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WORKING PAPER

Persistence of Educational Differences in Smoking, United States 1976-2005

Fred C. Pampel

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**PERSISTENCE OF EDUCATIONAL DIFFERENCES IN SMOKING,
UNITED STATES 1976-2005**

Abstract

Objectives. Concerns about SES disparities in smoking and prospects that current anti-tobacco policies will reduce disparities suggest the need to examine recent trends. This study describes changes in smoking prevalence by education level for race and gender groups from 1976 to 2005.

Methods. The analysis uses a measure of self-reported current smoking gathered in 23 National Health Interview Surveys. Logistic regression models test for differences in smoking changes across four education groups (0-11, 12, 13-15, and 16+ years of schooling) and use quadratic coefficients for year to generate predicted values and smoothed trends in smoking for each education group (with race-gender groups both combined and treated separately).

Results. With controls for age, race, and sex, the results for the combined sample reveal that the gap in smoking between the lowest and highest education group declined by 4 percentage points from 1998 to 2005. However, this decline stemmed largely from trends among Hispanic men and women; in contrast, smoking disparities among white and African-American men and women show no evidence of narrowing. Further, smoking of high school graduates and those attending some college relative to college graduates widened rather than narrowed in recent years.

Conclusions. Although educational disparities in smoking are no longer widening as they did decades ago, their persistence for most race-gender groups suggests that policies and programs more directly target low SES smokers.

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Although smoking increases the risk of premature mortality among all users (Department of Health and Human Services (DHHS), 2004; Peto et al., 1994; Rogers et al., 2005), the problem of tobacco use has special relevance to low socioeconomic status (SES) groups. Their greater smoking relative to high SES groups (Barbeau, Krieger, and Soobader, 2004; Giskes et al., 2005; Honjo, Tsutsumi, and Kawachi 2006; Huisman, Kunst, and Machenbach, 2005) contributes to SES differences in health and longevity (Jha et al., 2006; Marmot, 2006). Because of the SES differential, efforts to reduce smoking further need to focus on low SES groups, those who have been most resistant to change (Fagan et al., 2004). The NIH Strategic Plan to Reduce and Ultimately Eliminate Health Disparities (NIH, 2000), and Healthy People 2010 Initiative (DHHS, 2006) accordingly give prominent attention to tobacco use.

SES disparities in smoking have become an increasingly serious problem in the last several decades. Historically, high SES groups first adopted smoking early in the twentieth century and adoption by low SES groups followed (DHHS, 2001:135; Ferrence, 1989; Pampel, 2005). With the growing publicity of the harm of cigarettes in the 1960s, however, SES patterns of smoking began to shift (DHHS 2000:323). In the 1970s and 1980s, smoking fell faster among high SES groups, thus widening SES disparities considerably (Escobedo and Peddicord, 1996; Fiori et al., 1989; Pierce et al., 1989).

More recently, there are several reasons to expect that the trend of widening SES differences has begun to reverse. First, cigarette prices have risen by 210 percent from December 1997 to October 2005 (Bureau of Labor Statistics, 2006), and, by some accounts,

higher prices have stronger negative effects on smoking among low income and SES groups (DHHS, 2000:351; Farrelly and Bray, 1998; Townsend, 1987). The full effect of rising prices on tobacco prevention and cessation occurs over a period of years and decades (Becker, Grossman, and Murphy, 1994), but the higher financial cost brought by recent price increases to low SES groups may have already reduced disparities (Levy, Mumford, and Comptom, 2006). Second, establishment of statewide clean-air laws – covering seven states and 24 percent of the population as of 2005 (Bauer, Hyland, and Li, 2005) – may most benefit low SES workers (Farrelly, Evans, and Sfekas, 1999). In the absence of statewide laws, low SES workers in factories and plants are less often covered by smoke-free workplace policies (Moskowitz, Lin, and Hudes, 2000) and less often benefit from workplace health-promotion policies (Sorenson et al. 2004). Given the effectiveness of smoke-free workplaces in reducing smoking (Ong and Glantz, 2005), the recent spread of state mandates may most help low SES workers. Third, the increasing social unacceptability of smoking and publicity about the harm of tobacco use leads to lower smoking in general (Alamar and Glantz, 2006) but may most affect low SES groups with the highest prevalence. Although some express concern about the use of stigma for tobacco control (Bayer et al., 2006), anti-smoking norms and criticism of public cigarette use may help low SES persons otherwise less motivated to avoid tobacco (Gilpin, Lee, and Pierce, 2004). Fourth, the process of change implied by the epidemic model of smoking suggests that low SES groups will follow high SES groups, after a lag, in their rejection of smoking, just as they followed high SES groups, also after a lag, in the adoption of smoking (Lopez, Collishaw, and Piha, 1994; Pampel, 2005). After decades of greater decline among high SES groups, which have already reached levels low enough to make further change more difficult, low SES groups may start to catch up.

