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Socioeconomic correlates of smoking among an ethnically diverse sample of 8th grade adolescents in Southern California

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Abstract

Objective—Socioeconomic status (SES) has been associated with smoking among adolescents, but it is not known which attributes of SES are responsible for the added risk, or whether these associations are consistent in ethnically diverse samples.

Methods—This study investigated the associations between SES variables and smoking behavior among an ethnically diverse sample of 1847 8th-grade adolescents in Southern California in 2002. Several aspects of SES were examined: an objective composite measure of family and neighborhood SES, the adolescent's spending money, and the adolescent's perception of SES (family's ability to afford basic necessities, wealth relative to others, and wealth relative to last year).

Results—After controlling for demographic characteristics, smoking behavior of parents and friends, and parental monitoring, low scores on the objective SES index and large amounts of pocket money were associated with an increased risk of smoking. The subjective measures of perceived SES were not associated with smoking.

Conclusions—Results indicate that increased smoking prevention efforts are needed in low-SES areas, and that limiting adolescents' pocket money may be an effective strategy for preventing smoking.

Keywords

smoking; adolescence; socioeconomic status

Most studies of adolescent smoking have focused on psychological and social risk and protective factors rather than on economic factors (Tyas & Pederson, 1998). No single definition of socioeconomic status (SES) is universally accepted (Oakes & Rossi, 2003), but various SES measures have been linked to health outcomes and behaviors (Berkman & Kawachi, 2000). SES measures can be grouped into two categories (Adler, Epel, Castellazzo, & Ickovics, 2000). *Objective* measures of SES assess individuals' material and social capital such as income, occupational category, education, and control over resources (Oakes & Rossi, 2003). *Subjective* measures include individuals' perceptions about their position on the SES hierarchy relative to others, including relative deprivation (Runciman, 1966; Stewart, 2005), ladder-based measures (Singh-Manoux, Adler, & Marmot, 2003), and subjective prestige (Featherman & Hauser, 1976). Although subjective measures have not been used extensively

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in health research, researchers (Hodge, 1981; Rossi & Berk, 1987) argue that they reflect societal norms and are significant predictors of health (Goodman, Adler, Daniels, Morrison, Slap, & Dolan, 2003; Singh-Manoux, Marmot, & Adler, 2005).

SES factors are relevant to smoking etiology because they influence adolescents' neighborhood and peer environments, availability of cigarettes, and psychological well-being (Stewart, 2005). Two general hypotheses appear plausible: (1) Higher wealth leads to greater access to cigarettes and higher smoking prevalence; or (2) Lower wealth leads to feelings of relative deprivation and marginalization and higher smoking prevalence.

Family / neighborhood SES and adolescent smoking

Studies of U.S. adolescents (Chen, Matthews, & Boyce, 2002; Goodman & Huang, 2002; Lowry, Kann, Collins, & Kolbe, 1996; Seltzer & Oechsli, 1985; Scarinci, Robinson, Alfano, Zbikowski, & Klesges, 2002; Wardle, Jarvis, Steggle, Sutton, Williamson, Farrimond, Cartwright, & Simon, 2003) have shown inverse correlations between family/neighborhood SES and adolescent smoking. This association may be mediated by friends' smoking (Maddahian, Newcomb, & Bentler, 1986), parental smoking (Soteriades & DiFranza, 2003), cigarette availability (Maddahian et al., 1986), and depression (Goodman & Huang, 2002).

Spending money and smoking

Adolescents with more personal spending money are more likely to smoke (Stanton, Oei, & Silva, 2002; Scragg, Laugesen, & Robinson, 2002). It appears obvious that adolescents with more spending money would be more able to obtain cigarettes; however, most adolescents obtain their cigarettes from social sources rather than retail sources, typically without paying (White, Gilpin, Emery, & Pierce, 2005).

Lack of research on ethnically diverse samples

Most studies reviewed above were conducted among White and/or African American adolescents. Because the ethnic diversity of the U.S. is increasing, it is important to understand the predictors of smoking among other groups including Hispanics and Asians. Ethnic minority status and SES are typically interrelated. A failure to examine both as risk factors for smoking could cause researchers to attribute excess risk to ethnicity when it should be attributed to SES. Analyses of diverse samples are needed to disentangle ethnic and cultural influences from socioeconomic influences. This study extends the results of previous research by examining SES and smoking in an ethnically diverse sample.

