

Article

Educational Attainment Better Protects Non-Latino than Latino People Against Diabetes Mellitus

Shervin Assari ^{1,2,3,4,5,*}, Hossein Zare ^{6,7}

¹ Marginalized-Related Diminished Returns (MDRs) Research Center, Los Angeles, CA, USA

² Department of Internal Medicine, Charles R. Drew University of Medicine and Science, Los Angeles, CA, USA

³ Department of Psychiatry, Charles R. Drew University of Medicine and Science, Los Angeles, CA, USA

⁴ Department of Family Medicine, Charles R. Drew University of Medicine and Science, Los Angeles, CA, USA

⁵ Department of Urban Public Health, Charles R. Drew University of Medicine and Science, Los Angeles, CA, USA

⁶ Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA

⁷ School of Business, University of Maryland Global Campus (UMGC), Adelphi, USA

* Correspondence: Shervin Assari (assari@umich.edu)

Abstract: Background: High educational attainment is a well-recognized protective factor against health problems such as diabetes. However, the theory of Minorities' Diminished Returns (MDRs) suggests that this protective effect is weaker for ethnic minorities compared to non-Latino Whites. This diminished effect is thought to result from structural inequalities, such as lower-quality education and fewer occupational opportunities, faced by ethnic minorities. **Objective:** This study examined the protective effect of years of schooling—used as a proxy for educational attainment—on diabetes mellitus (DM), overall and by ethnicity. Based on the MDRs framework, we hypothesized that the protective effect of education would be weaker for Latino individuals compared to non-Latinos. **Methods:** Data were drawn from the 2012 wave of the Understanding America Study (UAS), a nationally representative, internet-based panel. The outcome of interest was self-reported doctor diagnosis of DM. Logistic regression models were used to assess the association between educational attainment and DM, with an interaction term to explore differences between Latino and non-Latino individuals. Models were adjusted for age, sex, employment, immigration status, and marital status. Findings were presented as adjusted odds ratios (OR), p-values, and 95% confidence intervals (CIs). **Results:** Higher educational attainment was associated with lower odds of DM in both Latino and non-Latino individuals ($p < 0.001$). An interaction between education and ethnicity ($p < 0.05$) indicated that the protective effect of education was weaker for Latino individuals compared to non-Latinos. **Conclusion:** The findings align with the MDRs framework, which suggests that the health benefits of education are not equally distributed across ethnic groups. For Latino individuals, structural barriers such as lower educational quality and labor market discrimination may limit the protective effect of education against DM. While education is a key determinant of health, its unequal returns contribute to ethnic health disparities. Policymakers must address structural inequalities in education and employment that disproportionately affect ethnic minorities. Tackling these disparities through multi-sector policy interventions will require bipartisan political support.

Keywords: Diabetes, Educational Attainment, Minorities' Diminished Returns, Latinos, Health Disparities, Structural Inequality

How to cite this paper:

Assari, S., & Zare, H. (2025).
Educational Attainment Better
Protects Non-Latino than Latino
People Against Diabetes Mellitus.
*Global Journal of Cardiovascular
Diseases*, 4(1), 95–106.
DOI: 10.31586/gjcd.2025.1099

Academic Editor:

Gabriel Parisotto

Received: September 6, 2024

Revised: January 12, 2025

Accepted: April 22, 2025

Published: May 4, 2025



Copyright: © 2025 by the authors.
Submitted for possible open access
publication under the terms and
conditions of the Creative
Commons Attribution (CC BY)
license

(<http://creativecommons.org/licenses/by/4.0/>).

1. Background

Educational attainment is widely regarded as a key social determinant of health [1-5]. Individuals with more years of schooling and higher educational achievement tend to have better health outcomes, including lower rates of chronic diseases like diabetes mellitus (DM) [6-17]. Several factors contribute to this protective effect, such as enhanced health literacy, improved nutrition, better access to healthcare resources, reduced stress, and healthier lifestyle choices, including greater physical activity [18-22]. Both the quantity and quality of education play a critical role in promoting overall health [20, 23]. Conversely, when the quality or access to education is compromised, the associated health benefits may be reduced [24-28].

A body of research has shown that each additional year of education correlates with reduced risk of DM and other chronic health conditions [18, 29, 30]. However, the assumption that education uniformly protects against health problems has been challenged by some studies, suggesting that its effects may not be consistent across different populations and social contexts [31]. This indicates that education's influence on health outcomes, such as DM, can vary depending on the individual's social and environmental conditions [32-36].

Although education is generally protective against many adverse health outcomes, the extent of this protection is not uniformly experienced across different ethnic and social groups [37]. The Minorities' Diminished Returns (MDRs) theory [38, 39] suggests that the positive health effects of socioeconomic factors—such as educational attainment—are less pronounced for ethnic minorities compared to non-Latino Whites. Even when ethnic minority individuals achieve similar levels of education, they often experience fewer health benefits, such as lower DM risk, due to systemic structural inequalities. These inequities arise from disparities in education quality, job opportunities, and access to resources, reflecting broader societal inequalities that extend beyond poverty or low education alone [37, 40-46].

Structural barriers embedded in systems like education, employment, finance, and law enforcement disproportionately impact minority communities, limiting their ability to fully translate educational attainment into better health outcomes. Historical and ongoing social marginalization reduces the ability of these groups to reap the health benefits associated with higher education [37]. As a result, MDRs manifest as a reduced protective effect of education on health outcomes, including DM, among minority populations [37, 47-56].

Numerous studies have documented MDRs in various areas, including health behaviors, mental health, and physical health outcomes [57-69]. For example, while educational attainment is generally associated with increased income and wealth, Black individuals experience lower financial returns on their education compared to their White counterparts [45, 70, 71]. This disparity can be attributed to factors such as labor market discrimination, residential segregation, and unequal access to high-quality education, which can result in highly educated Black individuals having less favorable job prospects and attending lower-quality schools than their White peers [72-74].