Despite reasons to expect change, studies have not examined recent trends in SES differentials in smoking. Earlier studies demonstrated the increasing disparities in previous decades (Escobdo and Peddicord, 1996; Pierce et al., 1989) but have not been extended through the 1990s and 2000s. Updating previous studies to describe the recent trends can help evaluate policies and practices. Evidence of narrowing disparities would be encouraging and suggest that strategies of tobacco reduction have successfully met the special needs of low SES groups. Evidence of persistent disparities would suggest the need to do more to target anti-tobacco policies and programs.

In examining trends in SES disparities, previous studies typically used education as an indicator of SES (Escobdo and Peddicord, 1996; Pierce et al., 1989). Education remains largely stable during adulthood and serves as a proxy for permanent income and wealth (Adda and Cornaglia, 2006). Income, employment status, and occupation change substantially from the time of adoption of cigarettes at younger ages to continued use during adulthood, which has the potential to weaken observed relationships. Education also creates human capital, problem-solving skills, and social ties that aid tobacco avoidance and cessation (Cowell, 2006; Mirowsky and Ross, 2003). Moreover, education does not face the same problems of error in reported income and missing occupations for those not in the labor force. Although education cannot stand for occupation and income, it has stronger effects than the other SES components (Barbeau, Krieger, and Soobader, 2004) and has advantages for over-time comparisons.

Along with education, the recent trends likely vary by race and ethnicity. From the 1950s to the 1980s, the gap in smoking between white and African-American adults widened from near equality to a white advantage (Novotny et al., 1988). The socioeconomic disadvantage of African Americans largely explains their higher smoking (Kandel et al., 2004; Kiefe et al., 2001;

Williams, 2005). More recently, however, the trend may have moved in the opposite direction. Studies of high school seniors since 1976 reveal a remarkable decline in cigarette use by African Americans (Johnston et al., 2005) that may prefigure movement toward lower African-American smoking in adulthood and changing SES disparities. Trends among Hispanics may also differ from other groups due to their lower smoking and high portions of foreign born (Osypuk et al., 2006). And since trends for women diverge from those for men, the race and ethnicity comparison of SES disparities should be done separately for men and women.

To address the issue of changes in SES differences in smoking, this study examines trends in cigarette use by level of education for persons ages 20-55 and for subgroups defined by race and sex. It does so using nationally-representative data from the National Health Interview Survey (NHIS) over the 30 years from 1976 to 2005 and appropriate controls for changes in the age composition of the population.

Methods

The NHIS is a continuous, multipurpose survey of the U.S. civilian non-institutionalized population living in addressed dwellings. Among many other things, it has asked questions on smoking in 23 surveys over the 30 years from 1976 to 2005 (National Center for Health Statistics (NCHS), 2006a). Briefly, the surveys use a multistage probability sampling design to select representative samples of households, and each week through the year trained Census interviewers obtain information on the characteristics of members of the sampled households. For most years, a randomly selected adult from each household is also interviewed in person (except in the few cases that the adult is physically or mentally unable to do the interview and a proxy answers questions). For the years through 1996, the selected adults answered

supplemental modules of questions that often included smoking items. Household response rates for the early core surveys exceeded 95 percent (Caban et al., 2005), but some of the supplemental surveys had lower rates (Escobedo and Peddicord, 1996). For the years from 1997 to 2005, the household and sample adult interviews included smoking items as part of the core questionnaire. Reflecting a trend of lower response in all national surveys, rates have fallen for the NHIS to 70-80 percent since 1997 (Caban et al., 2005). In 2004, for example, 87 percent of eligible households participated and 84 percent of sample adults within households participated, leaving a response rate of 73 percent (NCHS, 2005). Those ages 20-55 are selected for the analysis. Age 20 is the youngest age available on all surveys, and excluding those over age 55 minimizes the influence of differential mortality on educational comparisons.

