

## Diminished Returns of Income Against Cigarette Smoking Among Chinese Americans

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### Abstract

**Introduction:** Although educational attainment and income are protective against tobacco use, Marginalization-related Diminished Returns (MDRs) theory posits that the protective effects of socioeconomic status (SES) indicators may be smaller for marginalized groups than mainstream social groups. We aimed to compare the effects of educational attainment and income on current smoking status of Chinese American and European American adults.

**Methods:** Data came from the National Health Interview Survey (NHIS - 2015). A total number of 28081 individuals entered our analysis. This included 420 Chinese Americans and 27661 European Americans. The independent variables were educational attainment (years of schooling) and annual income. The dependent variable was current established smoking status. Age, gender, region, and marital status were covariates. Ethnicity (Chinese American vs. European American) was the moderator.

**Results:** Overall, educational attainment and income were inversely associated with the odds of current established smoking. Ethnicity showed a significant interaction with income but not educational attainment. This finding suggested that the protective effect of income, but not educational attainment, on odds of current established smoking might be smaller for Chinese Americans than European Americans.

**Conclusions:** While educational attainment reduces the odds of current established smoking, high-income Chinese Americans remain at high risk of smoking due to a phenomenon called MDRs. In fact, high income is associated with greater smoking prevalence in Chinese Americans, rather than less. To reduce ethnic disparities in tobacco use, we need to go beyond SES inequalities by addressing structural causes of higher than expected risk of smoking in high SES ethnic minorities.

**Keyword:** population groups; ethnicity; East Asians; Chinese; Whites; socioeconomic position; socioeconomic status; education; smoking; tobacco use

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## 1. Introduction

Ethnic disparities exist in the burden of tobacco use in the U.S. (1-5). Some of the ethnic disparities in tobacco use is due to lower socioeconomic status (SES) in ethnic groups (6-8). Ethnic minorities are also at an increased risk for point-of-sale advertising, retail display, coupons, and discounts (9). Due to having low access to cessation programs (3,10,11), ethnic minorities are also at an increased vulnerability to tobacco related diseases (12). Finally, some evidence suggests that Marginalization-related Diminished Returns (MDRs) of SES indicators may be another mechanism that contributes to ethnic disparities in tobacco use(13-16).

Socioeconomic status (SES) indicators such as educational attainment and income are among the main determinants of tobacco use in the general population (6-8). Despite the overall decline in tobacco use, SES disparities in the prevalence of smoking has increased in the US (8,17,18). From 1966 to 2015, the rate of decline in smoking was 83% in individuals with college degree and 40% in the individuals without high school diploma. A large proportion of such disparities may not be due to individuals making poor choices but higher exposure to tobacco products due to predatory marketing (19-21). For example, low SES individuals are at an increased risk for point-of-sale advertising, retail display, coupons, and discounts (9).

The MDRs refer to “less than expected” protective effects of SES indicators on tobacco use in marginalized populations (e.g. ethnic minority) relative to mainstream populations (13-16). This suggests that ethnic disparities in tobacco use are: (a) not all due to SES gaps, (b) partly because of differential health gains that follow high SES for ethnic minority groups, (c) wider at higher SES levels, and (d) present across all SES levels (13-16). Similar MDRs are found for Blacks (14,22), Hispanics (13,14), and Native Americans (23), however, we are not aware of any previous studies on MDRs of SES indicators among Asian Americans.

We conducted this study to compare Chinese Americans and European Americans for the effects of educational attainment and income on tobacco use. We hypothesized smaller effects of educational

attainment and income on tobacco use for Chinese Americans than European Americans (i.e. MDRs of SES for Chinese Americans). Similar patterns (13,24-34) are shown for Blacks (14,22), Hispanics (13,14), and Native Americans (23). We argue that highly educated Chinese Americans may remain at high risk of smoking, which is due to the MDRs of SES. If we document similar patterns for Asians Americans, then we would argue that the MDRs are not due to groups’ or individuals’ characteristics but differential treatment of ethnic groups by the society (35,36). That is, MDRs are not the product of choices of any specific minority group but how the U.S. society marginalizes all non-European people.

