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Immigrants' Diminished Protective Effects of Educational Attainment against Depressive Symptoms in the National Health and Nutrition Examination Survey (NHANES 2005-2016)

Assari S[1,2,3]* and Zare H[4,5]

[1]Marginalization-Related Diminished Returns (MDRs) Research Center, Charles R. Drew University of Medicine and Science, California, USA

[2]Department of Family Medicine, Charles R. Drew University of Medicine and Science, California, USA

[3]Department of Urban Public Health, Charles R. Drew University of Medicine and Science, California, USA

[4]Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health, Maryland, USA

[5]University of Maryland Global Campus, Health Services Management, Maryland, USA

***Corresponding author:** Shervin Assari, Marginalization-Related Diminished Returns (MDRs) Research Center, Charles R. Drew University of Medicine and Science, 1731 E 120th St, Los Angeles, California, USA

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Abstract

Background: Socioeconomic Status (SES) indicators such as educational attainment protect people against health problems, including but not limited to depressive symptoms. However, according to the marginalization-related Diminished Returns Framework (MDRs), SES indicators such as educational attainment show weaker health effects for marginalized than for socially privileged groups. We conducted this study-built on the MDRs-with two aims: First, to test the association between educational attainment and depressive symptoms, and second, to test variation in this association by immigration status.

Methods: This cross-sectional study used the National Health and Nutrition Examination Survey (NHANES 2005-2016) data. Participants included 28,682 adults who were either non-immigrant (US-born) or immigrant. Demographic factors (age, sex, race, ethnicity, and marital status), SES (educational attainment), and depressive symptoms (Patient Health Questionnaire-9 scale) were measured. Weighted Negative Binomial Regression (NBREG) models were used in Stata to adjust for the complex sample design of the NHANES. Models without and with interaction terms were estimated in the pooled sample and by immigration status.

Results: Overall, high educational attainment showed an inverse association with depressive symptoms. However, as documented by statistical interactions between educational and immigrant status showed that immigrants with college education or above had experienced higher depressive symptoms (IRR: 1.26; CI: 1.08-1.48) than US-born individuals with college education or above.

Conclusion: Educational attainment may have a differential association with the depressive symptoms of immigrant and non-immigrant people. Immigrant people report high depressive symptoms despite their high education.

Keywords: Depressive symptoms; Education; Socioeconomic status; Population groups

Background

The protective effects of Socioeconomic Status (SES) indicators such as educational attainment are well established [1]. Scholars such as Marmot [2,3], Hayward [4-6], Link and Phelan1, Ross and Miroswky [7-9], and others [10] have provided ample theoretical and empirical evidence explaining why educational attainment is associated with better health. In addition, although educational attainment is protective against almost all health problems [1], its protective effect against depressive symptoms is also well-known [11,12].

The Marginalization-related Diminished Returns (MDRs) phenomenon [13,14] refers to weaker health effects of educational attainment for marginalized communities. However, most of this work has focused on ethnic minorities [13,14]. As shown by Assari [13,14], Ferarro [15], Thorpe [16-18], Hudson [19-21], and others [22], weaker effects of educational attainment on health are found for ethnic minorities than for ethnic majorities. Other investigators such as Kaufman [23], Braveman [24], Shapiro [25,26], Williams [27,28], Ceci [29], and Navarro [30-32] have shown that educational attainment and other SES indicators may not even be comparable across social groups; as a result, the health effects of such SES indicators may also be unequal across various social groups [13,33]. For example, Ceci highlighted the differences between the Haves and the Have-Nots in their capacity to uptake any available or new resource (e.g., SES indicators) [29]. He argues that when resources become available, the Have-Nots (socially marginalized people) may be at a relative disadvantage for turning those resources into outcomes [29]. While any marginalized group may show MDRs (diminished health effects of SES), these MDRs are most robust for

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comparing ethnic groups, and they are best described for Blacks (relative to Whites) [13,14].

