

## Research Article

# Diminished Effects of Educational Attainment on Time Spent on Substance/Drug Use in Latino Individuals: Analysis of the American Time Use Survey (ATUS)

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## Abstract

**Background:** While socioeconomic status (SES) indicators such as educational attainment are among the major drivers of health behaviors such as substance use, the protective effects of these indicators may differ across ethnic groups. Built on the Marginalization related Diminished Returns (MDRs) phenomenon that refers to weaker health effects of SES indicators for marginalized and minoritized groups (vs. non-Latino White people), we conducted this study with two aims: First to test the association between educational attainment and time spent on substance/drug use, and second, to test for ethnic variation in this association.

**Methods:** This cross-sectional study used the American Time Use Survey (ATUS 2019) data. Participants included 7380 individuals who were either Latino or non-Latino White. We tested for associations between time spent on substance/drug use and a continuous measure of educational attainment using linear regression. Age and sex were control variables. We used logistic regression for sensitivity analysis using any time spent on substance/drug as the outcome.

**Results:** Overall, high educational attainment showed an inverse association with time spent on substance/drug use overall. We also documented a statistical interaction between ethnicity and educational attainment such that associations between educational attainment and time spent on substance/drug use was weaker in Latino vs. non-Latino White individuals. We could replicate the results using logistic regression for any time spent on substance/drug as the outcome.

**Conclusion:** We observe that SES indicators such as educational attainment may have a differential protective effect against time spent on substance/drug use for diverse ethnic groups. In contrast to non-Latino White individuals, Latino individuals reported spending similar amounts of time on substance/drug use across the full SES spectrum. This finding is in line with the MDRs framework and may be attributable to the effects of structural racism, social stratification, and marginalization impacting ethnic minorities in the United States.

**Keywords:** Educational attainment; Time use; Substance use; Drug use; Socioeconomic status; Population groups

## Background

Extensive work by Marmot [1,2], Hayward [3-5], Link and Phelan [6], Ross and Mirowsky [7-9], and others [10] suggest that socioeconomic status (SES) indicators such as educational attainment protect people against high-risk behaviors, including but not limited to substance use. Complementary to this work, research by Kaufman [11], Braveman [12], Shapiro [13,14], Williams [15,16], Ceci [17], and Navarro [18-20] has shown that the effects of these SES indicators may differ across ethnic groups. Kaufman has described this issue as arising from residual confounding of SES with unmeasured factors that vary across these groups [11]. Navarro has referred described this as “ethnicity and SES,” rather than “ethnicity or SES” effects due to the complex interplay between ethnicity and SES [18-20]. Ceci has mentioned that the “Have-Nots” may gain health less than the “Haves” from the same SES indicators due to diminished capacity

to mobilize resources and respond to changing environments [17]. Finally, Assari has used the term “Marginalization-related Diminished Returns” (MDRs) [21,22] to refer to the phenomenon of weaker health effects of SES indicators for the members of marginalized groups, particularly ethnic minorities, relative to US-born heterosexual non-Latino Whites [21,22]. In addition, Ferarro [23], Thorpe [24-26], Hudson [27-29], and others [30] have reported similar ethnic differences.

Nevertheless, literature on MDRs relevant to substance use is limited in two important respects. First, most prior work has focused on comparing Whites and African Americans, leaving it unclear whether these patterns extend to other minoritized racial/ethnic groups, such as Latinos. Second, most articles to date have focused on the relationship between SES indicators and tobacco use outcomes. It is therefore unclear whether similar intersectional patterns can also

be observed for other substances.

Although MDRs have been reported for various SES indicators, they are often particularly strong for educational attainment. This pattern likely arises because education is a more distal SES indicator (compared to, say, income) and can be affected by many social processes [31,32]. Based on MDRs, we hypothesized that educational attainment would generate less “protection” from substance use for Latino vs. non-Latino White individuals, such that high-SES Latinos would report greater substance use, on average, than their non-Latino White counterparts. We test this hypothesis using data from the 2019 American Time Use Survey, which interviews a representative, ethnically diverse sample of U.S. participants regarding the proportion of daily time spent on various activities, including substance use. We view time spent on substance use as a particularly informative proxy for substance use severity, given that it provides a direct measure of the extent to which use reduces an individual’s economic participation and family engagement [33].

## Materials and Methods

### Design, Setting and Sample

The 2019 American Time Use Survey (ATUS) is a cross-sectional survey that provides nationally representative estimates of time use patterns in US individuals. The ATUS sample includes US individuals 15-year or older. Although the overall sample size of the ATUS was 9435, in this analysis we only included 7380 individuals who were either Latino White or non-Latino White. Thus, we excluded Asian, Native American, Pacific Islander, Black/African American, other race, and mixed race people. Response rate was 42% in the ATUS sample. Although ATUS 2020 data were also available, we only used the 2019 data in the present analysis because the pandemic heavily affected ATUS data collection.

