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### Title

American Legacy Foundation, Legacy First Look Report 6. Youth Exposure to Environmental Tobacco Smoke

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# ***Legacy First Look Report*** **6**

*Youth Exposure to  
Environmental Tobacco Smoke*

*May 2001*



AMERICAN  
LEGACY  
FOUNDATION



## Preamble

In November 1998, Americans won an unprecedented victory in our nation's century long fight against tobacco use and abuse. A coalition of 46 state Attorneys General successfully settled their cases with the tobacco companies amounting to \$206 billion over the first 25 years. As part of the Master Settlement Agreement (MSA), a 501(c)(3) organization was established to reduce tobacco usage in the United States. Now known as the American Legacy Foundation (Legacy), it adopted four goals:

- Reduce youth tobacco use.
- Reduce exposure to secondhand smoke among all ages and populations.
- Increase successful quit rate among all ages and populations.
- Reduce disparities in access to prevention and cessation services and in exposure to secondhand smoke.

Legacy's Board of Directors represents a diverse mix of state governors, legislators, Attorneys General, and experts in the medical, education, and public health fields:

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## Purpose of the First Look Report Series

The purpose of the First Look Report Series is to provide brief research findings from the National Youth Tobacco Surveys and other tobacco use surveys. The series will cover a wide range of topics including tobacco use behaviors, attitudes and beliefs about tobacco, pro- and counter-tobacco marketing efforts, results of the American Legacy Foundation Initiatives, and other policies and programs related to tobacco use.

Dear Colleague:

Breathing environmental tobacco smoke (ETS) can cause reduced lung function, respiratory tract illness, and asthma and can predispose development of cancer, heart disease, and chronic lung disease. Over 6 million young people in the United States are exposed to ETS every day. This report — based on findings from Legacy's 1999 National Youth Tobacco Survey and the Legacy Media Tracking Survey — highlights the proportion of teens who live in households with smokers, the extent to which they are exposed to smoke through both family members and peers, and the association between parental smoking and youth smoking.

The American Legacy Foundation embraces four primary goals: reducing the proportion of youth who start smoking, reducing exposure to smoke and environmental tobacco, increasing the successful quit rate among all ages and all populations, and reducing disparities in access to prevention and cessation services and in exposure to secondhand smoke. While this report primarily addresses the second goal, by laying the informational groundwork for addressing reductions in youth exposure to ETS, it really addresses each of these goals.

It is well established that youth who become lifelong persistent smokers are more likely to have had one or more parents who smoked. Exposure to a smoking parent (i.e., role model) is one of the causes of imitation and continuance of smoking and may also be implicated in one's likelihood to make a serious quit attempt and to ultimately succeed or fail. It is also well established that peers' smoking, another source of ETS, is associated with smoking experimentation among initially nonsmoking youth. In these respects (and indeed in others such as youth role models in print and film smoking), smoking can be viewed as a socially contagious behavior.

Though this aspect of ETS is by no means the primary focus of this report, it is one of the growing list of ETS's untoward consequences. There are of course others; for example, young people exposed to secondhand smoke experience acute symptoms such as sore throats and eye irritation as well as the exacerbation of asthma, and they are placed at risk of injury or death due to tobacco-related residential fires.

There are many steps that individuals, families, and communities can take to reduce exposure to ETS. This report highlights the proportion of households that ban or permit smoking. Household smoking bans are highest among Hispanic families. In addition, Hispanic youth are 60 percent less likely to be exposed to ETS at home in middle school and 40 percent less likely in high school, relative to youth overall. This lower home exposure is primarily the result of an increased propensity to ban smoking in the home. In this regard, Hispanics are at the forefront of lowering risk, and efforts to reduce disparities in ETS exposure at home might well be informed by the strategies applied in Hispanic households.

The increased risk of ETS exposure among youth who work in the food service industry is another arena for action. Passage of clean air acts concerning restaurants would constitute a positive public health step by reducing not only teen employee and customer exposure but also exposure of all other patrons, including young children at highest risk of tobacco-induced asthma events.

Legacy is committed to conducting and sharing research that will inform and advance tobacco control and prevention. This report contributes to a growing body of knowledge about exposure to ETS. The findings presented here provide important information about the nature and scope of the problem of youth exposure to ETS; our hope is that this information will forward thinking about how to reduce ETS exposure among people of all ages. I am pleased to be able to share these important findings with you.

Sincerely,



Cheryl Heaton, DrPH  
President/CEO  
American Legacy Foundation

<b><i>Innovative</i></b>	<b><i>and Evidence-Based Programs</i></b>
<b><i>Marketing and Education</i></b>	The most visible of Legacy's efforts to date is the <b>truth<sup>sm</sup></b> campaign—a national youth movement against tobacco use. The <b>truth<sup>sm</sup></b> campaign is aimed at reducing tobacco use among youth ages 12 to 17 who are most open to using tobacco. Modeled after successful teen brands, this multicultural countermarketing program incorporates advertising, Internet, grassroots, and public relations components and gives teens a voice in the effort.
<b><i>Applied Research and Evaluation</i></b>	The National Youth Tobacco Survey, a Legacy-sponsored research effort, provided the first national assessment of smoking rates for both high school and middle school students earlier this year. The survey is one part of an integrated research program that will commission studies, fund research, and publish reports (such as this one) on tobacco issues. In addition, a comprehensive evaluation effort will ensure the effectiveness of the programs Legacy supports.
<b><i>Grants</i></b>	Legacy's grants program is designed to build on existing tobacco control efforts, leverage resources, and spark new tobacco control initiatives. Awards totaling \$35 million have been announced to states and organizations to develop grassroots youth empowerment programs to reduce tobacco use. Legacy is also supporting demonstration projects and encouraging model programs through competitive RFPs.
<b><i>Priority Populations</i></b>	Legacy is committed to addressing the needs of populations that have been disproportionately burdened by the epidemic of tobacco in America. In order to identify promising practices, culturally appropriate approaches, and resource gaps, Legacy convened six national Priority Population forums in 2000 among tobacco control experts who represented underserved populations. Their recommendations form the basis for the Priority Populations Initiative, which makes available up to \$21 million over 3 years for capacity-building grants and innovative projects and applied research grants.
<b><i>Training and Technical Assistance</i></b>	Legacy is committed to providing high quality and best practices based training and technical assistance to its grantees, local and state entities, and others who are working in the tobacco control movement. In addition, Legacy's training and technical assistance team coordinates a range of Youth Activism Projects and is a major funder and collaborator for the National Tobacco Training and Assistance Consortium.
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**Legacy First Look Report 6*****Youth Exposure to Environmental Tobacco Smoke***

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This report is based on the baseline Legacy Media Tracking Survey (LMTS) and the 1999 National Youth Tobacco Survey (NYTS). The baseline LMTS questionnaire was developed by Research Triangle Institute and the NYTS questionnaire was developed by the CDC Foundation and Macro International Inc. with technical support from the Office on Smoking and Health, CDC.

\*Research Triangle Institute °Health Benchmarks †American Legacy Foundation ‡University of Missouri ^Office on Smoking and Health §SmokeLess States

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## Introduction

Environmental tobacco smoke (ETS) consists of both smoke given off directly from the burning end of a cigarette and that exhaled by smokers. ETS contains over 4,000 substances, including over 40 known or suspected human carcinogens (Soczek, 1996). A recent article published in the *Journal of the National Cancer Institute* reports that spouses who live with smokers have five- to six-fold greater exposure levels to known human carcinogens than spouses who do not live with smokers (Anderson et al., 2001). While this study focuses on spouses, the results suggest that other family members — such as the children who live in households with smokers — may face similar risks. Many nonsmokers are exposed to ETS each day and as a result may experience short-term symptoms such as eye irritation, nasal symptoms, sore throat, and hoarseness. However, many smokers and nonsmokers may not realize the more serious, long-term health effects of ETS exposure, including the risk of increased morbidity and mortality from cancer, heart disease, and chronic lung disease.

A substantial body of literature documents the various health effects of ETS exposure, including respiratory conditions, cancer, cardiovascular disease, and decreased fetal growth (Dunn and Zeise, 1997; NRC, 1986; USDHHS, 1986; EPA, 1992). Adverse effects before birth, such as decreased fetal growth, occur when a pregnant woman is exposed to ETS or is herself a smoker. ETS exposure can be particularly damaging for infants and children, whose respiratory systems are still developing and whose respiratory rates are higher than those of adults (Davis, 1998). It has been estimated that each year ETS is responsible for up to 26,000 new asthma cases in children, up to 1,000,000 asthma exacerbations, and up to 300,000 cases of bronchitis and pneumonia in toddlers, 15,000 of which require hospitalization (EPA, 1992). Specifically among middle and high school aged youth, ETS exposure can cause a variety of respiratory health effects (Cook and Strachan, 1999), including

- acute symptoms such as respiratory annoyance and irritation,
- reduced lung function or development,
- acute lower and upper respiratory tract illness,
- chronic respiratory symptoms, and
- new cases of asthma or worsening of existing asthma.

