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This general population study explores characteristics influencing non-compliance with a home smoking ban among Texas households with children, particularly those with asthmatic children. Over 17% of adults reported non-compliance, with the highest rate in African Americans. Adults who currently smoke (25%) had higher reports of having an asthmatic child in the household and were more likely to not comply. Child asthma status was not a significant predictor of non-compliance; however, African Americans with no asthmatic children were more likely than African Americans with an asthmatic child to not comply. The role of race/ethnicity should be further investigated to improve interventions and home smoking bans should continue to be promoted in an effort to reduce environmental tobacco smoke exposure.

ENVIRONMENTAL TOBACCO SMOKE EXPOUSRE IN CHILDREN:

COMPLIANCE WITH A HOME SMOKING BAN

AMONG TEXAS HOUSEHOLDS

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ENVIRONMENTAL TOBACCO SMOKE EXPOSURE IN CHILDREN: COMPLIANCE WITH A HOME SMOKING BAN AMONG TEXAS HOUSEHOLDS

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CHAPTER 1

INTRODUCTION

Background and Significance

Exposure to environmental tobacco smoke (ETS) in childhood has been linked to numerous health outcomes, including the early onset of asthma and increased asthma severity (Boyaci, Etiler, Duman, Basyigit, & Pala, 2006). Children exposed to ETS are more susceptible to asthma because it compromises their respiratory health during a critical stage of lung development (Texas Department of State Health Services [DSHS], n.d.). Additionally, children have little control over their exposure, which occurs primarily at home by smoking parents and other household members (Ashley & Ferrence, 1998; Kegler & Malcoe, 2002; World Health Organization [WHO], 1999).

Both asthma and ETS exposure are important public health concerns. Asthma-related factors are addressed in eight *Healthy People 2010* objectives targeting the reduction of deaths, hospitalizations, emergency department visits and activity limitations related to asthma in children and adults (U.S. Department of Health and Human Services [DHHS], 2000a). ETS exposure constitutes five *Healthy People 2010* objectives, one aimed at reducing the proportion of children exposed to ETS at home to 10% from the 1994 estimate that 27% of children six years of age and under were exposed to smoke inside the home at least four days of the week (DHHS, 2000b).

ETS has received increasing attention, including the recent *2006 Report of the Surgeon General*. This report compiled research supporting the harmful effects of ETS, presenting evidence that secondhand smoke causes premature death and disease in

children and adults who do not smoke (DHHS, 2006). It also concluded that ETS exposure increases the risk of more severe symptoms and more frequent attacks among asthmatic children.

Efforts are underway in the United States to reduce and eliminate ETS exposure in response to the mounting evidence on its harmful effects. While most smoking bans are voluntary, there has been an increase in city- and state-level laws targeting ETS in public places such as government buildings, workplaces, and restaurants. More recently, initiatives to protect children have led several states to propose policies banning foster parents from smoking in the presence of their foster child(ren). Texas is one of the most recent states to adopt such a policy. As of January 1, 2007, Texas foster parents are prohibited from smoking in their home when foster children are living in the household and must restrict smoking in their car while a foster child is a passenger (George, 2006).

Home smoking bans – voluntary restrictions on smoking behaviors in personal residences - are effective strategies in reducing ETS exposure (Berman et al., 2003; Biener, Cullen, Di, & Hammond, 1997; Kegler & Malcoe, 2002; Pizacani et al., 2003; Wakefield et al., 2000; Yousey, 2006). The national prevalence of a home smoking ban among households in the United States has significantly increased, from 43% during 1992-1993 to

72.2% in 2003 (Centers for Disease Control and Prevention [CDC], 2007). During this time period, Texas alone had nearly a 70% increase, from 46% of households reporting a home smoking ban to nearly 79%.

While research shows that home smoking bans are becoming more prevalent, few studies have investigated the practice in households with asthmatic children, a particularly vulnerable population whose symptoms may be triggered or exacerbated by smoke (Mayo Clinic, 2006). In order for health professionals to promote home smoking bans as a strategy for reducing ETS exposure in children, information about the factors that influence non-compliance should be further understood. If factors vary based on the asthma status of children in the household, this knowledge can be incorporated into an outreach program to provide more targeted education. This can increase the chances that a home smoking policy is adopted in order to reduce ETS exposure in this vulnerable population.

Objectives

This study explores the relationship between household and adult characteristics and non-compliance with a home smoking ban among Texas households with children. Data from the 2004 Texas Behavioral Risk Factor Surveillance System (BRFSS) survey were used to study this relationship in all households with at least one child, with particular interest in households with asthmatic children. For the purpose of this study, a household is considered non-compliant when the adult respondent reports that smoking is allowed or that there are no current household rules regulating smoking inside the home.

