

# Assessing the Impact of Relative Social Position and Absolute Community Resources on Depression and Obesity Among Smokers

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**Abstract** We tested two competing hypotheses—relative social position and community resources—in regards to their effect on two co-occurring health problems (depression, and obesity) in a sample of smokers participating in an online smoking cessation intervention. Income and education data at the zip code level from the 2000 Census was linked with individual level data. Logistic regression models were used for each co-occurring problem to determine how each SES variable (individually and interactively) was associated with the presence of co-occurring health problems. We found that lower individual education was related to poorer health for all outcomes (Depression: OR = 1.25; Obesity: OR = 1.24; Both: OR = 1.46), lower community education was only related to obesity (OR = 1.20). Lower individual income was related to higher rates of depressive symptoms (OR = 1.64) and both health problems (OR = 1.55); a significant interaction of individual and community income (Wald = 6.13,  $p < .05$ ) revealed that high income individuals were less likely to be depressed if they lived in lower-income communities and became more likely to be so as community income increased. Relative social position was confirmed for depression, whereas community resources were prominent only for obesity. Higher individual education most

consistently predicted positive health outcomes, making it a potentially powerful target to reduce health disparities.

**Keywords** Socioeconomic status · Smoking · Depression · Obesity · Community

## Introduction

Co-occurring disorders, such as the combination of smoking and depression or obesity, present considerable challenges to public health due to their multiplicative contribution to disability, and premature death (Flegal et al. 2002). Specific associations differ, for example, while smoking is positively related to depression (Kendler et al. 1999), it is negatively related to obesity (Molarius et al. 1997). Furthermore depression and obesity are positively related (Simon et al. 2006). These risk factors are strongly influenced by socioeconomic factors: each health problem is more prevalent in lower socioeconomic status (SES) groups and communities. Although most studies assess single health outcomes, the presence of multiple health problems is ubiquitous in the general population. Given these established relationships, it is critical to understand how depression and obesity co-occur among smokers and the effect of community versus individual level SES on these processes. While the graded association of SES with health is well established, the mechanisms underlying the association remain unresolved, particularly among specific and multiple health problems.

Two different mechanisms have been suggested for the SES gradient. The *community resource* perspective proposes that the greater availability of material resources to individuals living in communities with higher mean income and education levels accounts for their better health

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(Lynch et al. 2000). This perspective emphasizes the importance of the absolute value of individual income, education and associated resources (e.g., home ownership) and of resources in wealthier communities (e.g., supermarkets, recreational facilities). The *relative social position* perspective emphasizes psychological and behavioral responses to low social status (Adler and Matthews 1994; Marmot et al. 1997). This perspective proposes that poorer health is due to greater psychosocial stress for those having lower SES than others in their community (i.e., lower social standing), regardless of the absolute level of available resources.

These two perspectives are not necessarily contradictory. SES may influence health both through differential access to resources as well as by psychosocial and behavioral responses to relative status. However, different predictions would be made from a *community resource* perspective versus a *relative social position* perspective regarding the interaction of individual and community SES. If absolute amounts of resources determine health, individuals at any SES level should have better health if they live in more affluent communities, due to greater availability of resources. However, if relative status matters more, higher community SES may have a negative impact on the health since a greater relative status gap will result from residents' perceptions that they are less affluent than their neighbors. Community resources may play a more vital role for individuals at lower SES levels, where individuals are struggling to meet their basic needs. Relative social position may be more salient at higher individual SES levels, when basic needs have been met and the stress of social comparisons becomes salient. One way to understand how these mechanisms operate is to apply them to health problems, singly and in combinations, to assess for varying mechanisms across different disorders.

This study tests the interaction of individual and community SES in relation to two important public health risks in a sample of smokers, to evaluate the roles of absolute community resources and relative social position. The absolute community resources perspective would predict higher rates of health risks associated with lower individual and community SES and either no interaction or an interaction in which only low SES individuals benefit more from higher SES residential context. The relative social position perspective predicts a significant effect of individual SES, and/or a significant interaction showing higher risk status for individuals who live in communities with higher SES than themselves. In addition to assessing SES as income, as is commonly done, we will also test the influence of education, another important SES component, to better assess mechanisms of association between SES and health.