Declines in lung function resulting from ETS exposure may persist into adulthood and predispose the development of chronic lung disease (Dunn and Zeise, 1997). In addition, ETS exposure appears to increase the risk of respiratory infection, and frequent infections may predispose the

development of asthma (Kattan, 1999). Children and adolescents with at least one smoking parent have a 25 to 40 percent increased risk of chronic respiratory symptoms such as cough, wheeze, breathlessness, and phlegm compared to those not exposed to ETS at home (Cook and Strachan, 1997). ETS is also known to cause over a 10 percent increased risk of developing asthma in children ages 6 to 18 who have a smoking parent, as well as worsen existing asthma by increasing the number and frequency of asthma attacks (Cook and Strachan, 1997; Strachan and Cook, 1998).

ETS exposure can be detected biologically by measuring cotinine (a metabolite of nicotine) levels in the blood stream. In a study by Pirkle et al. (1996), approximately 87.9 percent of non-tobacco users had detectable levels of serum cotinine, with higher exposures among children, non-Hispanic African-Americans, and males. In homes with at least one smoker, 43.1 percent of children ages 2 months to 11 years and 35.7 percent of youth ages 12 to 16 reported home ETS exposure. Since the time of Pirkle et al.'s study, which covers years 1988 through 1991, recent results from the 1999 National Health and Nutrition Examination Survey (NHANES) reported by the CDC's National Center for Environmental Health indicate that ETS exposure has dramatically declined. Since 1990, median cotinine levels among non-tobacco users have decreased by 75 percent. Also, based on unpublished data from the CDC, median cotinine levels among nonsmoking youth ages 3 to 19 (compared to youth ages 4 to 19 in 1990) decreased by 72 percent. Due to the small sample size in the 1999 NHANES and because the samples were obtained from only 12 locations across the country, more data will be needed to confirm these findings. When 2000 NHANES data become available, the 1999 and 2000 data from NHANES will be combined to provide new national estimates (CDC, 2001).

Most studies have defined children's ETS exposure as having one or both parents smoking currently or during pregnancy; data are most often collected on the mother but some studies also consider the father's smoking. There is some evidence of a dose-response relationship where the risk of negative health effects increases with the amount smoked, but it is not yet known whether there is an exposure threshold for ETS below which health effects do not occur (Brownson et al., 1997). Home is the predominant setting of ETS exposure among children because of the hours they spend there, although among middle and high school students, exposure at school and among peers becomes increasingly important (Brownson et al., 1997).

Parents who smoke not only negatively impact their children's health by exposing them to ETS but also send a message to their children that smoking is a normal adult behavior. As a result, children with parents who smoke are more likely to be smokers themselves (Bauman et al., 1990; Biglan et al., 1995; Conrad et al., 1992).



This report describes the patterns of ETS exposure among youth primarily at home but also in other settings. We also consider youth's perceptions of the dangers of ETS and parental influence on youth smoking behavior. We then apply prevalence rates to population estimates in order to estimate the number of youth ages 12 to 18 exposed to ETS in the United States.<sup>1</sup> The main findings discussed in this report are summarized below.

### **1. Prevalence of Youth Living in Households with Smokers**

The prevalence of smokers in the home provides an estimate of the percentage of youth who are at risk of being exposed to ETS. Overall, we find that 38 to 44 percent of youth live in a household with at least one smoker.

### **2. ETS Exposure Among Youth**

Although estimates of the percentage of youth living with a smoker provide an estimate of the percentage of youth who are at risk of being exposed to ETS, they do not necessarily reflect actual exposure to ETS because of rules about smoking that may exist in the home. Taking these rules into account, an estimated 23 percent or 6.2 million youth are exposed to ETS.

### **3. Self-Reported Measures of ETS Exposure**

In addition to estimating ETS exposure based on the presence of smokers in the home where smoking is not banned, ETS exposure can also be estimated by asking youth directly about their exposure to smoke. Based on self-reported exposure to ETS in rooms or cars, we found that 28 percent of youth are exposed to smoke every day of the week in a room and/or in a car.

## **1999 National Youth Tobacco Survey and Legacy Media Tracking Survey Design and Content**

In this report, we make use of two complementary data sources — the 1999 National Youth Tobacco Survey (NYTS) and the Legacy Media Tracking Survey (LMTS). The LMTS has the advantage of containing information on household smoking rules. However, the sample size of the LMTS is less than half that of the NYTS. As a result, we rely on both surveys to provide a more complete picture of youth exposure to ETS. The 1999 NYTS was administered to 15,058 students in grades 6 to 12 in 131 schools across the country in the fall of 1999. Students completed an anonymous, self-administered questionnaire that included questions

<sup>1</sup>We selectively present results in graphical format. Additional information, upon which tables and figures are based, is presented in the Appendix.

about tobacco use, exposure to ETS, minors' ability to purchase tobacco products, the price paid for cigarettes, knowledge and attitudes toward tobacco, and familiarity with pro- and counter-tobacco advertising. The school response rate was 90 percent and the student response rate was 93 percent, resulting in an overall response rate of 84 percent.

The NYTS was designed to produce a nationally representative sample of students in grades 6 to 12. To ensure separate analysis of African-American and Hispanic students, schools with substantial proportions of African-American and Hispanic students were oversampled. A weighting factor was applied to each student record to adjust for nonresponse and for the probability of selection, including the oversampling noted above.

The LMTS is a random-digit-dial telephone interview of a nationally representative survey of 12 to 24 year olds conducted by the American Legacy Foundation (Legacy) primarily to evaluate the impact on tobacco use of their **truth<sup>sm</sup>** campaign, a national tobacco countermarketing campaign launched in February 2000. LMTS questions address tobacco use; attitudes and beliefs about tobacco; exposure to broadcast media; aided and unaided recall of health and safety messages including tobacco; awareness of counter-tobacco campaigns, advertisements, and organizations in schools and communities; and exposure to pro-tobacco influences.

In order to enhance representation among African-Americans, Asians, and Hispanics, these racial/ethnic groups were oversampled by supplementing the random-digit telephone dialing with lists of households with Asian and Hispanic surnames and by oversampling telephone exchanges with high proportions of African-American, Asian, and Hispanic households. A weighting factor for all respondents in the survey was applied to account for oversampling.

In addition to collecting tobacco-related information, the NYTS also recorded basic demographic data including age, gender, grade, and race/ethnicity. To allow comparison between data from the NYTS and LMTS, the current report focuses on youth ages 12 to 18. The NYTS ascertained race/ethnicity using the questions, "How do you describe yourself? You can choose one answer, or more than one," and "Which one of these groups best describes you? Choose only one answer."

The response categories for both questions are as follows:

- American Indian or Alaska Native
- Asian
- Black or African-American
- Hispanic or Latino
- Native Hawaiian or Other Pacific Islander
- White

Similarly, the LMTS ascertained race/ethnicity using the questions, “How do you describe yourself? You can choose more than one of the following categories,” and “Which one of these groups best describes you? Choose only one of the following.” Response categories were the same as those used for the NYTS, with the addition of an “Other” category.

## Methods

This report focuses on the prevalence of ETS exposure from other people’s cigarette smoking among youth ages 12 to 18. Information on exposure to smoking in the home and frequency of exposure to smoke in rooms and cars comes from three questions asked on both the 1999 NYTS and LMTS (Table 1). The wording of some questions differed slightly between the two surveys, but the content of the questions is assumed to be similar enough to give comparable information.

As noted above, the LMTS provides an additional level of detail by asking youth about their relationship to each household smoker and about the type of household rules regarding indoor smoking, if any. Thus, LMTS data allow us to estimate exposure to ETS in the home,

**Table 1: ETS Exposure Questions from the 1999 NYTS and LMTS**

1999 NYTS	LMTS
<b>Home Exposure to ETS</b>	
Besides yourself, does anyone who lives in your home smoke cigarettes now?	Does anyone who lives in your home smoke cigarettes now? Who is this?
During the past 7 days, on how many days were you in the same room with someone who was smoking cigarettes?	During the past 7 days, on how many days were you in the same room with someone who was smoking cigarettes?
During the past 7 days, on how many days did you ride in a car with someone who was smoking cigarettes?	During the past 7 days, on how many days were you in a car with someone who was smoking cigarettes?
	What are the rules, if any, about smoking in your home?
<b>Other Questions Related to ETS Exposure</b>	
Do you think the smoke from other people’s cigarettes is harmful to you?	Do you think the smoke from other people’s cigarettes is harmful to you?

taking into account household smoking bans, whereas the information in the NYTS is limited to the presence of a smoker in the household. Youth responding to the LMTS were asked about any household rules regarding indoor smoking. The response choices are as follows:

- People can't smoke in the house.
- People can smoke only in certain rooms of the house.
- There are no rules about smoking at home.