The study objectives are:

1. To determine the proportion of Texas households with children who do not comply with a home smoking ban.

2. To identify household characteristics (including asthma status of household children) and personal characteristics of the adult respondent (including sociodemographics, smoking status, and perception of ETS harmfulness) that predict non-compliance.
3. To investigate the role of child asthma status in the relationship between household and adult characteristics and non-compliance.
4. To investigate the role of race/ethnicity in the relationship between household and adult characteristics and non-compliance.

Study Hypotheses

In assessing the relationships between various household and adult characteristics and non-compliance with a home smoking ban, it is hypothesized that:

1. The proportion of adults reporting non-compliance is higher among those with at least one asthmatic child in the household than those without an asthmatic child. This relationship will also be examined at the multivariate level after controlling for sociodemographics and other covariates.
2. The proportion of adults reporting non-compliance is higher among those who currently smoke tobacco products than those who do not smoke. This relationship will also be examined at the multivariate level after controlling for sociodemographics and other covariates.
3. The proportion of adults reporting non-compliance is higher among African Americans than Caucasians or Hispanics. This relationship will also be examined at the multivariate level after controlling for sociodemographics and other covariates.

4. Significant predictors for non-compliance with a home smoking ban differ based on the race/ethnicity of the adult respondent.

CHAPTER 2

LITERATURE REVIEW

Significance and Prevalence of Childhood Asthma

Asthma is the most common chronic disease among U.S. children (Institute of Medicine [IOM], 2004). It is a preventable disease and the majority of asthma-related problems can be reduced or eliminated if appropriately treated and managed (DHHS, 2000a). Despite this, asthma continues to cause significant physical and economic burden to the U.S. population.

Of the estimated 20.5 million Americans suffering from asthma in 2004, 6.2 million were children (American Lung Association [ALA], 2006b). When asthma prevalence peaked in the mid-1990s, self-reported asthma in children and adolescents nationwide was 7.5%, compared to 5.7% among the general population (DHHS, 2000a). According to the National Center for Health Statistics, the prevalence of current childhood asthma in the U.S. was 8.8% in 2003 (ALA, 2006b), with considerable geographical fluctuation (ranging from 5.7% in South Dakota and Idaho to 11.9% in Delaware). Texas exceeded the national average with approximately 9.9% of children reporting current asthma. Analyses of the 2005 National Health Interview Survey reported a similar rate in 2005. These data also reported that 12% of U.S. children under the age of 18 have ever been diagnosed with asthma. In Texas, the lifetime prevalence of childhood asthma was estimated to be 13.1% of children in 2003 (Trust for American's Health, 2006).

Despite the decrease in the prevalence of asthma in the United States in the last few years, it increased almost 50% from 1979-1981 to 1990-1992 (National Center for Health Statistics, 1997). This increase was not limited to the adult population; a 1998 report indicated that the asthma rate was rising more rapidly in preschool-aged children than in any other group (Mannino et al., 1998).

Between 1997 and 2004, children aged 5-17 had the highest prevalence rate of all age groups (ALA, 2006b). In 2004, 140.1 per 1,000 children ages 5-17 had been diagnosed with asthma in their lifetime (ALA, 2006b). This trend persisted for current asthma diagnosis, with a rate of 85.1 per 1,000 children aged 5-17; this was significantly greater than the 63.9 per 1,000 among those over the age of 18 (ALA, 2006b).

While more females are currently affected by asthma in the adult population, a reverse pattern is observed among those under the age of 18 (Mannino et al., 1998). In 2004, the prevalence rate among boys was 51% higher than that for girls (101.5 per 1,000 versus 67.1 per 1,000, respectively) (ALA, 2006b).

In general, most estimates of asthma prevalence are underestimated because they do not include undiagnosed asthma cases (ALA, 2006b). Studies have estimated that the prevalence of undiagnosed asthma could contribute an additional 14% to 17% to the asthma burden among children (Joseph, Foxman, Leickly, Peterson, & Ownby, 1996; Yeatts, Shy, Sotir, Music, & Herget, 2003). These figures emphasize the need to protect all children from potential triggers, including those who might be predisposed to developing asthma and those who exhibit asthma-like symptoms but have not been diagnosed by a physician.

Asthma Mortality and Morbidity

Deaths due to asthma are rare in children; only 154 of the 4,099 asthma-related deaths in 2003 were in children (ALA, 2006a). Considering all age groups, females in Texas have a higher risk of dying from asthma than males and African Americans have significantly higher mortality rates compared to Caucasians and Hispanics (DSHS, 2006a). Asthma mortality rates in Texas peaked in the 1990s, when it nearly doubled from 1980 to 1998 in all age groups, but it has slowly started to decrease since 2000 (DSHS, 2004).

