Indian or Alaska Native”, “Native Hawaiian”, “Guamanian or Chamorro”, “Samoa”, “Other Pacific Islander”, “Asian”, and “Other” [19]. Responses were then reclassified into seven categories: “Non-Hispanic White”, “Non-Hispanic Black/African American”, “Non-Hispanic Native American/Alaska Native”, “Non-Hispanic Native Hawaiian/Other Pacific Islander”, “Non-Hispanic Asian”, “Non-Hispanic more than one race”, and “Hispanic” [17]. Only “Non-Hispanic White” and “Non-Hispanic Asian” will be used in this study.

2.3.2 Major depressive episode

Using computer-assisted interviewing (CAI), questions assessing depressive symptoms for adults were developed from the depression section of the National Comorbidity Survey-Replication (NCS-R) [18]. For example, some questions [19] included in the survey are: “During that [worst/most recent] period of time, did you feel sad, empty, or depressed most of the day nearly every day, or did you feel discouraged about how things were going in your life most of the day nearly every day?”, “During that [worst/most recent] period of time, did you lose interest in almost all things like work and hobbies and things you like to do for fun?” and so on. Two options were available for these questions: “Yes” and “No”. As defined by the diagnostic criteria of DSM-V, people were classified as having had a lifetime major depressive episode (MDE) if they had five or more of nine symptoms in the same two-week period in their lifetime, in which at least one of the symptoms was a depressed mood or loss of interest or pleasure in daily activities [18]. After recoding, two categories were available for adult lifetime MDE: “Yes”, and “No”, which will be used for this study.

2.3.3 Employment, education, and English proficiency

Employment status was measured by self-administered questionnaire [19], in which participants were asked to answer a series of questions such as “did you work at a job or business at any time last week?” Based on the responses, participants were organized into four categories: “Employed full time”, “Employed part-time”, “Unemployed”, and “Other (incl. Not in the labor force)”. The highest education level achieved was reported by the participants by asking them to choose from a showcard with 22 groups available. The responses were then categorized into one of four groups: “less than high school”, “high school graduate”, “some college or associate’s degree”, and “college graduate” [17]. Since NSDUH does not include a specific question on immigration status, this study used the question “How well do you speak English?” as a proxy for immigration status. Six categories were provided for the participants: “Very well”, “Well”, “Not Well”, “Not at all”, “Don’t know”, and “Refused”. Those who answered “Very Well” and “Well” were combined as “Very well or well”, the other two responses were combined and assigned as “Other” since these participants are likely to be immigrants who were born outside of the U.S. As some participants chose to not answer this question, blank answers were counted as missing values along with those who answered “Don’t know”, “Refused”, and “BAD DATA LOGICALLY ASSIGNED”, which represent imputed missing data that were not consistent with other data.

2.4 Demographic variables

Some other variables that will also be included in the study include gender, age, sexual identity, education level, and marital status. Two categories of gender were recorded by the interviewer: “Male” or “Female”, and the answer was confirmed by the participants by asking them “you have entered that the respondent is male/female. Is this correct?” Date of birth was recorded by asking “what is your date of birth”, and age of the participants was then calculated and classified into five categories:

“12-17 Years Old”, “18-25 Years Old”, “26-34 Years Old”, “35-49 Years Old”, “50 or Older”. However, since this study only aims to study individuals aged 18-49 years old, only participants within these three categories will be included in this study. Responses on marital status included “Married”, “Widowed”, “Divorced or Separated”, “Have never married”, and “DK/REF” which stands for don’t know or refused [19]. Sexual identity was recorded by asking: “which one of the following do you consider yourself to be” and responses included: “Heterosexual/straight”, “Lesbian or Gay”, “Bisexual”, “Bad Data Logically assigned”, “Don’t Know”, “Refused”, “Blank (No answer)”, and “Legitimate Skip” [17]. Again, any answers other than the first three were assigned as missing value. Moreover, participants were asked to report their health insurance information. If they were covered by Medicare, Medicaid/CHIP, Tricare, Champus, ChampVA, VA, Military, or any private insurance, their answers were “Yes”, otherwise their answers were recorded as “No”. Poverty level was calculated by dividing the family income by the poverty threshold assigned by the U.S. Census Bureau [18]. Participants aged 18-22 who were living in a college dormitory were excluded from this variable while the rest of the eligible participants were asked to report their past year family income by choosing from several categories ranged from “less than \$1,000” to “\$150,000 or more” from the showcard [18]. If the calculated family income is less than the poverty threshold, the participants were defined as “Living in Poverty”, if the poverty level was twice the poverty threshold, the participants were categorized into “Up to 2X Fed Pov Thresh”, and if the poverty level was higher than twice of the poverty threshold, participants were classified as “Than 2X Fed Pov Thresh” [17].

2.5 Statistical analyses

All statistical analysis was performed using Stata (version 17.0) [20]. Univariable analysis was first conducted to describe the sociodemographic characteristics of the sample population. Since all variables are categorical, only frequencies and percentages were calculated. Bivariable analysis was then conducted to test the effect of all covariates on the exposure and the outcome using Pearson’s chi-square test. If the p-value was less than 0.05, the null hypothesis that covariates have no effects on the exposure/outcome was rejected. Furthermore, employment status, education level, and fluency in English were included in the multivariable analysis. Crude odds ratios (OR) were compared with the odds ratios of three adjusted logistic regression models each adjusting for one covariate. A full model adjusting for all three covariates was also developed to see the effect of all three variables on the association. 95% confidence intervals were calculated for all four models.

3. Results

3.1 Univariable analysis

The demographic characteristics of the participants are shown in Table 1. There were more females (55.38%) compared to males (44.62%) in the sample population and the majority of the sample population were heterosexual (82.02%) compared with Bisexual (10.38%) or homosexual (3.13%). Half of the participants have never been married, 41% of them were married, 7.67% of them were divorced or separated, and only 0.45% of them were widowed. The age distribution was even across groups, except that the age group of 26-34 years was approximately 10% lower than the other two groups. 91% of the participants have health insurance of any kind mentioned above, and nearly 70% of them have income more than twice the federal income threshold. The percentages of people living in poverty and people with income between 100% to 200% of the federal threshold were 13.79% and 16.43% respectively.

Among all participants, the ratio of non-Hispanic Whites versus non-Hispanic Asians was approximately 10:1, and 76.15% of them were classified as not having MDE. 57.25% of them reported being employed full-time, 16.54% reported being employed part-time, and 5.58% were unemployed. The percentage of college graduates was the highest among all degrees, with a percentage of 43.78%, followed by some college or AA degree (29.99%), high school graduates (19.52%), and less than high school (6.71%). Finally, 95.88% of all respondents claimed that they

are fluent in English, 0.63% claimed that they speak English not well or not at all, and the rest 3.49% were recorded as missing data.

Table 1. Sociodemographic characteristics of Asian and White Americans aged 18-49 years, National Survey on Drug Use and Health, United States, 2021, n = 23426

Variable	N (%)
Sociodemographic characteristics	
Gender	
Male	10453 (44.62)
Female	12973 (55.38)
Age	
18 - 25 years old	8335 (35.58)
26 -34 years old	6314 (26.95)
35 - 49 years old	8777 (37.47)
Marital status	
Married	9672 (41.29)
Widowed	105 (0.45)
Divorced or Separated	1797 (7.67)
Never Been Married	11852 (50.59)
Sexual identity	
Heterosexual	19215 (82.02)
Lesbian or Gay	733 (3.13)
Bisexual	2431 (10.38)
Missing ¹	1044 (4.47)
Health insurance	
Yes	21291 (90.89)
No	2135 (9.11)
Poverty Level	
Living in Poverty	3228 (13.79)
Income up to 2X Thresh ²	3845 (16.43)
Income > 2X Thresh	16334 (69.78)
Research question-based variables	
Major Depressive Episode	
No	17840 (76.15)
Yes	5586 (23.85)
Race/Ethnicity	
NonHisp ² White	21184 (90.43)
NonHisp Asian	2242 (9.57)
Employment status	
Employed full time	13412 (57.25)
Employed part time	3874 (16.54)
Unemployed	1307 (5.58)
Other (incl. not in labor force)	4833 (20.63)
Education level	
Less than high school	1572 (6.71)
High school graduate	4573 (19.52)
Some college or AA ⁴ degree	7026 (29.99)
College graduate	10255 (43.78)
How well speak English	
Very well or well	22461 (95.88)
Other ⁵	147 (0.63)
Missing	818 (3.49)