Based on the responses above, household smoking rules were classified as *complete ban*, *partial ban*, or *no ban* on smoking, respectively. These responses only indicate whether or not a smoking ban exists in the household and do not account for the stringency of enforcing these bans. It is possible that households with smoking bans make exceptions to when smoking is allowed in the household, which increases the potential of ETS exposure. While the LMTS does not address enforcement of household smoking bans, we assume that these bans are strictly and uniformly enforced.

Although the NYTS does not ask youth about smoking restrictions in their homes, it does ask youth directly how many days in the past week they were in a room and/or in a car with a smoker (see Table 1). These questions provide an alternative method for estimating exposure to ETS. Unfortunately, we cannot distinguish between those who are exposed to ETS for a few minutes and those exposed for hours at a time. Because neither the NYTS or LMTS address the duration of daily ETS exposure in rooms and/or in cars, the alternative measures of ETS exposure may be over- or under-estimated.

Finally, we examine ETS exposure among nonsmoking youth (i.e., involuntary smoking) in contrast to ETS exposure among current smokers. Current smoking among youth is defined as smoking on at least 1 day in the past 30 days (Farrelly et al., 2000). We also report on youth's perception of the harmfulness of ETS exposure with the question, "Do you think the smoke from other people's cigarettes is harmful to you?"

The questions contained in both surveys provide valuable and timely, but not comprehensive, data on exposure to ETS. The purpose of this report is to provide descriptive information on ETS in nationally representative samples of middle and high school students of various racial and ethnic groups. Other surveys and studies detail the sources and extent of exposure to ETS but often have more limited study populations. For example, the NHANES provides very precise data on the extent of ETS exposure among children of all ages using blood tests

that detect exposure to smoke (i.e., cotinine in the blood). However, in the past this nationally representative survey, which involves extensive physical examinations that are costly and time-consuming, has not been able to provide the same sample sizes of youth with the same frequency that is possible in the NYTS or LMTS. However, the NHANES was redesigned in 1999 and will have annual national estimates. While the annual sample size will remain smaller, data from this sample of youth will include serum cotinine assessments of exposure and future analyses will also track exposures to specific ETS-related carcinogens (NNK, etc.). While the NHANES is an important source for tracking actual ETS exposure, as surveillance tools, the NYTS and LMTS provide useful estimates and proxies of ETS exposure among youth and are important for identifying and tracking remaining disparities in ETS exposure.

Most studies that have estimated ETS exposure among youth have used self-reported data from nationally representative surveys similar to NYTS and LMTS, but using self-reported data may over- or under-report these estimates. Biological monitoring, such as the measurement of cotinine that is conducted in the NHANES, can be used to validate self-reported data, but few studies have used this type of data. When comparing self-reported ETS exposure measures to biological markers, studies that have collected both self-reported and cotinine measurements suggest that these two approaches yield comparable information for classifying children's ETS exposure (Chilmonczyk et al., 1993; Bakoula et al., 1995; Rylander et al., 1995). For example, the estimates of youth ETS exposure that are presented later in this report are comparable to Pirkle et al.'s (1996) estimates of ETS exposure among 12 to 16 year olds using NHANES III data (from 1988 to 1991). However, based on estimates that have recently been published in the *National Report on Human Exposure to Environmental Chemicals* (CDC, 2001), ETS exposure has declined since that time.

Additionally, although the NYTS and LMTS contain similar questions, the NYTS is conducted in schools while the LMTS is conducted over the telephone. Therefore, LMTS responses may be influenced if parents or someone else in the household is listening in during the survey. Also, because the LMTS is not a school-based survey, it includes responses from a small proportion (2.2 percent) of school-aged youth who were not currently in school. For ease of comparison with the NYTS, school level for the LMTS respondents, including the small proportion who were not currently enrolled in school, was determined based on their response to the question, "What is the highest grade or year of school that you completed?" Respondents who indicated that they completed grades 6 through 8 were classified as middle school students, and respondents who indicated that they completed grades 9 through 12 were classified as high school students.

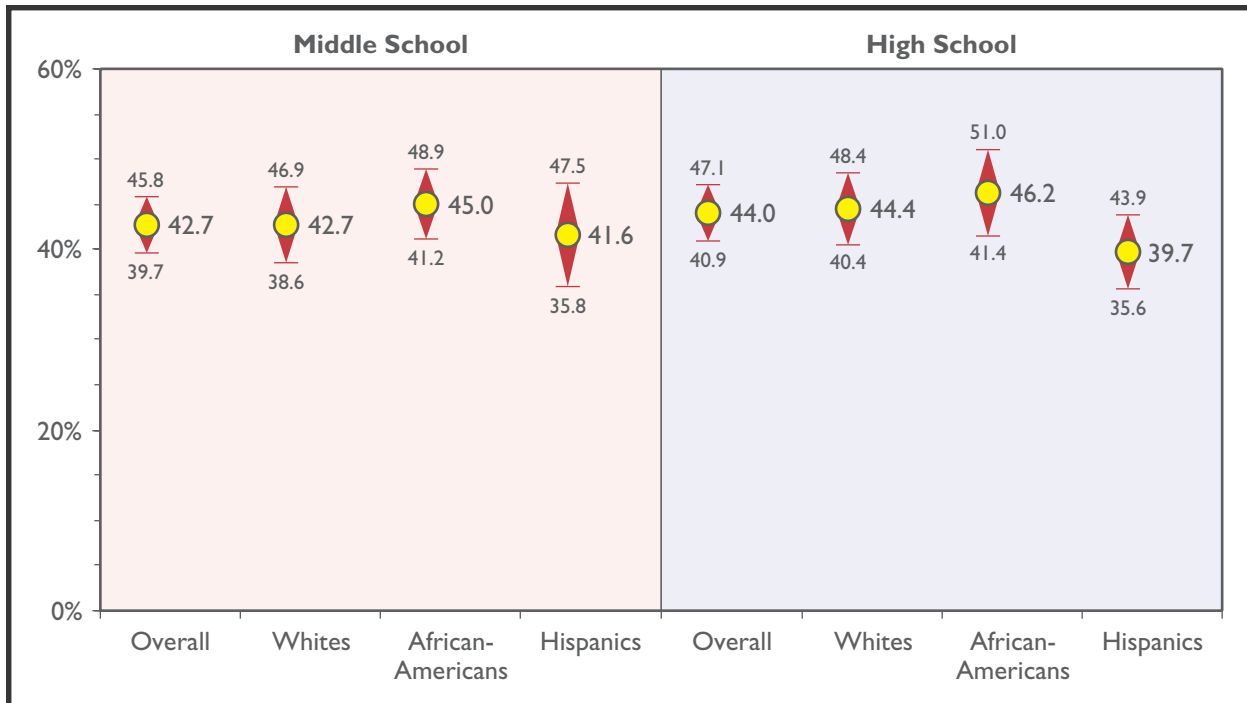
## Main Findings

### Prevalence of Households with Smokers and ETS Exposure in the Home

Overall, 43.5 percent of youth surveyed in the NYTS live in a household with at least one smoker. Previous surveys have reported comparable percentages of children nationwide living in households with a smoker but only focus on infants and younger children. Figure 1 presents estimates and 95 percent confidence intervals for the prevalence of households with a smoker among middle and high school students and for Whites, African-Americans, and Hispanics separately. The prevalence of households with a smoker does not differ significantly by school level, race/ethnicity, or gender.

Similar results are seen in data from the LMTS. Over a third (38.2 percent) of LMTS respondents live in a household with at least one smoker, which is somewhat lower than in the NYTS. This small difference may be due to the fact that the LMTS is conducted via

**Figure 1: Prevalence of Households with a Smoker By School Level and Race/Ethnicity — 1999 NYTS**



Note: Upper and lower ranges represent 95 percent confidence intervals that account for the survey design weighting.

telephone (and not administered in schools like the NYTS) where youth, in the presence of household members, may be less willing to indicate who in the household smokes. However, the difference between the two surveys is not statistically significant. Also similar to the NYTS, the LMTS rates do not vary significantly by school level, race/ethnicity, or gender.

