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Protective Effects of Educational Attainment Against Cigarette Smoking; Diminished Returns of American Indians and Alaska Natives in the National Health Interview Survey

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Abstract

Background: Although educational attainment is protective against health risk behaviors such as smoking, *Minorities' Diminished Returns* theory posits that these protective effects are smaller for ethnic minority than the majority groups.

Aims: compare the effects of educational attainment on smoking status of American Indian Alaska Native (AIAN) and White adults.

Methods: Data came from the National Health Interview Survey (NHIS - 2015). A total number of 21114 individuals entered our analysis. The independent variable was years of schooling. The dependent variable was current smoking status. Age, gender, region, marital status, and employment were covariates. Ethnicity was the moderator.

Results: Overall, educational attainment was inversely associated with current smoking. Ethnicity showed a significant interaction with educational attainment that was suggestive that the protective effects of educational attainment against smoking is smaller for AIAN than Whites.

Conclusions: In the United States, while educational attainment helps individuals stay healthy by avoiding high risk behaviors such as smoking, this effect is smaller for AIANs than Whites. The result is additional risk of smoking in highly educated AIANs. To reduce ethnic disparities in tobacco use, it is important to go beyond SES inequalities and investigate why high SES ethnic minorities remain at high risk of tobacco use.

Keywords

population groups; ethnicity; American Indian Alaska Native (AIAN); Whites; socioeconomic position; socioeconomic status; education; smoking; tobacco use

1. Background

Pervasive disparities in the burden of tobacco use by race/ethnicity[1–5] and socioeconomic status (SES)[6–8] exist in the US. Despite the overall decline in tobacco use, disparities by SES have increased [8–10] Between 1966 and 2015, smoking declined by 83% in individuals with college degree, while the decline for individuals without high school diploma was almost half (40%). A large proportion of such disparities may not be due to

individuals making poor choices but higher exposure due to predatory marketing[11–13]. Low SES individuals and ethnic minorities are at an increased risk for point-of-sale advertising, retail display, coupons, and discounts[14]. The result is their increasing vulnerability[15] such as higher rates of initiation combined with low access to cessation[3,16,17].

Minorities' Diminished Returns (MDRs) proposes that at least some of the ethnic disparities in tobacco use is due to “*less than expected*” protective effects of SES on tobacco use in minority populations. This suggests: (a) ethnic disparities in tobacco use are not all due to SES gaps but also because of differential health gains that follow high SES for ethnic groups, and (b) the ethnic gap in tobacco use widens at higher SES levels, which emphasizes a need to address ethnic disparities in tobacco use across all SES levels.

We conducted this study to compare American Indian Alaska Native (AIAN) and White individuals for the effect of educational attainment, one of the main SES indicators, on tobacco use. We hypothesized that the protective effects of educational attainment would be smaller for AIANs than Whites. That is, we expect MDRs to also be relevant to AIANs. As similar patterns are shown for Blacks and Hispanics [18–29], replication of the same patterns in AIANs will suggest that MDRs are not because of groups' or individuals' characteristics but differential treatment of all minority groups by the society. That is, as the U.S. society marginalizes non-White people, MDRs result in worse than health outcomes of highly educated non-Whites.

2. Methods

2.1. Design and settings

This is a secondary analysis of the NHIS data. Funded by CDC, NHIS is one of the main national health surveys of Americans. Data were collected in 2015.

2.2. Data retrieval

We used publicly available NHIS data set, downloaded from the NHIS website. We merged personal, individual, and cancer data sets, using the subject, family IDs. The current analysis only includes 21,114 adults who were either Whites or AIANs.

2.3. Sample and sampling

The NHIS population was the 1) civilian, 2) non-institutionalized US population, 3) 18+ years of age, and 4) American. The NHIS uses a multistage, clustered, stratified area probability sample design.

2.4. Analytical Sample

The current analysis is limited to adults who were either Whites or AIANs and had valid data on tobacco use. Our final analytical sample was 21,114 adults.

2.5. Study variables

The study variables include demographic factors (age and gender), ethnicity, educational attainment (SES), employment, marital status, region, and tobacco use, all measured at the individual level.

Educational Attainment.—Educational attainment was a continuous measure varying from 0 to xx.

Ethnicity.—Ethnicity was self-identified and was AIAN versus.

Current Smoking.—The main outcome was current smoking status. Smoking was self-reported (smoked 100 cigarettes, smokes currently, and smokes daily).

Demographic Characteristics.—Confounders were age, gender, marital status, employment status, and region. Age was a continuous measure. Gender was a dichotomous variable (male 1 female 0). Marital status was self-report and a dichotomous variable. Employment status was a dichotomous variable: 1 = employed last week, 0 = unemployed last week. Region was a 4-level categorical variable: 1) Northeast, 2) Midwest, 3) South, and 4) West.