In a similar vein, the positive effects of education on health-related behaviors (e.g., substance use) and mental health (e.g., depression [63, 75], anxiety [76], and suicide [63, 77-79]) are often weaker for Latino and Black populations than for non-Latino Whites. Studies also suggest that the health benefits of education, including lower DM prevalence [83], improved dietary habits [81, 82], reduced heart disease [83], and decreased mortality [84], are less pronounced for Black individuals compared to Whites.

Although MDRs have been widely studied across numerous outcomes, limited research has focused specifically on the effect of MDRs on DM risk, particularly among Latino populations. This gap in the literature is significant, as Latinos represent a growing demographic in the U.S., with increasing levels of educational attainment. Investigating

how the health benefits of education differ between Latino and non-Latino groups is essential for addressing both educational and health disparities. While some research has explored MDRs in relation to DM and its correlates [32-36], much of this work has focused on Black-White differences, highlighting the need for further investigation in Latino populations.

2. Methods

The Understanding America Study (UAS) is a nationally representative, internet-based panel survey managed by the University of Southern California (USC) aimed at providing insights into various social, economic, and health-related issues across the U.S. population [39, 85-88]. Panel members are selected through probability-based sampling from post-office delivery sequence files. To ensure a diverse and representative sample, individuals without internet access are provided with internet-enabled tablets and service, allowing them to participate. At the time of data collection, the UAS panel included over 9,600 participants, with nearly 5,000 individuals aged 50 or older. The UAS collects extensive background information from participants, covering areas such as well-being, retirement, personality traits, and cognitive functioning. These core surveys, along with periodic BMI measurements, are conducted annually or biennially, providing participants with regular opportunities to engage with the study through online surveys.

For this study, data were drawn from the 2012 UAS wave, with a focus on a specific subset of participants across various age groups (30-50, 50-64, 65-74, and 75+). Participants were asked whether they had ever been diagnosed with diabetes mellitus (DM) by a doctor, with responses categorized as a binary variable (1 for yes, 0 for no).

2.1. Data Analysis

To explore ethnic group differences in DM prevalence, a Chi-square test was initially performed. This test evaluated the group differences in DM rates between Latinos and non-Latinos. Additionally, t-tests were used to compare the age and education levels of these ethnic groups. Following these initial comparisons, logistic regression models were utilized to examine the relationship between educational attainment (measured in years of schooling) and DM, while controlling for other variables such as ethnicity, age, sex, employment status, and marital status. Two models were analyzed: Model 1 was the baseline model that included education, ethnicity, and other relevant predictors without interaction terms. Model 2 incorporated an interaction term between ethnicity and education to assess whether the relationship between educational attainment and DM varied between Latino and non-Latino individuals. Results from the logistic regression models were presented as odds ratios (OR), p-values, and 95% confidence intervals (CIs). This method allowed for the examination of any significant differences in the protective effects of education on DM prevention between ethnic groups, with particular attention to the concept of Minorities' Diminished Returns (MDRs) in Latino populations compared to non-Latino populations.

2.2. Ethics

All participants in this study were previously enrolled in the UAS panel and had given consent for their participation in UAS-related research. However, for this specific study, the USC Institutional Review Board (IRB) required an expanded consent process. This process clearly informed participants that individuals with progressive cognitive impairments, which might affect their ability to provide informed consent, were not eligible to take part. To ensure that participants fully understood their rights, they were asked to answer three multiple-choice questions about these rights before providing their final consent. This study received approval from the USC IRB.

3. Results

3.1. Descriptives

Table 1 presents descriptive statistics for the overall sample and by ethnicity (Non-Latino and Latino). The average age of participants was 48 years (SD = 16), with Non-Latino individuals being older on average (M = 50, SD = 15) compared to Latino individuals (M = 39, SD = 14). Educational attainment was slightly higher for Non-Latinos (M = 11.21 years, SD = 2.22) compared to Latinos (M = 10.34 years, SD = 2.46). In terms of race, 90.5% of the total sample identified as White, with 89.6% of Non-Latinos and 97.0% of Latinos identifying as such. The proportion of Black participants was 9.5% overall, with 10.4% among Non-Latinos and 3.0% among Latinos. Gender distribution showed that 42.5% of the overall sample were men and 57.5% were women. Among Non-Latinos, 43.8% were men and 56.2% were women, while for Latinos, 33.7% were men and 66.3% were women. Regarding marital status, 57.2% of the overall sample were married, with a slightly higher percentage of Non-Latinos being married (58.1%) compared to Latinos (50.7%). Labor market participation was similar across groups, with 58.2% of the overall sample being employed, 57.7% of Non-Latinos, and 61.2% of Latinos reporting employment. There were notable differences in nativity, as 93.6% of the overall sample were U.S.-born. However, only 73.7% of Latinos were U.S.-born compared to 96.4% of Non-Latinos. Finally, regarding diabetes mellitus (DM), 11.5% of the overall sample had been diagnosed with DM, with 11.7% of Non-Latinos and 9.8% of Latinos reporting a DM diagnosis. Significant differences were observed between Latino and Non-Latino groups for age, education, gender, marital status, and U.S. nativity ($p < 0.05$).

