

Decomposing Racial Differences in Adolescent Smoking in the U.S.¹

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Abstract

Despite declining smoking rates in the U.S., a substantial fraction of adolescents still smoke. In addition, there are notable racial differences in adolescent smoking. We use Add Health data and apply a nonlinear decomposition method to determine the extent to which racial differences in observable characteristics account for (i) the racial smoking gaps in adolescent smoking (ages 12-18) and (ii) racial gaps in the probability of becoming a smoker in young adulthood (ages 18-24), conditional on being a non-smoker in adolescence. The model includes a host of explanatory factors, including individual, family socioeconomic, smoke exposure, school characteristics, and county crime rate. Of the 19 (9) percentage-point gap in white-black (white-Hispanic) smoking in adolescence, these factors together account for 22-28% (39-77%) of the smoking gap; and of the 18 (13) percentage-point gap in white-black (white-Hispanic) smoking up-take in young adulthood, these factors together account for 26-50% (48-100%) of the gap, depending on which set of coefficients are used for the decomposition. The biggest drivers of racial smoking gaps in adolescence are differences in friends' smoking and school peer smoking, while only school peer smoking contributes to the explained portion of racial gaps in smoking up-take in young adulthood.

Key Words: Smoking, Racial differences, Decomposition

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1. Introduction

Since the publication of the 1964 Surgeon General report highlighting the dangers of smoking, smoking rates in the United States have fallen substantially from 43% in 1965 to 18% in 2012 (USDHHS 2013). However, smoking is still the single largest cause of preventable death and has substantial monetary and non-monetary costs. The Surgeon General estimates that smoking causes almost half a million deaths per year, and costs \$289-\$333 billion, including over \$150 billion in lost productivity due to premature death. Motivated by this, a large literature has focused on understanding the determinants of smoking. Research has shown that smoking is inversely related to socioeconomic factors such as education (Cowell 2006), employment (Hersch 2000), cigarette prices and taxes (Chaloupka 1991), and restrictive tobacco control policies (Chaloupka & Grossman 1996); on the other hand, smoking is positively related to factors like parental smoking (Loureiro et al. 2010, Balia & Jones 2011), school peer smoking (Gaviria & Raphael 2001; Fletcher 2010; Powell et al. 2005), and neighborhood crime (Virtanen et al. 2007).

Despite the now well understood dangers of smoking (Doll & Peto 1976, Doll et al. 1994, Doll et al. 2004)², in 2013 15.7% of students in grades 9-12 smoked cigarettes in the last month (Healthy People 2020), and more than 80% of established adult smokers started smoking before age 18 (USDHHS 2012). These statistics underscore the importance of studying adolescent smoking. One of the aims of Healthy People 2020 is to decrease the proportion of adolescents who smoked in the last month to 16%. There are also large racial disparities in adolescent smoking.

² A series of studies by Drs. Richard Doll, Richard Peto, and coauthors has examined the results of the British Doctors Survey, which followed the smoking status of 34,439 male doctors in 1951. These studies found that prolonged users of cigarettes lost 10 years of life expectancy on average than their non-smoking peers. And, quitting at ages 60, 50, 40, and 30 gained 3, 6, 9, and 10 years of life expectancy, respectively.

Among high school students in 2013, 18.6% of whites had smoked cigarettes in the last month, compared to only 14% of Hispanics and 8.2% of Blacks (Health People 2020). But why should one's race affect his/her decision to initiate smoking? The underlying assumption of this study is that race connotes significant differences in culture, history, socioeconomics, and opportunities that lead to racial differences in health behaviors, including smoking. It is erroneous to think that race is associated with different biology, physiology, or ability that somehow correlates with one's decision to take up smoking. In fact, our main finding supports the assumption that racial differences in smoking are attributable to the racial difference in the environments in which the adolescent resides. Decomposition of racial differences in adult smoking has received some attention in the literature (Dubowitz et al. 2011) but to the best of our knowledge there are no studies decomposing racial gaps in adolescent smoking. Understanding drivers of racial differences in adolescent smoking is important, as it is a time when individuals are likely to initiate smoking.

We use the National Longitudinal Study of Adolescent Health and the nonlinear decomposition method by Fairlie (2005) to quantify how much of the white-black and white-Hispanic gaps in (1) adolescent smoking (ages 12-18) and (2) probability of becoming a smoker in young adulthood (ages 18-24) conditional on being a non-smoker in adolescence are accounted for by racial differences in individual characteristics, family socioeconomic status, smoke exposure, school peer characteristics and county crime. It is important to note that while the majority of the literature on smoking is concerned with finding causal estimates of the determinants of smoking, this is a descriptive exercise concerned with estimating the extent to which differences in observable characteristics account for the racial gaps in adolescent smoking.

This study, like other studies that apply Oaxaca-Blinder type decompositions suffer from the same limitations. The method will not lead to irrefutable evidence of behavioral relationships and policy prescriptions because it does not uncover mechanisms underlying the relationships between independent variables and the outcome. Decomposition exercises add value to the literature as they serve to draw attention to the most important correlates of the gap they seek to study. For example, this study includes a host of factors that are found to be important correlates of smoking in the literature: parents' smoking status (e.g., Laureiro et al 2010, Lillard 2011), parents' socioeconomic status, including education and family income (Soteriades & DiFranza 2003), area crime (Virtanen et al 2007), demand for weight loss (Cawley & von Hinke Kessler Scholder 2013), gender (Lundborg & Andersson 2008), school peer smoking (Manski 1995, Gaviria & Raphael 2001, Lundborg 2006), and often unobserved characteristics like ability (Farrell & Fuchs 1982). Of these correlates, this study highlights that the racial gaps in friends' smoking status, school peer smoking, ability, and maternal smoking account for the biggest portion of the racial/ethnic gap in adolescent smoking.

We acknowledge that the results of this analysis could be different if we were able to address the potential sources of endogeneity; however, estimating such a causal model that contains a number of potentially endogenous variables would rely on using a variety of identification strategies, which would make this exercise intractable. In the discussion section, we attempt to estimate how these results would be different if we used an instrumental variable for the variable (school peer smoking) that accounts for the majority of the explained portion of the racial gaps in white-black and white-Hispanic smoking.

2. Methodology

The most common approach used to understand drivers of inequalities between different groups is the Oaxaca-Blinder decomposition (Blinder 1973, Oaxaca 1973). Recent studies have used this approach to investigate racial differences in adult binge drinking and fruit and vegetable consumption in the U.S. (Dubowitz et al. 2011), racial differences in adolescent BMI in the U.S. (Powell et al. 2012) and gender differences in adult smoking in South Korea (Chung et al. 2010). The Oaxaca-Blinder decomposition is given in equation (1). It decomposes the mean difference in an outcome between two groups into one part due to differences in observable characteristics and another part due to differences in the effect of those characteristics. We focus on the first part as that can potentially be affected by policy intervention.

$$(1) \quad \bar{Y}^1 - \bar{Y}^2 = [(\bar{X}^1 - \bar{X}^2)\hat{\beta}^1] + [\bar{X}^2(\hat{\beta}^1 - \hat{\beta}^2)]$$

This study uses the Fairlie decomposition method (Fairlie 2005) rather than the standard Oaxaca-Blinder method. We do so because our dependent variable is binary and the underlying regressions in Fairlie decomposition use probit estimation. Applying the Oaxaca-Blinder method, which utilizes Ordinary Least Squares regression, poses the risk that it will produce unreasonable results that lie outside the unit interval. Further, although the linear Oaxaca-Blinder method is a good approximation for binary variables, the Fairlie method is preferred when the racial gaps are in the tails of the distribution³ (Fairlie 2005). This approach has been used to decompose gender differences in obesity in South Africa (Averett et al. 2014).

³ By the Central Limit Theorem we know that the racial gap in the rate of smoking, $(\bar{Y}_W - \bar{Y}_B)$ is normally distributed with mean zero (null hypothesis), and the further away the gap is from zero the more it is said to lie in the tails. A back-of-the-envelope calculation using descriptive statistics in table 1 shows that white-black gap and white-Hispanic

We first estimate reduced-form health production functions for non-Hispanic white (white henceforth), non-Hispanic black (black henceforth), and Hispanic adolescents, using a probit regression. In the exposition below, we focus on the health differences between whites and blacks.

$$(2) \quad H_i^w = F(X_i^w \beta^w + u_i^w)$$

$$(3) \quad H_i^b = F(X_i^b \beta^b + u_i^b)$$

In equations (2) and (3) F represents the standard normal cumulative density function and the X 's represent inputs in the health production function. We use an extensive set of characteristics to measure ability, socioeconomic status, smoke exposure, and school peer characteristics as explanatory variables, which are described in the next section.