The prevalence of smokers in the home provides an estimate of the percentage of youth who are at risk of being exposed to ETS, but it does not necessarily reflect actual exposure to ETS because of rules about smoking that may exist in the home. The LMTS builds upon the question of household smoking by detailing exactly which family members in the household smoke and what smoking rules exist in the household. As shown in Table 2, parents are the most likely source of ETS exposure among 12 to 18 year olds. Information about the existence of smoking rules in the household is used to estimate the prevalence of ETS exposure in the home. Later in this report, prevalence estimates are applied to population counts to estimate the actual numbers of American youth exposed to ETS in the home.

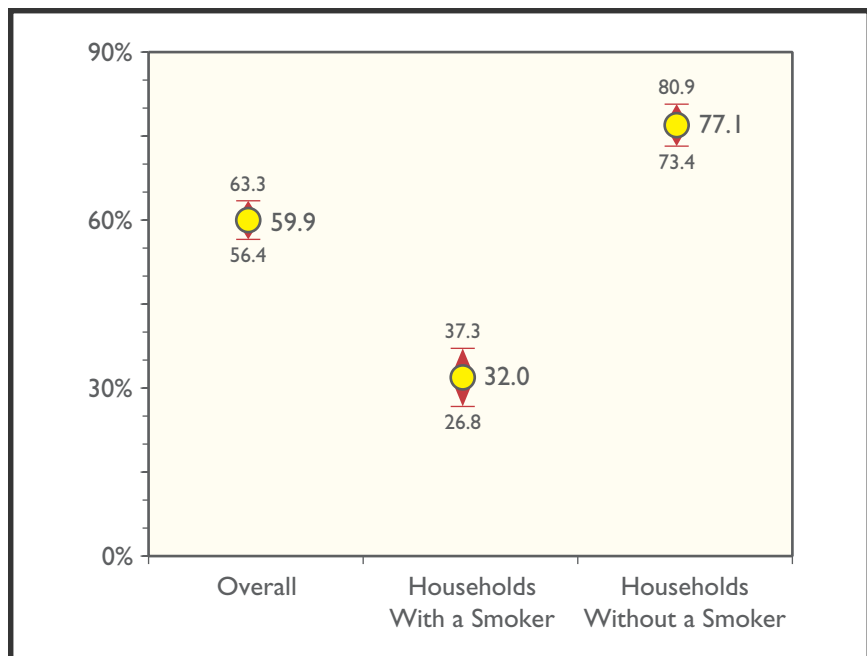
**Table 2: Relationship of Each Household Smoker to Youth Who Report Living in a Household With a Smoker — LMTS [95% Confidence Interval]**

Relationship	Frequency
Mother/Stepmother	54.8% [49.2–60.3]
Father/Stepfather	51.7% [46.1–57.3]
Sibling	15.5% [11.4–19.6]
Roommate	3.0% [1.4–4.5]
Spouse	0.3% [0–0.6]
Other	12.7% [9.3–16.0]

Note: The frequencies do not sum to 100 percent because the question permits multiple responses.

Although 60 percent of households completely ban smoking, only 32 percent of households with a smoker completely ban smoking (Figure 2). In other words, bans are least common in the households where smoke is most common and where they could do the most good. By implementing household smoking bans, health risks experienced by adolescents living with a smoker in households that have complete smoking bans can be substantially reduced (Biener et al., 1997). Although our estimate of the percentage of 12 to 18 year olds living in households with a smoker that have complete smoking bans is low, there is evidence that the trend in households with a smoker adopting complete smoking bans is rising. For example, in California, the percentage of households with a smoker and children under the age of 18 that prohibit smoking in the household was 36.9 percent in 1994 but increased to 52.9 percent in 1999 (Tobacco Control Section, 2000). This increase may be attributable to increased awareness of community efforts and media spots on ETS exposure through the California Tobacco Control Program (TCP). Results from an evaluation indicated that smokers reporting exposure to the California TCP were more likely to have restrictive home smoking policies than smokers not exposed to the TCP. Also, smokers reporting more restrictive home smoking policies were associated with reduced smoking behavior compared to smokers with no smoking rules in the home (Norman et al., 2000). Appendix Table A-1 provides further information on the prevalence of indoor smoking bans by household smoking status, school level, gender, and race/ethnicity.

**Figure 2: Prevalence of Households with Complete Bans on Smoking in the Home — LMTS**



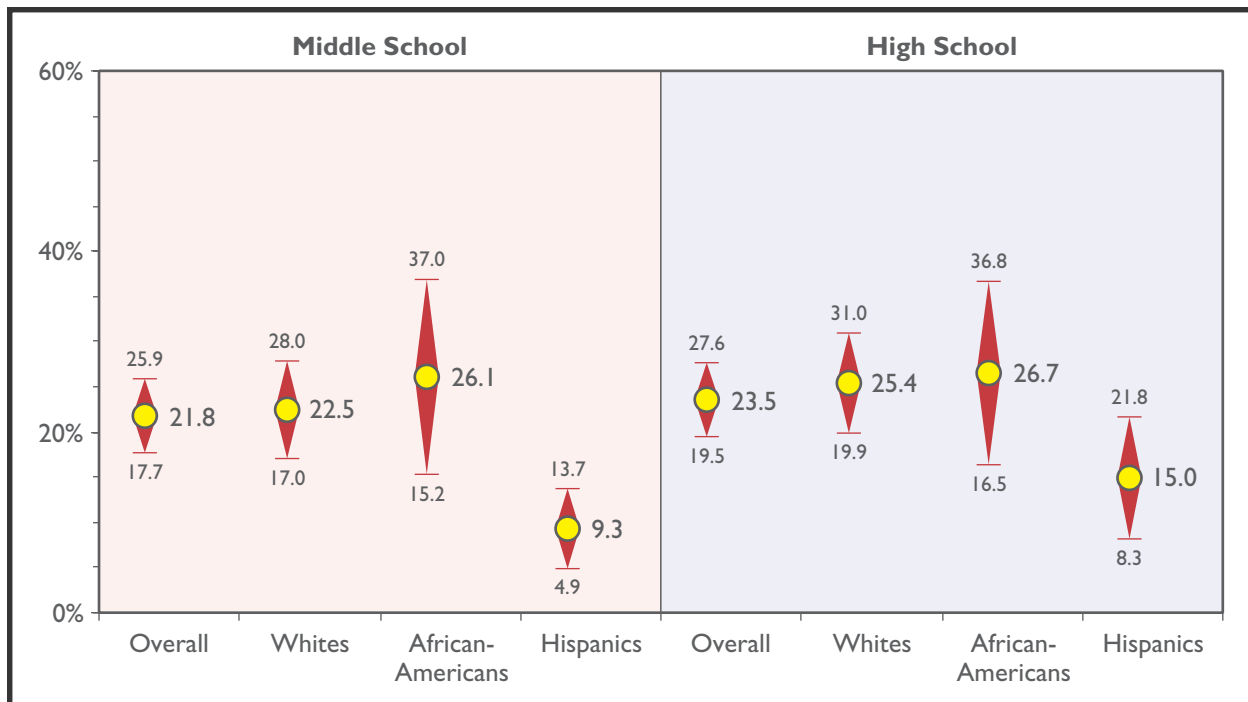
Note: Upper and lower ranges represent 95 percent confidence intervals that account for the survey design weighting.



In light of the potential protective effect that household smoking rules may have on ETS exposure, we estimate likely exposure by assuming that only a complete ban on household smoking prevents exposure to ETS, whereas partial bans do not. In this approach, youth living in households with a smoker where indoor smoking was not completely banned are considered exposed to ETS. Figure 3 illustrates that roughly 22 percent of middle school students and 24 percent of high school students are exposed to ETS in the home. At either school level, Hispanics have the least amount of ETS exposure across racial/ethnic groups. Compared to Whites and African-Americans, the amount of ETS exposure is approximately 60 percent lower among Hispanics in middle school, a statistically significant difference. Although the comparable difference is not statistically significant among high school students, the amount of ETS exposure is over 40 percent lower among Hispanics.

Hispanic smokers as a group tend to have lower rates of cigarette consumption than other ethnic groups (Haynes et al., 1990). This may make adoption of household smoking bans easier, which possibly explains the higher rates of smoke-free homes among Hispanics. Other cultural differences might also account for the higher prevalence of smoke-free homes among Hispanics compared to other racial/ethnic groups (Gilpin et al., 1999).