Table 1. Descriptive data

| | All (n = 6782) | | Non-Latino (n = 5952) | | Latino (n = 830) | |
|-------------------------|----------------|----------------|-----------------------|----------------|------------------|----------------|
| | Mean | Std. Deviation | Mean | Std. Deviation | Mean | Std. Deviation |
| Age (Yrs) * | 48 | 16 | 50 | 16 | 39 | 14 |
| Education Years* | 11.10 | 2.270 | 11.21 | 2.222 | 10.34 | 2.459 |
| | n | % | n | % | n | % |
| Ethnicity | | | | | | |
| Non-Latino | 5,953 | 87.8 | 5,953 | 100 | 0 | 0 |
| Latino | 830 | 12.2 | 0 | 0 | 830 | 100 |
| Race | | | | | | |
| White | 6,141 | 90.5 | 5,336 | 89.6 | 805 | 97.0 |
| Black | 642 | 9.5 | 617 | 10.4 | 25 | 3.0 |
| Gender* | | | | | | |
| Men | 2,886 | 42.5 | 2,606 | 43.8 | 280 | 33.7 |
| Women | 3,897 | 57.5 | 3,347 | 56.2 | 550 | 66.3 |
| Married* | | | | | | |
| No | 2,904 | 42.8 | 2,495 | 41.9 | 409 | 49.3 |
| Yes | 3,877 | 57.2 | 3,456 | 58.1 | 421 | 50.7 |
| In Labor market* | | | | | | |
| No | 2,833 | 41.8 | 2,511 | 42.2 | 322 | 38.8 |
| Yes | 3,945 | 58.2 | 3,437 | 57.7 | 508 | 61.2 |
| US Born | | | | | | |
| No | 435 | 6.4 | 217 | 3.6 | 218 | 26.3 |
| Yes | 6,348 | 93.6 | 5,736 | 96.4 | 612 | 73.7 |
| Diabetes | | | | | | |
| No | 6,003 | 88.5 | 5,254 | 88.3 | 749 | 90.2 |
| Yes | 780 | 11.5 | 699 | 11.7 | 81 | 9.8 |

* $p < 0.05$ for comparison of Latino and non-Latino

3.2. Regression Results without Interaction Term

Table 2 presents the results of the logistic regression analysis with diabetes mellitus (DM) as the outcome. Overall, age, education, employment status, and Black ethnicity were significant predictors of DM in this model. Overall, age, education, employment status, and Black ethnicity were significant predictors of DM in this model. Educational attainment (years of schooling) was significantly associated with lower odds of DM (OR = 0.877, 95% CI [0.848, 0.907], $p < 0.001$), suggesting a protective effect of education on DM risk. Employment was also protective, with individuals who were working showing lower odds of DM (OR = 0.696, 95% CI [0.585, 0.826], $p < 0.001$). However, no significant associations were found between DM and sex (OR = 0.922, 95% CI [0.787, 1.081], $p = 0.320$), Hispanic ethnicity (OR = 1.217, 95% CI [0.922, 1.607], $p = 0.166$), immigrant status (OR = 1.134, 95% CI [0.798, 1.610], $p = 0.484$), or marital status (OR = 1.066, 95% CI [0.907, 1.253], $p = 0.440$). Black individuals had significantly higher odds of DM compared to non-Black participants (OR = 1.719, 95% CI [1.347, 2.193], $p < 0.001$). Age was significantly associated with higher odds of DM (OR = 1.038, 95% CI [1.032, 1.044], $p < 0.001$), indicating that each additional year of age increased the odds of DM.

Table 2. Summary of regression without the interaction

| | OR | 95% CI | | P |
|-------------------|-------|--------|-------|--------|
| Age | 1.038 | 1.032 | 1.044 | < .001 |
| Sex (Female) | .922 | .787 | 1.081 | .320 |
| Years (Education) | .877 | .848 | .907 | < .001 |
| Hispanic | 1.217 | .922 | 1.607 | .166 |
| Immigrant | 1.134 | .798 | 1.610 | .484 |
| Working | .696 | .585 | .826 | < .001 |
| Married | 1.066 | .907 | 1.253 | .440 |
| Black | 1.719 | 1.347 | 2.193 | < .001 |
| Intercept | .084 | | | < .001 |

Table 3 shows the logistic regression results with an interaction term between ethnicity and education predicting diabetes mellitus (DM). Age remained significantly associated with higher odds of DM (OR = 1.038, 95% CI [1.032, 1.044], $p < 0.001$), indicating that older individuals had a higher likelihood of DM. Education continued to show a protective effect, with higher years of schooling being associated with lower odds of DM (OR = 0.863, 95% CI [0.832, 0.895], $p < 0.001$). Working status also remained protective, with employed individuals having significantly lower odds of DM (OR = 0.693, 95% CI [0.583, 0.824], $p < 0.001$). However, sex (OR = 0.918, 95% CI [0.783, 1.077], $p = 0.293$), Hispanic ethnicity (OR = 0.369, 95% CI [0.131, 1.040], $p = 0.059$), immigrant status (OR = 1.070, 95% CI [0.754, 1.518], $p = 0.705$), and marital status (OR = 1.062, 95% CI [0.903, 1.249], $p = 0.467$) were not significantly associated with DM. Importantly, the interaction term between ethnicity and education was significant (OR = 1.126, 95% CI [1.021, 1.241], $p = 0.017$), indicating that the protective effect of education on DM was weaker for Latino individuals compared to non-Latinos. Additionally, Black individuals continued to exhibit higher odds of DM (OR = 1.715, 95% CI [1.344, 2.189], $p < 0.001$). These results suggest that while education generally reduces the risk of DM, the strength of this protective effect is diminished for Latino individuals, in line with the Minorities' Diminished Returns (MDRs) framework.

Table 3. Regression Results with Interaction Term

| | OR | 95% CI | | p |
|-----------------------|-------|--------|-------|--------|
| Age | 1.038 | 1.032 | 1.044 | < .001 |
| Sex (Female) | .918 | .783 | 1.077 | .293 |
| Years (Education) | .863 | .832 | .895 | < .001 |
| Hispanic | .369 | .131 | 1.040 | .059 |
| Immigrant | 1.070 | .754 | 1.518 | .705 |
| Working | .693 | .583 | .824 | < .001 |
| Married | 1.062 | .903 | 1.249 | .467 |
| Black | 1.715 | 1.344 | 2.189 | < .001 |
| Ethnicity x Education | 1.126 | 1.021 | 1.241 | .017 |
| Intercept | .105 | | | < .001 |

4. Discussion

The purpose of this study was to investigate whether the relationship between educational attainment and diabetes mellitus (DM) varies between Latino and non-Latino individuals, using data from the Understanding America Study (UAS) [39, 85-88]. In line with the Minorities' Diminished Returns (MDRs) framework, we hypothesized that although higher educational attainment would be associated with lower odds of DM for both groups, the protective effect would be weaker for Latinos. The MDRs theory posits that the positive impact of socioeconomic resources, like education, is less substantial for marginalized groups when compared to non-minority populations.