Morbidity is a better reflection of the magnitude of the asthma problem. In the U.S. in 2004, approximately 38% of the asthma hospital discharges occurred in children under the age of 15, despite the fact that this subgroup represented only 21% of the U.S. population (ALA, 2006b). This translated to 31 per 10,000 population in children under the age of 15, the highest rate compared to all other age groups (ALA, 2006b).

Asthma was the fifth most common disease listed as the primary reason for hospital discharges in Texas for 2003, with 27,783 discharges (DSHS, 2006a). From 1999-2003, the highest rates of asthma hospitalizations were found among children under the age of five, with a rate of 37.3 hospitalizations per 10,000 population (DSHS, 2004). This age group had the most pronounced difference between males and females, with a rate of 47.7 hospitalizations per 10,000 population in males compared to 26.9 in females. This pattern of higher asthma-related hospital admission rates in males persists in all age groups up until the age of 15, at which point the rates for females surpass males for all succeeding age groups. As females take the lead, there is an additional shift in the pattern.

Rates for both genders decrease with increasing age up until the age group of 15-24, after which the rates in both genders increase with increasing age. Additionally, asthma is the leading cause of school absenteeism due to chronic illness for children under the age of 16 (ALA, 2006b; Asthma Coalition of Texas, 2004). According to the American Lung Association of Texas, asthmatic children reportedly miss twice as many school days than children who do not have asthma.

Treating asthma is costly. Nationally in 2004, direct medical expenditures for asthma amounted to $11.5 billion (ALA, 2006b). This was a three-fold increase from the reported $3.64 billion in direct medical expenditures in 1990 (DHHS, 2000a; Weiss, Gergen, & Hodgson, 1992). Texas spends approximately $435 million per year on direct medical expenditures due to asthma (Asthma Coalition of Texas, 2004).

While these figures appear alarming, there was a notable shift in the national distribution of expenses from 1990 to 2004. Direct medical expenses for hospital care (including inpatient, emergency room visits, and outpatient care) declined from 57% to 31% while physician-related services and prescription drug expenses increased (from 14% to 25% and 30% to nearly 44% of total expenditures, respectively). This shift from expenses related to urgent care to preventive care suggests an improvement in control and maintenance of this disease.

Ethnic Disparities in Childhood Asthma

African American children are disproportionately affected by asthma. Data from the 1997 to 2003 National Health Interview Survey show that African American children

have a greater asthma prevalence compared to Caucasians. It was also concluded that African American children are 20% more likely than Caucasian children to be diagnosed with asthma and they are twice as likely as Caucasian children to have an asthma-related emergency room visit in the past 12 months (McDaniel, Paxson, & Waldfogel, 2006).

Currently, African Americans have higher rates of current asthma in all age categories compared to Caucasians. Within both groups, the highest rates are among children ages 5 to 17, with rates of 143.2 per 1,000 persons in African Americans and 89.4 per 1,000 persons in Caucasians (ALA, 2006b). However, the lowest rates within these racial groups differ. Caucasians had the lowest prevalence rates in children under the age of five whereas African Americans had the lowest in adults aged 45-64 (ALA, 2006b). African American children under the age of five constituted the second highest rate in this race.

Environmental, socioeconomic, and genetic factors have been associated with increased risk of asthma. Research is mixed as to how much each of these factors account for the increased risk, particularly when considering the African American population and their disproportionate burden of this disease. However, the majority of studies found that the elevated risk for asthma among African American children was reduced, sometimes even to statistical insignificance, when controlling for social and environmental characteristics (Litonjua, Carey, Weiss, & Gold, 1999; Smith, Hatcher-Ross, Wertheimer, & Kahn, 2005; Weitzman, Gortmaker, & Sobol, 1990). However, evidence has persisted showing elevated risk among African Americans even after

controlling for an extensive list of socioeconomic and demographic characteristics (McDaniel et al., 2006).

An increased risk for asthma has also been reported among Puerto Rican children, sometimes surpassing the rates seen in African Americans. One study found the prevalence of diagnosed asthma in Puerto Rican children to be 21.6%, compared to 18.3% in African Americans, and 12.2% in the overall population of public school children in Chicago (Quinn, Shalowitz, Berry, Mijanovich, & Wolf, 2006). Similar patterns were seen in a study evaluating rates of recent wheezing, with 16.3% of Puerto Rican children being affected compared to 10.7% in non-Hispanic Whites and 11.3% in Non-Hispanic African Americans (Akinbami, Rhodes, & Lara, 2005). However, since most studies assess race/ethnicity as a larger category of "Hispanic or non-Hispanic," comparisons between Hispanic subgroups cannot be made in most cases, including this study.