The average health differential between whites and blacks can be decomposed into 2 parts:

$$(4) \quad \bar{H}^w - \bar{H}^b = \left[\sum_{\forall N^w} \frac{F(X_i^w \hat{\beta}^w)}{N^w} - \sum_{\forall N^b} \frac{F(X_i^b \hat{\beta}^w)}{N^b} \right] + \left[\sum_{\forall N^b} \frac{F(X_i^b \hat{\beta}^w)}{N^b} - \sum_{\forall N^b} \frac{F(X_i^b \hat{\beta}^b)}{N^b} \right]$$

The first term represents the portion of the difference in health that is due to differences in the distribution of the health inputs (the so-called explained part). The second term represents the “unexplained” portion of the health differential; this is the part that cannot be explained by differences in the distribution of X 's (health inputs, in this case). It represents the portion of the health differential that is attributable to racial differences in the effect of health inputs (the regression coefficients, β). This term would be zero if the β s for whites and blacks were the same. Differences in the effect of health inputs across racial groups may arise due to unobserved factors.

gaps are respectively 24.4-30.8 and 9.7-10.6 standard deviations (z-scores under the assumptions of unequal and pooled variances, respectively) from the mean. This shows why the Fairlie method applies to the current analysis.

For example, education may have a different effect on smoking probabilities of whites and blacks because the quality of the education received may differ. The white-Hispanic difference can be explained similarly.

In equation (4) the first term is weighted using white regression coefficients ($\hat{\beta}^w$) while the second term is weighted by the black distribution of average characteristics (X^b). An alternative would be to use the black coefficients ($\hat{\beta}^b$) as weight for the explained portion and the white distribution of average characteristics (X^w) as the weight for the unexplained portion.

$$(5) \quad \bar{H}^w - \bar{H}^b = \left[\sum_{\forall N^w} \frac{F(X_i^w \hat{\beta}^b)}{N^w} - \sum_{\forall N^b} \frac{F(X_i^b \hat{\beta}^b)}{N^b} \right] + \left[\sum_{\forall N^b} \frac{F(X_i^w \hat{\beta}^w)}{N^w} - \sum_{\forall N^w} \frac{F(X_i^w \hat{\beta}^b)}{N^w} \right]$$

While equations (4) and (5) are intuitively the same, they will not provide the exact same estimates because the regression coefficients from the white and black regressions are different. We estimate equation (4), but for robustness we also estimate equation (5) and apply the linear Oaxaca-Blinder decomposition method.

3. Data

We use data from the National Longitudinal Study of Adolescent Health (Add Health), which is a nationally representative sample of 20,745 students in grades 7 through 12 (aged 12-21) in 1994-95 (wave 1). Adolescents were surveyed from 132 schools that were selected to ensure representation with respect to region, urbanicity, school size and type and ethnicity. In wave 1, data were collected from adolescents, their parents, siblings, friends, relationship partners, fellow students and school administrators. The Add Health cohort has been followed 1 year (wave 2, 1996), 6 years (wave 3, 2001-02) and 13 years (wave 4, 2008) later. Our analyses are based smoking at wave 1 and the transition from being a nonsmoker to smoker in wave 3 of the survey.

After dropping adolescents who are older than 18 and those with missing values on any of the key variables, we have a final sample of 14,679 wave 1 adolescents.

Our outcome measure is a binary variable equal to 1 if the respondent has ever been a regular smoker. This is based on the question “have you ever smoked cigarettes regularly, that is, at least 1 cigarette every day for 30 days?” As a robustness test we also conduct our analysis with a binary variable that indicates if the respondent has ever tried smoking, even one or two puffs. We conceptualize that the probability of smoking is related to the following set of broad characteristics⁴:

Individual characteristics: age at survey, gender and birth order.

Ability/Delinquency: We use 3 different measures to capture ability. The first measure is the Add Health Picture Vocabulary Test (AHPVT) test score, which is a shortened version of the Peabody Picture Vocabulary Test. The second measure is a dummy variable equal to 1 if the adolescent has never been suspended or expelled. Third, we employ a dummy variable equal to 1 if the adolescent wants to go to college. Particularly, adolescents were asked “on a scale of 1 to 5, where 1 is low and 5 is high, how much do you want to go to college?” The dummy variable is equal to 1 if the respondent answered 4 or 5.

⁴ We acknowledge that many of the characteristics included in the model are likely to be endogenous because of unobserved factors that are correlated with these characteristics and smoking. For example, unobserved factors such as parental attention may be correlated with one’s smoking decision and likelihood of being expelled or suspended. There may also be reverse causation insofar as smoking affects these characteristics. For example, students may be suspended or expelled for smoking in school. Our aim however is not to identify causal relations, but to determine to what extent differences in these observable characteristics account for the racial gaps in smoking.

Family SES: We include the log of family income, mother's years of education, and a dummy variable equal to 1 if the parents are married. In order to maximize the sample size, missing values on family income, mother's education, parental marital status were imputed with the sample mean, and dummy variables for missing values are controlled for in the decompositions.

Smoke Exposure: We construct two dummy variables indicating (1) whether the mother smokes and (2) whether cigarettes are available at home. The third measure for smoke exposure is the percentage of the adolescent's friends that smoke, which is based on the question "of your 3 best friends, how many smoke at least 1 cigarette a day?"

Health: We include a dummy variable equal to 1 if the adolescent indicates that they are trying to lose weight. This is based on the question "are you trying to lose weight, gain weight or stay the same weight?"

School Peer Characteristics: We use the percentages of students in the school that are (1) female, (2) black or Hispanic, (3) living with both their parents, and (4) using tobacco. Alternatively, we also include school fixed effects, which capture all observable and unobservable school level characteristics that do not vary over time. Results of the model including school fixed effects are included in the discussion of our robustness tests.

County Crime Rates: We include the violent and non-violent crime rates per 100,000 population.

In addition to examining racial differences in adolescence smoking, we also use the longitudinal nature of Add Health to decompose racial differences in the probability of becoming a current smoker in young adulthood (wave 3, ages 18-24 with an average age of 21 years), conditional on being a non-smoker in adolescence at wave 1. We limit the sample to individuals who report being a non-smoker at wave 1, are present in wave 3 and have non-missing values on the variables described below. The final sample size is 7,930 individuals. The outcome variable is

an indicator equal to 1 if the individual is a non-smoker at wave 1 but a current smoker at wave 3. The question for current smoking at wave 3 is the same as at wave 1. We conceptualize that the probability of smoking take-up is related to wave 1 characteristics and the following characteristics at wave 3:

Wave 3 characteristics: Years of education, log of personal income and dummy variables for being employed, married, having children, living at home with parents, overweight and having no health insurance. Missing values on personal income were imputed with the sample mean, and a dummy variable for missing values is controlled for in the decompositions.

Further, in order to ensure that item nonresponse or our imputation of the same is not driving our results we also estimate both models after dropping observations with missing values for our independent variables. The two sets of results are very similar and the conclusions drawn from them are identical.

4. Results

Table 1 reports sample means and standard deviations of the variables by race. We observe that whites have significantly higher smoking rates than Hispanics and blacks. 25% of whites smoke compared to 16% of Hispanics and just 6% of blacks. Compared to blacks and Hispanics, whites have higher ability and come from higher SES families. For example, the average AHPVT score for whites is 105.07, whereas it is 94.21 for blacks and 94.33 for Hispanics. Moreover, 78% of whites have never been suspended or expelled, which is significantly higher than the 56% of blacks and 69% of Hispanics who have never been suspended or expelled. The one anomaly is the proportion of whites who want to go to college (84%), which is slightly lower than blacks (86%), but higher than Hispanics (80%). Whites are more likely to report that they are trying to lose weight (34%) compared to blacks (31%), but less likely compared to Hispanics (43%). In terms of family

SES, whites come from families with significantly higher income, more educated mothers, and where both parents are married. Whites also live in counties with lower crime rates compared to blacks and Hispanics. However, despite having better ability, coming from higher SES families and living in lower crime counties, whites are exposed to more smoking. 54% of whites report that their mother smokes, 34% report that cigarettes are available at home, and 30% of their best friends smoke at least 1 cigarette a day. This is much higher than the corresponding figures for blacks and Hispanics.

