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## Intergenerational education mobility and depressive symptoms in a population of Mexican origin

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### Abstract

**Purpose**—Low educational attainment has been associated with depression among Latinos. However, few studies have collected intergenerational data to assess mental health effects of educational mobility across generations.

**Methods**—Using data from the Niños Lifestyle and Diabetes Study, we assessed the influence of intergenerational education on depressive symptoms among 603 Mexican-origin individuals. Intergenerational educational mobility was classified: stable-low (low parent/low offspring education), upwardly-mobile (low parent/high offspring education), stable-high (high parent/high offspring education), or downwardly-mobile (high parent/low offspring education). High depressive symptoms were defined as scoring  $\geq 10$  on the CESD-10. We examined prevalence ratios (PR) for depressive symptoms with levels of educational mobility. We used general estimating equations with log-binomial models to account for within-family clustering, adjusting for age, sex, and offspring and parent nativity.

**Results**—Compared to stable-low participants, the lowest prevalence of CESD-10 score  $\geq 10$  occurred in upwardly-mobile (PR=0.55; 95% confidence interval [CI]=0.39–0.78) and stable-high (PR=0.62; 95% CI=0.44–0.87) participants. Downwardly-mobile participants were also less likely

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to have a CESD-10 score 10 compared to stable-low participants (PR=0.65; 95%CI=0.38–1.11), although the estimate was not statistically significant.

**Conclusions**—Sustained stress from low intergenerational education may adversely affect depression. Latinos with stable-low or downwardly-mobile intergenerational educational attainment may need closer monitoring for depressive symptoms.

### Keywords

Education; Latinos; Mexican Americans; family; depressive symptoms; mental health; social mobility; socioeconomic factors

## INTRODUCTION

The World Health Organization estimates that by 2030 depression will be the leading cause of disease burden in high-income countries[1]. In the United States (US), the Latino community suffers a disproportionate burden of poor mental health outcomes. Prevalence of depressive symptoms is estimated to be 27% for Latino adults, and Latinos aged 65+ years are twice as likely to suffer from depression as non-Hispanic Whites[2–6]. Given that individuals of Mexican origin comprise 64.6% of the US Latino population, examining factors associated with depression in this subgroup is of particular importance[7].

Personal educational attainment has shown a strong association with depression among Mexican-origin individuals, and recent data suggests that parental educational attainment may influence offspring mental health[8, 9]. These studies are limited to the independent effect of a single generation's educational attainment, either that of the parent or the offspring, on offspring mental health. However, educational mobility across multiple generations may affect health outcomes of future generations as a consequence of accumulated and persistent exposure to stressors and the resulting disruption of physiological systems[10–14].

Immigrant communities are uniquely prone to intergenerational transmission of low educational attainment due to marginalization, discrimination, and obstructed opportunities for upward social mobility[15, 16]. Cultural behaviors, identity, and immigration status are particularly salient for mental health and inextricably linked to socioeconomic factors such as education[17, 18]. Educational mobility, therefore, may differentially impact mental health by degree of acculturation. Yet few intergenerational cohort studies exist among Latinos, and no studies have examined interactions between educational mobility and cultural orientation on mental health.

This study utilized data from the Niños Lifestyle & Diabetes Study coupled with the Sacramento Area Latino Study on Aging, which includes parent-offspring pairs, allowing us to examine the association between educational mobility and depressive symptoms across two generations of Latinos. We hypothesized that participants with stable-low educational attainment across generations would have higher depressive symptom prevalence compared to those classified as stable-high, upwardly-mobile, or downwardly-mobile.

## MATERIAL AND METHODS

### Study population

Participants in this analysis were members of the Niños Lifestyle & Diabetes Study (NLDS). The NLDS cohort comprises adult biological offspring (GEN2), grandchildren (GEN3), and other referred biological relatives of participants (GEN1) in the Sacramento Area Latino Study on Aging (SALSA), which took place from 1998 to 2008[19]. Any living English- or Spanish-speaking biological relatives of the 1,789 SALSA participants aged 18+ years were eligible to participate. For the purposes of this study, we utilized participants from the NLDS who could be linked to a biological parent in either SALSA or NLDS.