While these MDRs hold across SES indicators and health outcomes, they are best described for ethnic minorities than for immigrants. A literature review shows only five studies on MDRs of SES indicators in immigrant people, and such literature is scattered across age groups of children [34], adults [35], and older adults [36] and various SES indicators such as income [36] and other SES indicators [34]. For example, in one study, income showed a more significant effect on the mental health of US-born than on immigrant older adults [36]. However, these are also rarely shown for psychological well-being [35], such as depressive symptoms [34]. As such, it is important to study the MDRs of education on depressive symptoms for immigrants. This is important because MDRs may be more robust for more distant (e.g., education) than proximal social determinants (e.g., income or employment). This is probably because more social processes can hinder the effects on health of educational attainment than other SES indicators such as income and employment on health [37]. Educational attainment may not result in the same employment for diverse people because of the labor market discrimination [38]. As such, we may expect stronger MDRs for educational attainment than for other SES indicators such as income and employment. As some of the MDRs of educational attainment may be due to differential employment opportunities or income, controlling for employment and income may reduce the significance of MDRs due to educational attainment [37].

The MDRs framework [13,14] can be regarded as a paradigm shift in health disparities research because MDRs perform the following: (a) seek how economic and health effects of available SES indicators vary across subpopulations, (b) explore health disparities across the full SES spectrum, (c) allow SES returns to across groups, (d) use a moderated-mediation rather than a mediation model, (e) test the non-linear and non-additive effects of group membership and SES which are more realistic than universal average effects, and (e) explain why some health gaps may widen rather than narrow as SES increases [13,14].

Aims

In response to the gap in the literature, we conducted a secondary analysis of the National Health and Nutrition Examination Survey (NHANES) to determine the association between educational attainment and depressive symptoms by immigration status. While we hypothesize an inverse association between educational attainment and depressive symptoms, in line with the MDRs framework, we hypothesized that a weaker association between educational attainment and depressive symptoms would be weaker for immigrants than for US-born adults. As a result, we expected high depressive symptoms in immigrant people across educational attainment levels. In contrast, we expected low depressive symptoms for highly educated US-born people.

Materials and Methods

We used the National Health and Nutrition Examination Survey (NHANES) data between 2005-2016, [39]. The NHANES is a cross-sectional survey that provides nationally representative health and nutritional status estimates for the US population. The response rate for this data between 1999-2016 reported 73.2% [40,41]. For this analysis, we included 28,682 individuals who were 20 years old and older. NHANES used a nationally representative sampling. The sampling strategy was clustered and stratified.

Outcome Variable

Depressive symptoms were defined using the Patient Health Questionnaire-9 cutoff of 10 or higher. The PHQ-9 is a "clinically validated survey with a sensitivity of 88% and a specificity of 88% at a cutoff score of 10 or higher" [42]. This measure asks people to rate how often over the past two weeks they experienced depressive symptoms, such as restless sleep, poor appetite, and feeling lonely. Each item was scored on a 4-point ordinal scale for frequency (0, not at all; 1, several days; 2, more than half the days; 3, nearly every day). The total score was calculated by finding the sum of 9 items; this approach yielded a maximum score of 27 [43]. We used this scale as the dependent variable in all NBREG models.

Main Independent Variables

The main independent variables of interest were educational attainment levels. Educational attainment was defined as a categorical variable (less than high school graduate, high school graduate or general equivalency diploma, some college or AA degree, college graduate or above).

Covariate

Covariates included race, ethnicity, age (years), sex, and marital status (1 = married, 0 = otherwise). Race was a nominal variable (non-Hispanic White = 0, non-Hispanic Black =1, Hispanic = 3, and other = 4).