**Figure 3: Prevalence of ETS Exposure By School Level and Race/Ethnicity — LMTS**

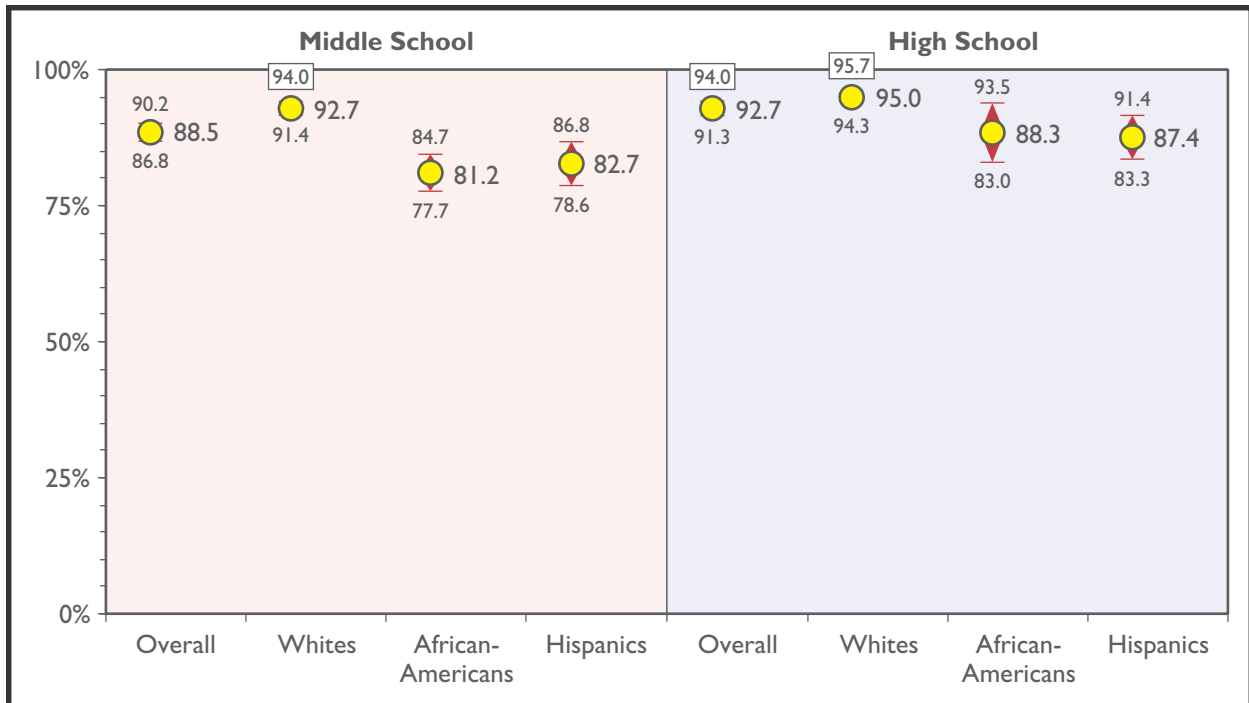


Note: Upper and lower ranges represent 95 percent confidence intervals that account for the survey design weighting.

As a point of comparison, we report the prevalence of households with a smoker for both the NYTS and the LMTS in the first two columns of Appendix Table A-2. Columns 2 and 3 illustrate the contrast between the presence of a smoker in the household and actual exposure to ETS accounting for smoking bans. This table shows that, over all ages, exposure decreases from 38.2 percent to 22.7 percent — a 40.6 percent decrease in exposure — if complete smoking bans are truly effective in preventing exposure in the home.

Youth generally are aware that ETS is harmful. As Figure 4 illustrates, over 80 percent of youth in each racial/ethnic group in both school levels are aware that ETS is harmful. At both the middle and high school levels, a significantly higher percentage of Whites are aware of the negative health effects of ETS than African-Americans or Hispanics. Knowledge increases somewhat between middle school and high school, but the only racial/ethnic group for which this increase is statistically significant is Whites.

**Figure 4: Percentage of Youth Who Think Smoke from Other People's Cigarettes is Harmful By School Level and Race/Ethnicity — 1999 NYTS**

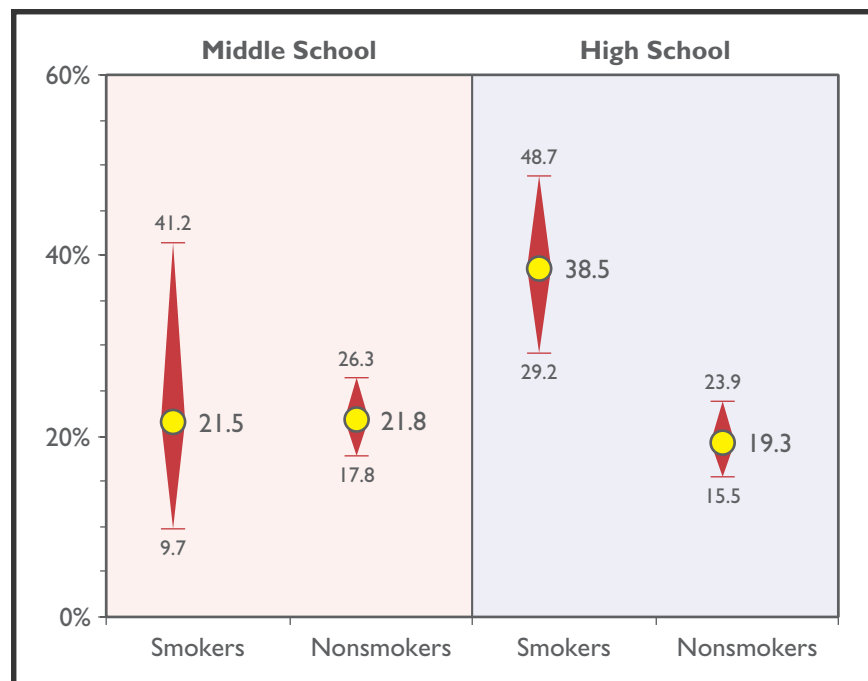


Note: Upper and lower ranges represent 95 percent confidence intervals that account for the survey design weighting.

## ETS Exposure in the Home among Smoking and Nonsmoking Youth

In this section, we present the prevalence of exposure to ETS in the home (based on LMTS data) by youth smoking status to highlight exposure to ETS among nonsmoking and smoking youth (Figure 5). Figure 5 indicates that ETS exposure is nearly identical among middle school smokers and nonsmokers (approximately 22 percent). However, in high school, a significantly higher proportion of smokers (38.5 percent) is exposed to ETS in the home than nonsmokers (19.3 percent). Appendix Table A-3 reflects ETS exposure by smoking status, school level, gender, and race/ethnicity. However, no statistically significant differences by smoking status and race/ethnicity or by smoking status and gender emerged.

**Figure 5: Prevalence of ETS Exposure By School Level and Youth Smoking Status — LMTS**



Note: Upper and lower ranges represent 95 percent confidence intervals that account for the survey design weighting.

## Population Estimates of ETS Exposure in the Home

To estimate the number of youth in the United States who are exposed to ETS in the home, we estimate ETS exposure prevalence estimates based on the LMTS (similar to Figure 3) by gender and individual ages (from 12 to 18). We then apply these prevalence estimates to U.S.

Census Bureau population estimates by gender and individual ages to estimate the total number of American youth exposed to ETS. These estimates indicate that 6.2 million youth ages 12 to 18 are exposed to ETS (10.4 million youth live in households with a smoker based on the LMTS versus 11.8 million youth based on NYTS estimates). Of the 6.2 million youth who are exposed to ETS, approximately 4.4 million are White, 1.1 million are African-American, and 489,000 are Hispanic. As we noted above, a number of negative health outcomes are associated with exposure to ETS, including, but not limited to, chronic respiratory symptoms, worsening of existing asthma, and new cases of asthma. As a result, the personal and social costs associated with 6.2 million youth who are exposed to ETS are likely to be considerable.

### ***Parental Influence on Youth Smoking Behavior***

Parents who smoke in the household not only impact their children's health but also send a message that smoking is an acceptable adult behavior. Youth who live with parents who smoke are more likely to start smoking themselves as illustrated by Appendix Table A-4 and in the literature (Bauman et al., 1990; Biglan et al., 1995; Conrad et al., 1992). While parents who smoke can communicate to their children that they should not smoke, there is little support that parent-child communication about tobacco use influences adolescent tobacco use. This suggests that what parents communicate nonverbally by what they do is more important than what they say (Ennett et al., 2001). While the smoking behavior of people who play a significant role in an adolescent's life, such as their parents, is a consistent predictor of adolescent smoking, the relative influence of parental smoking on adolescent smoking is still a matter of debate (Bauman et al., forthcoming; Flay et al., 1994; Chassin et al., 1984; Glynn, 1981; Huba and Bentler, 1980).