The stratified cluster sampling design requires statistical adjustments for overlap among respondents from the same primary sampling unit, and changes in the sample designs require different adjustments for 1976-1983, 1985, 1986-1994, 1995, and 1997-2005 (NCHS, 2006a, 2006b). The `svy` commands in Stata 9.2 (2005) correct standard errors for the deviations from simple random sampling. In addition, the use of the data requires weighting. Before 1995, the NHIS oversampled African Americans and since 1995 oversampled both African Americans and Hispanics. Weights given by the NHIS adjust for the size of the Hispanic and African-American samples, non-response, and stratification. In addition, the NHIS weights are adjusted for this analysis so that each year counts equally. After eliminating missing data on the key variables and selecting respondents ages 20-55, cases are weighted to create an identical sample size for each year ($n=19,285$) that equals the total sample size for all years ($N=433,553$) divided by the number of years (23).

Excepting occasional and minor changes in the treatment of irregular smokers, the surveys are consistent in basic questions on tobacco use. Ever smokers are defined as persons who report smoking at least 100 cigarettes in their lifetime. Among ever smokers, current and former smokers are then distinguished by their answer to the question, “Do you smoke now?” Those answering yes are classified as current smokers, and those answering no are classified as former smokers. Many surveys also contain retrospective information on age of initiation and periods of cessation, but the analysis focuses on the more easily obtained and accurate self-reports of current and former smoking (Patrick et al., 1994). Comparisons of trends in former and ever smokers with trends in current smokers provide information on educational differences in quitting and starting, but the analysis focuses mostly on current smoking.

Education is measured as years of school completed, but changes in the exact categories used by the NHIS suggest the creation of a small set of consistent groups that reflect the important milestones of high school and college graduation. Respondents are thus classified into four categories: 0-11 years (no high school degree), 12 years (high school graduation), 13-15 years (some college), and 16 and more years (college graduation). Beginning in 1997, a coding scheme added new categories for those obtaining GEDs (treated as completing 12 years of schooling) and getting vocational or technical degrees (treated as having some college). Compared to earlier years, the changes decrease the percentages of high school dropouts and graduates and increase the percentages with some college.

Along with age and sex, the main sociodemographic variable is race/ethnicity. This variable distinguishes four categories: self-identified non-Hispanic whites, non-Hispanic African Americans, non-Hispanic others, and Hispanics (whites, African Americans, others, and Hispanics for short). The small size and disparate membership of the other category (consisting

of only 3.7 percent of the sample and combining Asians, Pacific Islanders, Native Americans, and others) makes it less meaningful than the others. Respondents in this category will be included in the combined analyses but not used in the separate group analysis.

Logistic regression is used to model the trends in current smoking across the four educational categories with controls for changing age, sex, and race/ethnic composition of the population. With a quadratic time trend describing changes in smoking, the year and year squared terms interact with education to describe the education-specific trends. The coefficients for the additive and interactive year, year squared, and education terms are then used to compute predicted probabilities and describe smoothed trends in current smoking for the four education groups (with the control variables taking their mean values).

Results

Based on results in Table 1, the percent current smokers in all four education groups declines over time but does so slightly more for the college educated. Smoking of those without a high school degree falls by 15 percentage points from 52 to 37, while smoking of those with a college degree falls by 16 percentage points from 27 to 11. As a result, the difference between the two groups changes little. However, the trends differ between the first and last half of the time period. The gap between the two education groups of 25 percentage points in 1976-1980 rises to 34 percentage points in 1986-1990 and then falls to 26 percentage points in 2001-2005. The early period shows an increasing gap as smoking among the college educated falls faster than those without a high school degree, while the later period shows the opposite.

Table 1 About Here

Changes in percent former smokers and ever smokers, also presented in Table 1, each contribute to the changing education gap over time. Much like for current smoking, the differences in percent former smokers and percent ever smokers between the lowest educated and highest educated groups rise to a peak in 1986-1990 and then fall afterward. For example, the percent former smokers among the college educated in 1986-1990 is 8 points higher than among high school dropouts but drops to 4 percentage points higher in 2001-2005. The education differences in ever smokers likewise falls from 26 to 21 percentage points.