Analytical Strategy

We used Stata statistical software version 15 to perform all analyses. We used descriptive analysis to compare the mean and proportional differences between immigrant and non-immigrant people for all study variables. Demographics, SES, and depressive symptoms were evaluated using unequal variances t-tests and chi-square. We conducted several sets of weighted negative binomial regression models [44]. From our regression models, we reported Incidence-Rate Ratios (IRR) and the corresponding 95% Confidence Intervals (CI) [45,46]. For the first set of analyses, we ran additive models. Then, to find the impact of educational attainment interaction on depressive symptoms, we ran a model with an interaction between immigration status and educational attainment. Finally, for the last set of analyses and because the interaction between immigration status and educational attainment was significant ($p < 0.001$), we stratified the analyses by immigration status. All analyses were weighted using the NHANES individual-level sampling weights for 2005-2016 (6 waves of data). As such, the estimates are representative at the national level for the US civilian population [47].

Results

Descriptive Data

A total of 28,682 individuals entered our analysis. From all participants, 70.2% (n =16,624) were non-Hispanic White (NHW), 10.9% (n =2,581) non-Hispanic Black (NHB), 12.9% (n =3,055) Hispanics and 3.1% (n = 1,421) other racial groups. The prevalence of individuals with depressive symptoms was 7.7%. The mean age of

Table 1: Demographic Characteristics of Nationally Representative Samples of US-Born and Immigrants Aged 20 and above, NHANES 2005-2016.

	Immigrant (n = 5,805)		Non-Immigrant (n = 17,877)		All (n = 23,682)		*p*-value
Depressive Symptoms	**Mean/%**	**(SD)**	**Mean/%**	**(SD)**	**Mean/%**	**(SD)**	
PHQ-D Score	7	(28.2)	7.9	-21.6	7.7	(22.7)	0.093
If PHQ>10[a]	2.8	(4.4)	3.0	(3.3)	3.0	(3.5)	0.000
PHQ Categories							
Minimal	79.1	(45.1)	77.2	(33.7)	77.4	(35.6)	0.131
Mild	14	(38.4)	15	(28.6)	14.8	(30.3)	
Moderate	4.4	(22.6)	4.9	(17.3)	4.8	(18.3)	
Moderate-Severe and Severe	2.6	(17.6)	2.9	(13.6)	2.9	(14.3)	
Immigrant	100		100		14.5	(30.0)	
Socio-demographic							
Age (years)	44.3	(16.9)	48	(13.7)	47.5	(14.4)	0.000
Female	46.8	(55.3)	51.2	(40.1)	50.6	(42.6)	0.000
Married	69.3	(51.2)	62.3	(38.9)	63.3	(41.0)	
Educational attainment							
Less than high school	36	(53.2)	13.8	(27.7)	17.0	(32.0)	0.000
High school graduate/GED	17.1	(41.7)	24.2	(34.3)	23.1	(35.9)	
Some college or AA degree	20.8	(45.0)	33.3	(37.8)	31.5	(39.5)	
College graduate or above	26.1	(48.7)	28.7	(36.3)	28.3	(38.4)	
Race/Ethnicity							
White Non-Hispanic	16.5	(41.2)	79.3	(32.5)	70.2	(38.9)	0.000
Black Non-Hispanic	6.3	(26.9)	11.7	(25.8)	10.9	(26.6)	
Hispanics	54.2	(55.2)	5.8	(18.8)	12.9	(28.5)	
Other	22.9	(46.6)	3.1	(14.0)	6.0	(20.2)	

Note: Depressive symptoms categories were calculated using the Patient Health Questionnaire–9: none (0-4), mild (5-9), moderate (10-14), moderately severe (15-19), and severe (20). For this table, we combined moderately severe and severe as one group. The Percentages were weighted to the population of noninstitutionalized US adults aged 20 years or older. [a]We created a dummy variable if the score was equal to or higher than 10.

the participants was about 47.5 years (SD =14.4); 50.6% were female and 63.3% were married. Of all, 59.0% had an educational attainment higher than a high school degree (Table 1).

Bivariate analysis

As Table 1 shows, immigrant participants were younger than non-immigrant participants by four years. Education was also higher in non-immigrant than immigrant participants. While immigrants were more likely to be Hispanic, non-immigrants were more likely to be NHW and NHB. Immigrants and non-immigrants also varied in sex and likelihood of being married. Compared to non-immigrant people, immigrant individuals had lower probability of having PHQ-9 scales higher than 10 than US-Born, 2.8 (SD = 4.4) vs. 3.0 (SD = 3.3) (See Table 1). (Figure 1-Figures 4 and Table 2) show the distribution of PHQ-9 scales between immigrants and US-born.