Method

Data were obtained from the 8th-grade (2002) survey of a longitudinal study of Los Angeles adolescents (Johnson, Unger, Ritt-Olson, Palmer, Cen, Gallaher, & Chou, 2005). Surveys were conducted in 6th, 7th, and 8th grades, but only the 8th grade survey contained the economic measures. Therefore, this is a cross-sectional analysis of the 8th grade sample. Because the study's goal was to oversample Hispanics and Asian-Americans, schools were eligible to participate if their student population was at least 25% Hispanic and/or Asian-American. 36 public and private school districts were invited to participate; 26 agreed. The 26 districts contained 150 middle schools; 68 agreed to participate. Of those, 33 met the inclusion criteria. 9 participated in pilot research and the remaining 24 participated in this study. The median income in the schools' catchment areas was \$44,590, as compared \$47,493 throughout California in 2000 (U.S. Census Bureau, 2001).

Consent forms were sent home to the parents/guardians of all 6th-grade students. Of the 4,427 students invited, 3,326 (75%) provided active parental consent. Compared with students whose

parents did not respond to the request for consent, the students who provided parental consent were more likely to be female, non-African-American, never-smokers, and had higher grades in school (Unger, Gallaher, Palmer, Baezconde-Garbanati, Trinidad, Cen, & Johnson, 2004). The sample was not intended to be representative of a specific geographic area because it was an oversample of Hispanics and Asians. However, we did expect the sample of participants to be representative of the schools from which they were recruited. The ethnic distribution of this sample was approximately representative of the student populations of the 24 schools (50% Hispanic, 22% Asian / Pacific Islander, and 28% other in this sample vs. 51% Hispanic, 26% Asian / Pacific Islander, and 23% other in the schools' enrollment statistics; Greatschools.net, 2003).

Of the students with parental consent, 212 (6%) were absent from school on the day of data collection or chose not to participate. 3114 students completed the baseline survey. Of those, 2438 (78%) participated in the follow-up survey in 8th grade. Of those, 1847 (76%) provided complete data.

The analytic sample (n=1847) differed slightly from those lost to attrition. Those lost to attrition were more likely to be male (51.6% vs. 44.3%, $\chi^2=16.08$, $p<.0001$), older (mean age=11.4 years [SD=0.5] vs. 11.3 years [SD=0.5], $t=3.15$, $p<.005$), have tried smoking in 6th grade (12.1% vs. 6.5%, $\chi^2=29.87$, $p<.0001$), and live in ZIP Codes with median household income < \$30,000/year (50.1% vs. 26.9%, $\chi^2=173.55$, $p<.0001$). Nevertheless, the analytic sample still contained sufficient variability for these analyses.

Objective SES measures

SES measures were selected based on literature reviews and the investigators' judgments about which indicators of SES could be reported by adolescents. Some commonly-used measures (e.g., parents' income or occupational titles) were not included because our previous research indicated that many adolescents left these questions blank.

Parents' education—Students were asked whether each parent had finished high school and/or college. This measure was used because our previous pilot data indicated that many middle school students knew whether their parents had gone to college, but they were not able to identify the type of college degrees their parents had earned. Each parent's education was coded as 0 if the parent had not finished high school, 1 if the parent had finished high school but not college, and 2 if the parent was a college graduate. The two parents' scores were averaged to create the parents' education score. If there was only one parent, that parent's score was used.

Rooms per person in home—The ratio of the number of rooms to people in the respondent's residence has been used as an estimate of SES; it is typically correlated with overcrowding and poverty indices (Myers, Baer, & Choi, 1996) and can be reported by adolescents.

Median household income in ZIP Code—The median household income of each student's ZIP Code was obtained from 2000 U.S. Census data. We are aware that Census tracts may have provided more precise estimates (Krieger, Chen, Waterman, Soobader, Subramanian, & Carson, 2003), but the IRB did not allow us to ask the students' precise addresses.