Logistic regression for current smokers versus former and never smokers reveals more precisely how the trends in smoking vary by education group. In Table 2, columns 1-2 first demonstrate a curvilinear trend in smoking – one in which the rate of decline levels off in recent years – and strong effects of education. For example, the odds of smoking for those without a high school degree are 4.37 ($e^{1.475}$) times larger than for the omitted group of college graduates. The multiplicative interaction terms in columns 3-4 next show that the non-linear effects of year and year squared vary by education group. Compared to the trend for college graduates, the coefficients for the interaction terms of the education groups produce smaller negative year effects and smaller positive year squared effects.

Table 2 About Here

Figures 1a and 1b plot the means and predicted probabilities (based on the interaction model with no controls) of being a current smoker for each year and education group. In Figure 1a, the curve for those without a high school degree shows a stronger rate of decline in later years, while the curve for those with a college degree shows a decline that levels off in later years. The two trends produce some convergence. However, the curves for the other two education groups – those with high school degrees and with some college – show a smaller

decline, particularly in recent years. Their smoking diverges from that of the college educated. Indeed, the advantage of high school graduates compared to dropouts has nearly disappeared. Figure 1b plots the differences (rather than the levels) in the means and predicted probabilities of current smoking between college educated and the other three groups. The difference for the lowest educated group rises to a peak of about 34 percentage points in 1988 and then falls to 25 percentage points in 2005. However, the gap for the other two groups rises over the full time span. Although there is some narrowing for the least educated, the other education groups exhibit a widening gap. For example, the difference between high school graduates and college graduates begins in 1976 at 14 percentage points and rises to 23 percent in 2005.

Figures 1a and 1b About Here

These trends may be misleading because they do not control for compositional changes in the population. The proportion of the population that is Hispanic – a group with generally low smoking – has increased over time, likely lowering the smoking of less educated groups. Controls for race/ethnicity, as well as for age and gender, are added to the logistic regression model in columns 5-6 of Table 2. The positive age and negative age squared coefficients reflect the rise and fall of smoking with age, and the other coefficients show lower smoking of women compared to men and lower smoking of African Americans, Hispanics, and others compared to whites. With these controls, the levels of smoking among less educated groups increase relative to college educated. The odds ratio for high school dropouts relative to college graduates rises from 4.37 to 5.58 ($e^{1.720}$) with controls.

The interactions of the year and education variables in columns 7-8 continue to show different trends by education group. However, the models with the controls produce weaker evidence of convergence. Figure 2a uses the coefficients in column 7 to plot the trends in

smoking by education (with the control variables assigned their means). The curve of the lowest education group moves clearly toward the middle two groups but less clearly toward the highest education group. Moreover, the two middle education groups increase their smoking relative to the highest education group. The differences with college graduates appear in Figure 2b. The lowest education group shows a decline in its difference of about 4 percent from 1998 to 2005. The middle education groups increase their smoking relative to the highest education group.

Figures 2a and 2b About Here

Trends in educational disparities within race and gender groups demonstrate even less evidence of narrowing. For white males and females (Figures 3a and 3b), smoking of those with less than a high school degree has changed little, and the gap with college graduates widens considerably. The gaps also increase for high school graduates and those with some college compared to college graduates. For African-American males, smoking among all education groups has declined, although somewhat faster for college graduates (Figure 4a). For African-American females, near parity in smoking across education groups at the beginning of the period widens to produce the differentials observed for other groups (Figure 4b). In contrast to whites and African Americans, smoking of Hispanic males converges across educational levels (Figure 5a), while smoking of Hispanic females shows narrow gaps throughout the period. As the only ethnic group to exhibit convergence, Hispanics contribute to the modest narrowing of differentials found for the total population.

Figures 3a, 3b 4a, 4b, 5a, and 5b About Here

Discussion

Data from the NHIS reveal limited progress in eliminating educational disparities in smoking. On the plus side, those without high school degrees have improved relative to those with college degrees in the last 10 years – the difference in adjusted means falls by 4 percentage points. The decline represents an improvement compared to the widening disparities from the 1970s to the 1990s and is consistent with the findings of Levy, Mumford, and Compton (2006) for women from 1992 to 2002. On the minus side, this change appears to stem from only one ethnic group – Hispanics. White and African-American males and females without high school degrees show little decline in smoking and contribute little to declining disparities relative to college graduates. Further, smoking percentages for those with high school degrees and some college have risen slightly in recent years, as have their gaps with the smoking of college graduates. Most of the evidence shows persistence of educational disparities in smoking.