Trained interviewers collected data at baseline (March–November 2013) and follow up 12–18 months later (May–November 2014). Written or verbal informed consent was obtained from all participants, and study procedures were approved by institutional review boards at participating institutions. The protocol at each wave included: (I) a 30-minute phone interview, and (II) a 2-hour home visit that included an interview, anthropometric measurements, blood draw, and medication inventory. This analysis utilized baseline data collected from the phone interview and linked participants' data with baseline socioeconomic and demographic data from their parents. Of the 670 NLDS participants contributing baseline phone interviews, 638 could be linked to a parent with educational and nativity data. Participants who did not report education, age, sex, or nativity were excluded, leaving a total study sample of 603 offspring–parent pairs.

### Measures

**Assessment of high depressive symptoms**—The outcome of interest was Center for Epidemiological Studies Depression Scale-10 (CESD-10) scores among offspring. The CESD-10 is a 4-point Likert-type scale assessing the extent to which individuals experienced depressive symptoms during the prior week. The CESD-10 was derived from the 20-item CES-D, a widely-used self-report survey designed to measure depressive symptomology in the general population[20]. Both the CES-D and CESD-10 have been validated in Spanish-speaking populations[21–24], and the CESD-10 was pilot tested in our population. The shorter 10-item scale was developed to alleviate participant burden in older adults[25]. The CESD-10 corresponds closely to the full-length version[25] and has high internal consistency and test-retest reliability[26, 27]. As suggested by previous validation studies utilizing the CESD-10, participants scoring  $\geq 10$  were considered to have high depressive symptoms[26, 28].

**Assessment of educational attainment across generations**—Intergenerational educational mobility was the exposure of interest. We classified individual educational attainment for SALSA participants as low (<12 years) or high ( $\geq 12$  years) and for NLDS participants as low (<13 years) or high ( $\geq 13$  years). We utilized a lower education cut point for SALSA participants than NLDS participants to account for age- and location-related differences in education levels between generations in the two cohorts. Further, education cut points were based on categorization used in previous SALSA analyses and other studies of similar populations[29, 30]. If both parents of an NLDS participant were SALSA

participants, the more highly-educated parent was linked to the NLDS participant. We then classified each participant into one of four educational mobility categories: (1) stable-low (low parent/low participant education), (2) upwardly-mobile (low parent/high participant education), (3) stable-high (high parent/high participant education), and (4) downwardly-mobile (high parent/low participant education).

**Other covariates**—Nativity was based on participant-report of birth country. Participants and their parent were classified as either US-born or foreign-born (in Mexico or another Central or South American country). To measure degree of acculturation, we utilized a version of the Acculturation Rating Scale for Mexican-Americans II (ARSMIA-II), an established measure of cultural orientation that assesses multiple dimensions of the acculturative process, including ethnic identity and co-ethnic social ties[31]. This scale is comprised of the Anglo Orientation Subscale (AOS) and the Mexican Orientation Subscale (MOS). As recommended by Cuellar et al., the mean MOS was subtracted from the mean AOS to create an overall acculturation score with higher scores indicating lower Mexican orientation and a score of 0 indicating equal Anglo-and Mexican orientation[31]. We defined “high” Mexican orientation as an overall score <0 and “low” Mexican orientation as a score ≥ 0. Other covariates utilized in this analysis included age and sex of the NLDS participant.

### Statistical Analysis

The distributions of demographic, socioeconomic, and depressive characteristics by generation were summarized with descriptive and graphical analyses. Bivariate analyses were conducted for educational mobility and high depressive symptoms. We created and examined a directed acyclic graph to identify potential confounders and adjusted our final model for age, sex, and offspring and parent nativity. Nativity and location of education were highly correlated for both parents and offspring, and cross-tabulations of these variables revealed sparse data in several cells. For this reason, our final model included nativity and excluded location of education.