## 2. Methods

This is a secondary analysis of the NHIS 2015 data. Funded by CDC, NHIS is one of the main national health surveys of Americans. The publicly available NHIS data set was downloaded from the NHIS website. All participants provided informed consent. Westat’s institutional review board approved the study protocol.

The NHIS population was the 1) civilian, 2) non-institutionalized U.S. population, and 3) 18+ years of age. The NHIS uses a multistage, clustered, stratified area probability sample design. The current analysis is limited to adults who were either European Americans or Chinese Americans (n = 28,081).

The study variables include demographic factors (age and gender), ethnicity, educational attainment, and income, educational attainment and income both being operationalized as continuous measures. Established current smoking was the outcome, measured as self-reported. Current established smokers criteria were to have smoked 100 cigarettes, smoke currently, and smoke daily. Ethnicity was self-identified and was Chinese American versus European American. Confounders were age, gender, marital 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. Region was a categorical variable: 1) Northeast=Reference Group, 2) Midwest, 3) South, and 4) West.

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. 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 and in each ethnic group.

### 3. Results

This study included 28,081 American adults who were either European American (n=27,661) or Chinese American (n=420). Table 1 shows descriptive statistics of the overall sample as well as by ethnicity (Table 1).

Table 2 presents the summary of the results of our logistic regression models in the overall sample. Based on Model 1, high educational attainment and income were associated with lower odds of current established smoking. Model 2 showed a significant interaction between ethnicity and income but not educational attainment on current established smoking, suggesting that income, but not educational attainment, has a smaller protective effect on current established smoking for Chinese Americans than European Americans (Table 2).

Table 3 presents the summary of the results of two additional logistic regression models by ethnicity. Based on Model 3, in European Americans high educational attainment and income were associated with lower odds of current established smoking. Based on Model 4, however, in Chinese Americans, educational attainment was associated with lower odds of current established smoking status, however, income was associated with higher odds of smoking (Table 3).

### 4. Discussion

The current study showed two findings. First, overall, highly educated and high-income people were less likely to smoke. Second, ethnicity altered the effect of income on current established smoking status with income showing smaller protective effects against current established smoking for Chinese Americans than European Americans. In fact, high income was

associated with more, not less, smoking prevalence in Chinese Americans.

Built on our previous work on MDRs, highly educated, high income, and employed Blacks, Hispanics, and Native Americans are at an increased risk of substance use compared to high SES European Americans (14,15,22,23,25,37). We also found that high income Chinese Americans remain at high risk for current smoking. These patterns are all similar and document weaker associations between SES indicators and behavioral outcomes for ethnic minorities than European Americans.

This is the first study showing MDRs for Chinese Americans. 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 European Americans (13,24-33). A contribution of this study is to extend the MDRs literature to Chinese Americans.

Smaller effects of SES on smoking of ethnic minorities may be due to multiple societal and structural factors. Due to residential segregation, high SES ethnic minority Americans 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 ethnic minorities such as Blacks, Hispanics, and Chinese Americans.

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 among ethnic minority groups across SES levels. The experience of highly educated European Americans, however, differs (38).

Policies that tighten tobacco marketing regulations for ethnic minorities may have a role in reducing MDRs (38). 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 (38). 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 and income (14,15,25,36,39-44). States vary in point of sale advertisement, discounts, coupons, and flavoring, which may contribute to MDRs for tobacco use (14,25,38). There

is a need to study how variation in marketing strategies can undo MDRs (14,15,25,37) in ethnic minority communities.

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 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 retails, and area-level SES. Despite these limitations, this is the first study to show MDRs for Chinese Americans.

**Table 1:** Descriptive statistics in the overall sample.

	<i>All</i>		<i>European Americans</i>		<i>Chinese Americans</i>	
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>
Age*	51.21	18.41	51.33	18.384	42.90	18.245
Educational Attainment*	15.51 <i>N</i>	2.90%	15.50	2.884	16.52	3.462
Gender						
Women	15456	55.0	15236	55.1	220	52.4
Men	12625	45.0	12425	44.9	200	47.6
Marital Status*						
Not Married	15746	56.1	15538	56.2	208	49.5
Married	12335	43.9	12123	43.8	212	50.5
Employment						
Unemployed	12899	45.9	12715	46.0	184	43.8
Employed	15182	54.1	14946	54.0	236	56.2
Region*						
Northeast	4790	17.1	4696	17.0	94	22.4
Midwest	6620	23.6	6562	23.7	58	13.8
South	9664	34.4	9612	34.7	52	12.4
West	7007	25.0	6791	24.6	216	51.4
Current Established Smoking*						
No	23207	83.0	22803	82.8	404	96.4
Yes	4762	17.0	4747	17.2	15	3.6