The decline in smoking among low educated Hispanics – a key source of the overall decline for those without a high school degree – may come from the immigration of low-smoking Hispanic groups into the United States. In the 1995 NHIS, a question on years lived in the United States distinguishes foreign-born from native-born respondents. Some simple analyses show that among Hispanics without a high school degree, 14.2 percent of the foreign born smoked compared to 31.9 percent of the native born. These results confirm other studies that find lower smoking among immigrants (Wilkinson et al., 2005). A rise in the foreign-born Hispanic population might thus lower Hispanic smoking among the low educated. If so, the narrowing of SES disparities may come from low-educated Hispanics raised in large part outside the United States and following norms from other countries rather than from Hispanics born in

and acculturated to the United States. This possibility needs study but discouragingly implies that a major source of declining disparities comes from outside rather than inside the United States.

The trends in educational disparities for whites and African Americans suggest that, at least so far, higher prices, clean-air laws, and social unacceptability have had limited effects. These changes in the tobacco environment have lowered smoking but appear to influence the college educated, who are already prone to avoid health-risk behaviors (Link and Phelan, 1995), as much as the less educated. Although studies suggest low education groups should respond most to anti-smoking changes in the last ten years, clear evidence of such an outcome does not yet appear in the trends for whites and African Americans.

Perhaps changes in prices, regulations, and anti-smoking norms have lagged effects that will reduce SES disparities in the next decades. The benefits of higher prices for an addictive behavior like smoking accumulate slowly. However, with prices having more than doubled and smoking overall having dropped by about 13 percentage points since 1996, stronger evidence might be expected to have emerged in the analysis of SES disparities through 2005. Perhaps forces of change most affect younger smokers, who respond more quickly to incentives to start and stop smoking and will reveal more clearly the emerging trends toward smaller SES disparities. Models limited to whites ages 25-35 show little convergence, but young adults from other race and ethnic groups help lower education differences. However, these modest changes leave disparities at older ages intact and, given the slowness of cohort replacement, will take decades to work through the full population.

Although SES disparities are not immutable (indeed, high SES groups once smoked more than low SES groups), the greater resources of high SES groups may counter the equalizing influence of higher prices, restrictions on smoking, and public disapproval. For example,

although persons from all SES groups express similar desires to quit, high SES groups are more successful in reaching their goals (DHHS, 2000). They have more financial resources than others to use for counseling, nicotine replacement therapy, assistance from physicians, and prescription drugs (Honjo, Tsutsumi, and Kawachi, 2006), greater educational skills and knowledge to use in devising solutions to nicotine addiction (Mirowsky and Ross, 2003); and more varied occupational experiences to draw on in overcoming obstacles (Sorenson et al., 2004). In addition, they have greater social and cultural capital: Their friendship, neighborhood, and acquaintance networks offer more support, encouragement, and approval for quitting (Brown et al., 2006; Chen, White, and Pandina, 2001; Miles, 2006).

The results reinforce calls for vigorous efforts to target tobacco control at low SES groups. Besides such calls made by the NIH Strategic Plan to Reduce and Ultimately Eliminate Health Disparities (NIH, 2000), many studies of smoking have noted the need to prevent initiation and aid cessation among disadvantaged groups (Barbeau, Krieger, and Soobader, 2004; Levy, Mumford, and Compton, 2006; Sorensen et al., 2004). However, policies may need to do more than rely on higher prices and clean-air laws. They may need to identify measures that are tailored to groups with the higher smoking. Such groups include those with high school degrees and some college, whose position relative to college graduates has worsened in recent years. Progress in reducing smoking among the college educated group may come more slowly in the future because average levels have fallen to about 10 percent and now have less room to drop. In contrast, the considerably higher smoking among less educated groups leaves more room for decline and the influence of targeted programs.