Association Between ETS and Asthma

Asthma has several causes and contributors, including many environmental factors such as allergens (animal dander, cockroaches, and dust mites), molds, infectious agents, and air pollution and chemicals (ozone, particulate matter, pesticides, and ETS) (IOM, 2004). ETS is the exposure of interest for this study and its relation to asthma will be discussed in more detail.

The World Health Organization considers ETS to be a real and substantial threat to child health (WHO, 1999). Exposure to ETS in childhood has been associated with the

early development of asthma and increased severity of asthma symptoms (Boyaci et al., 2006; Cook & Strachan, 1999).

ETS has become a topic of considerable interest for research and it is investigated by many agencies and institutions. In an effort to address asthma, the U.S. Environmental Protection Agency was charged to form a committee to examine environmental factors related to this disease. The product of this investigation, a 2004 report titled *Clearing the air: Asthma and indoor air exposures*, found considerable evidence supporting the detrimental effects of ETS and its role in asthma (IOM, 2004). Regarding children, the committee concluded that there is sufficient evidence of a causal relationship between ETS exposure and exacerbation of asthma in preschool-aged children and there is sufficient evidence to conclude that there is an association between ETS exposure and the development of asthma in younger children (IOM, 2004). Additional findings include limited or suggestive evidence of a relationship between chronic ETS exposure and exacerbation of asthma in older children and adults and between acute ETS exposure and exacerbation of asthma in individuals who are responsive to ETS (IOM, 2004).

These claims are supported by more than 60 studies of school-aged children demonstrating that asthma and respiratory symptoms (such as wheezing, coughing, breathlessness and phlegm) are increased in children who have smoking parents (WHO, 1999).

ETS Exposure in Children

The World Health Organization estimates that nearly 700 million children, almost half of the world's child population, are exposed to tobacco smoke, particularly in the

home environment (WHO, 1999). Pirkle et al. (1996) estimated that over 40% of U.S. children are exposed to ETS in their homes and National Health Interview Survey data report that smoking occurs in 36% of homes that have children (Schuster, Franke, & Pham, 2002).

In Texas, nearly a million youth are estimated to be exposed to ETS in their home and other public places (DSHS, 2007). Results from the 2001 Texas Youth Tobacco Survey on middle and high school age students in Texas showed that among those who lived with a cigarette smoker, 80% of students reported ETS exposure compared to 44% who did not live with a cigarette smoker (CDC, 2003). Additionally, an estimated 2,500-4,500 Texas adults, children, and infants die each year from ETS exposure (DSHS, 2007).

Among asthmatic children, one study found that 52% of asthmatic children tested positive for ETS exposure through urine samples detecting a biological marker commonly found as a byproduct of exposure (Yousey, 2006). Results from the National Cooperative Inner-City Asthma Study found that 59% of families with an asthmatic child reported at least one smoker in the home (Kattan et al., 1997). Halterman, Fagnano, Conn, and Szilagyi (2006) found that 48% of asthmatic children lived in homes with one or more smoking adults.

ETS is especially concerning with children because they have limited control over their exposure. Sources and location of ETS exposure vary based on the age of the child, with young children receiving most of their exposure from smoking parents and other household members and it occurs mainly at home (Johansson, Hermansson, &

Ludvigsson, 2004a; WHO, 1999). As children get older, their exposure outside the home increases as they experience more contact with ETS in public places (WHO, 1999).

Attitudes and Perceived Harmfulness of ETS

Efforts to understand why some people smoke in the presence of children have included evaluations of knowledge and attitudes of the harmfulness of smoking and ETS exposure. The importance of these factors has implications for prevention strategies and interventions.

Perceptions on the harmfulness of ETS have been found to vary based on smoking status of the household. One study reported that 96% of households with non-smokers versus 88% with one or more smoker perceived ETS exposure to be a health hazard (Pizacani et al., 2003). In 2000, nearly 96% of non-smoking adults reportedly agreed that smoke inhaled by infants and children from their parent's cigarette was harmful compared to 87% of smoking adults (McMillen, Winickoff, Klein, & Weitzman, 2003). This trend persisted in the study's analysis of 2001 data. However, from 2000 to 2001, McMillen et al. reported that smokers had a greater increase in agreement than non-smokers, suggesting that awareness in smokers, while still being lower than that of non-smokers, was improving.