Spending money was assessed with the question: "How much money do you get each week to spend any way you want?", rated on a 7-point scale from "None" to "more than 50 dollars."

Subjective SES measures

Family's ability to afford basic necessities was assessed with a 3-item scale (Cronbach's $\alpha=.63$): "In the past year, was your family able to afford furniture or household equipment that needed to be replaced?"; "In the past year, was your family able to afford to buy the kind of food you should have?"; and "In the past year, was your family able to afford the kind of medical care you should have?" Response options were "yes" and "no." The "yes" responses were summed.

Perceived wealth relative to others was assessed with a 2-item scale (Cronbach's $\alpha=.59$): "Would you say that your family's income is higher, lower, or about the same as that of most of your friends?"; "Would you say that your family's income is higher, lower, or about the same as that of most of your neighbors?" Response options were, "higher," "lower," and "about the same." The scale score was the mean of the two items.

Perceived wealth relative to last year was assessed with the question, "Compared with last year, would you say your family's income is...." "Higher now than last year," "Lower than last year," or "About the same as last year."

Smoking behavior was assessed with the question, "Have you ever tried cigarette smoking, even a few puffs?" (yes/no) This lifetime smoking measure was used instead of more advanced levels of smoking because the prevalence of smoking in this sample was very low (only 3% of the respondents had smoked in the past month). Therefore, this is an analysis of early experimentation with smoking, not progression to more advanced levels of nicotine dependence.

The following covariates were included because they were significantly associated with smoking and SES and therefore could be confounders: Parents' smoking - "Think about the 2 adults you spend the most time with: How many of them smoke?"; Friends' smoking - "How many of your friends smoke cigarettes at least once a month?"; Parental monitoring - a 5-item scale described in detail elsewhere (Shakib, Mouttapa, Johnson, Ritt-Olson, Trinidad, Gallaher, & Unger, 2003). Demographic covariates included age, gender, and ethnicity (Asian, Hispanic, White, Other).

Statistical analysis

Logistic regression was used to analyze the association between SES and lifetime smoking. Because students were nested within schools, data were analyzed with multilevel logistic regression models using the SAS GLIMMIX procedure. To examine ethnic differences in the associations between SES and smoking, interaction terms representing each SES variable X ethnicity were included.

The complex data structure (ZIP codes partially, but not completely, nested within schools) creates an analytic challenge. We calculated intraclass correlation coefficients (ICCs) for smoking at the ZIP code and school levels. The school level ICC (.063) was considerably larger than the ZIP code level ICC (.026), indicating that ZIP codes are more heterogeneous in adolescent smoking than schools are. Therefore, we used school as the clustering variable, because most of the intraclass correlation occurs there.

Results

Table 1 shows the students' demographic characteristics and smoking behavior. Most lived in ZIP Codes where the 2000 median household income was below \$50,000 per year (69%). Most (82%) had never tried smoking.

Table 2 shows the intercorrelations among the SES measures. Because the three objective SES measures (ZIP Code median household income, parents' education, and rooms per person) were intercorrelated, they were combined to form a single SES scale. The scale score was calculated by standardizing each variable to a mean of 0 and a standard deviation of 1 and then taking the mean of the three items (Cronbach's alpha = .69). The other SES measures (spending money, perceived ability to afford basic necessities, perceived wealth relative to others, and perceived wealth relative to last year) were not correlated strongly with the objective SES measures or with one another. They were retained as separate predictor variables.

Table 3 shows the results of the logistic regression analysis predicting lifetime smoking. The objective SES scale was inversely associated with smoking (OR=0.83, 95% CI=0.70, 0.98); smoking prevalence was lower among those with higher SES. Spending money was positively associated with smoking (OR=1.21, 95% CI=1.06, 1.38); smoking prevalence was higher among those with larger amounts of spending money. The perceived SES measures were not associated with smoking.

SES X ethnicity interaction terms were examined in the logistic regression models to determine whether the associations varied across ethnic groups. None were significant, so they were not retained in the final model.