### Data collection

The ATUS one-time survey takes 15-20 minutes to complete from the moment participants pick up the phone. Interview questioned just one person from each household. After confirming information about the household, participants were asked to recall how they spent the past 24 hours and answer a few follow-up questions related to their time use.

### Interviews

The ATUS questionnaire was administered by bilingual interviewers who conduct interviews in English but can interview in Spanish when the designated respondent speaks only Spanish or is more comfortable responding in that language. The ATUS interview is a combination of structured questions and conversational interviewing. For the time-use diary, the interviewer uses conversational interviewing rather than asking scripted questions. This is a flexible interviewing technique designed to allow the respondent to report on his or her activities comfortably and accurately. This technique also allows interviewers to use methods to guide respondents through memory lapses, to probe in a non-leading way for the level of detail required to code activities, and to redirect respondents who are providing unnecessary information.

### Limitations of the data

While attempts have been made to collect the most accurate data

possible, the ATUS data do have limitations. With the exception of childcare, information on secondary activities (activities that are done at the same time as the primary activity) is not collected. This could lead to underestimates of the amount of time people spend doing activities that are frequently done in combination with other activities. For example, ATUS estimates likely underestimate the amount of time people spend listening to music since so many people listen to music while doing other things. Survey estimates are subject to non-sampling errors that may arise from many different sources, such as an inability to obtain information from all individuals in the sample, data entry errors, coding errors, and misinterpretation of definitions. Errors also could occur if nonresponse is correlated with time use. Non-sampling errors were not measured. However, the Census Bureau uses quality-assurance procedures to minimize non-sampling, data entry, and coding errors in the survey estimates.

**Outcome variable:** Our outcome variable measured how much the individual spent time in a day using tobacco, alcohol, or other substances. This variable was treated as a continuous measure, with a higher score indicating more time spent on substance use. For our replication, we used any time spent on substance/drug as our nominal outcome.

**Main independent variable:** The main independent variable was educational level. This variable was measured using the following item: What is your highest level of schooling? This variable was treated as a continuous measure, with a higher score indicating higher educational attainment. This variable ranged from 0 to 17.

**Covariates:** For the demographic variables, we included age (a continuous variable), sex (male=1), and employment (1=employed, 0=unemployed or not in labor market).

**Ethnicity:** We tested ethnicity as a potential moderator of educational attainment effects (1=Latino, 0=non-Latino White).

### Analytic strategy

We used the SPSS 25.0 for data analysis. For descriptive analysis, we reported our variables across ethnic groups and overall. For our main analysis, we used multivariate linear regression models to estimate beta coefficients and the corresponding 95% confidence intervals (CI). First, we ran models without interaction terms in the model. These models only tested the main effects of our variables. Then we tested for MDRs by running models including the interaction between ethnicity and educational attainment. Finally, we ran stratified models separately in Latino and non-Latino White. We also used logistic regression for sensitivity analysis using any time spent on substance/drug as the outcome. We considered P-values <0.05 as statistically significant and all tests were two-sided.

### Ethics

In the ATUS Study, an advance letter advises designated persons that this is a voluntary survey. All participants provided informed consent and the study protocol was approved by the XXX IRB. All information about respondents was kept strictly confidential, following standard U.S. Census Bureau security safeguards.

## Results

Of the 7380 participants included in the present sample, 6253 (84.7%) were non-Latino and 1127 (15.3%) were Latino. Table 1

**Table 1:** Descriptive data overall and by ethnicity.

|                                            | Full Sample<br>N = 7380 (100%) |        | Non-Latino<br>N = 6253 (84.7%) |        | Latino<br>N = 1127 (15.3%) |        |
|--------------------------------------------|--------------------------------|--------|--------------------------------|--------|----------------------------|--------|
|                                            | N                              | %      | N                              | %      | N                          | %      |
| Male (vs. Female)                          | 3394                           | 46.00% | 2915                           | 46.60% | 479                        | 42.50% |
| Employed (vs. Unemployed)                  | 4572                           | 62.00% | 3840                           | 61.40% | 732                        | 65.00% |
|                                            | Mean                           | SD     | Mean                           | SD     | Mean                       | SD     |
| Age (Years)                                | 52.4                           | 17.5   | 53.3                           | 17.6   | 47.6                       | 16.6   |
| Education (Years)                          | 10                             | 2.7    | 10.4                           | 2.4    | 8.1                        | 3.5    |
| Time spent on substance/drug use (Minutes) | 0.3                            | 4.1    | 0.3                            | 3.7    | 0.2                        | 5.8    |