These findings are limited by the use of self-reported smoking. Although reliable on average, self-reports may reflect bias that varies across education groups. If highly educated

persons, who may face greater stigmatization by workmates, friends, and family, deny their use of cigarettes to interviewers more than lower SES persons, it may artificially increase SES disparities. Similar to studies of reported cigarette use, studies of cotinine levels demonstrate that educational disparities are real (Adda and Cornaglia 2006), but a focus on changes in self-reported smoking by education level may lead to special measurement problems. Even with accurate self-reports, measures based on recall of age of starting, age of quitting, periods of abstinence, intensity of cigarette use, and exposure to second-hand smoke would provide more information. Current smoking status has the advantages of being straightforwardly measured, comparable across time, and critical for health. Still, investigation of past as well as current smoking can add to the literature (Escobedo and Peddicord, 1996). Studies of other components of SES such as employment, occupational prestige, and income can also add to the literature. Given its stability over the life course and comparability across time, education serves as a useful single indicator of SES, but other components deserve more study.

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Table 1. Percent Current, Former, and Ever Smokers by Education Group and Year

Smoking Status Education	1976 to 1980	1981 to 1985	1986 to 1990	1991 to 1995	1996 to 2000	2001 to 2005	76/80 minus 01/05	86/90 minus 01/05
Percent Current Smokers								
0/11	52	50	49	45	41	37	15	12
12	41	39	36	35	36	33	8	3
13/15	36	30	27	26	27	25	11	2
16+	27	20	15	14	12	11	16	4
0/11 minus 16+	25	30	34	31	29	26	-1	8
Percent Former Smokers								
0-11	15	17	16	16	14	13	2	3
12	17	19	20	19	17	17	0	3
13-15	19	20	21	21	19	18	1	3
16+	22	24	24	22	19	17	5	7
0/11 minus 16+	-7	-7	-8	-6	-5	-4	-3	-4
Percent Ever Smokers								
0-11	67	67	65	61	54	49	18	16
12	59	58	56	55	53	50	9	6
13-15	55	50	47	47	45	43	12	4
16+	49	44	39	36	31	28	21	11
0/11 minus 16+	18	23	26	25	23	21	-3	5

Table 2. Logistic Regression Coefficients and Z-Ratios for Models of Current Smoking

Independent Variable	Additive No Controls		Interactive No Controls		Additive With Controls		Interactive With Controls	
	b	Z	b	Z	b	Z	b	Z
Year ^a	-.033	-13.2	-.082	-17.6	-.034	-13.5	-.080	-16.4
Year ² (b*10 ²)	.041	5.3	.129	8.6	.056	7.4	.138	9.0
Ed. 0/11	1.475	80.0	.920	29.1	1.720	89.4	1.119	25.2
* Year			.078	11.9			.076	12.0
* Year ²			-.210	-9.8			-.187	-9.0
Ed. 12	1.119	73.5	.527	19.3	1.201	77.6	.633	15.0
* Year			.054	10.5			.055	9.3
* Year ²			-.097	-5.4			-.089	-4.9
Ed. 13/15	.750	52.3	.341	12.8	.811	55.9	.414	10.6
* Year			.032	5.9			.031	5.1
* Year ²			-.030*	-1.6			-.028*	-1.5
Age					.066	17.8	.065	17.7
Age ² (b*10 ²)					-.092	-18.8	-.092	-18.7
Female (=1)					-.319	-37.2	-.312	-36.3
Black (=1)					-.188	-11.3	-.191	-11.4
Hispanic (=1)					-.832	-43.1	-.835	-42.9
Other (=1)					-.367	-12.2	-.362	-12.0
Constant	-1.292		-.830		-2.216		-1.754	

^a 1976=1, 1977=2, . . . , 2005=30

* Not significant, p > .01

Figure 1a. Trends in Smoking by Education (Observed and Predicted)

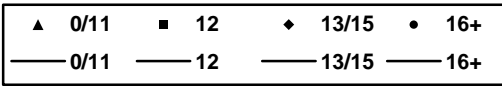
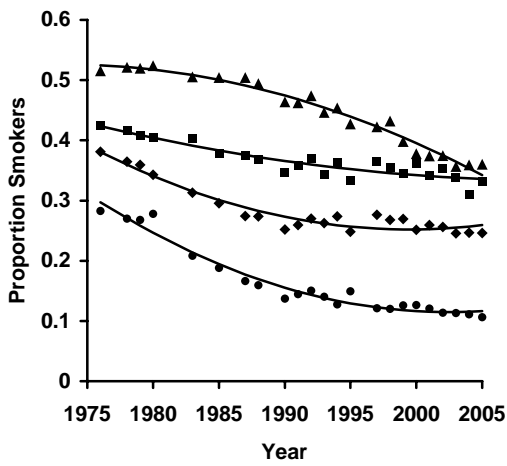