In terms of school characteristics, whites go to schools where there are fewer black or Hispanic students – on average, whites attend schools where 18% of the school population is black or Hispanic whereas black and Hispanics attend schools where 61% are racial/ethnic minorities. The racial segregation of schools in the U.S. is corroborated by other studies. In the mid-1990s racial segregation for black and Hispanic students was on the rise, which was predicted to worsen over time (Orfield et al. 1997). As more blacks move into a residential area, white parents tend to send their children to majority-white schools (Sikkink & Emerson 2008, Billingham & Hunt 2016). Table 1 also shows that whites go to schools where more students report smoking: 38% of white adolescents' schoolmates report smoking, compared to 32% and 30% of students who smoke where blacks and Hispanics attend high school. Prior literature shows that the percentage of racial/ethnic minorities in schools is associated with reduced likelihood of smoking take-up overall (Kandel et al 2003); the reduction in daily smoking take-up is found for blacks and Hispanics, but not whites (Johnson & Hoffman 2000). This may be because white students are more likely to smoke than blacks and there is a virtual lack of interracial friendships, which together reduces the risk of black smoking take-up (Walsemann & Bells 2010). Table 2 presents marginal effects from probit regressions on the probability of being a regular smoker at wave 1. Like the descriptive

statistics, the estimates indicate that there are instances of large racial differences in the associations between some of the characteristics and smoking. For example, in terms of individual ability/delinquency whites who have never been suspended or expelled (want to go to college) are 16.4 (4.7) percentage points less likely to be a smoker compared to whites who have been suspended or expelled (do not want to go to college). This is substantially larger than associations for blacks, where the corresponding estimate for never suspended or expelled (want to go to college) is -0.041 (-0.025). The differences in marginal effects in ability/delinquency between whites and Hispanics is much smaller compared to white-black differences. Surprisingly measures of family socioeconomic status do not appear to affect smoking, and some of the estimates are counter intuitive. An extra year of mother's education increases the probability of blacks and Hispanics smoking by 4 and 9 percentage points respectively. County-crime rate and the measures of school characteristics are not associated with smoking probabilities.

The variables that have the largest association with smoking are the 2 measures of peer smoking (percentage of friends and percentage of students in the respondent's school who smoke in school). When the proportion of school peer smoking increases by 1 percentage point, the probability of smoking increases by approximately 0.20 percentage points for both whites and Hispanics. The association is smaller for blacks, with an increase in the probability of smoking by 0.085 percentage points on average. One percentage-point increase in the percent of friends who smokes is associated with a 0.46 percentage point increase in the probability of whites smoking. The corresponding results are 0.09 and 0.26 for blacks and Hispanics, respectively. The availability of cigarettes at home is positively associated with the probability of smoking, but the associations are small compared to peer smoking. Having a mother that smokes is accompanied with an increase in the probability of white smoking by 2.8 percentage points. However, mothers' smoking is not

meaningfully associated with the likelihood of black adolescent smoking and negatively associated with the probability of Hispanic smoking (-2.4 percentage points).

Table 3 presents the Fairlie nonlinear decomposition results for smoking at wave 1 based on equation (4) using white coefficients. As whites have the highest smoking rate among blacks and Hispanics, all of racial gaps in probability of smoking are positive. Positive coefficients indicate that the correlate accounts for a portion of the racial smoking gap, whereas negative coefficients show that the racial gap in smoking is not attributable to racial differences in those variables. Positive coefficients indicate that if whites had the same characteristics as minorities, their smoking prevalence would be lower, thus reducing the racial gap. Negative coefficients indicate the opposite: if whites had the same characteristics as minorities, their smoking prevalence would be higher, which means the racial gap would be larger. The white-black smoking gap is 19 percentage points and the differences in characteristics accounts for 28.25% of the gap in total. This means that if whites had the same characteristics as blacks, the racial gap would be reduced by 28.25%. The total percentage explained for the white-Hispanic gap 37.78%, indicating that if whites had the same characteristics as Hispanics, the racial gap would be reduced by 38.77%. Of all the factors included in our model, racial differences in smoke exposure (percentage of friends that smoke and percentage of school students that smoke) is the largest driver of the racial gap in smoking. On the other hand, ability or delinquency measures reduce the likelihood of whites smoking.

Examining the relative contribution of the characteristics, it is evident that racial differences in smoking cannot be appreciably attributed to differences in individual characteristics and family SES. All the point estimates are small and the majority are statistically insignificant. Ability measures do not contribute to the explained portion of racial gap either. The coefficients

are negative, indicating that if whites had lower ability, as measured by having a lower AHPVT test score and being more likely to be suspended or expelled, their smoking and thus the racial smoking gap would be higher. However, the contribution of never being suspended or expelled is sizeable. If whites had the same probability of being suspended or expelled as blacks (Hispanics) then the white-black (white-Hispanic) smoking gap would increase by 15.79% (13.33%). County-crime rates also do not explain the racial gap. The estimates for the violent crime rate are negative, indicating that if whites lived in higher crime counties, the smoking gap would increase.

Differences in most school peer characteristics (percentage female, black or Hispanic, live with both parents) are positive indicating that if whites went to schools that had the same average characteristics of schools that minorities go to, then the smoking gap would be reduced. However, the estimates are insignificant and the relative contribution is small. The one exception is the percentage of school peers that smoke. The estimates for both the white-black and white-Hispanic gaps are positive and statistically significant at the 1 percent level. Blacks and Hispanics both go to schools where fewer students report smoking compared to whites. Therefore if whites went to schools with fewer smokers, their smoking rate would be lower. In particular, the white-black smoking gap would be reduced by 5.26% and the white-Hispanic smoking gap would be reduced by 14.44%.

The factor that accounts for the majority of the explained portion of racial differences in smoking is exposure to smoke. The summary statistics showed that whites had a significantly higher proportion of friends that smoke than blacks or Hispanics. The estimate for the percentage of friends that smoke shows that if whites had the same proportion of friends that smoke as blacks (Hispanics) then the smoking gap would be reduced by 37.37% (32.22%), because the whites would be less likely to smoke. The other measures of smoke exposure (whether the mother smokes

and whether cigarettes are available at home) also reduce the racial smoking gaps, and contributes 7% to the explained portion. In total however, of the 19 (9) percentage-point difference in the white and black (Hispanic) adolescent smoking, 48.69% (66.72%) may be attributed to differences in the smoking environment (school peer smoking, percentage of friends that smoke, mother smokes, cigarettes at home).

We now turn to examining racial differences in the probability of becoming a smoker in young adulthood, conditional on being a nonsmoker in adolescence. The descriptive statistics in table 4 show that conditional on being a nonsmokers at wave 1, whites are 18 percentage points more likely to take up smoking compared to blacks, and 13 percentage points more likely compared to Hispanics. Compared to blacks and Hispanics, whites have better socioeconomic characteristics. Whites have higher education attainment, are more likely to employed, have a higher income, and are less likely to be overweight. The only characteristic for which there is no significant difference is the proportion of whites and blacks with no health insurance. The Fairlie decompositions in table 5, which also use white coefficients as weights, show that the model accounts for 25.56% (47.47%) of the white-black (white-Hispanic) gap in smoking. The relative contribution of most of the characteristics is small, though there are a few points to note. First, racial differences in the percentage of adolescent friends that smokes contributes less than 4% to the racial smoking gaps, whereas it accounted for over 30% of the racial gaps in smoking at wave 1. The smaller contribution is because there are no large racial differences in the percentage of friends that smokes in wave 3. However, exposure to school peer smoking accounts for 5% (9.23%) of the white-black (white-Hispanic) gap. Second, wave 3 characteristics do not contribute much to the explained portion of the racial gaps. The factor that contributes the most is education, but this would increase the racial gap. If whites had the same education as blacks (Hispanics) the

white-black (white-Hispanic) gap would increase by 9.44% (11.54%), because whites would be more likely to smoke.