Figure 1 illustrates the significant associations. Smoking prevalence increased with spending money, from 14% among those with no spending money to 36% among those who received \$30 or more per week. The prevalence of smoking was 21-23% among those in the lowest 3 quintiles of SES, but it decreased to 10% among the highest quintile.

Discussion

This study examined two hypotheses about SES and smoking among adolescents: (1) Higher wealth leads to greater access to cigarettes and higher smoking prevalence; or (2) Lower wealth leads to feelings of relative deprivation and marginalization and higher smoking prevalence. Support was found for both hypotheses, depending on the measure of SES used. Consistent with Hypothesis 1, smoking was more prevalent among those with more spending money. Consistent with Hypothesis 2, smoking was more prevalent among those with lower objectively-measured SES. These findings in an ethnically diverse sample are consistent with findings in less diverse samples (Chen et al., 2002; Goodman & Huang, 2002; Lowry et al., 1996; Scragg et al., 2002; Seltzer & Oechli, 1985; Scarinci et al., 2002; Stanton et al., 2002; Wardle et al., 2003). They indicate that the association between SES and smoking exists among Hispanic and Asian-American adolescents, in addition to African-American and White adolescents. The associations did not differ across ethnic groups, providing additional support for their generalizability.

Contrary to expectations, the adolescents' perceptions of their families' SES were not associated with their smoking behavior. The correlations between the objective SES measures and the adolescents' perceptions of their relative SES were low. Los Angeles is comprised of a diverse array of neighborhoods that vary greatly in SES. Adolescents in relatively economically deprived areas may not perceive themselves as deprived, because their friends and neighbors are equally deprived. Nevertheless, adolescents in low-SES areas are exposed to a greater concentration of cigarette retailers and storefront cigarette advertising (Novak, Reardon, Raudenbush, & Buka, 2006; Laws, Whitman, Bowser, & Krech, 2002) which may influence their smoking risk regardless of whether they are aware of their economic deprivation.

The measures of perceived SES may have lacked reliability or validity. Because we were not able to find brief survey measures of relative deprivation appropriate for adolescents, we wrote

these measures specifically for this survey. Although they have good face validity and adequate internal consistency reliability, additional research is needed to determine whether they have good construct validity and test-retest reliability.

Limitations

Because SES was not the primary focus of the study, detailed SES measures were only included on the 8th grade survey, so only a cross-sectional analysis of the 8th grade survey was possible. Future studies should assess SES at baseline and follow students prospectively. These results may not generalize to the students who were lost to attrition.

It is difficult to obtain reliable objective SES data from adolescents. The adolescents' self-reported rooms per person, parents' educational achievement, and ZIP Codes were used to create an SES index, which may have contained random error. Random error would attenuate associations between the index and smoking, so the results reported here are conservative. The composite measures had low Cronbach's alphas. Psychometric research is needed to validate measures suitable for adolescents.

Low family/ neighborhood SES and large amounts of pocket money are risk factors for smoking among culturally diverse adolescents. Smoking prevention programs for low-SES adolescents could be a useful strategy to prevent tobacco-related diseases.

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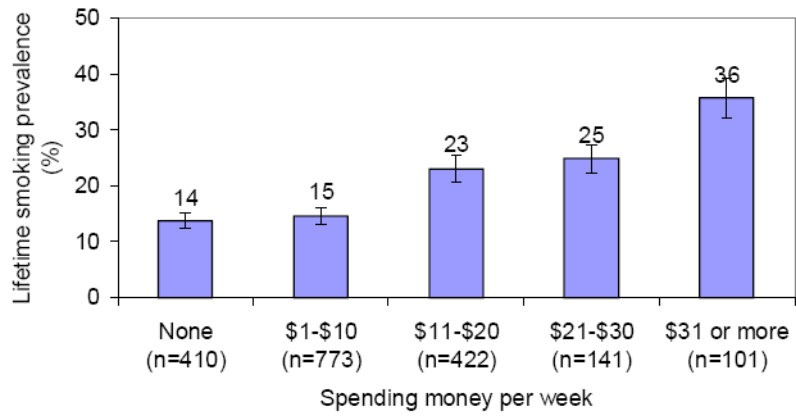
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Lifetime smoking prevalence according to spending money