Figure 1b. Trends in Education Differences in Smoking (Observed and Predicted)

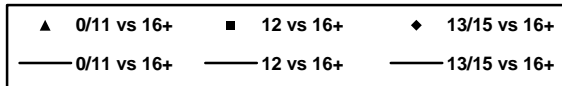
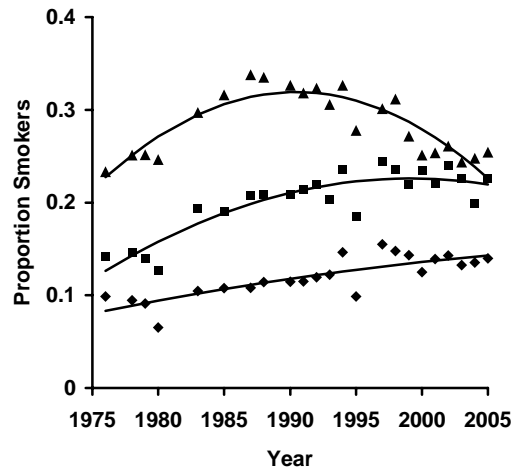


Figure 2a. Adjusted Trends in Smoking by Education (Observed and Predicted)

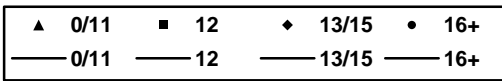
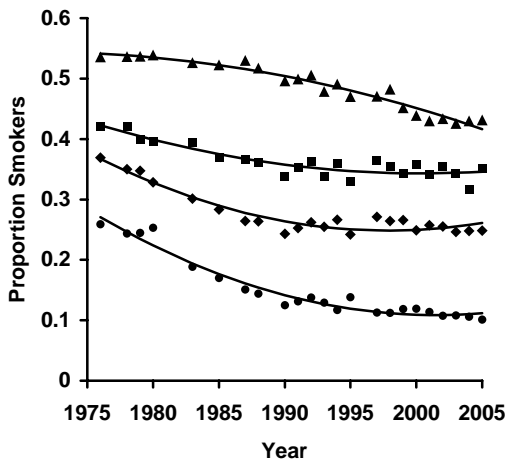


Figure 2b. Adjusted Trends in Education Differences in Smoking (Observed and Predicted)

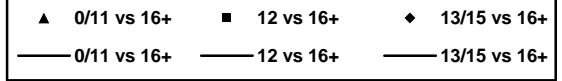
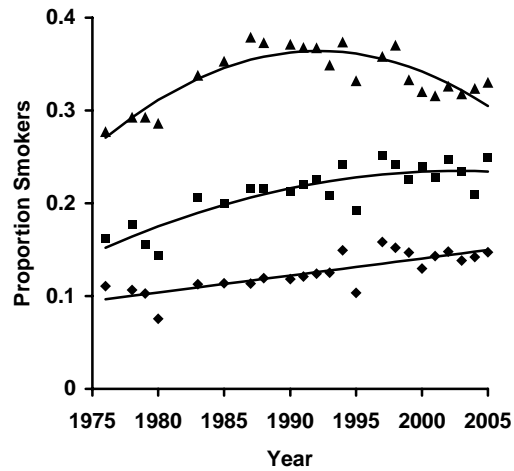


Figure 3a. Adjusted Trends in Smoking by Education for White Males (Observed and Predicted)

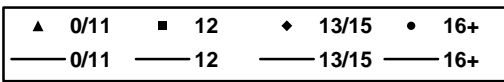
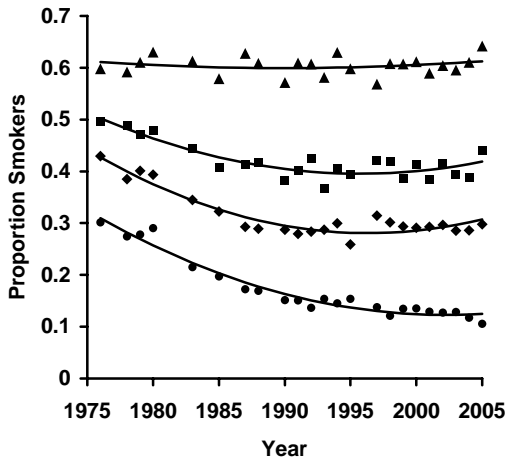