We conducted a number of robustness checks. First, we estimated Fairlie decompositions using the minority group regression coefficients as the weights (equation 5). The overall pattern of results (available upon request) was similar to those in tables 3 and 5. However, the total percentage explained for smoking at wave 1 was lower for the white-black gap (22.22%), but higher for the white-Hispanic gap (77.77%). In contrast, the total percentage explained for uptake of smoking at wave 3 was higher for both the white-black and white Hispanic gaps at 50% and 100% respectively when minority group regression coefficients are used. Second, we replaced school characteristics with school fixed effects. School fixed effects accounted for very little of the overall racial gap in smoking. Based on equation (4), school fixed effects explained 10.53% (24.44%) of the white-black (white-Hispanic) racial smoking gap in adolescence, and was statistically insignificant. For smoking up-take in young adulthood, school fixed effects explained -11.11% (15.38%) of the white-black (white-Hispanic) racial gap. Third, we used an indicator variable that takes the value 1 if the respondent reported yes to the question, “Have you ever tried cigarette smoking, even just 1 or 2 puffs?” as an alternative outcome measure at wave 1. This measure has the advantage that it captures adolescents who have tried smoking but did not become regular smokers. The conclusions from that analysis are similar to the ones discussed above. Finally, we estimate the standard, linear Oaxaca-Blinder decomposition instead of Fairlie and the pattern of results (appendix tables A1 and A2) are largely unaltered.

5. Discussion

The bottom line of the first part of this analysis is that the racial gap in friends’ smoking and school peer smoking are the largest drivers of the racial/ethnic differences in adolescent

smoking. Intuitively, this means that white adolescents are more likely to be in a peer group of smokers and are themselves more likely to smoke, whereas black and Hispanic adolescents are less likely to be surrounded by smokers and are less likely to smoke themselves. These results may sound obvious and there are good reasons for suspecting endogeneity bias in peer effects: (i) one's probability of smoking and peer smoking may be determined simultaneously; (ii) unobserved school characteristics may influence smoking decisions for the individual and his/her peers; and (iii) parents may sort themselves into school districts and unobserved characteristics, like conscientiousness, may potentially bias peer effects (Manski, 1995).

5.1 Endogeneity of peer effects: We are unable to directly address the endogeneity of peer effects or any of the potentially endogenous correlates in the model. However, decomposition results are still valid if the ignorability assumption holds (Fortin et al. 2011). Under the ignorability assumption unobservables do not need to be independent of the X, as long as their conditional distribution given X is the same for both groups (white-Hispanic and white-black).

The potential endogeneity of peer effects and causality has been discussed in the literature. It suggests that there is a causal relationship between peer smoking and individual smoking, although evidence on the direction of the bias is mixed. Gaviria and Raphael (2001) use instrumental variables⁵ to estimate the causal effect of peer behavior on decisions like smoking, drinking, drug use, church going, and dropping out of high school. They find that moving an individual from a school with zero percent smoking to one where a quarter of the students smoke, raises the individual's likelihood of smoking by 4 percentage points. Addressing endogeneity bias,

⁵ The non-self mean of parental/household characteristics (percentages of classmates with college-educated parents, from single-parent homes, with parents with drug problems, and parental involvement variables, etc.) of students in the school serve as an instrument for peer effects.

however, does not affect estimates of peer effects in most behaviors, including smoking. An alternate identification strategy that added controls for several school-related variables (e.g., does school allow students to leave campus, is parent involvement encouraged, whether school has a dropout prevention program) did not notably change the conclusion. Lundborg (2006) using Swedish data and Powell, Tauras, and Roth (2005) using U.S. data confirm the importance of peer effects in adolescent smoking decision; however, whereas the former concludes that not accounting for endogeneity underestimates the effect of peer smoking, the latter concludes that the naïve estimate of peer effects are fairly similar to the ones using alternate instrumental variables. In a simultaneous equation framework that accounts for both peer selection and peer effects, Krauth (2005) finds that peer effects play an important role in an individual's decision to smoke and that ignoring bias overestimates peer effects in smoking. Using Add Health dataset, Fletcher (2010) finds that increasing the percentage of classmates who smoke by 10% increases the individual likelihood of smoking by 3 percentage points and concludes that OLS overestimates peer effects.

Although we are unable to fully account for the endogeneity of peer effects, we attempt to shed light on how addressing endogeneity would affect our results. We estimate regressions using a similar set of correlates⁶ as described above but with an alternate measure of school peer smoking – the percentage of students in the same school *and grade* who smoke (results available upon request). We first compute naïve OLS regressions using the newly defined variable followed by

⁶ We include the same set of variables as our primary model but we exclude school characteristics because a version of these variables are used as instruments instead. Additionally, we control for number of siblings, number of older siblings, religious attendance, school grade, and number of classmates.

2SLS regressions⁷ that include school fixed effects. This yields two regression coefficients, one naïve and one that addresses endogeneity to some extent, for our main variable of interest – school peer smoking. These coefficients are utilized for back-of-the-envelope calculations to estimate the percentage of the racial gap in smoking that is accounted for by school peer smoking. Calculations show that measuring school peer smoking differently accounts for 7% (13%) of the white-black (white-Hispanic) gap in smoking, and that accounting for endogeneity increases the portion attributable to school peer smoking to 21% (42%) of the white-black (white-Hispanic) gap in smoking. Extrapolating from these results, we cautiously conclude that addressing endogeneity in our model will likely increase the percent explained by school peer smoking significantly.

5.2 Policy implications of peer effects: To the extent that our results are underestimates of the true peer effect on smoking, our results suggest that high school policies that limit smoking on school grounds can potentially serve to reduce racial gaps in adolescent smoking. The following explains how such a policy would translate into lower adolescent smoking. There are two theoretical models that are purported to explain the racial/ethnic difference in smoking – social bonding and social learning. Social bonding theory (Burkette and Jensen, 1975) suggests that the weaker an individual’s bonds are with different social institutions, such as family, church, and school, the greater their propensity to engage in risky behaviors later in life. For example, the 2010 Gallup poll (Newport, 2010) revealed that whereas 55% of non-Hispanic blacks reported attending church at least once a week, only 41% of non-Hispanic whites and 46% and 52% of Hispanics (white and

⁷ We employ as instruments the non-self mean characteristics of students in the same school-grade and their parents; these include percentages of grade peers who are female, black/Hispanic, residing with married parents, and having a mother that smokes, and the averages of family income, maternal education years, number of siblings, number of older siblings and religious attendance.

black, respectively) reported the same. Social bonding theory in this case would predict that whites would be at greatest risk of engaging in deviant behavior as they are least likely to have social support through religious attachment. The theory of social learning due to Bandura (1977) suggests that learning can also occur by observing the behaviors of others and through instruction. This learning can change an individual's preferences or their cost-benefit calculus (i.e., rational response to change in constraints (Wilson (1996)) and is strengthened or reinforced by observing the rewards and punishments of others' actions. Examples of responses based on the change in constraints are as follows: one model (Sah, 1991) suggests that if smoking on school grounds is punished and the probability of being caught diminishes as more students smoke (resources spent on apprehending an individual criminal declines as number of criminals increases), then smoking among one's peers will be positively correlated with one's own decision to smoke. Bernheim (1994) proposes an economic model of the idea that individuals fear social ostracism and penalty for deviating from the social norm (e.g., bullying) and have a strong desire for status. In this scenario, the higher the prevalence of smoking in the peer group, the higher the likelihood of an individual taking up smoking. Empirical evidence shows that social learning (or peer effects) is much more salient in determining adolescents' decision to smoke than is social bonding (Ellickson, Perlman, and Klein, 2003). Thus, the theory of social learning explains why policy changes aimed at limiting adolescent smoking will have both a direct and an indirect effect (through peer effects), and has the potential to change individual behavior via the so-called social multiplier effect (Manski, 1995).

An example of a policy based on social learning that has been successfully implemented in several European countries is the Smoke Free Class Competition (SFC)⁸. In this policy, classes

⁸ More information on SFC can be found on their website <http://www.smokefreeclassroom.info>

decide together to refrain from smoking for a six-month period. Students in the class sign a contract and policing of smoking is conducted by the students themselves. Classes that are successful in abstaining for the time period are rewarded. An examination of SFC in Switzerland (Stucki et al. 2014) showed that completing the SFC reduced the prevalence of smoking, compared to classes that did not participate. However, this effect was mediated by peer effects: smoking prevalence declined only in classes where no student has any peers that smoked. Although the evaluation is not based on a randomized control trial, these results are suggestive of the importance of peer influence.