A separate study found a 20% difference between smokers and non-smokers on the agreement that children exposed to ETS are more likely to have asthma attacks (Helgason & Lund, 2001). They concluded that smokers were two and a half times more likely to disagree with this statement (Helgason & Lund, 2001). The main conclusion

from this study was that there appeared to be a dose-response relationship between the awareness of the harmful effects of ETS in children and ETS exposure in those children.

Preventing Asthma and ETS Exposure in Children

Preventing children's exposure to ETS can improve health during childhood and it can ultimately reduce mortality and morbidity in adulthood (WHO, 1999). Targeting ETS exposure has great potential in helping asthmatics control their disease as well as preventing the onset of asthma in healthy individuals (IOM, 2004). To successfully accomplish this, education, public policy, and advocacy are integral components.

State and National Initiatives. Texas has initiated efforts to reduce the prevalence of both asthma and ETS exposure. The Texas Department of State Health Services (DSHS) received $4.9 million in direct funds and services from the National Center for Environmental Health from fiscal years 2001 through 2003 to assist in various activities, including those related to asthma surveillance (CDC, 2004b). In response to this support from the CDC, DSHS partnered with the American Lung Association of Texas to form the Asthma Coalition of Texas to address asthma-related issues. The Asthma Coalition of Texas developed a *Texas State Asthma Plan* which was adopted to direct the state's efforts in medical management, epidemiology and surveillance, education, and advocacy (Asthma Coalition of Texas, 2004).

A key issue highlighted in the *Texas State Asthma Plan* was the need for improved asthma surveillance. Currently, asthma-related data are collected using the Behavioral Risk Factor Surveillance System (BRFSS), hospitalization rates from the Texas Health Care Information Collection (THCIC), and mortality rates from the Texas

Vital Statistics Unit (VSU). While these sources provide valuable information, they do not provide a comprehensive picture of the burden of asthma in Texas, particularly among children. This, with additional support from the CDC, led to the development and implementation of a state-wide asthma surveillance program for school-aged children. Findings from a pilot study have been published, and while the surveillance system is still under development and revision, the results have already begun to assist in the better understanding of the burden of childhood asthma in Texas (Petronella, Bricker, Perrotta, Brown, & Brooks, 2006). Ultimately, this surveillance system is intended to fill in the gaps to provide detailed asthma surveillance.

Additionally, Texas has taken steps to educate the public about the harmfulness of ETS exposure. The Texas Department of State Health Services Strategic Plan for 2003-2008 for tobacco prevention and control includes the goal of eliminating exposure to secondhand smoke and has laid out four strategies to achieve this goal: 1) Increase enforcement of federal, state, and local ETS laws; 2) Educate the public, including parents, about the harmful effects of ETS; 3) Provide support for evidence-based programs in communities aimed at reducing ETS exposure; and 4) Educate health professionals to assess and counsel situations where ETS exposure may need to be eliminated (DSHS, 2007). In the 2006 fiscal year, Texas initiated *Share Air*, a media campaign with television, radio, outdoor, theater, Internet and print advertisements in both English and Spanish promoting this message (DSHS, 2005a; 2007).

Texas, as well as many states across the country, has increased legislative action regarding ETS exposure, primarily through state and local ordinances regulating smoking

in municipal facilities, restaurants, and other public places. An extensive database of municipal clean indoor air ordinances has been developed and is maintained by the University of Houston under contract with DSHS (DSHS, 2006b). This information provides valuable information used to identify populations not being protected from ETS exposure and can be used in assisting the development of future ETS policies.

In an effort to protect children, Texas has regulated tobacco use in childcare centers since 1985. More recently, the Texas Department of Family and Protective Services increased regulations for home foster care, restricting smoking in foster parents' homes at all times and in cars when the children are present (DSHS, 2007; George, 2006).

Efforts to educate the public about ETS exposure are not isolated to Texas. The Environmental Protection Agency developed the Smoke-Free Home Pledge Initiative which is a nationwide campaign promoting voluntary home and car smoking bans (CDC, 2003; U.S. Environmental Protection Agency, 2007). This program encourages the public to not allow smoking in the home and car, especially in the presence of children, particularly if smoking adults are not ready to quit smoking. The Web site provides useful information on how to initiate a voluntary smoking ban and offers an interactive pledge with a printable certificate.

Home Smoking Bans. No level of ETS exposure is risk free (CDC, 2006d; DHHS, 2006), and the only reliable effective means of preventing ETS exposure is through source control (stopping smoking) (IOM, 2004). When parents and other adult caregivers cannot stop smoking, they should be encouraged to reduce or eliminate their children's

exposure to ETS. Home smoking bans have been shown to be a successful approach in reducing ETS exposure in the home environment (Berman et al., 2003; Biener et al., 1997; Kegler & Malcoe, 2002; Pizacani et al., 2003; Wakefield et al., 2000; Yousey, 2006).