\*p<0.05 for comparison of ethnic groups: 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 (Chinese American)	-1.73	0.39	0.18	0.08	0.38	.000
Gender (Male)	0.22	0.05	1.24	1.13	1.36	.000
Age	-0.01	0.00	0.99	0.99	1.00	.000
Married	-0.47	0.05	0.62	0.57	0.69	.000
Region						.039
Midwest	0.20	0.07	1.22	1.05	1.40	.008
South	0.11	0.07	1.11	0.97	1.28	.126
West	0.06	0.07	1.06	0.92	1.23	.412
Education	-0.22	0.01	0.80	0.79	0.82	.000
Income	-0.05	0.01	0.95	0.93	0.96	.000
Constant	2.46	0.17	11.70			.000
Model 2 (All)						
Ethnicity (Chinese American)	-1.96	1.72	0.14	0.00	4.10	.255
Gender (Male)	0.22	0.05	1.24	1.13	1.36	.000
Age	-0.01	0.00	0.99	0.99	1.00	.000
Married	-0.47	0.05	0.62	0.57	0.69	.000
Region*						.038
Midwest	0.20	0.07	1.22	1.05	1.40	.008
South	0.11	0.07	1.11	0.97	1.28	.129
West	0.06	0.07	1.06	0.92	1.23	.422
Education	-0.22	0.01	0.81	0.79	0.82	.000
Income	-0.05	0.01	0.95	0.93	0.96	.000
Ethnicity (Chinese American) × Education	-0.16	0.13	0.85	0.65	1.11	.226
Ethnicity (Chinese American) × Income	0.40	0.16	1.49	1.08	2.04	.014
Constant	2.46	0.17	11.74			.000

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

SE: Standard Error; CI: Confidence Interval; OR: Odds Ratio Outcome: Current established smoking

\*Northeast=Reference Group.

**Table 3:** Logistic regression in the pooled sample.

	B	SE	OR	95% CI	p	B	SE	OR	95% CI	p		
	<b>Model 3 (European Americans)</b>					<b>Model 4 (Chinese Americans)</b>						
Gender (Male)	0.21	0.05	1.24	1.13	1.36	.000	2.19	1.33	8.90	0.65	121.77	.101
Age	-0.01	0.00	0.99	0.99	1.00	.000	-0.09	0.05	0.91	0.83	1.01	.064
Married	-0.47	0.05	0.62	0.57	0.68	.000	1.65	1.12	5.22	0.58	46.74	.139
Region*						.040						.706
Midwest	0.19	0.07	1.21	1.05	1.40	.009	0.10	1.74	1.11	0.04	33.54	.954
South	0.11	0.07	1.11	0.97	1.28	.139	1.52	1.61	4.58	0.19	107.99	.346
West	0.06	0.08	1.06	0.91	1.23	.448	1.13	1.25	3.09	0.27	35.72	.367
Education	-0.22	0.01	0.81	0.79	0.82	.000	-0.44	0.16	0.64	0.47	0.89	.007
Income	-0.05	0.01	0.95	0.93	0.96	.000	0.36	0.17	1.43	1.03	1.98	.034
Constant	2.46	0.17	11.76			.000	1.14	3.14	3.13			.717

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

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

Outcome: Current established smoking

\*Northeast=Reference Group.

## 5. Conclusion

In the United States, ethnicity alters the effects of income on smoking. While high income European Americans show very low rate of high-risk behaviors such as smoking, high-income Chinese Americans continue to smoke, regardless of their SES. The result is additional risk of smoking in high SES and middle-class Chinese Americans.

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## What Is Already Known?

Socioeconomic status (SES) indicators such as income are associated with odds of smoking.

## What This Study Adds?

The majority group can better use SES indicators such as income to avoid high risk behaviors such as smoking.

## Conflicts of Interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest, or non-financial interest in the subject matter or materials discussed in this manuscript.

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