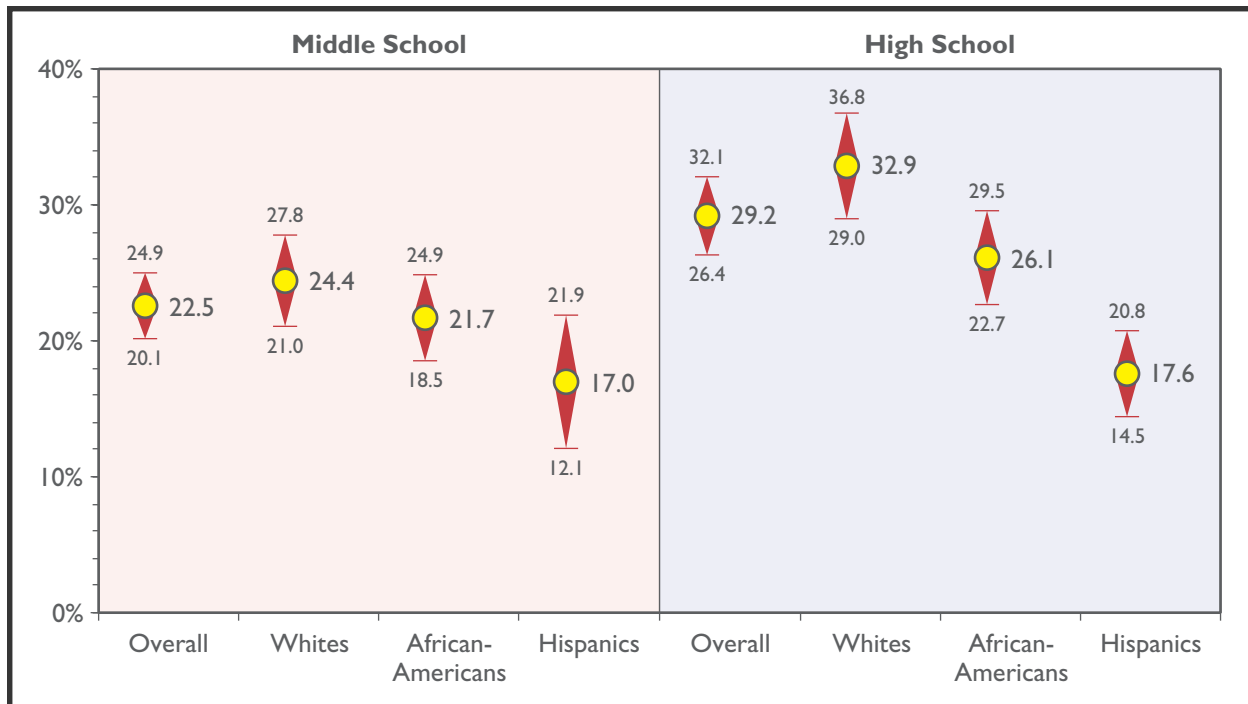
The data in Appendix Table A-4 suggest that youth smoking prevalence is influenced by the smoking status of their parents. The prevalence of youth smoking increases as the number of parents who smoke increases. While this table does not control for the influence of single-parent households on youth smoking, the pattern of influence is still clear. While the differences in smoking prevalence rates between no parents smoking and one parent smoking and between one parent smoking and two parents smoking are not significant, there are some significant differences between no parents smoking and two parents smoking. Overall, smoking prevalence among youth who have two parents who smoke is 31.3 percent, which is significantly higher than the 13.7 percent of youth who live in households where no parents smoke. Similar results are found among males (36.1 percent versus 13.5 percent) and Whites (34.4 percent versus 14.5 percent).

## Self-Reported ETS Exposure

As noted in the Introduction, ETS exposure can be estimated based on the presence of smokers in the home where smoking is not banned or by asking youth directly about their exposure to smoke. The analysis above using data from the LMTS takes the former approach. Using data from the NYTS, we now present self-reported data on exposure to ETS in rooms and cars. The NYTS asks youth directly how frequently they have been in a room and in a car with a smoker in the past week. Unfortunately, we cannot distinguish between those who are exposed to ETS for a few minutes and those exposed for hours at a time.

We begin by exploring self-reported daily exposure to ETS in a room. Figure 6 illustrates the differences by school level and race/ethnicity in the prevalence of being in a room every day in the previous week with someone who was smoking. Approximately 23 percent of all middle school students report having daily exposure to ETS in a room, and this figure increases significantly to 29 percent among high school students.

**Figure 6: Prevalence of Daily Exposure to Cigarette Smoke in a Room By School Level and Race/Ethnicity — 1999 NYTS**

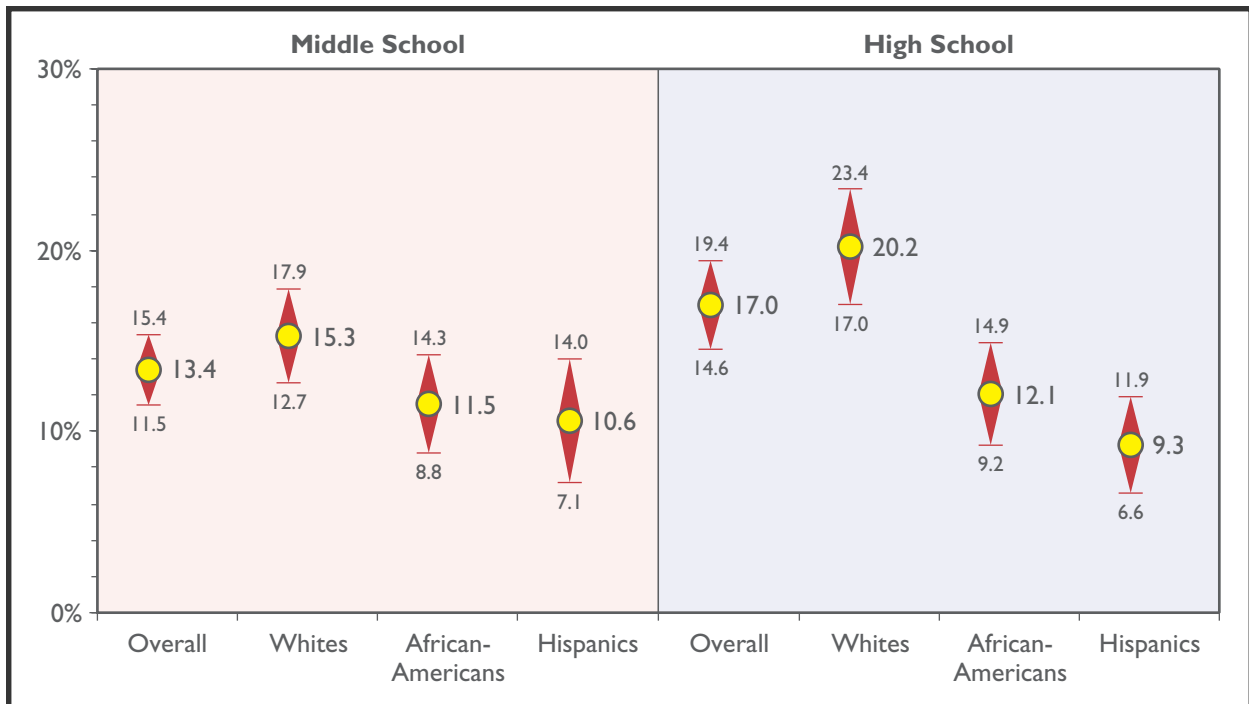


Note: Upper and lower ranges represent 95 percent confidence intervals that account for the survey design weighting.

At either school level, Whites have the highest exposure of all the racial/ethnic groups and Hispanics have the lowest exposure (see Figure 6). Daily ETS exposure in a room is 50 percent lower among Hispanics than among Whites. Between middle school and high school, the prevalence of exposure increases significantly for Whites but not for African-Americans or Hispanics. In high school, the proportion exposed differs significantly among all three racial/ethnic groups.

Fewer students are exposed daily to ETS in a car than in a room, but as shown in Figure 7, the patterns of car exposure by school level and race/ethnicity very closely reflect those of exposure in a room. Overall, exposure is higher among high school students (17.0 percent) than middle school students (13.4 percent), but the difference is not statistically significant. Whites have the highest exposure of all the racial/ethnic groups. Significant racial/ethnic differences are apparent in high school, where more Whites than either African-Americans or Hispanics are exposed. Appendix Table A-5 gives the entire distribution of exposure to cigarette smoke in a room and in a car for middle and high school students, using the following response categories: 0 days, 1–2 days, 3–4 days, 5–6 days, and 7 days.