BRFSS data for 2005 indicate a high level of compliance to home smoking bans in the 14 states that included this assessment in their survey. Estimates ranged from 64% in Kentucky to 83% in Arizona, with a median of 74% of persons reporting that smoking is not allowed anywhere inside their home (CDC, 2006d). These results are similar to the 73% of households reported by Yousey (2006). Texas reported that 78.8% of all households practice a complete home smoking ban in 2005.

Limited information exists on the prevalence of home smoking bans among children at risk of developing asthma or who suffer from asthmatic symptoms. This is an important area since there is great potential to reduce the asthma burden in this population by enforcing a ban. Yousey (2006) reported no significant differences in the report of smoking bans between households based on the presence of an asthmatic child. One clinical sample of asthmatic children estimated that 71% of these children were protected by a home smoking ban, but that dropped to 64 % when considering a complete ban in both the home and car (Halterman et al., 2006). Halterman et al. also reported that only 51% of households with smokers practiced a home smoking ban, and that asthmatic children who lived with smokers were 10 times less likely to be protected by a complete smoking ban. These results were similar to those in other studies, which reported rates of

compliance as low as 41% for those living with a smoker (Berman et al., 2003; Wakefield et al., 2000).

Attitudes and perceptions of ETS exposure have been shown to influence compliance and support of home smoking bans. McMillen et al. (2003) found that 74% of adult respondents from a nationally representative survey reported having a household smoking ban; however, a wide range was seen when stratifying by smoking status (86% of non-smokers versus 30% of smokers). Another study found that attitude scores (measured using a 13-item Likert scale assessing negative attitudes and beliefs about smoke exposure) had a significant negative correlation with no or partial smoking bans (Yousey, 2006). Yousey also showed that attitude scores significantly predicted the presence of a home smoking ban and concluded that this supported the relationship between attitudes about ETS exposure and compliance to home smoking bans.

Study Implications

Despite the existing research on home smoking bans, few studies have investigated their use in households with asthmatic children. Most studies that have were in clinical settings and not in the general population. This study will expand on the knowledge of home smoking bans in a population of Texas households with children, with and without asthma, in an effort to fill this gap. This information has the potential for contributing valuable knowledge in shaping future interventions targeting the general population (i.e. it could provide support for screening adults for asthma status of children in the household when promoting the use of a home smoking ban). Additionally, this

study will explore the role of race/ethnicity in non-compliance with the potential for the findings to contribute to racial/ethnic-specific intervention planning.

CHAPTER 3

METHODOLOGY

Research Design and Data Collection

This study used data from the Behavioral Risk Factor Surveillance System (BRFSS) collected in 2004 for the state of Texas. The BRFSS survey is a cross-sectional telephone survey used to collect data on risk behaviors and preventive practices that affect health status (CDC, 2006b; 2006c). It is the largest on-going telephone survey system, collecting data in all 50 U.S. states as well as three U.S. territories and the District of Columbia (Washington State Department of Health, 2006). Supported by the CDC, the survey is conducted on a continuing, monthly basis by state-level health departments.

Telephone numbers were obtained through random-digit dialing from a Telcordia Technologies database of numbers. BRFSS protocol calls for the selection of telephone numbers in such a way that all households with telephones have a known, nonzero chance of inclusion (CDC, 2006b). The telephone numbers were stratified into high and medium-density blocks based on the presumed density of known telephone household numbers (CDC, 2006b). The high-density stratum telephone numbers were sampled at the highest rate in an effort to yield more residential telephone numbers. This process was used to more accurately achieve a statistically representative sample. A detailed description of BFRSS protocol for handling calls with no answer, refusals, and hang-up calls can be found in the *Behavioral Risk Factor Surveillance System Operational and*

User's Guide (2006b). The response rate for the 2004 BRFSS Texas sample was 43.3% and nationwide the median response rate was 52.7% (CDC, 2005).

According to the BRFSS protocol, an eligible household was defined as "a housing unit that has a separate entrance, where occupants eat separately from other persons on the property, and that is occupied by its members as their principal or secondary place of residence" (CDC, 2006b, p. 44). Excluded households were: 1) Vacation homes not occupied by household members for more than 30 days per year, 2) Group homes, such as sorority and fraternity houses/residences, halfway houses, and shelters and 3) Institutions such as nursing homes and college dormitories (CDC, 2006b).