2.7. Data analytical plan

We analyzed the data using SPSS 23.0 (IBM Corporation, Armonk, NY, USA). Using SPSS 23.0, we were able to accommodate survey weights. First, we examined the distribution of our categorical and continuous variables. Then we used Pearson correlation tests to explore unadjusted correlations between the study constructs. To perform multivariable analysis, we applied binary logistic regression. However, we first ruled out collinearity between independent variables. We ran models in the pooled sample.

2.8. Ethics

All adult participants in the NHIS provided informed consent. Westat's institutional review board approved the National Health Interview Survey (NHIS) study protocol.

3. Results

3.1. Descriptive Statistics

This study included 21,114 American adults who were either White (n = 20,855) or AIAN (n = 259). Table 1 shows descriptive statistics of the overall sample as well as for Whites and AIANs (Table 1).

3.2. Multivariable models in the pooled sample

Table 2 presents the summary of the results of our logistic regression models with educational attainment as the independent variable and current smoking as the dependent variable. Both models were estimated in the overall sample. *Model 1* only entered the main effects of educational attainment, race, ethnicity, and covariates. *Model 2* also added two interaction terms between race and ethnicity with educational attainment. Based on *Model 1*,

high educational attainment was associated with lower odds of current smoking. *Model 2* showed significant interactions between ethnicity and educational attainment on current smoking, suggesting that high educational attainment has smaller protective effect on current smoking for AIANs than Whites (Table 2).

3.3. Multivariable models by ethnicity

Table 3 presents the summary of the results of two additional logistic regression models with educational attainment as the independent variable and smoking status as the outcome. Based on *Model 3*, in Whites high educational attainment was associated with lower odds of current smoking. Based on *Model 4*, in AIANs, educational attainment was not associated with smoking status (Table 3).

4. Discussion

The current study showed two findings. First, overall, highly educational people were less likely to smoke. Second, ethnicity altered the effect of educational attainment on smoking status with educational attainment showing smaller protective effects against smoking for AIANs than Whites.

Built on our previous work on MDRs, highly educated, high income, and employed Blacks and Hispanics are at an increased risk of substance use compared to high SES Whites [19,30–32]. We also found that highly educated AIANs remain at high risk for smoking. These patterns are all similar and due to weaker associations between SES indicators and behavioral outcomes for non-Whites than Whites.

This is the first study showing MDRs for AIANs. The effects of educational attainment, income, marital status, and employment on obesity, depression, anxiety, self-rated health, and chronic disease are smaller for Blacks and Hispanics than Whites[18–28]. A contribution of this study is to extend the MDRs literature to AIANs.

Smaller effects of educational attainment on smoking of non-Whites may be due to multiple societal and structural factors. Due to residential segregation, highly educated non-Whites are more likely to live in ethnic enclaves that are higher in stress, poverty, and social disorder and lower in resources. In addition, due to labor market discrimination, highly educated ethnic minorities are less likely to secure employment and income. Segregation as well as lower availability of resources in schools also reduces the effects of educational attainment for people of color such as Blacks, Hispanics, and AIANs.

Predatory marketing practices and availability of tobacco retailers may also be other potential mechanisms that cause ethnic disparities in tobacco use, particularly through MDRs. Predatory marketing and advertising may disproportionately increase risk of tobacco use to people of color and ethnic groups, across SES levels. The experience of highly educated Whites, however, differs.

Policies that tighten tobacco marketing regulations for ethnic minorities may have a role in reducing MDRs. In this view, introducing more restrictive marketing policies that ban point-of-sale advertisement and flavoring for poor areas may not only reduce overall smoking

rates but may disproportionately impact ethnic disparities. Future research should test if restricting predatory marketing will reduce tobacco use disparities by ethnicity.

There is a need for policy evaluations to compare national and local policies that can potentially reduce or increase the ethnic and SES disparities in tobacco use, particularly those that due to MDRs of educational attainment [19,31–39]. States vary in point of sale advertisement, discounts, coupons, and flavoring, which may contribute to MDRs for tobacco use [19,32]. There is a need to study how variation in marketing strategies can undo MDRs [19,30–32] in communities of color.

4.1. Limitations

This study had some methodological limitations. The cross-sectional design of our data does not allow causal inferences. Sample size was imbalanced across ethnic groups. Many SES indicators such as income and wealth were not included. This study was limited to individual level SES and future research should investigate structural factors such as tobacco policy, density of retailers, area level SES. Despite these limitations, this is the first study to show MDRs for AIANs.