Pooled sample models

Table 3 shows the regression models in the pooled sample. According to the model without interaction term (Model 1), high educational attainment was inversely associated with depressive symptoms. However, according to the models with interaction terms (Model 2), immigrants with college education or above experienced a higher relative ratio (IRR; C: 1.26; [1.08-1.48]) than US-born with college education or above.

Stratified models

Table 4 shows the weighted negative binomial regression estimates for immigrants and US-born. Education is protective for all levels of education in US-born, but only in immigrants with college education or above (IRR: 0.73; CI: 0.64-0.83). Sex and marital status are predictors for immigrants and US-born.

Discussion

Educational attainment was associated with lower levels of depressive symptoms; however, immigration status moderated this association: We observed a weaker association for the immigrants than for US-born people. As a result, highly educated immigrant people reported higher-than-expected depressive symptoms.

There are a few previous reports of MDRs in the immigrant population. Here we can refer to five papers among immigrant children, adults, and older adults. First, in one study, income showed a larger effect on the mental health of US-born than immigrant older adults [36]. In adults participating in the National Health Interview Survey, highly educated immigrants were more likely to report poor self-rated health than highly educated US-born adults [33]. In a study of adults, highly educated immigrants showed heavier smoking than higher educated US-born people [48]. Fourth, another study found that higher education was associated with better health in terms

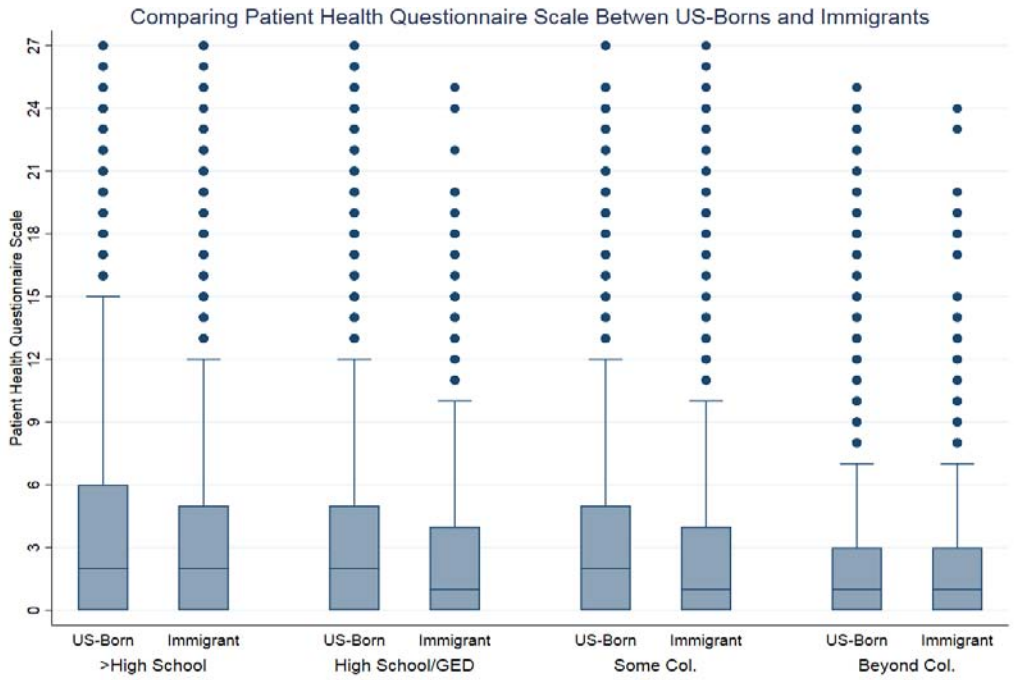


Figure 1:

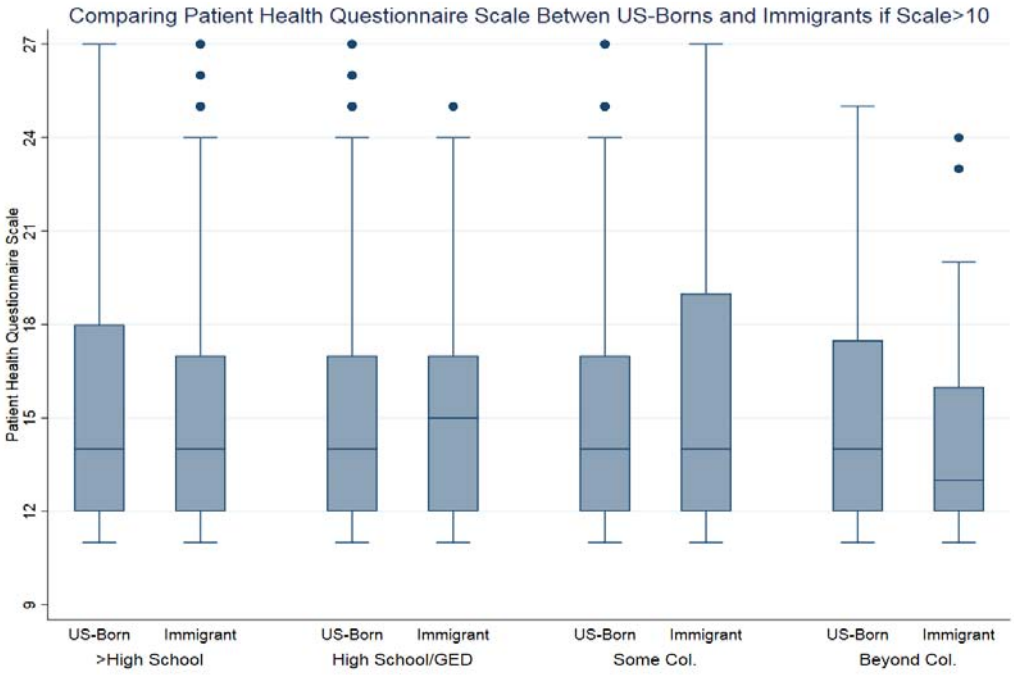
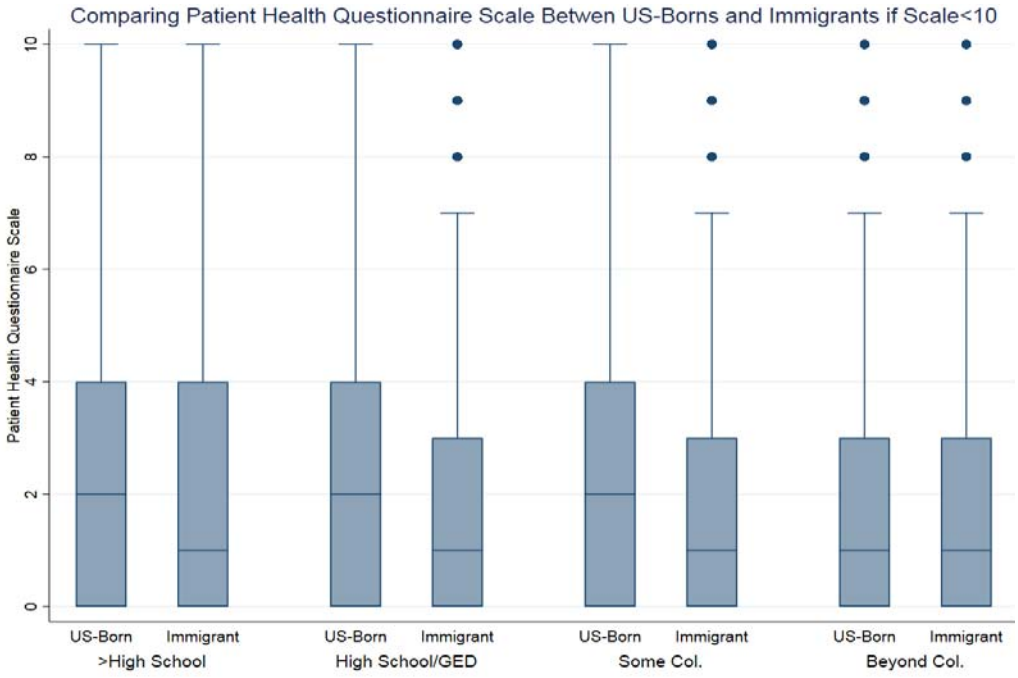