Once the household was selected, all eligible adult household members were identified. Household members were considered to be all related adults 18 years or older, unrelated adults, roomers, and domestic workers who consider the household their home, even though they were not home at the time of the call (CDC, 2006b). Adult family members who were currently living elsewhere, such as at college, a military base, a nursing home, or correctional facility, were not considered household members (CDC, 2006b).

If there was only one eligible household member, that individual was the targeted individual to be interviewed. If there was more than one eligible adult, one was randomly selected and efforts were made to contact this individual for an interview. Approximately 200-250 adults were interviewed per month for the 2004 Texas BRFSS. A trained staff member conducted the telephone interview using a Computer Assisted Telephone Interviewing (CATI) system for navigating through the interview and recording

responses. Interviews were considered complete if there were data for age, race, and sex (CDC, 2006b).

At the start of the survey, respondents were informed of the purpose of the study and asked if they were interested in participating. They were also informed that they would not be asked any identifying personal information, that all information would be kept confidential, and that their voluntary participation could be ended at any time during the interview.

Instrumentation

The survey consists of three parts: 1) The core component; 2) Optional modules; and 3) State-added questions. The core component includes questions that all states were required to ask, including sociodemographic data and information about current health-related perceptions, conditions, and behaviors (CDC, 2006a). States could then choose to include optional modules and/or state-added questions to target more specific areas of interest (DSHS, 2005b). For the 2004 survey, Texas included eight of the 20 optional modules available for use, including extended questions about adult asthma history and childhood asthma, use of other tobacco products, and home smoking policy. An additional question of interest for this study was the state-added question on perceived harmfulness of ETS exposure.

Target Population

The target population for this study was the non-institutionalized Texas adult population, 18 years and older, residing in households with active telephone numbers, who also had at least one child living in the household.

Study Inclusion Criteria

The sample population for this study included only those adult respondents who reported at least one child residing in their household. This was assessed by using the variable from the dataset which identified the number of children under the age of 18 living in the household. This variable was used to filter the main dataset.

Variables

Outcome variable. Home smoking ban: Respondents were asked to select the statement that best described the rules about smoking inside their home from the following response categories: 1) Smoking is not allowed anywhere inside your home; 2) Smoking is allowed in some places or at some times; 3) Smoking is allowed anywhere inside the home and 4) There are no rules about smoking inside the home. A dichotomous variable was created to distinguish between a complete ban (smoking is not allowed anywhere inside your home) from a partial or no ban (smoking is allowed in some places or at some times, smoking is allowed anywhere inside the home, and there are no rules about smoking inside the home). These partial and no bans were considered non-compliance and were the focus of this study.

Independent variables: Household characteristics. For *Child Asthma Status*, which was measured through proxy-response from the adult respondent, two questions were asked pertaining to asthma and the child(ren) residing in the household: 1) How many of these children have ever been diagnosed with asthma, and 2) Does this child/How many of these children still have asthma? From these two questions, a dichotomous variable indicating the child asthma status of the household was created:

1) Households with asthmatic children: at least one child in the household has ever had or currently has asthma; 2) Households without asthmatic children: no children in the household have ever had asthma or currently have asthma. *Number of Household Children* was measured through a continuous variable indicating the number of children under the age of 18 living in the household, as reported by the adult respondent. *Number of Household Adults* is a dichotomous variable indicating only one adult residing in the household versus two or more adults. This is a proxy-indicator for single parent households.

Independent variables: Adult sociodemographics. For *Gender*, a dichotomous variable was used to designate the adult respondent as male or female. *Age*. A categorical measure with six age categories: 18 to 29, 30-39, 40-49, 50-59, and 60 and older. *Race/Ethnicity*. Four mutually exclusive categories (Non-Hispanic White, Black, Hispanic, Other) indicating the adult respondents' self-report of race/ethnicity. *Marital Status*. The adult respondent's marital status (married, divorced, widowed, separated, never married, unmarried couple) was collapsed into three categories: 1) Married/unmarried couple; 2) Divorced/separated/widowed; 3) Never married. *Education*. Highest grade or year of school completed by the adult respondent (less than high school graduate, high school graduate, some college, and college graduate). *Employment status*. The original eight level variable was collapsed into three categories: 1) Employed (employed for wages and self employed); 2) Unemployed (out of work for more than one year, out of work for less than one year, student, retired, and unable to

work) and 3) Homemaker. Homemaker was kept as a separate category because it constituted 14% of the study population.