5.3 Discussion of remaining results: The remaining results show that availability of cigarettes at home and mother's smoking status explains less than 5% of white-black and 10% of the white-Hispanic racial smoking gap. Another result of this analysis is that racial differences in the lack of delinquency (never expelled/suspended from school) also contributes to the explained portion of the decomposition. This means that if white students had a comparable level of delinquency as their black and Hispanic counterparts (who are less likely to have never been suspended or expelled), smoking prevalence among whites would be higher, and so would the racial gap. Another way to look at this is that a school policy aimed at reducing delinquency among whites could potentially reduce smoking prevalence among whites and make the racial gap smaller.

The second part of our analysis shows that conditional on being a nonsmoker in adolescence, racial differences in the percent of friends who smoke explains approximately 4% of the white-black and less than 1% of the white-Hispanic smoking take-up gaps. In contrast, racial differences in school peer smoking accounts for 5-9.23% (for white-black and white-Hispanic, respectively) of the racial gap in the probability of taking up smoking in young adulthood. This

suggests that a school-level policy such as SFC could have long-term benefits by reducing the smoking take-up in the period following adolescence.

The majority of the racial gaps in adolescent smoking and young adult take-up remains unexplained. Appendix tables A3 and A4 present the unexplained portion that is due to racial differences in marginal effects weighted by the mean white characteristics⁹. In labor economics, the unexplained part is called labor market discrimination, but in our context the differences may be viewed as the cultural differences and disparate social experiences that lead to racial differences in the response (marginal effects) to X's. Intuitively, if whites and minorities had the same characteristics (X's in the model), the unexplained portion is attributable to the white-black and white-Hispanic differences in the marginal effects of the X's in the model. For example, assuming that both white and black (Hispanic) adolescents had the same percentage of friends who smoke (17% reported in Table 1), 27% (41%) of the white-black smoking gap would be attributed to white-black difference in the *marginal effects* of the percentage of friends who smoke. This tells us that a school policy aimed at reducing smoking will not elicit the same response from children of different races. The unexplained portion of the racial gap does not typically inform policy intervention as one cannot readily change the cultural response to changes in factors around them. However, this portion sheds light on the extent to which different races (or cultures) respond differently to policy intervention.

⁹The Fairlie Stata command does not provide estimates of the unexplained portion, thus we have presented the unexplained results of the Oaxaca-Blinder estimation. We do not think this is problematic because we have demonstrated that the Fairlie results (Tables 3 and 5) are virtually identical to the Oaxaca-Blinder results (Appendix Tables A1 and A2).

One similar but different study (Dubowitz et al. 2011) uses the Oaxaca-Blinder method to examine the white-Mexican American and white-black gaps in adult (ages 20 or over) smoking. They do not include any measures of peer effects but include a more extensive set of neighborhood characteristics than we do. Their race/ethnicity breakdowns are also not directly comparable to ours. But there are some similarities in results. Dubowitz et al. (2011) find that individual characteristics (e.g., age, educational attainment, marital status, family income, etc.) explain 8.9% of the white-Mexican American and 6.7% of the white-black smoking gaps, respectively. Further, neighborhood socioeconomic status (index of census tract-level variables such as male unemployment rate, percentage of household receiving public assistance, median household income, etc.) explains 3.5% of white-Mexican American and 5.1% of white-black racial gaps in smoking. We too find that individual educational attainment matters, but not in the same sense. In our analysis, educational attainment does not explain the racial gap because mean educational attainment is higher among whites than it is among minorities, which means that if whites had the same educational attainment as their black and Hispanic counterparts, whites would have a higher rate of smoking and the racial gap in smoking would be larger than it is.

6. Conclusion

This study demonstrates that racial differences in observable characteristics account for 22% to 100% (depending on the weights used) of the racial gaps in adolescent smoking and smoking take-up after adolescence. Racial differences in the smoking environment (friends' smoking, school peer smoking, maternal smoking, and cigarette availability at home) account for the vast majority of the explained portion, irrespective of the smoking measure and weights used. Results highlight that the most salient factor of all smoking environment measures is the racial difference in peer smoking (percentage of friends that smoke and school peer smoking). To the

extent that peers causally affect individual behavior, the takeaway message of this analysis is that policy changes aimed at limiting adolescent smoking in schools, neighborhoods, and wherever adolescents make friends may potentially change individual behavior both directly and indirectly (via peer effects). Further, policies geared towards eliminating or reducing smoking in school potentially have long-term consequences by deterring smoking take-up in young adulthood.

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Table 1: Summary Statistics

	Whites (1)	Blacks (2)	Hispanics (3)	(1) - (2)	(1) - (3)
Smoking at wave 1	0.25 (0.43)	0.06 (0.24)	0.16 (0.36)	0.19***	0.09***
Individual Characteristics					
Age	15.81 (1.59)	15.82 (1.57)	16.14 (1.52)	-0.01	-0.33***
Female	0.51 (0.50)	0.54 (0.50)	0.51 (0.5)	-0.03***	0.004
Birth Order	1.75 (1.02)	1.83 (1.25)	1.96 (1.37)	-0.08***	-0.21***
Individual Ability					
AHPVT Score	105.07 (12.00)	94.21 (13.99)	94.33 (16.06)	10.86**	10.74***
Never Expelled or Suspended	0.78 (0.42)	0.56 (0.50)	0.69 (0.46)	0.22***	0.09***
Want to go to college	0.84 (0.37)	0.86 (0.34)	0.81 (0.34)	-0.02***	0.03***
Family SES					
Log Family Income	10.65 (0.66)	10.28 (0.82)	10.31 (0.74)	0.37***	0.34***
Family Income Missing	0.18 (0.39)	0.28 (0.45)	0.29 (0.45)	-0.10***	-0.11***
Mother's Education	13.44 (.85)	13.27 (1.89)	11.94 (2.44)	0.17***	1.50***
Mother's Education Missing	0.12 (0.33)	0.19 (0.39)	0.20 (0.40)	-0.07***	-0.08***
Parents Married	0.73 (0.44)	0.41 (0.49)	0.59 (0.49)	0.32***	0.14***
Parents Married Missing	0.09 (0.28)	0.15 (0.36)	0.16 (0.36)	-0.06***	-0.07***
Smoke Exposure					
Mother Smokes	0.54 (0.50)	0.43 (0.50)	0.40 (0.49)	0.11***	0.14***
Cigarettes Available at Home	0.34 (0.47)	0.25 (0.43)	0.26 (0.44)	0.09***	0.08***
% of friends that smoke	0.30 (0.37)	0.17 (0.29)	0.25 (0.34)	0.13***	0.05***
Health					
Lose Weight	0.34 (0.47)	0.31 (0.46)	0.43 (0.50)	0.03***	-0.09***
School Characteristics					
% Female	0.50 (0.05)	0.51 (0.05)	0.50 (0.05)	-0.01***	-0.01***
% Black or Hispanic	0.18 (0.18)	0.61 (0.26)	0.61 (0.27)	-0.43***	-0.43***
% Smoke	0.38 (0.11)	0.32 (0.09)	0.30 (0.09)	0.06***	0.08***
% Live with both parents	0.77 (0.08)	0.63 (0.11)	0.69 (0.08)	0.14***	0.08***
County-Crime					
Violent crime rate per 100,000 population	511 (432)	1210 (703)	1152 (587)	-699***	641***
Non-violent crime rate per 100,000 population	4147 (1959)	5894 (2043)	5907 (2487)	-1747***	-1760***
N	8,669	3,424	2,586		

Notes: Standard deviations in parentheses. ***significant at 1% **significant at 5% *significant at 10%

Table 2: Marginal Effects from Probit Regressions on the Probability of being a Regular Smoker at wave 1