Figure 3b. Adjusted Trends in Smoking by Education for White Females (Observed and Predicted)

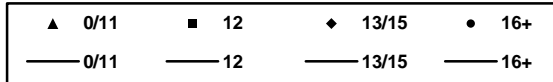
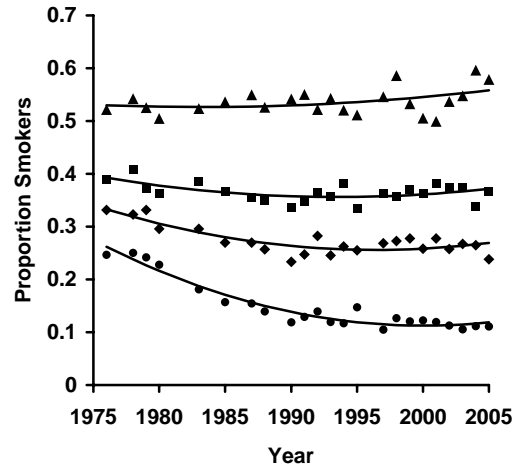


Figure 4a. Adjusted Trends in Smoking by Education for Black Males (Observed and Predicted)

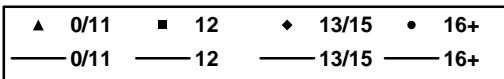
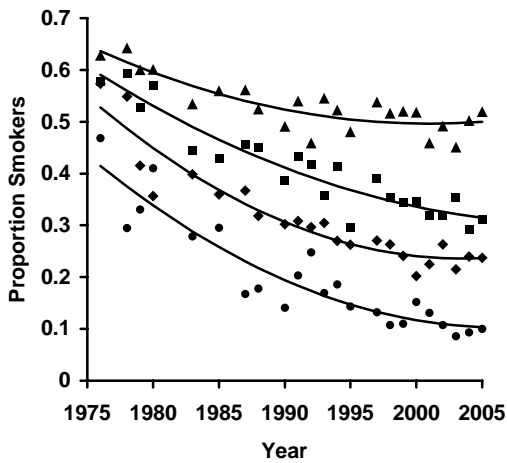


Figure 4b. Adjusted Trends in Smoking by Education for Black Females (Observed and Predicted)

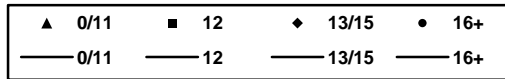
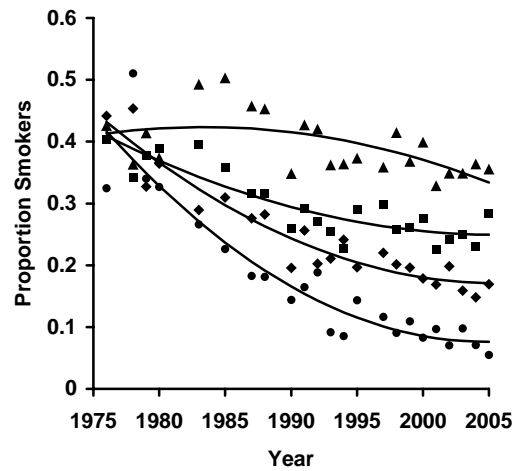


Figure 5a. Adjusted Trends in Smoking by Education for Hispanic Males (Observed and Predicted)

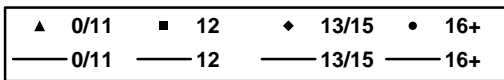
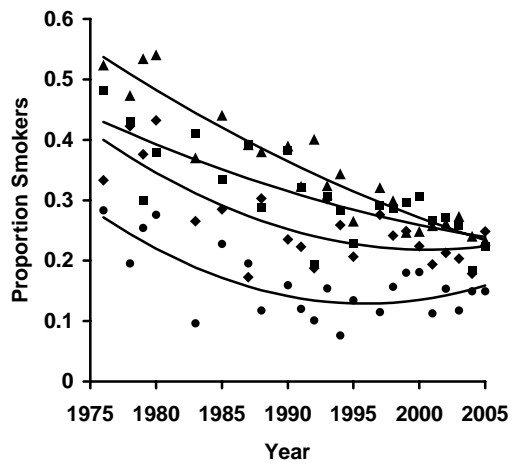


Figure 5b. Adjusted Trends in Smoking by Education for Hispanic Females (Observed and Predicted)