The results confirmed our hypothesis. While increased educational attainment was associated with lower odds of DM for both Latino and non-Latino individuals, the health advantages of education—specifically the reduction in DM prevalence—were smaller for Latinos. This finding is consistent with previous research on other marginalized populations, such as Black Americans [32-36], and supports the MDRs framework by suggesting that structural factors may limit the health benefits of education for Latinos [89]. For example, a recent study using data from the 2022 National Health Interview Survey (NHIS) examined how educational attainment impacts marital status, employment, and food insecurity among Latino and non-Latino adults. This study found that education's protective effects against food insecurity were weaker for Latinos, partially due to lower marriage and employment rates. These results emphasize the structural barriers that prevent Latinos from fully benefiting from education, not only in terms of health but also in socioeconomic outcomes [89].

A wealth of research supports the idea that education plays a crucial role in promoting cardiometabolic health outcomes [18, 29, 30]. Higher education is linked to better health literacy, improved diet, and greater access to health-promoting resources, all of which contribute to better cardiometabolic health [18, 29, 30]. Education also helps individuals manage stress and develop problem-solving skills, enabling them to navigate health challenges more effectively. Many studies have documented that each additional year of schooling is associated with improved cardiometabolic health outcomes, underscoring the importance of education in promoting physical well-being across the lifespan [18, 29, 30].

Research on MDRs has consistently shown that the benefits of education and other socioeconomic resources are less pronounced for ethnic minorities, especially Black individuals [37, 41, 44, 47, 51, 56, 90-95]. Although higher education generally leads to improved outcomes—such as higher income, better mental health, and enhanced physical health—the benefits are often smaller for Black individuals compared to White people [45, 72, 96, 97]. For instance, Black individuals with higher education frequently earn less and hold lower-quality jobs than their White peers, reducing the health benefits associated

with education [73, 98, 99]. While much of the existing research on MDRs has focused on Black populations, limited attention has been given to Latinos, particularly concerning the effects of education on health outcomes like DM.

Research on how MDRs apply to Latino populations, especially regarding DM, remains sparse. While some studies have acknowledged that Latinos face similar structural barriers as other marginalized groups—such as discrimination and limited economic opportunities—the specific impact of these challenges on the health benefits of education is underexplored [100-103]. This study contributes to the growing body of MDRs research by providing evidence that the health benefits of education, particularly related to cardiometabolic health outcomes, are diminished for Latinos. This highlights the need for further research on how MDRs affect Latinos, especially in relation to physical health.

Several factors could explain why Latinos experience reduced health benefits from education. Structural inequalities likely play a major role, as systemic barriers limit access to high-quality education, healthcare, and job opportunities, even for those with higher educational attainment [104-106]. Social marginalization, economic instability, and discrimination may also contribute to increased chronic stress among Latinos, negatively affecting their physical health over time [107-109]. Additionally, labor market discrimination may hinder Latinos from securing jobs that promote a healthy lifestyle, further weakening the positive health effects of education [110-112]. Poor nutrition, higher rates of food insecurity, and reduced access to health-promoting resources further exacerbate these challenges, creating an environment where the protective effects of education on cardiometabolic health, such as DM, are diminished for Latinos [113, 114].

4.1. Implications

The findings from this study have important implications for both public health and educational policy. Improving physical health outcomes among Latino populations requires more than just increasing educational access; policymakers must also address the structural barriers, such as labor market discrimination and limited job opportunities, that prevent Latinos from fully benefiting from their educational achievements. Additionally, public health initiatives aimed at improving nutrition, access to healthcare, and social support systems may help reduce the impact of chronic stress and economic insecurity on Latino health outcomes. Tailored interventions addressing these structural and social determinants of health are essential for improving cardiometabolic outcomes in Latino populations.

4.2. Limitations

This study has several limitations. First, the sample was limited to English-speaking UAS participants, which may not fully capture the diversity of the broader U.S. Latino population, particularly those with lower levels of acculturation or non-English speakers. Second, while the analysis controlled for various demographic factors, other potential confounders, such as early-life socioeconomic conditions or childhood education access, were not included. Finally, the cross-sectional design of the study limits the ability to draw causal conclusions about the relationship between education and DM. Longitudinal studies are needed to confirm these findings and explore how the association between education and DM evolves over time.

5. Conclusion

This study provides new evidence supporting the theory of Minorities' Diminished Returns (MDRs), demonstrating that the health benefits of education, particularly in reducing DM prevalence, are less pronounced for Latino individuals compared to non-Latinos. While education remains an important determinant of health, its benefits are not equally distributed across ethnic groups. Structural inequalities, chronic stress, and

adverse socioeconomic conditions likely contribute to the reduced health returns of education for Latinos. Addressing these disparities requires multi-level interventions that target both individual and systemic factors to promote health equity and improve outcomes for marginalized populations.