## Methods

### Participants

Participants were recruited via online advertisements to an international Internet Stop Smoking study, conducted from 2005 to 2008 (Muñoz et al. 2009). For this study, only baseline data from US participants were used. Eligible participants were 18 years or older, current smokers (5+ cigarettes per day), had at least weekly access to email, and were able to read and write English or Spanish. Our sample of U.S. residents ( $n = 2,263$ ) was mostly English speaking (92.97%) and female (61.33%). The modal education level was a bachelor's degree or higher (31.88%), the modal categorical income was \$20,000–\$50,000 (37.56%). Most (79.41%) participants identified as Caucasian (3.76%—African-American, 3.18%—Asian-American, the rest—other categories), 10.87% identified as Hispanic or Latino. Within the zip codes in this sample, the mean per capita income in the year 2000 was \$23,689.34 ( $SD = 11,182.64$ ), and mean percentage of area residents with a bachelor's degree or higher was 27.42% ( $SD = 16.28$ ).

### Measures

The *Center for Epidemiological Studies—Depression* scale (CES-D; Radloff 1977) is a well-validated self-report scale assessing the current level of depressive symptoms. The CES-D has a range of 0–60. For this study, the score of 24 (severe symptomatology) was used as a cutoff, to target more severe depression and to decrease false positives. *Obesity* was determined by Body Mass Index (BMI) calculated from self-reported height and weight. Consistent with NIH guidelines, individuals with BMI over 30 were classified as obese. The average BMI in this sample was 26.87 ( $SD = 5.98$ ; range: 15.73–61.99), which falls into the overweight category and is similar to reported U.S. averages of 26.6 (Romero-Corral et al. 2008).

Participants' reported their *income* in one of 9 categories of household income, first with four \$5,000 increments (\$0–\$20,000), followed by two \$15,000 increments (\$20,001–\$50,000) and, \$25,000 increments (\$50,001–\$100,000), and a final category of \$100,001 and higher. These categories were converted to 4 categories to roughly denote lower (0–\$20,000), lower-middle (\$20,001–\$50,000), upper-middle (\$50,001–\$100,000) and upper income levels (\$100,000 and higher). Participants' *education* was measured in years up to 12, and then in categories (some college, bachelor's degree, master's degree, doctoral degree). Education categories were converted into 4 categories: (1) high school or less, (2) some college, (3) bachelor's degree, and (4) master's degree or higher (See Table 1 for group values).

**Table 1** Sample description

Sample overview	N	%
Gender		
Male	871	38.68
Female	1,381	61.32
White/Nonwhite		
Nonwhite	453	20.13
White	1,797	79.87
Individual income		
0–\$20,000	429	19.31
\$20,001–\$50,000	850	38.25
\$50,001–\$100,000	672	30.24
\$100,000+	271	12.20
Community income		
\$5,072.00–\$12,506.74	84	3.80
\$12,506.75–\$23,689.34	1,340	60.66
\$23,689.35–\$34,871.95	558	25.26
\$34,871.96–\$148,899	227	10.28
Individual education		
High school or less	495	21.89
Some college	1,045	46.22
Bachelor's degree	487	21.54
Master's degree or higher	234	10.35
Community education (% with bachelor's degree or higher)		
3.00–11.14%	259	11.75
11.15–27.42%	1,079	48.96
27.43–43.70%	500	22.69
43.71%+	366	16.61
Depression		
Low depression symptoms (CES-D < 24)	1,694	76.79
High depression symptoms (CES-D ≥ 24)	512	23.21
Obesity		
Not obese (BMI < 30)	1,664	75.74
Obese (BMI ≥ 30)	533	24.26
Depression & obesity		
Absence of both	1,937	92.90
Presence of both	148	7.10

*Community income* was attained from the most recent (1999) zip code per capita income data on the U.S. Census factfinder website (U.S. Census Factfinder 2000). *Community education* was also based on the U.S. Census data, by calculating the percentage of people in each zip code with a bachelor's degrees or higher. Data for both community variables was divided into 4 groups by a standard deviation split, such that the lowest group was over one standard deviation below the mean, the lower middle group was between –1SD and the mean, the upper middle group was between the mean and +1SD, and the upper group was over one standard deviation above the mean, as shown in Table 1.

## Analysis

Three binary logistic regression models were constructed: one for depression, one for obesity and another for both depression and obesity as the dependent variables. We first tested for main effects of individual and community level SES variables on obesity and depression (individually and co-occurring) among smokers. For each model, individual and community income and individual and community education were entered as simultaneous predictors; age, gender, and race (Non-Hispanic White vs. All others) were included as covariates. We then tested the relative social position hypothesis by adding another step in each model: interactions between income and education at the individual and community levels. Nonsignificant interactions were removed to better interpret remaining interactions and main effects. Variables were centered about the mean to address multicollinearity and to present interaction effects more clearly.