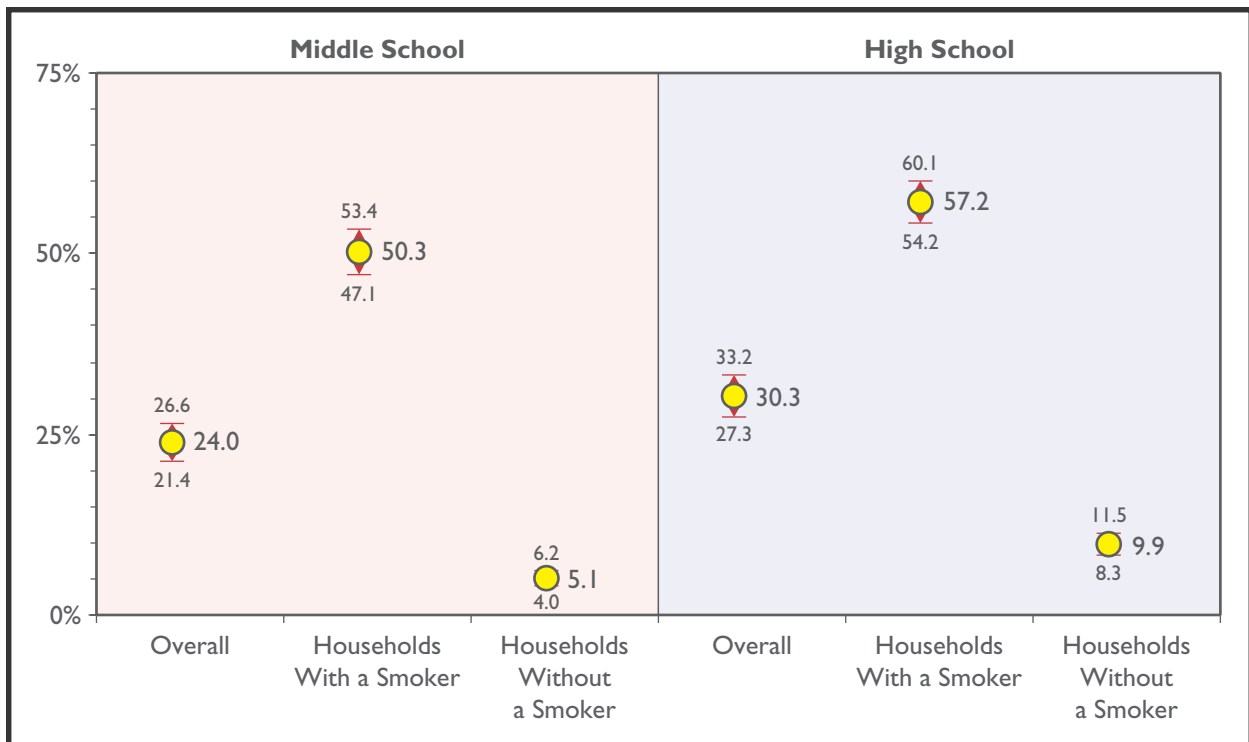
**Figure 7: Prevalence of Daily Exposure to Cigarette Smoke in a Car By School Level and Race/Ethnicity — 1999 NYTS**



Note: Upper and lower ranges represent 95 percent confidence intervals that account for the survey design weighting.

To capture daily self-reported exposure to ETS in rooms and cars, we create a global measure that captures daily exposure to ETS in either a room or a car. In Figure 8, we present the prevalence of this global measure for middle and high school students. We find that 24.0 percent of middle school and 30.3 percent of high school students are exposed to smoke every day of the week in a room and/or in a car. This level of exposure is higher than exposure to smoke in the home (see Figure 3); however, the differences are not statistically significant. To demonstrate how self-reported exposure to ETS is associated with the presence of smokers in the household, we report daily exposure to smoke in rooms and/or cars separately by household smoking status in Appendix Table A-6.

**Figure 8: Global Measure of Daily ETS Exposure By School Level and Household Smoking Status — 1999 NYTS**



Note: Upper and lower ranges represent 95 percent confidence intervals that account for the survey design weighting.

## Summary

In contrast to the prevalence of smoking, which varies substantially by age and by race/ethnicity (Farrelly et al., 2000), exposure to ETS affects youth of all ages, races, and ethnicities equally, with the exception of Hispanics who have lower exposure. However, this report reveals that households with a smoker are considerably less likely to ban smoking in the household compared to households without a smoker. Although not surprising, this fact highlights the need to encourage parents who smoke to restrict their smoking around their children in an effort to reduce the negative health consequences of ETS. According to our estimates, 10 to 11 million youth ages 12 to 18 live in a household with at least one smoker and over 6 million youth are exposed to ETS daily. This indicates that a significant number of youth are at risk of developing ETS-related health problems. Our results show that a significant number of youth (4 to 5 million) are protected from exposure to ETS because some households with a smoker completely ban smoking in the home.

Although the vast majority of youth think that ETS is harmful, parental education is needed to stress the importance of protecting youth from ETS exposure. Increases in household smoking bans have the potential to greatly reduce ETS exposure and attendant detrimental health effects. While implementation and enforcement of household smoking bans are unlikely to ever be subject to legislation, state and local legislatures have the ability to influence changing social norms regarding household smoking. Using the California Tobacco Control Program as an example, state tobacco control programs can include elements designed to raise public awareness of the dangers of ETS exposure through media campaigns, school programs, and medical care programs to encourage smokers to adopt and enforce smoke-free home policies (Pierce et al., 1998). Similar tactics can be applied to increase the prevalence of households with smoking bans in cars and smoking bans in public places.

Research also indicates that smoking bans, such as those that have been implemented in workplaces, are the most effective method of reducing ETS exposure (USDHHS, 2000). Gerlach et al. (1997) indicate that youth are over-represented in the food service industry where workplace smoking restrictions are relatively low compared to other industries. As a result, state and local ordinances that curb smoking in these settings would also decrease exposure to ETS among youth.



This report is limited to self-reported survey data, and further research is needed to understand how the level of exposure implied by these self-reported data compare with biological measures of ETS exposure. In addition, further research is needed to better understand the health effects attributable to ETS (e.g., reduced lung function or development, acute lower and upper respiratory tract illness, chronic respiratory symptoms, and asthma) and their associated costs as well as the extent and cause of racial/ethnic differences in ETS exposure.

Finally, more research is needed on the efficacy of specific policy and environmental changes to protect youth from ETS exposure and the most effective way to implement these changes. A recent review of interventions to reduce ETS exposure found that there is strong scientific evidence that workplace smoking bans and restrictions reduce ETS exposure (Hopkins et al., 2001). Also, efforts in California and Massachusetts suggest that public education campaigns seem to encourage home smoking bans and restrictions, although more evidence is needed. In addition, Hopkins et al. specify other research issues requiring further investigation to better understand

- the extent of reduction in ETS exposure in homes that have smoking bans or smoking restrictions,
- whether households with children are more likely to adopt home smoking bans or restrictions,
- the effectiveness of home smoking bans compared to home smoking restrictions,
- the extent to which workplace smoking bans and restrictions increase cigarette consumption and ETS exposure in the home, and
- the effects of different types of local ordinances that ban or restrict smoking in communities.

One of Legacy's primary goals is to reduce exposure to ETS among all ages and populations. This report highlights that much work remains to be done because millions of youth are exposed to the harmful effects of ETS, such as reduced lung function or development, acute lower and upper respiratory tract illness, chronic respiratory symptoms, and asthma. In addition, the presence of smokers in the home sends a message to millions of children that smoking is an acceptable adult behavior.

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# Appendix A:

## ETS Exposure — Detailed Tables

**Table A-1: Prevalence of Complete Indoor Smoking Bans by Household Smoking Status — LMTS [95% Confidence Interval]**

	All Households	Households With a Smoker	Households Without a Smoker
<b>Overall (All Ages)</b>	<b>59.9%</b> [56.4–63.3]	<b>32.0%</b> [26.8–37.3]	<b>77.1%</b> [73.4–80.9]
	<b>Middle School</b>		
<b>Overall</b>	<b>60.7%</b> [55.8–65.6]	<b>31.7%</b> [24.5–38.9]	<b>78.5%</b> [73.3–83.7]
<b>Males</b>	<b>55.1%</b> [48.1–62.0]	<b>28.9%</b> [19.2–38.5]	<b>72.4%</b> [64.3–80.5]
<b>Females</b>	<b>67.0%</b> [60.6–73.4]	<b>35.2%</b> [24.6–45.8]	<b>85.0%</b> [79.1–90.9]
<b>Whites</b>	<b>60.8%</b> [54.3–67.3]	<b>32.6%</b> [22.8–42.4]	<b>79.2%</b> [72.2–86.1]
<b>African-Americans</b>	<b>49.8%</b> [38.5–61.1]	<b>17.8%</b> [7.6–28.0]	<b>71.6%</b> [60.5–82.7]
<b>Hispanics</b>	<b>73.9%</b> [64.2–83.6]	<b>54.5%</b> [39.3–69.7]	<b>81.0%</b> [69.2–92.9]
	<b>High School</b>		
<b>Overall</b>	<b>59.2%</b> [54.4–64.1]	<b>32.3%</b> [24.8–39.8]	<b>76.0%</b> [70.7–81.3]
<b>Males</b>	<b>63.4%</b> [56.5–70.2]	<b>32.3%</b> [21.5–43.0]	<b>82.2%</b> [75.7–88.7]
<b>Females</b>	<b>55.0%</b> [48.4–61.5]	<b>32.3%</b> [22.0–42.7]	<b>69.5%</b> [61.4–77.5]
<b>Whites</b>	<b>59.1%</b> [52.7–65.4]	<b>30.7%</b> [20.8–40.7]	<b>77.7%</b> [70.4–85.0]
<b>African-Americans</b>	<b>54.0%</b> [42.7–65.3]	<b>30.8%</b> [16.5–45.0]	<b>71.3%</b> [58.6–84.0]
<b>Hispanics</b>	<b>60.2%</b> [49.1–71.3]	<b>38.5%</b> [24.8–52.2]	<b>70.4%</b> [58.2–82.5]