Funding

Part of Hossein Zare effort comes from the NIMHD U54MD000214. No funders had any role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

References

- [1] Mirowsky J, Ross CE: Education, cumulative advantage, and health. *Ageing International* 2005, 30(1):27-62.
- [2] Mirowsky J, Ross CE: Education, Health, and the Default American Lifestyle. *J Health Soc Behav* 2015, 56(3):297-306.
- [3] Ross CE, Mirowsky J: Refining the association between education and health: the effects of quantity, credential, and selectivity. *Demography* 1999, 36(4):445-460.
- [4] Ross CE, Mirowsky J: Refining the association between education and health: the effects of quantity, credential, and selectivity. *Demography* 1999, 36(4):445-460.
- [5] Ross CE, Mirowsky J: The interaction of personal and parental education on health. *Social science & medicine* 2011, 72(4):591-599.
- [6] Ayine P, Selvaraju V, Venkatapoorna CM, Geetha T: Parental feeding practices in relation to maternal education and childhood obesity. *Nutrients* 2020, 12(4):1033.
- [7] Chaparro MP, Koupil I: The impact of parental educational trajectories on their adult offspring's overweight/obesity status: a study of three generations of Swedish men and women. *Soc Sci Med* 2014, 120:199-207.
- [8] Dulgheroff PT, da Silva LS, Rinaldi AEM, Rezende LF, Marques ES, Azeredo CM: Educational disparities in hypertension, diabetes, obesity and smoking in Brazil: a trend analysis of 578 977 adults from a national survey, 2007–2018. *BMJ open* 2021, 11(7):e046154.
- [9] Inoue K, Seeman TE, Nianogo R, Okubo Y: The effect of poverty on the relationship between household education levels and obesity in U.S. children and adolescents: an observational study. *Lancet Reg Health Am* 2023, 25:100565.
- [10] Kocken PL, Theunissen MH, Schonbeck Y, Henneman L, Janssens AC, Detmar SB: Ethnicity, educational level and attitudes contribute to parental intentions about genetic testing for child obesity. *J Community Genet* 2013, 4(2):243-250.
- [11] Lamerz A, Kuepper-Nybelen J, Wehle C, Bruning N, Trost-Brinkhues G, Brenner H, Hebebrand J, Herpertz-Dahlmann B: Social class, parental education, and obesity prevalence in a study of six-year-old children in Germany. *International journal of obesity* 2005, 29(4):373-380.
- [12] Maddah M, Nikooyeh B: Factors associated with overweight in children in Rasht, Iran: gender, maternal education, skipping breakfast and parental obesity. *Public Health Nutr* 2010, 13(2):196-200.
- [13] Madden D: Childhood obesity and maternal education in Ireland. *Econ Hum Biol* 2017, 27(Pt A):114-125.
- [14] Matthiessen J, Stockmarr A, Biloft-Jensen A, Fagt S, Zhang H, Groth MV: Trends in overweight and obesity in Danish children and adolescents: 2000-2008—exploring changes according to parental education. *Scand J Public Health* 2014, 42(4):385-392.
- [15] Noonan RJ, Fairclough SJ: Is there a deprivation and maternal education gradient to child obesity and moderate-to-vigorous physical activity? Findings from the Millennium Cohort Study. *Pediatr Obes* 2018, 13(7):458-464.
- [16] Ogden CL, Fakhouri TH, Carroll MD, Hales CM, Fryar CD, Li X, Freedman DS: Prevalence of obesity among adults, by household income and education—United States, 2011–2014. *Morbidity and Mortality Weekly Report* 2017, 66(50):1369.
- [17] Ruiz M, Goldblatt P, Morrison J, Porta D, Forastiere F, Hryhorczuk D, Antipkin Y, Saurel-Cubizolles MJ, Lioret S, Vrijheid M et al: Impact of Low Maternal Education on Early Childhood Overweight and Obesity in Europe. *Paediatr Perinat Epidemiol* 2016, 30(3):274-284.
- [18] Cohen AK, Rai M, Rehkopf DH, Abrams B: Educational attainment and obesity: a systematic review. *Obesity reviews* 2013, 14(12):989-1005.
- [19] Elovainio M, Rosenström T, Hakulinen C, Pulkki-Råback L, Mullola S, Jokela M, Josefsson K, Raitakari OT, Keltikangas-Järvinen L: Educational attainment and health transitions over the life course: testing the potential mechanisms. *Journal of Public Health* 2016, 38(3):e254-e262.
- [20] Hampson SE, Goldberg LR, Vogt TM, Dubanoski JP: Mechanisms by which childhood personality traits influence adult health status: educational attainment and healthy behaviors. *Health psychology* 2007, 26(1):121.
- [21] Kawachi I, Adler NE, Dow WH: Money, schooling, and health: Mechanisms and causal evidence. *Annals of the New York Academy of Sciences* 2010, 1186(1):56-68.
- [22] Cutler DM, Lleras-Muney A, Vogl T: Socioeconomic status and health: dimensions and mechanisms. 2008.