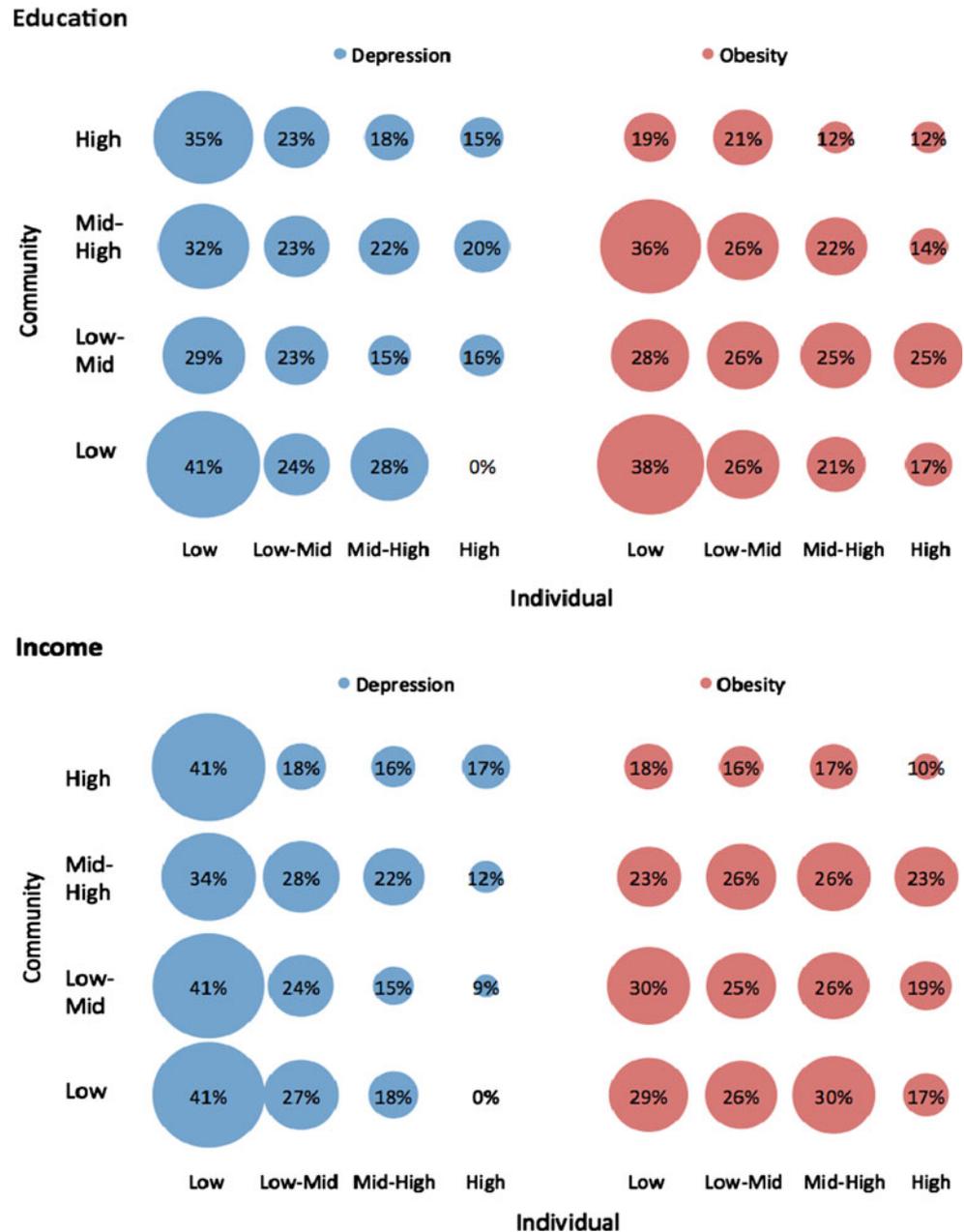
## Results

Individuals with less education had more depression (OR = 1.25, CI = 1.09–1.42, Wald = 10.66,  $p < .001$ ), obesity (OR = 1.24, CI = 1.09–1.40, Wald = 11.07,  $p < 0.01$ ) and more likelihood of having both conditions (OR = 1.46, CI = 1.16–1.83, Wald = 10.54,  $p < 0.01$ ) independent of demographic characteristics, community education and both individual- and community-level income. Individuals with lower household income had more depression (OR = 1.64, CI = 1.44–1.87, Wald = 56.53,  $p < .001$ ) and combined depression and obesity (OR = 1.55, CI = 1.25–1.93, Wald = 16.13,  $p < 0.001$ ) but did not have more obesity alone. The only community level SES variable that was independently and significantly related to health risk was community level education in relation to obesity, such that lower community education levels were associated with increased obesity (OR = 1.20, CI = 1.00–1.43, Wald = 4.01,  $p < .05$ ). Interaction terms assessing the combination of individual and community education and income were entered in a separate step in both models. For depressive symptomatology, the interaction between individual income and community income was significant (Wald = 6.13,  $p < .05$ ). Among those with higher household incomes, depressive symptomatology increased as community level income increased (Fig. 1). This offers support for the relative social position hypothesis. No other interactions attained significance.

## Discussion

Our data reveal that components of SES (income & education) have varying relationships with health outcome of interest.

**Fig. 1** Depression and obesity by individual and community SES



We did not find consistent support for any single hypothesis (relative social position hypothesis or community resources) across health outcomes. Rather, we found evidence for both. The *community resources* hypothesis was supported only for obesity, where lower community education was related to increased obesity. The *relative social position* hypothesis was confirmed for depression among high-income individuals; this finding also supports the hypothesis that relative position matters more at higher incomes after basic needs are met (see Fig. 1). Individual level income was related to having both depression and obesity concurrently. Though individual income was also related to depression, that relationship was moderated by community income in a manner consistent with

the *relative social position* hypothesis. Wealthier individuals exhibit more depressive symptoms when surrounded by more well-off peers compared to those living in lower income communities.

The strong relationship of individual education to each health outcome (and both combined) among smokers is striking and important. Education-related factors such as health literacy may suffer among those with less education and hinder their ability to optimally manage their health risk. Higher levels of education are related to positive health behaviors, such as healthy eating (Cutler and Lleras-Muney 2008). If education is a proxy for health literacy, community health literacy or lack thereof may have an additive effect to