5. Conclusion

In the United States, ethnicity alters the effects of educational attainment on smoking. While highly educated Whites show very low rate of high-risk behaviors such as smoking, highly educated AIANs continue to smoke, regardless of their educational attainment. The result is additional risk of smoking in highly educated AIANs.

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Table 1.

Descriptive statistics in the overall sample.

	All		Whites		AIAN	
	Mean	SD	Mean	SD	Mean	SD
Age*	52.28	18.47	52.36	18.46	45.83	17.56
Educational Attainment*	15.64	2.74	15.66	2.74	14.42	2.85
	<i>n</i>	%				
Gender	11402	54.0	11262	54.0	140	54.1
Women	9712	46.0	9593	46.0	119	45.9
Men						
Marital Status*						
Not Married	11143	52.8	10964	52.6	179	69.1
Married	9971	47.2	9891	47.4	80	30.9
Employment*						
Unemployed	9688	45.9	10964	52.6	179	69.1
Employed	11426	54.1	9891	47.4	80	30.9
Region						
Northeast	3792	18.0	9552	45.8	136	52.5
Midwest	5521	26.1	11303	54.2	123	47.5
South	6425	30.4	11262	54.0	140	54.1
West	5376	25.5	9593	46.0	119	45.9
Current Smoker*						
Non-Smoker	17353	82.5	9552	45.8	136	52.5
Smoker	3681	17.5	11303	54.2	123	47.5

the National Health Interview Survey (NHIS 2015)

Table 2.

Logistic regression in the pooled sample.

	B	SE	OR	95% CI		p
Model 1 (All)						
Ethnicity (AIAN)	0.11	0.15	1.12	0.83	1.51	.453
Gender (Male)	0.11	0.04	1.12	1.04	1.21	.003
Age	-0.02	0.00	0.98	0.98	0.98	.000
Education	-0.20	0.01	0.82	0.81	0.83	.000
Married	-0.53	0.04	0.59	0.54	0.63	.000
Employed	-0.10	0.04	0.91	0.83	0.99	.024
Region						.021
Midwest	0.16	0.06	1.17	1.04	1.31	.008
South	0.14	0.06	1.15	1.03	1.29	.014
West	0.06	0.06	1.06	0.94	1.19	.348
Constant	2.70	0.14	14.85			.000
Model 2 (All)						
Ethnicity (AIAN)	-1.96	0.74	0.14	0.03	0.61	.008
Gender (Male)	0.11	0.04	1.12	1.04	1.21	.003
Age	-0.02	0.00	0.98	0.98	0.98	.000
Education	-0.20	0.01	0.82	0.81	0.83	.000
Married	-0.53	0.04	0.59	0.54	0.63	.000
Employed	-0.10	0.04	0.91	0.83	0.99	.025
Region						.021
Midwest	0.16	0.06	1.17	1.04	1.32	.008
South	0.14	0.06	1.15	1.03	1.29	.015
West	0.06	0.06	1.06	0.94	1.19	.336
Ethnicity (AIAN) × Educational Attainment	0.15	0.05	1.16	1.05	1.28	.004
Constant	2.74	0.14	15.43			.000

Notes: Source the National Health Interview Survey (NHIS 2015)

SE: Standard Error; CI: Confidence Interval; OR: Odds Ratio

Outcome: Current smoking

Table 3.

Logistic regression in the pooled sample.

	B	SE	OR	95% CI		p
Model 3 (Whites)						
Gender (Male)	0.11	0.04	1.12	1.04	1.21	.004
Age	-0.02	0.00	0.98	0.98	0.98	.000
Education	-0.20	0.01	0.82	0.81	0.83	.000
Married	-0.53	0.04	0.59	0.54	0.63	.000
Employed	-0.09	0.04	0.91	0.84	1.00	.043
Region						.021
Midwest	0.16	0.06	1.17	1.04	1.32	.008
South	0.15	0.06	1.16	1.04	1.30	.011
West	0.07	0.06	1.07	0.95	1.21	.275
Constant	2.73	0.14	15.38			.000
Model 4 (AIANs)						
Gender (Male)	0.17	0.30	1.18	0.66	2.13	.580
Age	-0.02	0.01	0.98	0.96	1.00	.028
Education	-0.03	0.05	0.97	0.88	1.08	.635
Married	-0.48	0.37	0.62	0.30	1.27	.189
Employed	-0.52	0.32	0.60	0.32	1.11	.103
Region						.466
Midwest	-0.08	0.58	0.92	0.30	2.86	.888
South	-0.60	0.59	0.55	0.17	1.76	.312
West	-0.53	0.54	0.59	0.20	1.69	.324
Constant	0.94	1.05	2.56			.370

Notes: Source the National Health Interview Survey (NHIS 2015)

SE: Standard Error; CI: Confidence Interval; OR: Odds Ratio

Outcome: Current smoking