¹ Combined by “logically assigned bad data”, “don’t know”, “refused” and “blank”

² 2X Fed Pov Thresh: 200% of the poverty threshold defined by the federal government

³ NonHisp: non-Hispanic

⁴ AA: Associate's degree

⁵ Combined by “Well”, “Not well”, and “Not at all”

3.2 Bivariable analysis

Table 2 shows the association between each covariate and race/ethnicity. Compared with non-Hispanic Asians, non-Hispanic Whites have a 10% higher proportion of MDE patients. The percentages of people who were employed full-time were also higher for Whites (57.94%) compared to Asians (50.80%). On the contrary, there were more Asian college graduates (61.86%) than White college graduates (41.86%). As expected, only 0.31% of White Americans were not confident with speaking English very well, while 3.83% of Asian Americans were unable to speak English very well or well. Table 3 shows the association between each covariate and MDE. Among all MDE patients, there were more Whites (94.06%) compared to Asians (5.94%). The percentages dropped a bit to 89.29% for Whites and increased to 10.71% for Asians when counting participants without MDE. There were fewer MDE patients with full -time jobs (51.58%) compared with non-MDE patients (59.03%). The proportion of college graduates was also lower for people with MDE (40.51%) than those without MDE (44.80%). Last but not least, 99.83% of MDE patients speak English very well, while this percentage decreased to 99.2% for non-MDE patients.

Table 2. Bivariable associations between major depressive episode, key sociodemographic characteristics, covariates and race/ethnicity among Asian and White Americans aged 18-49 years, National Survey on Drug Use and Health, United States, 2021, n = 23426

Sociodemographic characteristics	Total N (%)	Race/ethnicity N (%)		P-value ¹
		NonHispanic White	NonHispanic Asian	
Gender				
Male	10453 (44.62)	9436 (44.54)	1017 (45.36)	0.459
Female	12973 (55.38)	11748 (55.46)	1225 (54.64)	
Age				
18 - 25 years old	8335 (35.58)	7471 (35.27)	864 (38.54)	<0.05
26 -34 years old	6314 (26.95)	5761 (27.20)	553 (24.67)	
35 - 49 years old	8777 (37.47)	7952 (37.54)	825 (36.80)	
Marital status				
Married	9672 (41.29)	8715 (41.14)	957 (42.69)	<0.05
Widowed	105 (0.45)	100 (0.47)	5 (0.22)	
Divorced or Separated	1797 (7.67)	1718 (8.11)	79 (3.52)	
Never Been Married	11852 (50.59)	10651 (50.28)	1201 (53.57)	
Sexual identity				
Heterosexual	19215 (85.86)	17266 (85.20)	1949 (92.19)	<0.05
Lesbian or Gay	733 (3.28)	693 (3.42)	40 (1.89)	
Bisexual	2431 (10.86)	2306 (11.38)	125 (5.91)	
Health insurance				
Yes	21291 (90.89)	19217 (90.71)	2074 (92.51)	<0.05
No	2135 (9.11)	1967 (9.29)	168 (7.49)	
Poverty Level				
Living in Poverty	3228 (13.79)	2883 (13.62)	345 (15.39)	<0.05
Income up to 2X Thresh	3845 (16.43)	3534 (16.70)	311 (13.88)	
Income > 2X Thresh	16334 (69.78)	14749 (69.68)	1585 (70.73)	
Research question-based variables				