**Table 2:** Summary of linear regression models without (M1) and with (M2) interactions.

|                            | M1<br>All (No Interaction) |       |        |        |        |       | M2<br>All (M1 + Interaction) |       |        |        |        |       |
|----------------------------|----------------------------|-------|--------|--------|--------|-------|------------------------------|-------|--------|--------|--------|-------|
|                            | B                          | SE(B) | Beta   | 95% CI |        | Sig.  | B                            | SE(B) | Beta   | 95% CI |        | Sig.  |
| Latino                     | -0.283                     | 0.14  | -0.025 | -0.558 | -0.009 | 0.043 | -0.995                       | 0.384 | -0.088 | -1.747 | -0.242 | 0.01  |
| Sex (Male)                 | 0.31                       | 0.096 | 0.038  | 0.122  | 0.498  | 0.001 | 0.313                        | 0.096 | 0.038  | 0.125  | 0.502  | 0.001 |
| Employed                   | -0.035                     | 0.115 | -0.004 | -0.26  | 0.189  | 0.757 | -0.026                       | 0.115 | -0.003 | -0.251 | 0.199  | 0.822 |
| Age (Years)                | -0.001                     | 0.003 | -0.004 | -0.007 | 0.005  | 0.743 | -0.001                       | 0.003 | -0.004 | -0.007 | 0.005  | 0.786 |
| Education (Years)          | -0.085                     | 0.019 | -0.057 | -0.122 | -0.049 | <.000 | -0.109                       | 0.022 | -0.072 | -0.152 | -0.065 | <.001 |
| Education (Years) x Latino |                            |       |        |        |        |       | 0.082                        | 0.041 | 0.064  | 0.001  | 0.162  | 0.047 |

**Outcome:** Time spent on substance/drug use.

**Table 3:** Summary of linear regression models by ethnicity.

|                   | M3<br>Non-Latino |       |        |        |        |       | M4<br>Latino |       |        |        |       |       |
|-------------------|------------------|-------|--------|--------|--------|-------|--------------|-------|--------|--------|-------|-------|
|                   | B                | SE(B) | Beta   | 95% CI |        | Sig.  | B            | SE(B) | Beta   | 95% CI |       | Sig.  |
| Sex (Male)        | 0.276            | 0.094 | 0.037  | 0.092  | 0.46   | 0.003 | 0.559        | 0.356 | 0.048  | -0.14  | 1.258 | 0.117 |
| Employed          | 0.077            | 0.114 | 0.01   | -0.147 | 0.3    | 0.5   | -0.576       | 0.398 | -0.048 | -1.357 | 0.206 | 0.149 |
| Age (Years)       | 0                | 0.003 | -0.002 | -0.006 | 0.006  | 0.919 | -0.001       | 0.011 | -0.002 | -0.023 | 0.021 | 0.956 |
| Education (Years) | -0.112           | 0.02  | -0.072 | -0.152 | -0.073 | <.001 | -0.011       | 0.051 | -0.006 | -0.111 | 0.089 | 0.835 |

**Outcome:** Time spent on substance/drug use.

shows the summary of descriptive statistics overall and by ethnicity. Latino participants completed fewer years of education, on average, than non-Latino White participants. In addition, non-Latino White individuals reported spending less time using substances, on average, than their Latino counterparts.

### Linear regression models in the pooled sample

As shown by Table 2, Latino ethnicity showed a main effect on individuals' time spent on substance/drug use. Compared to non-Latino White individuals, Latino people reported less time spent on substance/drug use. While educational attainment was protective against time spent on substance/drug use, this effect was weaker for Latino individuals than non-Latino White individuals.

### Linear regression models stratified by ethnicity

As shown by Table 3, non-Latino White but not Latino individuals showed a main effect of educational attainment on time spent on substance use, with non-Latino Whites with more years of education reporting less time spent on substance use relative to their less-educated peers.

We used logistic regression for sensitivity analysis using any time spent on substance/drug as the outcome. The results could be replicated suggesting that the protective effect of educational

attainment on reducing any time use on substance/drug was weaker for Latino than non-Latino individuals (data not shown due to similarity of the findings).

## Discussion

In the 2019 ATUS survey, high educational attainment was associated with a less time spent on substance use. However, ethnicity moderated this association. We observed a significantly weaker moderate association for Latino than non-Latino White participants. As a result, Latino participants who were highly educated reported higher-than-expected time spent on substance use, which is a proxy of substance use risk.