We used log-binomial models to estimate prevalence ratios (PR) of CESD-10 score ≥ 10, comparing each level of educational mobility to stable-low educational attainment. To assess potential modification of the educational mobility effect by cultural orientation and nativity, we examined models including interaction terms and assessed results stratified by cultural orientation and nativity of the offspring. General estimating equations were used to account for within-family clustering[32]. All analyses were conducted in SAS 9.4 (SAS Institute, Inc., Cary, NC).

## RESULTS

Table 1 displays selected individual and parent characteristics of the sample overall and stratified by nativity. Participants had an average age of 53.0±11.8 years, and 38.2% were male. Additionally, 75.6% of offspring were US-born compared to 51.6% of their parents. Similarly, 81.1% of participants completed their entire education in the US compared to 58.3% of their parents. Foreign-born participants were predominantly of Mexican origin (~88%). Offspring were more highly educated than their parents; 13.3% of participants completed <12 years of education compared to 60.5% of their parents. Regarding

acculturation, 31.7% of participants were classified as having high Mexican orientation. In terms of intergenerational education, 28.0% of participants had stable-low educational mobility, 34.2% were upwardly-mobile, 29.3% were stable-high, and 8.4% were downwardly-mobile. Participants with CESD-10  $\geq 10$  comprised 28.3% of the sample. Stratification by nativity indicated that, compared to US-born participants, foreign-born participants were slightly older and more likely to be male, be foreign-educated, have high Mexican orientation, have <12 years of education, have stable-low educational mobility, and have CESD-10  $\geq 10$ .

Table 2 shows PRs for high depressive symptoms by educational mobility among NLDS participants. Model 1 adjusts for age, sex, and family-level clustering, and model 2 further adjusts for parent and offspring nativity. Compared to stable-low participants, upwardly-mobile participants had the lowest prevalence of CESD-10  $\geq 10$  (PR=0.55; 95% confidence interval [CI] = 0.39–0.78), closely followed by stable-high participants (PR=0.62; 95% CI = 0.44–0.87). Downwardly-mobile participants were less likely to have CESD-10  $\geq 10$  compared to stable-low participants (PR=0.65; 95% CI = 0.38–1.11), although this estimate was not statistically significant.

We additionally tested for modification of the educational mobility-depressive symptom association by offspring cultural orientation and nativity. Stratification by cultural orientation (Table 3) suggested that compared to participants with stable-low educational mobility, stable-high educational mobility was protective against depressive symptoms among participants with low Mexican orientation (PR=0.57; 95% CI = 0.38–0.85) but had no effect among those with high Mexican orientation (PR=0.94; 95% CI = 0.53–1.63). However, the small sample size of the high Mexican orientation category led to imprecise estimates, and a model with an interaction term indicated no statistically significant interaction between educational mobility and cultural orientation (interaction p-value=0.506). Stratification by nativity (Table 4) indicated that the educational mobility-depressive symptom association did not differ by birth country, and a test for modification by nativity produced non-significant results (interaction p-value=0.997).

## DISCUSSION

Our study supports an association between educational mobility and depressive symptoms among individuals of Mexican origin. We found that stable-high education and upward educational mobility were nearly equally protective against depressive symptoms. Additionally, adverse effects of low educational attainment in offspring appeared to be offset by high parental education, although this association did not reach statistical significance. Our stratified analysis further suggested that stable-high education levels conferred a mental health benefit to individuals with lower Mexican orientation (e.g. more culturally oriented to the US), but the interaction term was non-significant.

Consistent with our findings, studies have long shown an association between education and depression prevalence, with higher prevalence among those with low education[33, 34]. Individuals with low educational attainment may lack access to the personal and financial resources, such as increased locus of control and self-esteem, better coping styles, and

treatment for mental illness, that buffer the impacts of chronic stress on depression[33, 35]. Recently, the socioeconomic patterning of depression has been documented in Latino communities[8, 36, 37]. Latinos experience lower overall educational attainment and high school graduation rates than all other US racial/ethnic groups[7], putting them at greater risk of adverse mental-health effects of low educational attainment.