Major Depressive Episode				
No	17840 (76.15)	15930 (75.20)	1910 (85.19)	<0.05
Yes	5586 (23.85)	5254 (24.80)	332 (14.81)	
Employment status				
Employed full time	13412 (57.25)	12273 (57.94)	1139 (50.80)	<0.05
Employed part time	3874 (16.54)	3498 (16.51)	376 (16.77)	
Unemployed	1307 (5.58)	1169 (5.52)	138 (6.16)	
Other	4833 (20.63)	4244 (20.03)	589 (26.27)	
Education level				
Less than high school	1572 (6.71)	1472 (6.95)	100 (4.46)	<0.05
High school graduate	4573 (19.52)	4303 (20.31)	270 (12.04)	
Some college or AA degree	7026 (29.99)	6541 (30.88)	485 (21.63)	
College graduate	10255 (43.78)	8868 (41.86)	1387 (61.86)	
How well speak English				
Very well or well	22461 (95.88)	20375 (99.69)	2086 (96.17)	<0.05
Other	147 (0.63)	64 (0.31)	83 (3.83)	

¹ p-value for Pearson's chi-square test

Table 3. Bivariable associations between race/ethnicity, key sociodemographic characteristics, covariates and major depressive episode among Asian and White Americans aged 18-49 years, National Survey on Drug Use and Health, United States, 2021, n = 23426

Sociodemographic characteristics	Total N (%)	Major depressive episode N (%)		P-value ¹
		Yes	No	
Gender				
Male	10453 (44.62)	1909 (34.17)	8544 (47.89)	<0.05
Female	12973 (55.38)	3677 (65.83)	9296 (52.11)	
Age				
18 - 25 years old	8335 (35.58)	2322 (41.57)	6013 (33.71)	<0.05
26 -34 years old	6314 (26.95)	1465 (26.23)	4849 (27.18)	
35 - 49 years old	8777 (37.47)	1799 (32.21)	6978 (39.11)	
Marital status				
Married	9672 (41.29)	1753 (31.38)	7919 (44.39)	<0.05
Widowed	105 (0.45)	30 (0.54)	75 (0.42)	
Divorced or Separated	1797 (7.67)	547 (9.79)	1250 (7.01)	
Never Been Married	11852 (50.59)	3256 (58.29)	8596 (48.18)	
Sexual identity				
Heterosexual	19215 (85.86)	3793 (71.38)	15422 (90.37)	<0.05
Lesbian or Gay	733 (3.28)	264 (4.97)	469 (2.75)	
Bisexual	2431 (10.86)	1257 (23.65)	1174 (6.88)	
Health insurance				
Yes	21291 (90.89)	5072 (90.80)	16219 (90.91)	0.794
No	2135 (9.11)	514 (9.20)	1621 (9.09)	
Poverty Level				
Living in Poverty	3228 (13.79)	879 (15.75)	2349 (13.18)	<0.05
Income up to 2X Thresh	3845 (16.43)	1093 (19.58)	2752 (15.44)	
Income > 2X Thresh	16334 (69.78)	3610 (64.67)	12724 (71.38)	
Research question-based variables				
Race/ethnicity				
NonHisp White	21184 (90.43)	5254 (94.06)	15930 (89.29)	<0.05
NonHisp Asian	2242 (9.57)	332 (5.94)	1910 (10.71)	