The first of these findings is in line with fundamental cause theory and the social determinants of health framework. The second finding aligns with recent observations that the effects of SES indicators such as one's own or parents' educational attainment on obesity, depression, anxiety, suicide, internalizing symptoms, externalizing symptoms, and self-rated health are all weaker for Latino and African American than non-Latino White individuals and adults. These MDRs may explain why we observe a higher-than-expected risk of chronic diseases<sup>34-36</sup>, disability, hospitalization, and mortality for high SES Latino and African American individuals, while the

same risks remain low in non-Latino Whites with similar SES. As a result of these MDRs, we see smaller than expected health effects of investments on equalizing SES across ethnic groups [17].

This is the first time MDRs have been shown for an outcome denominated in “time spent”. Previous work has described MDRs for mental [37], behavioral [38,39], and physical health [40], as well as healthcare use [41,42]. In addition, poor mental health [43,44], poor sleep [45], poor diet [46], and high substance use [39,47,48] than Whites have previously been reported for high SES African American and Latino people. However, the substance use literature to date has focused mainly on tobacco products [31,49]. The unique contribution of this work is thus the expansion of the MDRs framework to time spent on overall substance use.

The MDRs framework can be regarded as a paradigm shift in disparities research [21,22] because it differs from popular models that suggest group-level differences in SES are a fundamental cause of ethnic health inequalities. In contrast to these models, the MDR framework acknowledges that ethnic disparities can occur across the full SES spectrum and thus that researchers and quantitative modelers should allow SES effects to vary by ethnicity. In addition, it invites researchers to identify the structural and environmental mechanisms that might explain why the health effects of SES indicators tend to be weaker in ethnic minority groups. Studies that are built on MDRs thus do not reduce the problems of health and behavioral disparities to the problem of low SES and SES gaps. By testing non-linear and non-additive effects of ethnicity and SES, MDRs allow SES effects to vary by group. Such an assumption is more realistic than the universality of SES effects. The application of MDRs may also help us understand why ethnic health gaps sometimes widen rather than narrow as SES increases [21,22].

A wide range of structural, social, and behavioral mechanisms may explain these MDRs. It is difficult to decompose the mechanism, since many social mechanisms and processes can interfere with the return of educational attainment and how it generates employment, income, wealth, and residential area. Most of these processes are racialized in the US, generating less advantageous outcomes for ethnic minorities [21,22]. For example, highly-educated minority people tend to work in jobs with lower pay and lower occupational prestige if they are Latino or African American (vs. non-Latino Whites). Similarly, highly educated African American and Latino people also tend to work in jobs with higher stress and exposure to toxins [50]. Ethnic compositions of jobs may also be associated with discrimination for highly educated African American and Latino employees [51]. As a result, highly educated ethnic minorities [21,22] remain at risk of economic insecurity [52], stress [53], poor residential areas [54], and low wealth [55]. Thus, interwoven complex social processes may explain why highly educated ethnic minority individuals remain at behavioral, economic, and health risk. More research is needed to test if factors like work conditions, income, occupational prestige, and employment benefits explain why education generates fewer health and behavioral benefits for ethnic minorities than non-Latino Whites.

## Limitations

This study had a few limitations. First, cross-sectional data provides only weak support for causal inferences. However, while

the association between educational attainment and time spent using substances was cross-sectional, educational attainment likely preceded time use patterns assessed at the time of the survey. Time spent using substances over the past 24 hours are an informative, yet potentially imperfect proxy of overall substance use severity. Another limitation is that we did not include SES indicators other than educational attainment and ethnic minority groups other than Latinos. We need to test the same hypotheses for Native American, Latino, and Asian American individuals. Finally, this study did not include any factor such as attitude regarding substance use.

## Implications

The results suggest that efforts aimed at eliminating ethnic inequalities in substance use may require multilevel policies, practices, and programs that go beyond simply closing ethnic gaps in SES to also target mechanisms responsible for diminished returns. One potential contributor to these MDRs is segregation that differentially exposes populations to risk [56-58]. Acknowledging the role of MDRs as a contributor to ethnic disparities is important because solutions that address low returns of SES indicators such as educational attainment for ethnic minorities (i.e., MDRs) are different from closing the SES gap. If we limit our efforts to closing the SES gap and forget that SES generates more outcomes for the Haves than the Have-Nots, we may fail to completely close the gap. Thus, we should go beyond closing the SES gap and address structural causes of ethnic health inequalities that operate across social class lines. Otherwise, it is likely that SES will continue to be “a source” in addition to “a solution” to ethnic health disparities.

## Conclusion

As shown here, SES indicators such as educational attainment do not have similar associations with individuals’ time spent on substance use across ethnic groups. Specifically, highly educated Latino participants reported spending more time on substance use than their non-Latino White counterparts. Thus, ethnic health disparities should not be reduced to the problem of poverty or low human capital. Instead, these MDRs may reflect social stratification, structural racism, and marginalization that hinder ethnic minorities across SES levels.

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