

Background

- Depression is a common and serious psychiatric disorder that significantly affects U.S. adults both physically and psychologically, resulting in increased disability, morbidity, mortality, and socioeconomic burden.
- Education level, the main exposure of interest in this study, has been associated with depression prevalence related to gender, age, race/ethnicity, and health insurance coverage.
- Since individuals with lower education levels have higher chances of facing socioeconomic challenges, understanding depression prevalence among them can help create targeted interventions.

Study Objectives

- The association between education level and depression among U.S. adults ≥ 20 years old while controlling for age, race, and health insurance coverage, and whether this relationship is modified by gender.
- I hypothesize that education level is negatively associated with depression and age, race, and health insurance coverage have confounding effects on this association while gender may be an effect measure modifier.

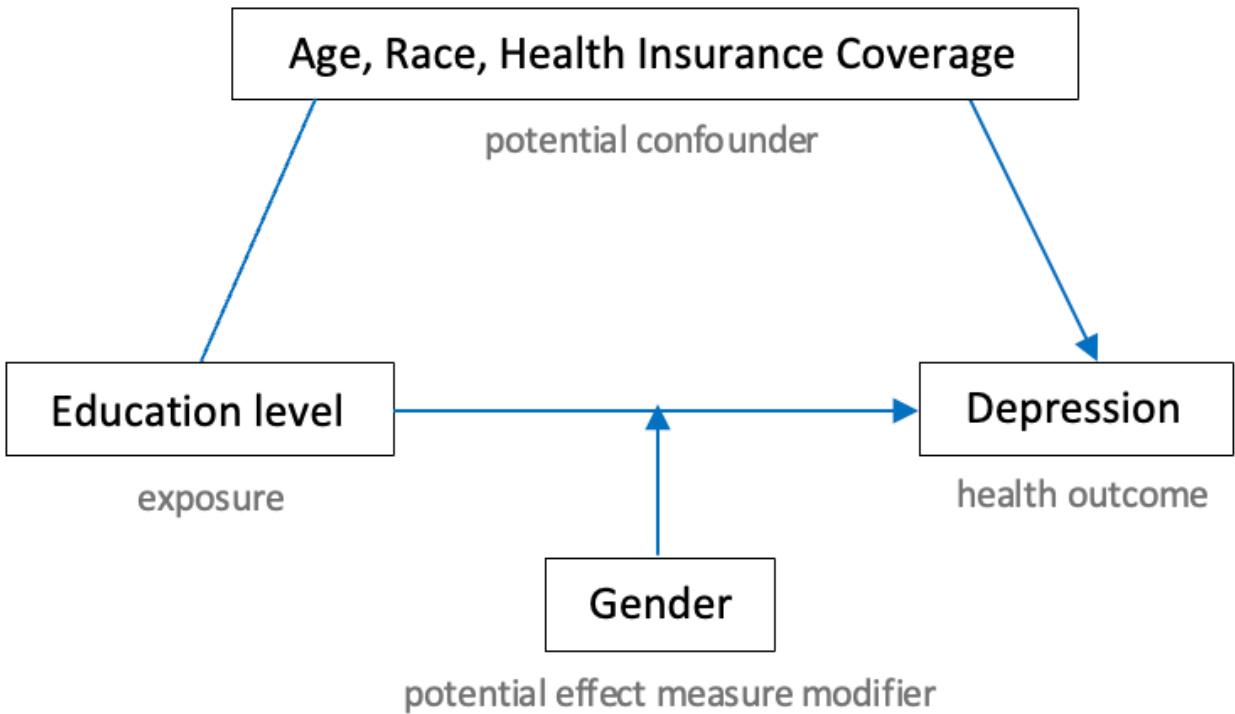


FIGURE 1. Directed acyclic graph of the study

Methods

- This cross-sectional study analyzes a nationally representative health survey, the National Health and Nutrition Examination Survey (NHANES) from 2017 – prepandemic March 2020, to investigate education level among depressed U.S. adults ≥ 20 years old during the period of the survey.
- Among the 15,560 observations in the NHANES dataset, eligible observations were adults ≥ 20 years old (n=7,812) in the study sample, representing 50.21% of the NHANES dataset.
- Univariable analyses are conducted for continuous variables (continuous depression score). Measures of central tendency and dispersion are examined. For categorical (gender, race/ethnicity, marital status, Ratio of Family Income to Poverty (RFIP), dichotomous depression status, and health insurance coverage) and ordinal (age and education level) variables, frequencies and percentages of each level within a given category are analyzed.
- Bivariable analyses (either Chi-square test or ANOVA) are conducted to study the association between the main exposure “education level” and depression status (Yes or No), confounder (age, race, health insurance coverage), and the hypothesized effect measure modifier (gender). Similarly, analyses are performed to determine the association between the outcome variable (depression status) and each covariate.

TABLE 1. Univariable analysis of the association between education level and depression among U.S. adults ≥ 20 years old (N=7,812), National Health and Nutrition Examination Survey (NHANES), United States, 2017-prepandemic March 2020.