Employment status				
Employed full time	13412 (57.25)	2881 (51.58)	10531 (59.03)	<0.05
Employed part time	3874 (16.54)	1133 (20.28)	2741 (15.36)	
Unemployed	1307 (5.58)	380 (6.80)	927 (5.20)	
Other	4833 (20.63)	1192 (21.34)	3641 (20.41)	
Education level				
Less than high school	1572 (6.71)	336 (6.02)	1236 (6.93)	<0.05
High school graduate	4573 (19.52)	1014 (18.15)	3559 (19.95)	
Some college or AA degree	7026 (29.99)	1973 (35.32)	5053 (28.32)	
College graduate	10255 (43.78)	2263 (40.51)	7992 (44.80)	
How well speak English				
Very well or well	21300 (94.21)	5361 (99.83)	17100 (99.20)	<0.05
Other	1308 (5.79)	9 (0.17)	138 (0.80)	

¹ p-value for Pearson's chi-square test

3.3 Multivariable analysis

In the unadjusted model shown in Table 4, all associations were significant at 95% confidence level except for education level with high school (95% CI: 0.91 – 1.20) and college degrees (95% CI: 0.92 – 1.19). The crude OR of MDE was 0.53 (0.47 – 0.59) for Non-Hispanic Asians with non-Hispanic Whites as the reference group. In model 1, after adjusting for employment status, OR dropped to 0.52 (0.46 – 0.58). After adjusting for education level in model 2, the OR increased to 0.54 (0.49 – 0.61). And finally, in model 3 where fluency in English was adjusted, the OR of MDE increased to 0.55 (0.49 – 0.62). The OR of MDE among those who cannot speak English very well or well increased significantly from 0.21 (0.11– 0.41) to 0.27 (0.14 – 0.53) after adjusting for fluency in English. In the full model which adjusted for all three variables, the OR of MDE was 0.54 (0.48 – 0.61) for non-Hispanic Asians. The OR of MDE also increased among participants with all levels of education and English proficiency. On the contrary, the OR of MDE decreased after adjusting for all types of employment status.

Table 4. Multivariable logistic regression analysis between race/ethnicity, key covariates and major depressive episode among Asian and White Americans aged 18-49 years, National Survey on Drug Use and Health, United States, 2021, n = 23426

	Crude OR (95% CI)	Adjusted OR ¹ (95% CI ²)			
		Model 1 (Employment status)	Model 2 (Education level)	Model 3 (How well speak English)	Model 4 (Full Model)
Race/ethnicity					
NonHisp White	ref.	ref.	ref.	ref.	ref.
NonHisp Asian	0.53 (0.47– 0.59)	0.52 (0.46– 0.58)	0.54 (0.48– 0.61)	0.55 (0.49– 0.62)	0.54 (0.48–0.61)
Employment status					
Unemployed	ref.	ref.			ref.
Employed full time	0.67 (0.59– 0.76)	0.66 (0.58– 0.75)			0.62 (0.55–0.71)
Employed part time	1.01 (0.88– 1.16)	1.00 (0.87– 1.15)			0.93 (0.81–1.07)
Other	0.80 (0.70– 0.92)	0.81 (0.70– 0.92)			0.78 (0.68–0.90)
Education level					
Less than high school	ref.		ref.		ref.
High school graduate	1.05 (0.91– 1.20)		1.05 (0.91– 1.20)		1.10 (0.95–1.27)
Some college or AA degree					1.50 (1.31–1.72)

College graduate	1.43 (1.26–1.64) 1.04 (0.92–1.19)	1.44 (1.26–1.64) 1.08 (0.95–1.23)	1.22 (1.06–1.40)
How well speak English			
Very well or well	<i>ref.</i> 0.21 (0.11–0.41)	<i>ref.</i> 0.27 (0.14–0.53)	<i>ref.</i> 0.27 (0.14–0.53)
Other			

¹ OR: odds ratio

² CI: confidence interval

4. Discussion

Based on the above results, it can be concluded that all demographic variables except for gender were significantly associated with race/ethnicity, and all variables except for health insurance were significantly associated with the presence of MDE (P -value < 0.05), which implies that they serve as confounders in the association of race/ethnicity and depressive symptoms. MDE is also significantly associated with race/ethnicity, in which the odds of Asian Americans being identified with MDE are 0.55 times the odds of White Americans being identified with MDE. Having a full-time job, a lower education level, as well as a lack of proficiency in English were correlated with a decreased risk of MDE, given that the OR increased slightly after adjusting for each covariate.