	Whites	Blacks	Hispanics
Individual Characteristics			
Age	0.030 (.003)***	0.008 (.002)***	0.015 (.005)***
Female	0.054 (.010)***	-0.003 (.006)	0.023 (.013)*
Birth Order	0.007 (.004)	-0.0006 (.002)	0.003 (.004)
Individual Ability			
PVT Score	-0.0004 (.0004)	0.0002 (.0002)	0.001 (.000)
Never Expelled or Suspended	-0.164 (.013)***	-0.041 (.008)***	-0.131 (.017)***
Want to go to college	-0.047 (.014)***	-0.025 (.010)***	-0.070 (.019)***
Family SES			
Log Family Income	0.010 (.008)	0.009 (.004)*	0.010 (.010)
Family Income Missing	-0.004 (.016)	-0.010 (.008)	-0.010 (.019)
Mother's Education	0.001 (.002)	0.004 (.002)**	0.009 (.003)**
Mother's Education Missing	0.012 (.024)	-0.014 (.010)	-0.038 (.023)
Parents Married	-0.028 (.014)**	-0.007 (.006)	-0.0002 (.016)
Parents Married Missing	-0.033 (.029)	-0.008 (.017)	0.035 (.041)
Smoke Exposure			
Mother Smokes	0.028 (.010)**	-0.0006 (.006)	-0.024 (.013)*
Cigarettes Available at Home	0.070 (.011)**	0.027 (.010)***	0.074 (.017)***
% of friends that smoke	0.455 (.013)***	0.092 (.010)***	0.256 (.018)***
Health			
Lose weight	0.022 (.010)	-0.001 (.007)	0.015 (.013)
School Characteristics			
% Female	-0.108 (.079)	-0.098 (.061)	0.082 (.176)
% Black or Hispanic	-0.042 (.045)	-0.018 (.021)	-0.073 (.082)
% Smoke	0.200 (.059)***	0.085 (.049)*	0.208 (.109)*
% Live with both parents	0.056 (.098)	-0.024 (.045)	0.090 (.162)
County-Crime			
Violent crime rate	0.002 (.001)	0.0006 (.0007)	0.005 (.001)***
Non-violent crime rate	-0.00002 (.0003)	0.00005 (.0002)	-0.001 (.0004)**
N	8,669	3,424	2,586

Notes: Standard errors in parentheses. ***significant at 1% **significant at 5% *significant at 10%
Violent and non-violent crime rates have been rescaled to represent crime rates per 10,000,000 population

Table 3: Nonlinear Fairlie Decompositions for Adolescence Smoking at Wave 1

	Whites-Blacks	% Explained	Whites-Hispanics	% Explained
<i>Smoking gap</i>	0.19		0.09	
<i>Individual Characteristics</i>				
Age	0.001 (.0003)**	0.53%	-0.005 (.001)***	-5.55%
Female	-0.001 (.0003)***	-0.53%	0.001 (.0002)**	1.11%
Birth order	-0.001 (.0003)	-0.53%	-0.001 (.001)	-1.11%
<i>Ability Measures</i>				
AHPVT Score	-0.004 (.004)	-2.11%	-0.004 (.003)	-4.44%
Never suspended or expelled	-0.030 (.003)***	-15.79%	-0.012 (.001)***	-13.33%
Want to go to college	0.001 (.0003)***	0.53%	-0.001 (.0002)***	-1.11%
<i>Family SES</i>				
Log family income	0.003 (.002)	1.58%	0.002 (.002)	2.22%
Family income missing	0.0002 (.001)	0.10%	0.0003 (.001)	0.33%
Mother's education	0.0001 (.0003)	0.05%	0.001 (.003)	1.11%
Mother's education missing	-0.001 (.001)	-0.53%	-0.001 (.002)	-1.11%
Parent's married	-0.007 (.003)**	-3.68%	-0.003 (.001)**	-3.33%
Parents' married missing	0.001 (.001)	0.53%	0.002 (.002)	2.22%
<i>Smoke Exposure</i>				
Mum smokes	0.003 (.001)***	1.58%	0.004 (.001)***	4.44%
Cigarettes at home	0.006 (.001)***	3.16%	0.006 (.001)***	6.66%
% friends that smoke	0.071 (.002)***	37.37%	0.029 (.001)***	32.22%
<i>Health</i>				
Lose weight	0.001 (.0004)**	0.53%	-0.001 (.001)	-1.11%
<i>School Characteristics</i>				
% Female	0.001 (.001)	0.53%	0.0003 (.0002)	0.33%
% Black or Hispanic	0.014 (0.015)	3.16%	0.014 (.015)	15.56%
% Smoke	0.010 (.003)***	5.26%	0.013 (.004)***	14.44%

% Live with both parents	0.006 (.010)	3.20%	0.003 (.009)	3.33%
<i>County-Crime</i>				
Violent crime	-0.013 (.004)	-6.84%	-0.013 (.009)	-14.44%
Nonviolent crime	0.0003 (.004)	0.15%	0.0003 (0.004)	0.33%
Total Explained		28.25%		38.77%
N	12,093		11,255	

Notes: Standard errors in parentheses. ***significant at 1% **significant at 5% *significant at 10%

Table 4: Summary Statistics for Wave 3 Analytic Sample

	Whites (1)	Blacks (2)	Hispanics (3)	(1) – (2)	(1) - (3)
Smoking at wave 1	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00	0.00
Smoking at wave 3	0.36 (0.48)	0.18 (0.38)	0.23 (0.42)	0.18***	0.13***
<i>Individual Characteristics</i>					
Age	15.52 (1.62)	15.74 (1.57)	16.07 (1.54)	-0.22	-0.55***
Female	0.52 (0.50)	0.58 (0.49)	0.51 (0.50)	-0.06***	0.01
Birth Order	1.74 (1.02)	1.85 (1.22)	1.90 (1.27)	-0.12***	-0.16***
<i>Individual Ability</i>					
AHPVT Score	106.41 (12.06)	94.53 (13.78)	95.00 (15.27)	11.88***	11.41***
Never Expelled or Suspended	0.86 (0.35)	0.59 (0.49)	0.76 (0.43)	0.27***	0.10***
Want to go to college	0.89 (0.32)	0.88 (0.33)	0.85 (0.36)	0.01	0.03***
<i>Family SES</i>					
Log Family Income	10.70 (0.63)	10.28 (0.83)	10.35 (0.71)	0.42***	0.35***
Family Income Missing	0.16 (0.37)	0.26 (0.44)	0.28 (0.45)	-0.10***	-0.12***
Mother's Education	13.63 (1.90)	13.35 (1.92)	11.85 (2.51)	0.28***	1.78***
Mother's Education Missing	0.10 (0.31)	0.18 (0.39)	0.19 (0.39)	-0.08***	-0.09***
Parents Married	0.77 (0.42)	0.44 (0.50)	0.64 (0.48)	0.33***	0.13***
Parents Married Missing	0.07 (0.25)	0.14 (0.34)	0.15 (0.35)	-0.07***	-0.08***
<i>Smoke Exposure</i>					
Mother Smokes	0.49 (0.50)	0.41 (0.49)	0.38 (0.48)	0.08***	0.11***
Cigarettes Available at Home	0.28 (0.45)	0.23 (0.42)	0.25 (0.43)	0.05***	0.03**
% of friends that smoke	0.18 (0.29)	0.15 (0.26)	0.18 (0.29)	0.03***	0.005
<i>Health</i>					
Lose Weight	0.32 (0.47)	0.33 (0.47)	0.43 (0.50)	-0.01	-0.11***
<i>School Characteristics</i>					
% Female	0.50 (0.05)	0.51 (0.05)	0.50 (0.05)	-0.01***	-0.01***
% Black or Hispanic	0.18 (0.18)	0.62 (0.26)	0.62 (0.28)	-0.44***	-0.44***
% Smoke	0.37 (0.11)	0.32 (0.09)	0.30 (0.08)	0.05***	0.07***
% Live with both parents	0.77 (0.08)	0.64 (0.11)	0.69 (0.08)	0.13***	0.09***
<i>County-Crime</i>					
Violent crime rate	503 (432)	1183 (678)	1152 (579)	-680***	- 649***
Non-violent crime rate	4159 (1909)	5760 (1955)	5978 (2515)	-1601***	-1819***
<i>Wave 3 Characteristics</i>					
Years of Education	13.58 (1.91)	13.08 (1.82)	13.11 (1.81)	0.50***	0.47***
Employed	0.74 (0.44)	0.61 (0.49)	0.76 (0.42)	0.15***	-0.02*
Log income	8.69 (2.05)	8.51 (2.04)	8.56 (2.38)	0.18***	0.13***
Income missing	0.04 (0.19)	0.12 (0.32)	0.06 (0.24)	-0.08***	-0.02***
Live at home	0.38 (0.49)	0.45 (0.50)	0.54 (0.50)	-0.07***	0.16***
Married	0.15 (0.36)	0.09 (0.29)	0.20 (0.40)	0.06***	-0.05***