Figure 2:

of psychological distress, self-rated health, and chronic diseases [35]. However, immigrants had weaker protective effects of college graduation on psychological distress, self-rated health, and chronic diseases than U.S.-born counterparts [35]. Finally, in the Adolescent Brain Cognitive Development study, children from high-income and highly educated immigrant families remained at risk of depression [34]. And poor executive function [49] compared to US-born children.

This finding aligns with the recent observations that the effects of educational attainment and other SES indicators are all weaker for ethnic minorities than for Whites. These MDRs also hold for mental and physical health [50-52]. For instance, they are shown for depression, anxiety, suicide, substance use, obesity, heart disease,



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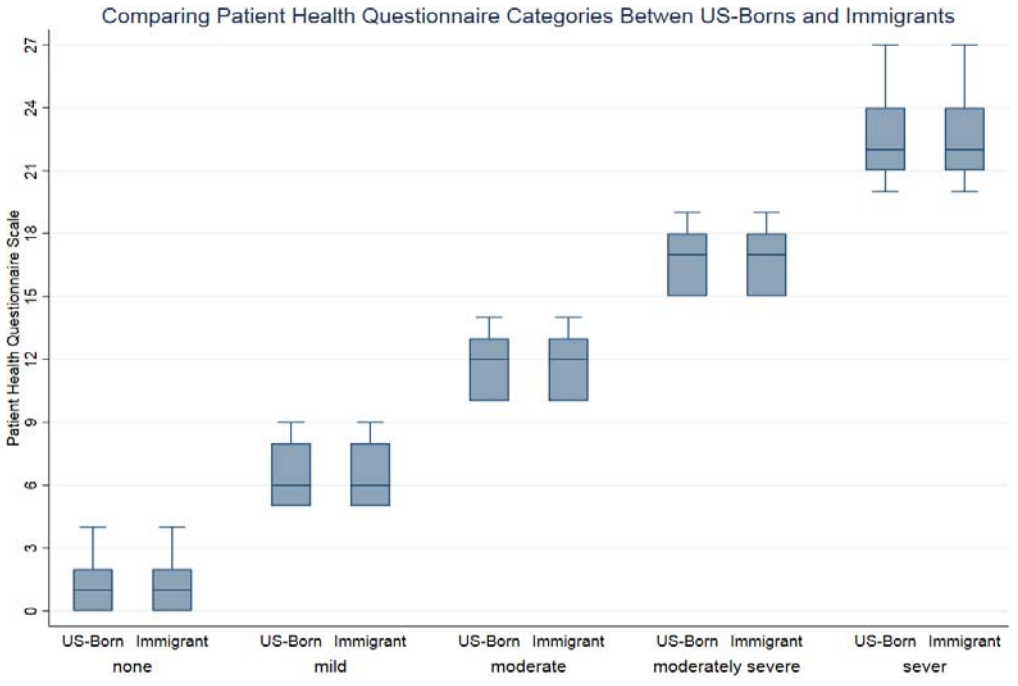

Figure 4:

and hypertension. They may also have spillover effects on outcomes such as disability, hospitalization, and mortality. As a result of these MDRs, we observe premature mortality of highly educated ethnic minority people.