- [23] Friis K, Lasgaard M, Rowlands G, Osborne RH, Maindal HT: Health literacy mediates the relationship between educational attainment and health behavior: a Danish population-based study. *Journal of Health Communication* 2016, 21(sup2):54-60.
- [24] Sisco S, Gross AL, Shih RA, Sachs BC, Glymour MM, Bangen KJ, Benitez A, Skinner J, Schneider BC, Manly JJ: The role of early-life educational quality and literacy in explaining racial disparities in cognition in late life. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences* 2015, 70(4):557-567.
- [25] Seblova D, Eng C, Avila-Rieger JF, Dworkin JD, Peters K, Lapham S, Zahodne LB, Chapman B, Prescott CA, Gruenewald TL: High school quality is associated with cognition 58 years later. *Alzheimer's & Dementia: Diagnosis, Assessment & Disease Monitoring* 2023, 15(2):e12424.
- [26] Hamad R, Nguyen TT, Glymour MM, Vable A, Manly JJ, Rehkopf DH: Quality and quantity: The association of state-level educational policies with later life cardiovascular disease. *Preventive medicine* 2019, 126:105750.
- [27] Manly JJ, Jacobs DM, Touradji P, Small SA, Stern Y: Reading level attenuates differences in neuropsychological test performance between African American and White elders. *Journal of the International Neuropsychological Society* 2002, 8(3):341-348.
- [28] Manly JJ, Jacobs DM, Sano M, Bell K, Merchant CA, Small SA, Stern Y: Effect of literacy on neuropsychological test performance in nondemented, education-matched elders. *Journal of the International Neuropsychological Society* 1999, 5(3):191-202.
- [29] Caird J, Kavanagh J, Oliver K, Oliver S, O'Mara A, Stansfield C, Thomas J: Childhood obesity and educational attainment: a systematic review. 2011.
- [30] Cohen AK, Rehkopf DH, Deardorff J, Abrams B: Education and obesity at age 40 among American adults. *Social science & medicine* 2013, 78:34-41.
- [31] Assari S: Education Attainment and Obesity Differential Returns Based on Sexual Orientation. *Behav Sci (Basel)* 2019, 9(2).
- [32] Assari S: American Indian, Alaska Native, Native Hawaiian, and Pacific Islander Children's Body Mass Index: Diminished Returns of Parental Education and Family Income. *Res Health Sci* 2020, 5(1):64-84.
- [33] Assari S, Boyce S, Bazargan M, Mincy R, Caldwell CH: Unequal Protective Effects of Parental Educational Attainment on the Body Mass Index of Black and White Youth. *International Journal of Environmental Research and Public Health* 2019, 16(19):3641.
- [34] Assari S, Cobb S, Bazargan M: Race by Gender Differences in the Protective Effects of Education and Income Against Subsequent Changes in Self-rated Health, Physical Activity, and Body Mass Index Among Older Americans. *J Health Econ Dev* 2019, 1(2):9-21.
- [35] Assari S, Cobb S, Najand B, Zare H, Sonnega A: Race, Educational Attainment, and Sustained High Body Mass Index over 24 Years of Follow-up in Middle-Aged and Older Adults. *Journal of Racial and Ethnic Health Disparities* 2023:1-9.
- [36] Assari S, Malek-Ahmadi MR, Caldwell CH: Parental Education or Household Income? Which Socioeconomic Status Indicator Can Better Reduce Body Mass Index Disparities among Latino Children? *J Econ Public Financ* 2021, 7(1):19-37.
- [37] Assari S: Diminished Economic Return of Socioeconomic Status for Black Families. *Soc Sci (Basel)* 2018, 7(5).
- [38] Assari S: Unequal Gain of Equal Resources across Racial Groups. *Int J Health Policy Manag* 2017, 7(1):1-9.
- [39] Assari S: Understanding America: unequal economic returns of years of schooling in Whites and Blacks. *World journal of educational research (Los Angeles, Calif)* 2020, 7(2):78.
- [40] Assari S: Health Disparities due to Diminished Return among Black Americans: Public Policy Solutions. *Social Issues and Policy Review* 2018, 12(1):112-145.
- [41] Assari S: Family Socioeconomic Position at Birth and School Bonding at Age 15; Blacks' Diminished Returns. *Behav Sci (Basel)* 2019, 9(3).
- [42] Assari S: Parental Educational Attainment and Academic Performance of American College Students; Blacks' Diminished Returns. *J Health Econ Dev* 2019, 1(1):21-31.
- [43] Assari S: Income and Mental Well-Being of Middle-Aged and Older Americans: Immigrants' Diminished Returns. *International Journal of Travel Medicine and Global Health* 2020, 8(1):37-43.
- [44] Assari S: Parental Education and Youth Inhibitory Control in the Adolescent Brain Cognitive Development (ABCD) Study: Blacks' Diminished Returns. *Brain Sciences* 2020, 10(5):312.
- [45] Assari S: College Graduation and Wealth Accumulation: Blacks' Diminished Returns. *World J Educ Res* 2020, 7(3):1-18.
- [46] Assari S: Socioeconomic Status and Current Cigarette Smoking Status: Immigrants' Diminished Returns. *Int J Travel Med Glob Health* 2020, 8(2):66-72.
- [47] Assari S BM, Caldwell CH, Zimmerman MA: Diminished Returns of Parental Educational Attainment on School Achievement of Non-Hispanic Black High School Students. Under review 2020.
- [48] Assari S BM, Caldwell CH, Zimmerman MA: Educational Attainment and Tobacco Harm Knowledge Among American Adults: Diminished Returns of African Americans and Hispanics. *International Journal of Epidemiologic Research* 2020.
- [49] Assari S SJ: Parental Educational Attainment and Frequency of Marijuana Use in Youth: Hispanics' Diminished Returns. *Journal of Education and Culture Studies* 2021, 5(6).
- [50] Barsha RAA, Assari S, Hossain MB, Apata J, Sheikhattari P: Black Americans' Diminished Return of Educational Attainment on Tobacco Use in Baltimore City. *J Racial Ethn Health Disparities* 2023.
- [51] Boyce S, Bazargan M, Caldwell CH, Zimmerman MA, Assari S: Parental Educational Attainment and Social Environment of Urban Public Schools in the U.S.: Blacks' Diminished Returns. *Children* 2020, 7(5):44.