Being employed full-time decreases the odds of MDE by 33% compared to being unemployed, which is similar to another study conducted in Korea, in which the researchers claimed that precarious employment and unemployment would inflate the risk of developing depressive symptoms [21]. Our study further showed that people with some college or associate's degree had greater risk of MDE compared to people with other educational levels, however, colleague graduates also had a higher risk of MDE compared to people with less than high school degree. The mixing of risks and benefits of education level on depression was also shown in other studies: Some stated that people with lower education levels would have higher risks of being depressed compared to people with years of education [22, 23]. Yet, another study by Miech and Shanahan [24] claimed that there was an increasing association between depression and education level with increased age, and lower risk of depression with higher education could be attributed to the better physical health of those with higher education achievement. The OR adjusted for fluency in English increased by 28.6%, which validated the theory that Non-Hispanic Asians born in the States would have a higher risk of psychiatric disorders [16]. Another study assessing English-language proficiency and mental disorders also predicted the same result, that is, a higher risk of 12-month disorders for Asian men who speak English proficiently [25].

However, it is surprising to see that after adjusting for all three covariates, the OR of MDE for Asians does not change significantly compared to the crude OR, which indicates that the variance of MDE prevalence between Asians and Whites in the U.S. should be explained by something other than demographic factors. For example, cultural differences could be one of the factors influencing how people handle depressed mood. Hornsey et al [26] proposed that people influenced by Asian holistic cultures such as Buddhism and Confucianism have relatively more moderate "self-ideals" compared to non-holistic cultures, which means that they have lower expectations of their ideal ways of being (i.e. happiness, health, and self-esteem), giving them stronger resilience against negative events, which serves as a protective factor against depression. Alternatively, Kalibatseva and Leong [27] pointed out that Asians, compared to Westerners, are more likely to report somatic symptoms of depression instead of depressed mood, which would lead to misdiagnosis of depression. Additionally, traditional beliefs in Asian culture produce stigma against mental illness, as people with mental issues would be considered a shame to the family [28]. This would also introduce bias to the analysis, as Asian people would underreport their depressive symptoms to avoid being diagnosed with depressive disorder.

Besides the social desirability bias introduced by cultural differences, this study uses English proficiency as a proxy variable for immigration status since it is the only variable related to immigration in the NSDUH dataset. However, it is uncertain if someone who can speak English fluently was surely born in the U.S., which could lead to an overestimated number of proficient English speakers. And it is worth noting that the NSDUH only measures MDE instead of MDD. The main difference between them is that MDD is a chronic disorder characterized by MDE and excludes hypomania or manic episodes, while MDE can occur with hypomania or manic episodes, which could indicate bipolar disorder (BD) instead of MDD [3, 29]. Therefore, given the fact that MDE can possibly transit to BD, the prevalence is sometimes overestimated for MDE compared to MDD alone [30, 31]. For example, Kessler et al [30] estimated the 12-month and lifetime prevalence of MDE as 8.6% and 29.9%, respectively, using the US National Comorbidity Survey Replication from 2001 to 2003. The 12-month prevalence of MDD provided by DSM-V [3] was around 7% in the US, and the lifetime prevalence in a study by Lee et al [32] was 18.5% in 2020. And lastly, sensitivity and specificity of NCS-R were not provided, therefore it is uncertain if it is an applicable tool for the measurement of MDE in this sample population.

Despite the limitations mentioned above, this study assessed the association between being an Asian in the U.S. and depressive symptoms. The result that the prevalence of Asians was still distinct from Whites after adjusting for key demographic factors showed that there should be other factors responsible for the low risk of depression among Asians in the U.S. Future studies could focus on the effect of culture-related stigma, acculturation, and other unique factors within the Asian community but not yet being discovered.

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