As a result of the existing MDRs, highly educated minority individuals show worse mental [53], behavioral [54,55], and physical health [17], and underutilize preventive healthcare [56,57]. In addition, poor mental health [58,59], high substance use [55-61], poor sleep [62], and poor diet [63] may result in a higher risk of depressive symptoms in highly educated people of color [37,64].

A wide range of structural and social mechanisms may explain these observed MDRs. It is difficult to decompose the mechanism, particularly because educational attainment influences a wide range of proximal outcomes and behaviors. We propose that highly

Table 2: Prevalence of Depressive Symptoms in US-Born and Immigrants Aged 20 and above, NHANES 2005-2016.

PHQ Scale	Less than high school		High school graduate/GED		Some college or AA degree		College graduate or above	
	Mean/%	(SD)	Mean/%	(SD)	Mean/%	(SD)	Mean/%	(SD)
Immigrant	3.24	0.11	2.83	0.19	2.76	0.14	2.07	0.11
US-Born	4.13	0.15	3.32	0.1	3.16	0.8	2.12	0.5
Overall	3.85	0.11	3.26	0.09	3.11	0.08	2.11	0.04
***p*-value (Immigrant *vs.* US-Born**	0		0		0		0	
PHQ Category								
Immigrant								
Minimal	1,842	72.5	752	78.2	860	78.6	1,036	85.5
Mild	411	16.2	142	14.8	158	14.4	129	10.7
Moderate	174	6.9	37	3.8	48	4.4	32	2.6
Moderate-Severe and severe	112	4.4	31	3.2	28	2.6	14	1.2
Total Immigrant	**2,539**		**962**		**1,094**		**1,211**	
US-Born								
Minimal	2,385	67.2	3,332	73.4	4,289	74.3	3,405	84.7
Mild	629	17.7	754	16.6	948	16.4	460	11.4
Moderate	316	8.9	284	6.3	334	5.8	101	2.5
Moderate-Severe and severe	220	6.2	170	3.7	198	3.4	53	1.3
Total US-Born	**3,550**		**4,540**		**5,769**		**4,019**	

Table 3: Weighted Negative Binomial Regression Estimates in US adults aged 20 and above, NHANES 2005-2016.

	Model 1 IRR [95% CI]	**Model 2** IRR [95% CI]
Age (years)	1.00*** [1.00-1.00]	1.00** [1.00-1.00]
Female	1.38*** [1.32-1.44]	1.38*** [1.32-1.44]
Married	0.76*** [0.72-0.79]	0.76*** [0.72-0.79]
Education (Ref. Less than high school)		
High school graduate/GED or equivalent	0.84*** [0.79-0.90]	0.82*** [0.76-0.89]
Some college or AA degree	0.77*** [0.71-0.83]	0.75*** [0.69-0.82]
College graduate or above	0.55*** [0.51-0.59]	0.53*** [0.48-0.57]
Immigration status		
Non-US-Born (immigrant)	0.85*** [0.79-0.92]	0.76*** [0.68-0.84]
Race/Ethnicity (Ref. NHW)		
Black Non-Hispanic	0.99 [0.93-1.06]	0.99 [0.93-1.05]
Hispanics	1.04 [0.97-1.12]	1.07 [0.99-1.15]
Other	1.12* [1.02-1.22]	1.10* [1.01-1.20]
Education # Immigration status		
Immigrant with high school graduate/GED or equivale	NA	1.08 [0.92-1.27]
Immigrant with some college or AA degree	NA	1.12 [0.98-1.28]
Immigrant with college education or above	NA	1.26** [1.08-1.48]
N	**23,682**	**23,682**

*p<0.05, **p<0.01, ***p<0.001
IRR: Incidence Rate Ratios.

educated immigrant people work in jobs with lower pay and lower occupational prestige that are associated with higher stress and exposure to toxins. This is shown for ethnic minorities [65] but not for immigrants. Discrimination may also be a contributor to differential returns of education across social groups. However, it is mainly studied in highly educated ethnic minorities rather than in immigrant people [66]. Highly educated ethnic minorities [13,14] remain at risk of economic insecurity [67], stress [68], live in poor residential areas [69], generate less income [67], and accumulate less wealth [70]. However, most of these economic processes are shown

Table 4: Weighted Logistic Regression Estimates in Immigrants and US-Born Adults 20 Years of aged and above, NHANES 2005-2016.