- [52] Boyce S, Darvishi M, Marandi R, Rahmanian R, Akhtar S, Patterson J, Assari S: Review Paper Racism-Related Diminished Returns of Socioeconomic Status on Adolescent Brain and Cognitive Development.
- [53] Chalian H, Khoshpour P, Assari S: Patients' age and discussion with doctors about lung cancer screening: Diminished returns of Blacks. *AGING MEDICINE* 2019, 2(1):35-41.
- [54] S A: Parental Educational Attainment and Frequency of Marijuana Use in Youth: Hispanics' Diminished Returns. *Journal of Education and Culture Studies* 5(6):p47 2021, 5(6).
- [55] Shervin Assari CHC, Mohsen Bazargan: Parental Educational Attainment and Black-White Adolescents' Achievement Gap: Blacks' Diminished Returns. *Open Journal of Social Sciences* 2020, 8(3):282-297.
- [56] Zare H, Assari S: Non-hispanic Black Americans' diminished protective effects of educational attainment and employment against cardiometabolic diseases: NHANES 1999-2016. *Austin journal of public health and epidemiology* 2021, 8(4).
- [57] Assari S, Bazargan M: Educational Attainment and Self-Rated Oral Health among American Older Adults: Hispanics' Diminished Returns. *Dentistry Journal* 2019, 7(4):97.
- [58] Assari S, Bazargan M: Unequal Effects of Educational Attainment on Workplace Exposure to Second-Hand Smoke by Race and Ethnicity; Minorities' Diminished Returns in the National Health Interview Survey (NHIS). *J Med Res Innov* 2019, 3(2).
- [59] Assari S, Boyce S: Family's Subjective Economic Status and Children's Matrix Reasoning: Blacks' Diminished Returns. *Res Health Sci* 2021, 6(1):1-23.
- [60] Assari S, Boyce S, Bazargan M: Subjective Family Socioeconomic Status and Adolescents' Attention: Blacks' Diminished Returns. *Children* 2020, 7(8):80.
- [61] Assari S, Boyce S, Bazargan M, Caldwell CH: Diminished Returns of Parental Education in Terms of Youth School Performance: Ruling out Regression toward the Mean. *Children* 2020, 7(7):74.
- [62] Assari S, Boyce S, Bazargan M, Caldwell CH: Mathematical Performance of American Youth: Diminished Returns of Educational Attainment of Asian-American Parents. *Educ Sci (Basel)* 2020, 10(2).
- [63] Assari S, Boyce S, Bazargan M, Caldwell CH: African Americans' diminished returns of parental education on adolescents' depression and suicide in the Adolescent Brain Cognitive Development (ABCD) study. *European journal of investigation in health, psychology and education* 2020, 10(2):656-668.
- [64] Assari S, Boyce S, Bazargan M, Caldwell CH, Zimmerman MA: Place-Based Diminished Returns of Parental Educational Attainment on School Performance of Non-Hispanic White Youth. *Frontiers in Education* 2020, 5(30).
- [65] Assari S, Boyce S, Caldwell CH, Bazargan M: Minorities' Diminished Returns of Parental Educational Attainment on Adolescents' Social, Emotional, and Behavioral Problems. *Children* 2020, 7(5):49.
- [66] Assari S, Boyce S, Caldwell CH, Bazargan M: Parent Education and Future Transition to Cigarette Smoking: Latinos' Diminished Returns. *Front Pediatr* 2020, 8:457.
- [67] Assari S, Caldwell CH: Parental Educational Attainment Differentially Boosts School Performance of American Adolescents: Minorities' Diminished Returns. *J Family Reprod Health* 2019, 13(1):7-13.
- [68] Assari S, Caldwell CH: Racism, Diminished Returns of Socioeconomic Resources, and Black Middle-Income Children's Health Paradox. *JAMA pediatrics* 2021, 175(12):1287-1288.
- [69] Assari S, Cobb S, Cuevas AG, Bazargan M: Diminished Health Returns of Educational Attainment Among Immigrant Adults in the United States. *Front Psychiatry* 2020, 11:535624.
- [70] Assari S: Subjective financial status and suicidal ideation among American college students: Racial differences. *Arch Gen Intern Med* 2019, 3(1):16-21.
- [71] Assari S NB: Black-White Differences in the Protective Effects of Income against Perceived Financial Difficulties in the United States. *Journal of Education and Culture Studies* 2022, 6(4).
- [72] Assari S: Black Americans' Diminished Health Returns of Professional Occupations: A Thirty-Year Follow-Up Study of Middle-Aged and Older Adults. *J Racial Ethn Health Disparities* 2024.
- [73] Assari S, Bazargan M: Unequal associations between educational attainment and occupational stress across racial and ethnic groups. *International journal of environmental research and public health* 2019, 16(19):3539.
- [74] Assari S, Zare H, Sonnega A: Racial Disparities in Occupational Distribution Among Black and White Adults with Similar Educational Levels: Analysis of Middle-Aged and Older Individuals in the Health and Retirement Study. *J Rehabil Ther* 2024, 6(1):1-11.
- [75] Assari S: Household Income and Children's Depressive Symptoms: Immigrants' Diminished Returns. *Int J Travel Med Glob Health* 2020, 8(4):157-164.
- [76] Assari S, Caldwell CH, Zimmerman MA: Family Structure and Subsequent Anxiety Symptoms; Minorities' Diminished Return. *Brain Sci* 2018, 8(6).
- [77] Assari S, Boyce S, Bazargan M, Caldwell CH: Race, Family Conflict and Suicidal Thoughts and Behaviors among 9–10-Year-Old American Children. *International Journal of Environmental Research and Public Health* 2021, 18(10):5399.
- [78] Assari S, Najand B, Mincy R, Caldwell C: Family Income May Better Protect White Than Black American Youth Against Suicidality. *Hospital Practices and Research* 2022, 7(2):50-57.
- [79] Assari S, Schatten HT, Arias SA, Miller IW, Camargo CA, Boudreaux ED: Higher Educational Attainment is Associated with Lower Risk of a Future Suicide Attempt Among Non-Hispanic Whites but not Non-Hispanic Blacks. *J Racial Ethn Health Disparities* 2019.