that of the individual's, as in the case of obesity. Obesity is the only health outcome that was significantly related to a community level variable (i.e., community education) potentially due to limited access to healthy foods, and safe public spaces for exercise needed to maintain a healthy weight (Brownell 2005). However, the combination of obesity and depression was related only to individual level income and education suggesting potentially different pathways than those for obesity and smoking alone. It is possible that depression might be a mediating factor in obesity for some that may be more influenced through individual level pathways whereas obesity without depression may be a more environmentally influenced pathway. These are important questions to be addressed in future studies of predictors of co-occurring multiple health problems.

These findings suggest that improving education of the population is a key way to reduce health disparities, and that community-wide health education campaigns targeting obesity may be indicated for communities with low education. Future research should continue to examine the mechanisms by which education exerts its influence. On a policy level, these findings add to the literature suggesting improving education of the population as a key way to reduce health disparities.

One of our goals for this study was to determine whether, in a sample of smokers, *relative social position* or *community resources* was more dominant in determining the three outcomes (depression, obesity, or both) under investigation. Our data showed support for both hypotheses, which reflects the disagreement that exists in this line of research. The applicable hypothesis may depend on the health outcomes of focus and on income level. Future research should continue to seek out the mechanisms by which SES influences multiple and co-occurring health outcomes across diverse populations.

### Limitations

Our sample consisted of smokers who use the Internet, and thus is not representative of all smokers or all U.S. adults. Our cross-sectional data limits our ability to make causal inferences. In addition, the participants were not sufficiently concentrated geographically to allow multi-level modeling, and we did not have data beyond zip codes, which cover larger and more diverse areas than do block groups or census tracts.

### Conclusions

Our findings provide partial support for both the *relative social position* and *community resource* hypotheses.

Greater education related to all outcomes and could improve health through either mechanism. Community level education was related to obesity, providing support for a *community resources* model, potentially through shared knowledge, behaviors, along with characteristics of the environment such as less access to healthy foods. This finding suggests a potential role for health education, as well as education writ large, as a key intervention in improving public health. The *relative position* hypothesis was supported for depression in relation to wealthier individuals. The relationship between individual income and depression varied based on community income, with those at high income showing greater likelihood of depression as community income increased. These hypotheses are therefore differentially applicable to specific health problems, likely working through different problem-specific mechanisms. Most prominently, the results highlight the strong relationship of individual education on depression and obesity among smokers. Education may be a strong buffer against the burden of disease.

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