Lifetime smoking prevalence according to SES quintile

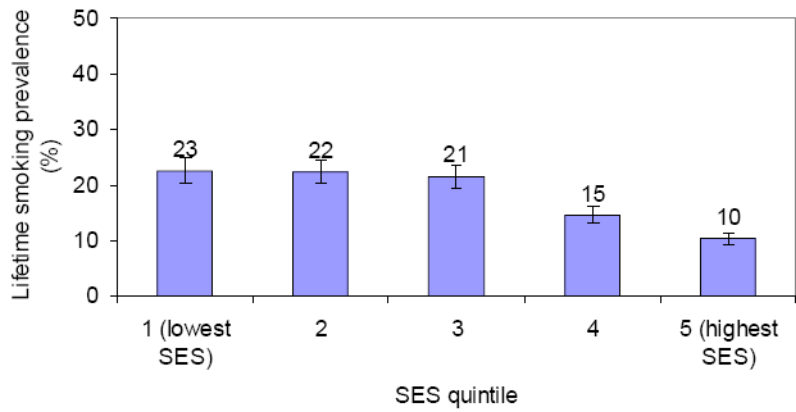


Figure 1. Lifetime smoking prevalence according to spending money and SES, Los Angeles, California, 2002
 Note. Error bars represent standard errors.

Table 1
Demographic characteristics of respondents, Los Angeles, California, 2002

		N	%
Age (years)	11-12	50	3%
	13	1595	86%
	14	195	11%
	15-16	7	0%
Gender	Female	1030	56%
	Male	817	44%
Race/Ethnicity	Hispanic	915	50%
	Asian	406	22%
	Other	406	22%
	White	120	6%
Median annual household income in ZIP Code	< \$30,000	500	27%
	\$30,000 - \$39,999	550	30%
	\$40,000 - \$49,999	214	12%
	\$50,000 - \$59,999	336	18%
	\$60,000 +	247	13%
Lifetime smoking	Yes	337	18%
	No	1510	82%
Past-month smoking	Yes	65	3%
	No	1782	97%

Table 2
Correlation matrix of economic measures, Los Angeles, California, 2002

	ZIP Code median income	Rooms per person	Parents' education	Spending money	Able to afford basic necessities	Perceived wealth relative to others	Perceived wealth relative to last year
ZIP Code median income	1						
Rooms per person	.44*	1					
Parents' education	.47*	.36*	1				
Spending money	-.13*	-.01	-.07*	1			
Able to afford basic necessities	.03	.02	.04	.07*	1		
Perceived wealth relative to others	.03	.11*	.11*	.22*	.13*	1	
Perceived wealth relative to last year	.00	.00	.05*	.11*	.11*	.24*	1

* p<.05

Table 3
 Logistic regression predicting lifetime smoking, Los Angeles, California, 2002

Variable	Odds Ratio	95% Confidence Interval
Age	1.72 *	(1.25, 2.37)
Female (vs. male)	0.94	(0.72, 1.23)
Asian (vs. White)	0.76	(0.37, 1.54)
Hispanic (vs. White)	1.50	(0.76, 2.99)
Other ethnicity (vs. White)	1.28	(0.65, 2.53)
Friends' smoking ¹	1.72 *	(1.52, 1.93)
Parents' smoking ¹	1.22 *	(1.09, 1.38)
Parental monitoring ¹	0.68 *	(0.60, 0.78)
SES scale ¹	0.83 *	(0.70, 0.98)
Spending money ¹	1.21 *	(1.06, 1.38)
Perceived ability to afford basic necessities ¹	0.93	(0.82, 1.05)
Perceived wealth relative to others ¹	0.92	(0.79, 1.06)
Perceived wealth relative to last year ¹	1.12	(0.98, 1.28)

* p<.05

Note. All variables were entered simultaneously into the model, so each odds ratio is controlled for the other variables in the model.

¹ Scale score is standardized to a mean of 0 and a standard deviation of 1. Therefore, the odds ratio represents the odds associated with a 1 standard deviation difference in the score.