Unlike our analysis, the measures used in most previous studies have been limited to a single generation. To our knowledge, no existing studies examine educational mobility across two generations in relation to offspring depression among a Mexican-origin population. However, a small number of studies have assessed independent effects of parental education, without considering its interaction with offspring education, on depression in adult offspring. These studies found that low parental educational attainment[9, 38–41], and low maternal education in particular[38, 40], was associated with depression among both non-Hispanic Whites and Latinos. Only one study examined the association between socioeconomic trajectories and depressive symptoms. Consistent with our results, this study found that compared to those with stable-low social mobility, upward mobility was associated with fewer depressive symptoms[38]. However, this study combined parental education with several other childhood socioeconomic measures to create a single index emphasizing life course, rather than intergenerational, socioeconomic trajectory of offspring; further, it collected parental socioeconomic data retrospectively from offspring rather than directly from parents and had a sample comprised mostly of non-Hispanic Whites.

Our study advances the results of previous single-generation studies by examining how intergenerational educational attainment, collected directly from multiple generations of Mexican-origin individuals, interacts to impact depressive symptoms in subsequent generations. Our finding that stable-high and upwardly-mobile educational attainments equally protected against depressive symptoms compared to stable-low educational attainment indicates that the effect of parental education on depressive symptoms depends upon offspring education. Additionally, our suggestive findings of lower prevalence of high depressive symptoms among the downwardly mobile compared to those with stable-low educational attainment imply that the effect of offspring education on depressive symptoms also depends on parental education. Thus, our overall findings demonstrate for the first time in a Latino population that joint effects of education across multiple generations, rather than independent effects of a single generation's education, plays a key role in mental health.

An intergenerational perspective may provide insight into how sustained stress exposure across generations can influence the mental health of subsequent generations. Studies of poverty cycles indicate that parental education greatly impacts offspring education, especially among Latino populations[38, 42]. Latinos are uniquely susceptible to intergenerational transmission of socioeconomic risk factors due to obstructed opportunities for upward social mobility experienced across multiple generations caused by the historical and present-day marginalization and discrimination faced by these communities[15, 16]. Consequently, to more comprehensively understand the social patterning of depression among US Latinos, intergenerational social position and discrimination should be taken into account.

Studies show that chronic stress exposure can disrupt physiological systems and affect mental health outcomes[11–13]. Our finding that participants with stable-low educational mobility had the highest prevalence of depressive symptoms supports these studies and suggests that downstream effects are particularly pronounced when chronic stress associated with poor socioeconomic conditions has accumulated over multiple generations. Our finding that those with stable-high educational mobility and upward mobility were equally protected against depressive symptoms suggests that increasing social mobility can offset the negative impacts of low parental educational attainment. These results suggest that breaking the cycle of low educational attainment across generations could benefit the mental health status of future generations.

Our study had a number of strengths including data collected from multiple generations of families representative of the Latino community living in the Sacramento Valley and the use of validated surveys to collect depressive symptoms and acculturation data. Our study was the first to examine educational mobility effects on depressive symptoms in Mexican-origin individuals by assessing interactions between parent and offspring education and collecting data from parents and offspring directly. Finally, while most previous studies report odds ratios of socioeconomic effects, our study estimated prevalence ratios. Given the high prevalence of depressive symptoms in our population, odds ratios greatly overstated the effect. Prevalence ratios are also more directly interpretable and allow for better estimation of relative between-population differences.

Our study also had limitations. Use of cross-sectional baseline data prevented determination of the temporal direction of the education-depressive symptom association. Reverse causality may have influenced our results; depressed individuals may not achieve high education as a result of their mental status while non-depressed individuals may be capable of pursuing higher education. Additionally, the cross-sectional design precluded examination of causal interrelations and temporal sequencing between education, immigration, and acculturation, variables that are undeniably linked. Nevertheless, the implicit direction of parent to offspring education gives a sense of intergenerational directionality. Further, we lacked the power to detect a significant interaction between acculturation, nativity, and educational mobility despite our results being suggestive of modification. The smaller sample size of the foreign-born and highly Mexican-oriented subsamples likely contributed to these non-significant modification analyses. Very few foreign-born or highly Mexican-oriented participants classified as downwardly mobile (2% and 5%, respectively) or stable-high (10% for both subsamples). Nevertheless, foreign-born and highly Mexican-oriented participants were more likely to classify as stable-low compared to US-born and low Mexican-oriented participants; this may have implications for depression prevalence in these groups and merits further future investigation with a larger sample of intergenerational Latinos.