- [80] Assari S: Educational Attainment and Exercise Frequency in American Women; Blacks' Diminished Returns. *Women's Health Bulletin* 2019, 6(3):e87413.
- [81] Assari S, Lankarani M: Educational Attainment Promotes Fruit and Vegetable Intake for Whites but Not Blacks. *J* 2018, 1(1):5.
- [82] Assari S, Boyce S, Bazargan M, Caldwell CH, Mincy R: Maternal Education at Birth and Youth Breakfast Consumption at Age 15: Blacks' Diminished Returns. *J—Multidisciplinary Scientific Journal* 2020, 3(3):313-323.
- [83] Assari S, Cobb S, Saqib M, Bazargan M: Diminished returns of educational attainment on heart disease among Black Americans. *The open cardiovascular medicine journal* 2020, 14:5.
- [84] Assari S, Lankarani MM: Race and Urbanity Alter the Protective Effect of Education but not Income on Mortality. *Front Public Health* 2016, 4:100.
- [85] Alattar L, Messel M, Rogofsky D: An introduction to the Understanding America Study internet panel. *Soc Sec Bull* 2018, 78:13.
- [86] Robinson E, Daly M: Explaining the rise and fall of psychological distress during the COVID-19 crisis in the United States: Longitudinal evidence from the Understanding America Study. *British journal of health psychology* 2021, 26(2):570-587.
- [87] Liu Y, Finch BK, Brenneke SG, Thomas K, Le PD: Perceived discrimination and mental distress amid the COVID-19 pandemic: evidence from the understanding America study. *American Journal of Preventive Medicine* 2020, 59(4):481-492.
- [88] Kim JK, Crimmins EM: How does age affect personal and social reactions to COVID-19: Results from the national Understanding America Study. *PloS one* 2020, 15(11):e0241950.
- [89] Assari S: Latinas' diminished returns of educational attainment on reducing food insecurity: the role of ethnic disparities in family structure and employment. *Frontiers in Public Health* 2024, 12:1407005.
- [90] Assari S: Parental Educational Attainment and Mental Well-Being of College Students; Diminished Returns of Blacks. *Brain Sci* 2018, 8(11).
- [91] Assari S: Blacks' Diminished Health Returns of Educational Attainment: Health and Retirement Study. *J Med Res Innov* 2020, 4(2).
- [92] Assari S, Sheikhattari P, Zare H: Blacks' Diminished Returns of Parental Education on Household Income: A Study of College Students in the US. *Open Journal of Educational Research* 2024, 4(4):187-196.
- [93] Assari S, Thomas A, Caldwell CH, Mincy RB: Blacks' Diminished Health Return of Family Structure and Socioeconomic Status; 15 Years of Follow-up of a National Urban Sample of Youth. *J Urban Health* 2018, 95(1):21-35.
- [94] Assari S, Zare H: Household Income and Offspring Education Explain Blacks' Diminished Returns of Parental Education. *Open Journal of Psychology* 2024, 4(1):18-29.
- [95] Shervin A: Parental Education and Spanking of American Children: Blacks' Diminished Returns. *World journal of educational research (Los Angeles, Calif)* 2020, 8(2).
- [96] Assari S: Parental Education Better Helps White than Black Families Escape Poverty: National Survey of Children's Health. *Economies* 2018, 6(2):30.
- [97] Assari S, Moghani Lankarani M: Poverty status and childhood asthma in white and black families: National Survey of Children's Health. In: *Healthcare: 2018: MDPI*; 2018: 62.
- [98] Assari S: Educational Attainment Better Protects African American Women than African American Men Against Depressive Symptoms and Psychological Distress. *Brain Sci* 2018, 8(10).
- [99] Assari S: High sense of mastery reduces psychological distress for African American women but not African American men. *Arch Gen Intern Med* 2019, 3(1):5-9.
- [100] Rumbaut RG: *Pigments of our imagination: The racialization of the Hispanic-Latino category*. 2014.
- [101] Leeman J: *21 Categorizing Latinos in the history of the US Census: the official racialization of Spanish. A political history of Spanish: The making of a language* 2013:305.
- [102] De Genova N, Ramos-Zayas AY: Latino racial formations in the United States: An introduction. *Journal of Latin American Anthropology* 2003, 8(2):2-16.
- [103] Massey DS: *The racialization of Latinos in the United States. The Oxford handbook of ethnicity, crime, and immigration* 2014:21-40.
- [104] Dondero M, Muller C: School stratification in new and established Latino destinations. *Social Forces* 2012, 91(2):477-502.
- [105] Madrid EM: *The Latino Achievement Gap. Multicultural Education* 2011, 19(3):7-12.
- [106] Fuller B, Kim Y, Galindo C, Bathia S, Bridges M, Duncan GJ, García Valdivia I: *Worsening school segregation for Latino children? Educational Researcher* 2019, 48(7):407-420.
- [107] Feagin JR, Cobas JA: *Latinos facing racism: Discrimination, resistance, and endurance: Routledge*; 2015.
- [108] Roth WD: "There is no racism here": Understanding Latinos' perceptions of color discrimination through sending-receiving society comparison. *Racism in the 21st Century: An Empirical Analysis of Skin Color* 2008:205-234.
- [109] Millard AV, Chapa J, McConnell ED: "Not Racist like Our Parents": Anti-Latino Prejudice and Institutional Discrimination. In: *Apple pie and enchiladas: Latino newcomers in the rural Midwest*. edn.: University of Texas Press; 2004: 102-124.
- [110] Reimers CW: *Labor market discrimination against Hispanic and black men. The review of economics and statistics* 1983:570-579.
- [111] Espino R, Franz MM: Latino phenotypic discrimination revisited: The impact of skin color on occupational status. *Social Science Quarterly* 2002, 83(2):612-623.

- [112] Meléndez E, Carré F, Holvino E: Latinos need not apply: The effects of industrial change and workplace discrimination on Latino employment. *New England Journal of Public Policy* 1995, 11(1):8.
- [113] Wilson MD, Ramírez AS, Arsenaault JE, Miller LMS: Nutrition label use and its association with dietary quality among Latinos: The roles of poverty and acculturation. *Journal of nutrition education and behavior* 2018, 50(9):876-887.
- [114] Carter-Pokras O, Zambrana RE, Poppell CF, Logie LA, Guerrero-Preston R: The environmental health of Latino children. *Journal of Pediatric Health Care* 2007, 21(5):307-314.