**Table A-2: Prevalence of Exposure to ETS among Youth Ages 12 to 18 — 1999 NYTS and LMTS [95% Confidence Interval]**

	Prevalence of Households With a Smoker from NYTS <sup>a</sup>	Prevalence of Households With a Smoker from LMTS (Ignoring Smoking Bans)	Estimated ETS Exposure (Accounting for Smoking Bans)
<b>Overall (All Ages)</b>	<b>43.5%</b> [41.0–46.0]	<b>38.2%</b> [34.8–41.6]	<b>22.7%</b> [19.8–25.6]
	<b>Middle School</b>		
<b>Overall</b>	<b>42.7%</b> [39.7–45.8]	<b>37.9%</b> [33.1–42.8]	<b>21.8%</b> [17.7–25.9]
<b>Males</b>	<b>41.5%</b> [38.5–44.5]	<b>39.6%</b> [32.6–46.5]	<b>23.9%</b> [17.7–30.1]
<b>Females</b>	<b>44.0%</b> [40.2–47.8]	<b>36.1%</b> [29.5–42.7]	<b>19.3%</b> [14.2–24.5]
<b>Whites</b>	<b>42.7%</b> [38.6–46.9]	<b>39.5%</b> [33.0–46.0]	<b>22.5%</b> [17.0–28.0]
<b>African-Americans</b>	<b>45.0%</b> [41.2–48.9]	<b>40.1%</b> [28.3–51.9]	<b>26.1%</b> [15.2–37.0]
<b>Hispanics</b>	<b>41.6%</b> [35.8–47.5]	<b>27.5%</b> [19.5–35.5]	<b>9.3%</b> [4.9–13.7]
	<b>High School</b>		
<b>Overall</b>	<b>44.0%</b> [40.9–47.1]	<b>38.4%</b> [33.6–43.2]	<b>23.5%</b> [19.5–27.6]
<b>Males</b>	<b>42.7%</b> [39.2–46.2]	<b>37.7%</b> [30.7–44.7]	<b>23.1%</b> [17.2–28.9]
<b>Females</b>	<b>45.4%</b> [42.0–48.7]	<b>39.1%</b> [32.6–45.5]	<b>24.0%</b> [18.4–29.6]
<b>Whites</b>	<b>44.4%</b> [40.4–48.4]	<b>39.7%</b> [33.4–46.0]	<b>25.4%</b> [19.9–31.0]
<b>African-Americans</b>	<b>46.2%</b> [41.4–51.0]	<b>42.7%</b> [31.6–53.9]	<b>26.7%</b> [16.5–36.8]
<b>Hispanics</b>	<b>39.7%</b> [35.6–43.9]	<b>31.9%</b> [22.1–41.7]	<b>15.0%</b> [8.3–21.8]

<sup>a</sup>There is no information in the 1999 NYTS on household smoking restrictions.

**Table A-3: ETS Exposure According to Current 30-Day Youth Smoking Status — LMTS [95% Confidence Interval]**

	Middle School		High School	
	Smoker	Nonsmoker	Smoker	Nonsmoker
<b>Overall</b>	<b>21.5%</b> [9.7–41.2]	<b>21.8%</b> [17.8–26.3]	<b>38.5%</b> [29.2–48.7]	<b>19.3%</b> [15.5–23.9]
<b>Males</b>	<b>23.5%</b> [8.5–50.6]	<b>24.0%</b> [18.1–31.0]	<b>35.7%</b> [23.6–50.0]	<b>19.6%</b> [14.0–26.7]
<b>Females</b>	<b>17.0%</b> [6.9–36.2]	<b>19.5%</b> [14.6–25.4]	<b>41.3%</b> [28.1–56.0]	<b>19.1%</b> [14.2–25.2]
<b>Whites</b>	<b>19.2%</b> [6.3–45.8]	<b>22.8%</b> [17.6–29.0]	<b>42.0%</b> [29.9–55.2]	<b>20.2%</b> [15.1–26.4]
<b>African-Americans</b>	<b>29.5%</b> [6.0–73.2]	<b>25.9%</b> [16.3–38.7]	<b>34.4%</b> [16.1–59.0]	<b>25.4%</b> [15.9–38.2]
<b>Hispanics</b>	<b>8.0%</b> [1.5–33.6]	<b>9.4%</b> [5.7–15.1]	<b>29.6%</b> [14.6–50.9]	<b>10.9%</b> [6.2–18.5]

**Table A-4: Prevalence of Smoking By the Number of Parents Who Smoke — LMTS [95% Confidence Interval]**

	Two Parents Smoke	One Parent Smokes	No Parents Smoke
<b>Overall</b>	<b>31.3%</b> [21.2–43.5]	<b>17.1%</b> [12.5–23.1]	<b>13.7%</b> [11.1–16.8]
<b>Males</b>	<b>36.1%</b> [21.3–54.0]	<b>18.3%</b> [11.5–28.1]	<b>13.5%</b> [10.0–17.9]
<b>Females</b>	<b>25.6%</b> [14.2–41.6]	<b>15.9%</b> [10.4–23.4]	<b>13.9%</b> [10.2–18.7]
<b>Whites</b>	<b>34.4%</b> [22.3–48.8]	<b>18.6%</b> [12.2–27.3]	<b>14.5%</b> [10.9–19.0]
<b>African-Americans</b>	<b>8.3%</b> [1.5–34.2]	<b>17.2%</b> [9.1–30.0]	<b>9.6%</b> [4.9–18.2]
<b>Hispanics</b>	<b>41.7%</b> [14.7–74.8]	<b>10.3%</b> [5.7–17.9]	<b>14.8%</b> [9.9–21.6]



**Table A-5. Frequency Distribution of Number of Days in Past Week in Same Room or Car as Someone Smoking Cigarettes — 1999 NYTS [Cumulative Percentage]**

	Middle School		High School	
<b>Days in same room</b>				
0	44.3%	[44.3]	28.7%	[28.7]
1-2	20.3%	[64.6]	23.1%	[51.8]
3-4	8.5%	[73.1]	12.2%	[64.0]
5-6	4.4%	[77.5]	6.8%	[70.8]
7	22.5%	[100.0]	29.2%	[100.0]
<b>Days in same car</b>				
0	57.8%	[57.8]	46.2%	[46.2]
1-2	15.2%	[73.0]	19.4%	[65.6]
3-4	7.8%	[80.8]	10.1%	[75.7]
5-6	5.8%	[86.6]	7.3%	[83.0]
7	13.4%	[100.0]	17.0%	[100.0]

**Table A-6: Measures of Daily ETS Exposure by Household Smoking Status — 1999 NYTS [95% Confidence Interval]**

	Middle School		High School	
	Households With a Smoker	Households Without a Smoker	Households With a Smoker	Households Without a Smoker
<b>Global Measure</b>	<b>50.3%</b> [47.1-53.4]	<b>5.1%</b> [4.0-6.2]	<b>57.2%</b> [54.2-60.1]	<b>9.9%</b> [8.3-11.5]
<b>Room</b>	<b>46.8%</b> [43.6-49.9]	<b>4.4%</b> [3.5-5.3]	<b>55.2%</b> [52.3-58.1]	<b>8.8%</b> [7.4-10.2]
<b>Car</b>	<b>28.7%</b> [25.9-31.6]	<b>2.0%</b> [1.4-2.6]	<b>32.5%</b> [29.2-35.8]	<b>4.7%</b> [3.7-5.7]





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