Key Characteristics	Study Sample	
Total	7812	(100.00%)
Gender		
Male	3780	(48.39%)
Female	4032	(51.61%)
Age (years)		
20-29	1164	(14.90%)
30-39	1212	(15.53%)
40-49	1232	(15.77%)
50-59	1324	(16.95%)
60-69	1476	(18.89%)
70-79	835	(10.69%)
≥ 80	568	(7.27%)
Race/Ethnicity		
Mexican American	855	(10.94%)
Other Hispanic	755	(9.66%)
Non-Hispanic White	2865	(36.67%)
Non-Hispanic Black	2033	(26.02%)
Non-Hispanic Asian	922	(11.80%)
Other Race – Including Multi-Racial	382	(4.89%)
Education Level		
Less than 9th grade	537	(6.87%)
9-11th grade (incl. 12th grade with no diploma)	841	(10.77%)
High school graduate/GED or equivalent	1879	(24.05%)
Some college or AA degree	2594	(33.21%)
College graduate or above	1961	(25.10%)
Marital Status		
Married/Living with Partner	4528	(57.96%)
Widowed/Divorced/Separated	1811	(23.18%)
Never Married	1473	(18.86%)
Ratio of Family Income to Poverty		
≤ 1	1517	(19.42%)
> 1	6295	(80.58%)
Depression Score, Continuous		
Mean (SD)	2.88	(4.12)
Median (IQR)	1	(0,4)
Depression, Dichotomous		
Yes	621	(7.95%)
No	7191	(92.05%)
Health Insurance Coverage		
Yes	6633	(84.91%)
No	1179	(15.09%)

Results

- The study sample is 48.39% male and 51.61% female.
- 7.95% of the sample have depression; 8.05% among those who are depressed have an education level of less than 9<sup>th</sup> grade, 15.78% are 9-11<sup>th</sup> grade, 28.50% are HS graduate/GED or equiv. 35.10% with some college or AA degree, and 12.56% are college graduate or above.
- Consistent with the literature, education level (p<0.001), gender (p<0.001), age (p=0.018), and race/ethnicity (p<0.001) are all associated with depression.
- In addition, marital status (p<0.001) and RFIP (p<0.001) are also associated with depression.
- However, health insurance coverage (p=0.278) is not associated with depression.

TABLE 3A. Bivariable associations between depression (categorical) and education level, key sociodemographic characteristics and other covariates among U.S. adults ≥ 20 years old (N=7,812), National Health and Nutrition Examination Survey (NHANES), United States, 2017-prepandemic March 2020.

Key Characteristics	Depression (Main Outcome)				p-value
	YES	%	NO	%	
Total	621	(7.95%)	7191	(92.05%)	
Gender					
Male	233	(37.52%)	3547	(49.33%)	<0.001
Female	388	(62.48%)	3644	(50.67%)	
Age (years)					
20-29	94	(15.14%)	1070	(14.88%)	0.018
30-39	94	(15.14%)	1119	(15.56%)	
40-49	96	(15.46%)	1136	(15.80%)	
50-59	129	(20.77%)	1195	(16.62%)	
60-69	125	(20.13%)	1351	(18.79%)	
70-79	54	(8.70%)	781	(10.86%)	
≥ 80	29	(4.67%)	539	(7.50%)	
Race/Ethnicity					
Mexican American	62	(9.98%)	793	(11.03%)	<0.001
Other Hispanic	74	(11.92%)	681	(9.47%)	
Non-Hispanic White	248	(39.94%)	2617	(36.39%)	
Non-Hispanic Black	151	(24.32%)	1882	(26.17%)	
Non-Hispanic Asian	31	(4.99%)	891	(12.39%)	
Other Race – Including Multi-Racial	55	(8.86%)	327	(4.55%)	
Education Level					
Less than 9th grade	50	(8.05%)	487	(6.77%)	<0.001
9-11th grade (incl. 12th grade with no diploma)	98	(15.78%)	743	(10.33%)	
High school graduate/GED or equivalent	177	(28.50%)	1702	(23.67%)	
Some college or AA degree	218	(35.10%)	2376	(33.04%)	
College graduate or above	78	(12.56%)	1883	(26.19%)	
Marital Status					
Married/Living with Partner	281	(45.25%)	4247	(59.06%)	<0.001
Widowed/Divorced/Separated	196	(31.56%)	1615	(22.46%)	
Never Married	144	(23.19%)	1329	(18.48%)	
Ratio of Family Income to Poverty					
≤ 1	199	(32.05%)	1318	(18.33%)	<0.001
> 1	422	(67.95%)	5873	(81.67%)	
Health Insurance Coverage					
Yes	518	(83.41%)	6115	(85.04%)	0.278
No	103	(16.59%)	1076	(14.96%)	

Discussion

- Education level is associated with depression in this sample.
- Sampling method of NAHNES may have excluded certain high-risk (e.g., institutionalized) populations.
- Associations identified are consistent with existing literature, and the results may be generalizable to the non-institutionalized U.S. population.
- Further research should include longitudinal studies and mental and physical health outcomes related to education. Regression, machine learning, and deep learning techniques/methods can be implemented to investigate further associations between education level and depression.