Furthermore, education is a limited measure of socioeconomic position, and future analysis could include additional variables such as income, occupation, and wealth. The NDLS did collect data on participant income; however, income and education were highly correlated in our dataset. Moreover, education is often the preferred measure since it predicts future occupation and wages and is less influenced by age-related changes in these



characteristics[43, 44]. NLDS ages ranged from 18 to 85 years, while SALSA ranged from 60 to 101. Therefore, educational attainment may be a more salient marker of socioeconomic position because younger individuals in NLDS may not have achieved their income potential while those in SALSA may be retired and therefore not have incomes representative of their earlier occupations. It is also possible, however, that those aged approximately 18–40 years have not achieved their maximal educational attainment, resulting in an underestimate of potential future educational mobility and thereby biasing our results towards the null. Nonetheless, educational attainment is a key measure of socioeconomic position, and its use is consistent with other studies examining socioeconomic effects among Latino populations[29, 30].

## CONCLUSIONS

Our findings support an association between educational mobility and depressive symptoms among adults of Mexican origin. Overall, our study suggests that Mexican-origin individuals with stable-low or downward educational mobility may require closer monitoring for depressive symptoms. If the observed association between educational mobility and depressive symptoms is causal, improving educational opportunities for Mexican-origin children with low parental education may counteract detrimental intergenerational socioeconomic impacts on their mental health and that of their future offspring. However, improving these opportunities is challenging given current levels of discrimination, segregation, exclusionary policies, and unequal resource allocation for US Latinos. Of note, altering individual beliefs and behaviors towards health care is unlikely to improve Latino mental health. Indeed, research suggests that US Latinos generally feel very positive about seeking mental health treatment[45]. However, socioeconomic and cultural barriers to such treatment are highly prevalent. Moreover, the educational differential among Latinos makes interacting with Latino clinicians a rare experience; <2% of American Psychological Association members identify as Latino[46]. Given this complexity, public health interventions at multiple levels are necessary to address depression disparities. Support of state and federal anti-poverty and safety net programs that help halt intergenerational poverty cycles by assisting disadvantaged families may ultimately alleviate some of depression's burden. Additionally, recommendations for poverty screenings, much like those recently issued by the American Academy of Pediatrics[47], could be made to all family practitioners. Our study further suggests that implementation of targeted depression screening practices where multiple generations of poverty are identified could improve identification of depression in this underdiagnosed population and ultimately lead to increased treatment among individuals of Mexican origin.

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## Abbreviations

<b>US</b>	United States
<b>NLDS</b>	Niños Lifestyle &. Diabetes Study
<b>SALSA</b>	Sacramento Area Latino Study on Aging
<b>CESD-10</b>	Center for Epidemiological Studies Depression Scale-10
<b>ARSMa-II</b>	Acculturation Rating Scale for Mexican-Americans II
<b>AOS</b>	Anglo Orientation Subscale
<b>MOS</b>	Mexican Orientation Subscale
<b>PR</b>	Prevalence ratio
<b>CI</b>	Confidence interval

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### Highlights

- Parent-child concordance in high education attainment protects against depression.
- Upwardly-mobile educational attainment also protects against depression.
- Acculturation and nativity do not modify this association in Mexican Americans.

**Table 1**

Descriptive characteristics of the NLDS population, overall and stratified by nativity