	Model 1 IRR [95% CI]	**Model 2** IRR [95% CI]
Age (years)	1 [1.00-1.00]	1.00*** [1.00-1.00]
Female	1.39*** [1.28-1.51]	1.38*** [1.31-1.44]
Married	0.71*** [0.64-0.79]	0.77*** [0.73-0.80]
Education (Ref. Less than high school)		
High school graduate/GED or equivalent	0.92 [0.80-1.06]	0.82*** [0.76-0.89]
Some college or AA degree	0.89 [0.78-1.01]	0.74*** [0.68-0.81]
College graduate or above	0.73*** [0.64-0.83]	0.52*** [0.48-0.57]
Race/Ethnicity (Ref. NH White)		
NH Black	0.93 [0.78-1.12]	0.99 [0.93-1.06]
Hispanics	1.14 [0.99-1.30]	1.01 [0.93-1.09]
Other	0.97 [0.81-1.17]	1.23*** [1.10-1.38]
N	**5,805**	**17,877**

*p<0.05, **p<0.01, ***p<0.001
IRR: Incidence Rate Ratios.

for ethnic minority people, and the relevance of the same processes for immigrants needs to be studied in detail.

More research should test whether neighborhoods, behaviors, work conditions, occupational prestige, stress, healthcare access, and discrimination explain the weaker effects of educational attainment in marginalized people. It is likely that treatment across institutions would partially explain why educational attainment is associated with fewer health returns for marginalized and immigrant individuals.

Limitations

This study is not free of limitations. First, similar to other cross-sectional data, no causal inference is implied. Second, while the association between educational attainment and depressive symptoms is bidirectional, depressive symptoms are less likely to reduce education than vise-versa. Still, the results should be interpreted with more caution regarding the directionality of the educational attainment-mental health association. Another limitation is that the sample size was asymmetrical, with lower n for immigrants than for non-immigrant people. This is, however, the case in all national studies with representative samples. In addition, depressive symptoms were self-reported and were not verified by structured interviews, physician diagnosis, or health claims. Finally, this study did not include a wide range of SES indicators such as employment, income, and wealth. The reason for not controlling such SES indicators was that employment, income, or wealth may be on the causal path for the differential association of educational attainment and health across groups. In other terms, controlling for such factors may bias the results toward the null. Thus, income, employment, and wealth are not confounders but potential mediators when studying MDRs of educational attainment.

Implications

The results suggest that to eliminate ethnic depressive symptoms inequalities, we may need policies beyond poverty elimination and address occupational disparities that may equalize the health return of educational attainment by race. Such policies that address social inequalities such as labor market discrimination or differential quality of educational attainment are hoped to reduce ethnic health disparities due to MDRs. This is important because solutions to health disparities due to low returns of educational attainment for marginalized people (i.e., MDRs) are different from those due to inadequate education, unemployment, and associated poverty. Thus, unless we develop policies that address MDRs in marginalized people, and unless we go beyond poverty elimination by addressing MDRs-related health inequalities, educational attainment may continue to operate as a source in addition to a solution to health disparities.

Conclusion

We found that educational attainment does not show a similar association with depressive symptoms in non-immigrant and immigrant groups in the US. Highly educated immigrant people report high depressive symptoms risk, a pattern different from their non-immigrant counterparts. Thus, disparities in depressive symptoms in immigrants sustain across the entire educational spectrum. As proposed by the MDRs, health disparities should not be reduced to the problem of low SES, poverty, or low education. Some health inequalities are due to MDRs that may reflect social stratification and differential treatment of marginalization of people across SES levels.

Declaration

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Data Availability Statement: The data presented in this study are openly available in [National Health and Nutrition Examination Survey (NHANES) at https://www.cdc.gov/nchs/nhanes/index.htm]

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