Children	0.12 (0.32)	0.26 (0.44)	0.22 (0.42)	-0.14***	-0.10***
No health insurance	0.19 (0.39)	0.20 (0.40)	0.26 (0.44)	-0.01	-0.07***
Overweight	0.47 (0.50)	0.55 (0.50)	0.58 (0.49)	-0.08***	-0.11***
N	4,517	2,043	1,370		

Notes: Standard deviations in parentheses. ***significant at 1% **significant at 5% *significant at 10%

Table 5: Nonlinear Fairlie Decompositions for the Probability of becoming a Regular Smoker in young adulthood, conditional on being a non-smoker in adolescence

	Whites-Blacks	% Explained	Whites-Hispanics	% Explained
<i>Smoking gap</i>	0.18		0.13	
<i>Wave 3 Characteristics</i>				
Education	-0.017 (.002)***	-9.44%	-0.015 (.002)***	-11.54%
Employed	0.004 (.002)*	2.22%	-0.0004 (.0003)	-0.30%
Log income	0.001 (.001)	0.56%	0.001 (.000)*	0.77%
Income missing	0.002 (.003)	1.11%	0.001 (.001)	0.77%
Live at home	0.001 (.001)	0.56%	0.003 (.002)	2.31%
Married	-0.003 (.001)**	-1.67%	0.002 (.001)	1.54%
Children	-0.005 (.003)	-2.78%	-0.004 (.003)	-3.08%
No health insurance	-0.002 (.0003)***	-1.11%	-0.007 (.001)***	-5.38%
Overweight	0.003 (.001)	1.67%	0.004 (.002)**	3.08%
<i>Individual Characteristics</i>				
Age	0.008 (.001)***	4.44%	0.019 (.003)***	14.62%
Female	0.002 (.001)***	1.11%	-0.001 (.0003)***	-0.77%
Birth order	-0.0003 (.001)	-0.17%	-0.001 (.001)	-0.77%
<i>Ability Measures</i>				
AHPVT Score	0.010 (.007)	5.56%	0.009 (.006)	6.15%
Never suspended or expelled	-0.013 (.005)**	-7.22%	-0.005 (.002)**	-3.85%
Want to go to college	0.0001 (.0001)	0.05%	0.001 (.001)	0.77%
<i>Family SES</i>				
Log family income	0.001 (.005)*	0.56%	0.008 (.004)**	6.15%
Family income missing	0.005 (.002)**	2.78%	0.006 (.002)**	4.62%
Mother's education	0.0003 (.001)	0.17%	0.002 (.007)	1.54%
Mother's education missing	0.008 (.003)**	4.44%	0.008 (.003)**	6.15%
Parent's married	0.001 (.007)	0.56%	0.0002 (.003)	0.15%

Parents' married missing	-0.011 (.004)***	-6.11%	-0.012 (.004)	-9.23%
<i>Smoke Exposure</i>				
Mum smokes	0.003 (.001)***	1.67%	0.004 (.002)**	3.08%
Cigarettes at home	0.001 (.001)	0.56%	0.001 (.001)	0.77%
% friends that smoke	0.006 (.001)***	3.33%	0.001 (.0003)***	0.77%
<i>Health</i>				
Lose weight	-0.0001 (.0002)	-0.05%	-0.007 (.002)**	-5.38
<i>School Characteristics</i>				
% Female	-0.001 (.001)	-0.56%	-0.0001 (.0003)	-0.07%
% Black or Hispanic	0.021 (.027)	11.67%	0.020 (.025)	15.38%
% Smoke	0.009 (.004)**	5.00%	0.012 (.005)**	9.23%
% Live with both parents	0.001 (.019)	0.56%	0.001 (.011)	0.77%
<i>County-Crime</i>				
Violent crime	0.003 (.016)	1.67%	0.003 (.014)	2.31%
Nonviolent crime	0.008 (0.008)	4.44%	0.008 (.008)	6.15%
Total Explained		25.56%		47.47%
N	6,560		5,887	

Notes: Standard errors in parentheses. ***significant at 1% **significant at 5% *significant at 10%

Appendix Table A1: Oaxaca-Blinder Decompositions for Adolescence Smoking at Wave 1

	Whites-Blacks	% Explained	Whites-Hispanics	% Explained
<i>Smoking gap</i>	0.19		0.09	
<i>Individual Characteristics</i>				
Age	-0.0001 (.0006)	-0.05%	-0.007 (.001)***	-7.78%
Female	-0.001 (.001)**	-0.53%	0.0001 (.001)	0.01%
Birth order	-0.0004 (.0003)	-0.21%	-0.001 (.001)	-1.11%
<i>Ability Measures</i>				
AHPVT Score	-0.002 (.004)	-1.05%	-0.002 (.003)	-2.22%
Never suspended or expelled	-0.034 (.003)***	-17.89%	-0.013 (.002)***	-14.44%
Want to go to college	0.001 (.0004)***	0.53%	-0.001 (.0005)***	-1.11%
<i>Family SES</i>				
Log family income	0.004 (.003)	2.11%	0.003 (.003)	3.33%
Family income missing	0.0001 (.001)	0.05%	0.0001 (.001)	0.11%
Mother's education	0.0003 (.0004)	0.15%	0.003 (.004)	3.33%
Mother's education missing	-0.001 (.002)	-0.53%	-0.001 (.002)	-1.11%
Parent's married	-0.007 (.004)*	-3.68%	-0.003 (.002)	-3.33%
Parents' married missing	0.002 (.002)	1.05%	0.002 (.002)	2.22%
<i>Smoke Exposure</i>				
Mum smokes	0.002 (.001)***	1.05%	0.003 (.001)***	3.33%
Cigarettes at home	0.006 (.001)***	3.16%	0.005 (.001)***	5.56%
% friends that smoke	0.068 (.004)***	35.79%	0.027 (.004)***	30.00%
<i>Health</i>				
Lose weight	0.0004 (.0002)	0.21%	-0.001 (.001)	-1.11%
<i>School Characteristics</i>				
% Female	0.001 (.001)	0.53%	0.0004 (.0003)	0.44%
% Black or Hispanic	0.017 (0.016)	8.95%	0.017 (.016)	18.89%
% Smoke	0.007 (.003)**	3.68%	0.009 (.004)***	10.00%
% Live with both parents	0.011	5.79%	0.007	7.78%

	(.011)		(.006)	
<i>County-Crime</i>				
Violent crime	-0.013 (.010)	-6.84%	-0.012 (.009)	-13.33%
Nonviolent crime	0.0002 (.005)	0.10%	0.0002 (0.005)	0.22%
Total Explained		32.37%		39.68%
N	12,093		11,255	

Notes: The decompositions use white coefficients as weights. Standard errors in parentheses. ***significant at 1%

**significant at 5% *significant at 10%

Appendix Table A2: Oaxaca-Blinder Decompositions for the Probability of becoming a Regular Smoker in young adulthood, conditional on being a non-smoker in adolescence

	Whites-Blacks	% Explained	Whites-Hispanics	% Explained
<i>Smoking gap</i>	0.18		0.13	
<i>Wave 3 Characteristics</i>				
Education	-0.020 (.003)***	-11.11%	-0.018 (.003)***	-13.85%
Employed	0.004 (.002)*	2.22%	-0.001 (.001)	-0.77%
Log income	0.001 (.001)	0.56%	0.001 (.001)	0.77%
Income missing	0.002 (.003)	1.11%	0.001 (.001)	0.77%
Live at home	0.001 (.001)	0.56%	0.003 (.002)	2.31%
Married	-0.003 (.001)**	-1.67%	0.002 (.001)	1.54%
Children	-0.005 (.004)	-2.78%	-0.004 (.003)	-3.08%
No health insurance	-0.002 (.001)	-1.11%	-0.008 (.002)***	-6.15%
Overweight	0.003 (.001)**	1.67%	0.004 (.002)**	3.08%
<i>Individual Characteristics</i>				
Age	0.007 (.002)***	3.89%	0.019 (.003)***	14.62%
Female	0.003 (.001)**	1.67%	-0.001 (.001)	-0.77%
Birth order	-0.0003 (.001)	-0.17%	-0.001 (.001)	-0.77%
<i>Ability Measures</i>				
AHPVT Score	0.011 (.007)	6.11%	0.010 (.007)	7.69%
Never suspended or expelled	-0.014 (.006)**	-7.78%	-0.005 (.002)**	-3.85%
Want to go to college	0.0001 (.0002)	0.05%	0.001 (.001)	0.77%
<i>Family SES</i>				
Log family income	0.010 (.006)*	5.56%	0.009 (.005)**	6.92%
Family income missing	0.005 (.002)**	2.78%	0.006 (.003)*	4.62%
Mother's education	0.0003 (.001)	0.17%	0.002 (.007)	1.54%
Mother's education missing	0.008 (.003)**	4.44%	0.008 (.003)**	6.15%
Parent's married	0.001 (.007)	0.56%	0.0004 (.003)	0.31%
Parents' married missing	-0.011	-6.11%	-0.012	-9.23%