Offspring (Gen 2 & 3) variables		Mean±SD or %		
		Overall (N=638)	US-born (N=482)	Foreign-Born (N=156)
Covariates	Age	53.0±11.8	52.0±11.9	55.9±10.7
	Male	38.2	36.3	44.2
	Offspring birth country			
	United States	75.6		
	Mexico	21.5		
	Other	3.0		
	Offspring location of education			
	United States	81.1	100.0	16.2
	Mexico	9.1	0.0	41.2
	Both/uncertain	9.4	0.0	42.6
	Acculturation			
	High Mexican orientation	31.7	16.6	78.2
	Low Mexican orientation	68.3	83.4	21.8
Socioeconomic Position	Offspring education (years)			
	<12	13.3	7.6	31.9
	12	23.3	23.6	22.2
	13–16	51.1	55.2	37.5
	>16	12.4	13.7	8.3
	Intergenerational education mobility <sup>1</sup>			
	Stable low	28.0	20.7	52.1
	Upwardly mobile	34.2	33.6	36.1
	Stable high	29.3	35.3	9.7
	Downwardly mobile	8.4	10.4	2.1
Depression	10 CESD-10 score	28.3	25.6	36.7
Covariates	Age	69.2±8.1	68.2±8.3	70.4±7.7
	Parent birth country			
	United States	51.6		
	Mexico	43.4		
	Other	5.1		
	Parent location of education			
	United States	58.3	100.0	9.3
	Mexico	38.6	0.0	84.1
	Both/uncertain	3.0	0.0	6.6
	Socioeconomic Position	Parent education (years)		
<12	60.5	41.6	80.9	
12	14.5	20.1	8.5	
13–16	19.6	29.4	9.1	
>16	5.3	8.9	1.5	

<sup>1</sup>Mobility from Gen1 parents to Gen2 offspring or from Gen2 parents to Gen3 offspring

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**Table 2**

Effect estimates for high depressive symptoms in NLDS participants

Education mobility category <sup>1</sup>	Prevalence Ratio (95%CI)	
	Model 1 <sup>2</sup>	Model 2 <sup>3</sup>
Stable low	1	1
Upwardly mobile	0.53 (0.38, 0.74)	0.55 (0.39, 0.78)
Stable high	0.59 (0.43, 0.81)	0.62 (0.44, 0.87)
Downwardly mobile	0.64 (0.38, 1.08)	0.65 (0.38, 1.11)

<sup>1</sup> Stable low (n=170), upwardly mobile (n=209), stable high (n=178), downwardly mobile (n=52)

<sup>2</sup> Adjusted for age, sex, and clustering at family level

<sup>3</sup> Adjusted for age, sex, child nativity, parent nativity, and clustering at family level

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**Table 3**

Prevalence ratios (PR) of high depressive symptoms in NLDS participants, stratified by cultural orientation

Education mobility category	Model 3 <sup>1</sup> PR (95% CI)	
	High Mexican orientation <sup>2</sup>	Low Mexican orientation <sup>3</sup>
Stable low	1	1
Upwardly mobile	0.57 (0.34, 0.96)	0.52 (0.34, 0.81)
Stable high	0.94 (0.53, 1.63)	0.57 (0.38, 0.85)
Downwardly mobile	0.46 (0.14, 1.51)	0.71 (0.40, 1.29)

<sup>1</sup>Adjusted for age, sex, and clustering at family level. Stratified by cultural orientation of NLDS participants.

<sup>2</sup>Stable low (n=88), upwardly mobile (n=68), stable high (n=19), downwardly mobile (n=10)

<sup>3</sup>Stable low (n=82), upwardly mobile (n=141), stable high (n=159), downwardly mobile (n=42)

**Table 4**

Prevalence ratios (PR) of high depressive symptoms in NLDS participants, stratified by nativity

Education mobility category	Model 4 <sup>1</sup> PR (95% CI)	
	Foreign born <sup>2</sup>	US born <sup>3</sup>
Stable low	1	1
Upwardly mobile	0.58 (0.33, 1.02)	0.54 (0.35, 0.82)
Stable high	0.63 (0.24, 1.64)	0.61 (0.42, 0.89)
Downwardly mobile	0.64 (0.10, 4.02)	0.65 (0.37, 1.13)

<sup>1</sup> Adjusted for age, sex, parent nativity, and clustering at family level. Stratified by nativity of NLDS participants.

<sup>2</sup> Stable low (n=73), upwardly mobile (n=51), stable high (n=14), downwardly mobile (n=3)

<sup>3</sup> Stable low (n=97), upwardly mobile (n=158), stable high (n=164), downwardly mobile (n=49)