	(.004)***		(.004)**	
<i>Smoke Exposure</i>				
Mum smokes	0.003 (.001)***	1.67%	0.004 (.002)**	3.08%
Cigarettes at home	0.001 (.001)	0.56%	0.001 (.001)	0.77%
% friends that smoke	0.007 (.002)***	3.89%	0.001 (.002)	0.77%
<i>Health</i>				
Lose weight	-0.0004 (.001)	-0.22%	-0.007 (.002)**	-5.38
<i>School Characteristics</i>				
% Female	-0.001 (.002)	-0.56%	-0.0001 (.0004)	-0.08%
% Black or Hispanic	0.023 (.028)	12.78%	0.023 (.028)	17.69%
% Smoke	0.009 (.004)**	5.00%	0.013 (.006)**	10.00%
% Live with both parents	0.002 (.020)	1.11%	0.001 (.012)	0.77%
<i>County-Crime</i>				
Violent crime	0.003 (.017)	1.67%	0.003 (.002)	2.31%
Nonviolent crime	0.008 (.008)	4.44%	0.009 (.010)	6.92%
Total Explained		30.94%		49.46%
N	6,560		5,887	

Notes: The decompositions use white coefficients as weights. Standard errors in parentheses. ***significant at 1%

**significant at 5% *significant at 10%

Appendix Table A3: Oaxaca-Blinder Decompositions of unexplained proportion Adolescence Smoking at Wave 1

	Whites-Blacks	%Unexplained	Whites-Hispanics	%Unexplained
<i>Smoking gap</i>	0.19		0.09	
<i>Individual Characteristics</i>				
Age	0.209 (.064)***	110%	0.145 (.091)	161%
Female	0.028 (.006)***	14.74%	0.011 (.008)	12.22%
Birth order	0.010 (.009)	5.26%	0.006 (.012)	6.67%
<i>Ability Measures</i>				
AHPVT Score	-0.067 (.044)	-35.26%	-0.063 (.052)	-70.00%
Never suspended or expelled	-0.059 (.007)***	-31.05%	-0.014 (.012)	-15.56%
Want to go to college	-0.002 (.014)	-1.05%	0.026 (.016)*	28.89%
<i>Family SES</i>				
Log family income	-0.044 (.097)	-23.16%	0.004 (.133)	4.44%
Family income missing	0.003 (.005)	1.58%	0.002 (.007)	2.22%
Mother's education	-0.032 (.045)	-16.84%	-0.090 (.046)*	-100%
Mother's education missing	0.006 (.005)	3.16%	0.010 (.007)	11.11%
Parent's married	-0.004 (.006)	-2.11%	-0.014 (.011)	-15.56%
Parents' married missing	-0.006 (.005)	-3.16%	-0.009 (.007)	-10.00%
<i>Smoke Exposure</i>				
Mum smokes	0.009 (.005)*	4.74%	0.018 (.007)***	20.00%
Cigarettes at home	0.006 (.003)*	3.16%	-0.004 (.004)	-4.49%
% friends that smoke	0.052 (.004)***	27.37%	0.037 (.006)***	41.11%
<i>Health</i>				
Lose weight	0.004 (.000)	2.11%	0.0001 (.007)	0.11%
<i>School Characteristics</i>				
% Female	0.039 (.059)	20.53%	-0.083 (.093)	-92.22%
% Black or Hispanic	-0.013 (0.029)	-6.84%	0.014 (.037)	15.56%
% Smoke	0.001 (.027)	0.53%	-0.030 (.038)	-33.33%

% Live with both parents	0.068 (.065)	35.79%	-0.037 (.027)	-41.11%
County-Crime				
Violent crime	0.014 (.027)	7.37%	-0.037 (.028)	-41.11%
Nonviolent crime	-0.006 (.024)	-3.16%	0.040 (0.030)	44.44%
Constant	-0.089 (.139)	-46.84	0.123 (.202)	136.67
Total Unexplained		66.84%		61.22%
N	12,093		11,255	

Notes: Unexplained proportion from Oaxaca-Blinder decompositions, where differences marginal effects are weighted by the mean of white characteristics. Standard errors in parentheses. ***significant at 1% **significant at 5% *significant at 10%

Appendix Table A4: Oaxaca-Blinder Decompositions of unexplained proportion for Probability of Regular Smoking in Young Adulthood, conditional on being a non-smoker in adolescence

	Whites-Blacks	% Unexplained	Whites-Hispanics	%Unexplained
<i>Smoking gap</i>	0.18		0.13	
<i>Wave 3 Characteristics</i>				
Education	-0.099 (.095)	-55%	0.011 (.115)	8.46%
Employed	0.033 (.014)**	18.33%	0.028 (.023)	21.54%
Log income	0.037 (.045)	20.56%	0.057 (.051)	43.85%
Income missing	0.002 (.005)	1.11%	0.004 (.004)	3.08%
Live at home	0.002 (.010)	1.11%	-0.030 (.016)*	-23.08%
Married	-0.010 (.004)**	-5.56%	0.002 (.008)	1.54%
Children	0.001 (.008)	0.56%	0.004 (.009)	3.08%
No health insurance	0.014 (.006)**	7.78%	0.018 (.008)**	13.85%
Overweight	-0.016 (.012)	-8.89%	-0.030 (.016)*	-23.08%
<i>Individual Characteristics</i>				
Age	-0.459 (.133)***	-255%	-0.599 (.173)***	460%
Female	0.044 (.014)***	24.44%	0.0007 (.014)	0.54%
Birth order	0.0004 (.017)	0.22%	0.011 (.021)	8.46%
<i>Ability Measures</i>				
AHPVT Score	-0.050 (.087)	-27.78%	-0.194 (.096)**	-149%
Never suspended or expelled	0.004 (.016)	-2.22%	-0.057 (.026)**	-43.85%
Want to go to college	0.042 (.030)	23.33%	0.016 (.034)	12.31%
<i>Family SES</i>				
Log family income	0.045 (.189)*	25%	0.081 (.240)	62.31%
Family income missing	-0.016 (.009)*	-8.89%	0.003 (.012)	2.31%
Mother's education	0.043 (.087)	23.89%	-0.074 (.078)	-56.92%
Mother's education missing	-0.016 (.010)*	-8.89%	-0.004 (.012)	-3.08%
Parent's married	-0.0004 (.012)	-0.22%	0.027 (.023)	20.77%

Parents' married missing	0.026 (.009)**	14.41%	0.019 (.008)**	14.62%
<i>Smoke Exposure</i>				
Mum smokes	-0.008 (.009)	-4.44%	0.004 (.011)	3.08%
Cigarettes at home	-0.003 (.006)	-1.67%	-0.013 (.008)	-10.00%
% friends that smoke	0.010 (.006)*	5.56%	0.019 (.008)**	14.62%
<i>Health</i>				
Lose weight	-0.006 (.008)	-3.33%	0.031 (.013)**	23.85
<i>School Characteristics</i>				
% Female	-0.086 (.120)	-47.78%	-0.042 (.178)	-32.31%
% Black or Hispanic	0.078 (.055)	43.33%	0.097 (.068)	74.62%
% Smoke	-0.030 (.051)	-16.67%	0.100 (.067)	76.92%
% Live with both parents	0.147 (.126)	81.67%	0.256 (.226)	196.92%
<i>County-Crime</i>				
Violent crime	-0.008 (.038)	-4.44%	0.007 (.051)	5.38%
Nonviolent crime	0.015 (.047)	8.33%	0.054 (.056)	41.54%
<i>Constant</i>				
Total Explained	0.382 (.277)	212.22	0.260 (.374)	200%
N	6,560	65.56%	5,887	51.31%

Notes: Unexplained proportion from Oaxaca-Blinder decompositions, where differences marginal effects are weighted by the mean of white characteristics Standard errors in parentheses. ***significant at 1% **significant at 5% *significant at 10%