Independent variables: Smoking-related. For *Current Smoking Status*, a dichotomous variable was used to indicate the current smoking status of the adult respondent, including the use of cigarettes, cigars, pipes, bidis, kreteks, or other smoked forms of tobacco. This smoking status variable was computed from two separate variables: 1) A four-level variable indicating cigarette smoking status (current smoker every day, current smoker some days, former smoker, and never smoker) and 2) A dichotomous (yes/no) variable assessing the adult respondent's use of other tobacco products such as cigars, pipes, bidis, and kreteks. If the respondent indicated being a current smoker of cigarettes and/or a current smoker of other types of tobacco products, then he/she was considered a current smoker. *Perceived Harmfulness of ETS.* A four-level variable assessing the adult respondent's belief on how harmful ETS is to those who are exposed to it (not at all harmful, not very harmful, somewhat harmful, and very harmful). For ease of interpretation and to account for low numbers in the two 'harmful' categories, this variable was collapsed into two categories: 1) Not at all harmful/not very harmful and 2) Somewhat harmful/very harmful.

Important excluded variable: Income. Annual household income was not included in these analyses because 245 respondents (13%) did not report their income. Income is commonly missing in the BRFSS survey, being the variable with the largest percentage of missing data for the BRFSS survey nationwide (CDC, 2005). The literature indicates that income is an important socioeconomic variable in relation to home smoking bans,

smoking behavior, and ETS exposure (CDC, 2006e; Norman, Ribisl, Howard-Pitney, & Howard, 1999; Pizacani et al., 2003; Yousey, 2006). In this study among households with children, missing income was unevenly distributed across race/ethnicity. Hispanics had the highest proportion, constituting 58.7% of the missing income; this difference was statistically significant. Since other socioeconomic variables were available (including education level, employment status, and race/ethnicity which are common indicators of income), the decision was made to exclude the income variable rather than introduce bias into the analyses.

Controlling for geographic location. Asthma occurrence and asthma severity can be related to air quality (i.e. pollution), weather changes and seasonal variations, and outdoor allergens such as pollen (CDC, n.d.; National Health Lung and Blood Institute, n.d.). Because these factors vary greatly by geographic location, this was controlled for in the multivariate analyses by including a nine-level variable grouping the adult respondent's place of residency by metropolitan and micropolitan statistical areas.

Statistical Analyses

Data were managed in SPSS software to manipulate and recode variables. All of the analyses were preformed using SUDAAN software (Research Triangle Institute, 2002) to more appropriately estimate the standard errors by accounting for the complex sampling design of the BFRSS survey. Data were weighted to adjust for non-response and varying probabilities of sampling selection. The weight used was the Texas-specific state weight calculated by the CDC and made available in the data set. Weighting the data takes into consideration design factors, including the number of residential telephones in

the household, the number of adults in the household, and geographic or density stratification (CDC, 2006b). This process adjusts variables of age, race, and gender between the sample and the entire population (CDC, 2006b, p. 54).

The first level of analysis included univariate descriptive statistics (frequencies, percentages and means) to examine the distribution of variables in the sample. Bivariate associations between categorical independent variables and non-compliance with a home smoking ban were tested using chi-square statistics. Further analyses were preformed to test associations between selected variables of interest (including adult smoking status, perception of ETS harm, and child asthma status) and home smoking ban stratified by race/ethnicity. For multivariate analyses, logistic regression analyses were conducted to identify household predictors that are significant risk factors for non-compliance.

CHAPTER 4

RESULTS

Sample Description

The 2004 Texas BRFSS survey interviewed a total of 6,317 adults ages 18 and older, of which 2,581 (40.9%) reported at least one child living in their household. From this subpopulation, 244 respondents were excluded because they were not asked the question regarding their perception of the harmfulness of ETS exposure. Since the reason for this exclusion was unknown and because missing data could not be estimated from other existing data, the decision was made to eliminate the respondents completely from the analyses. The final sample size included 2,337 adult respondents with at least one child residing in the household. Data in the tables represent weighted percentages and unweighted Ns.

Slightly over half of the respondents were female (55.1%) and the majority were married or part of a cohabitating couple (74.8%) (see Table 1). The sample population consisted predominantly of Caucasians (43.5%, n=1,065) and Hispanics (43.3%, n=962) with the remaining being African American (9.8%, n=231) and of Other races/ethnicities (3.4%, n=68). Direct comparison of this racial/ethnic distribution to the state of Texas population of households with children is difficult to make. The distribution in this study population is slightly different when compared to the 2000 Census distribution among all Texas households with children: 47.8% Caucasian, 12.7% African American, 35.3% Hispanic, and 4.2% Other races/ethnicities. However, from 2000 to 2004, the overall proportion of Caucasians and African Americans declined while it increased for

Hispanics and Others in the total Texas population (not limited to households with children). Additionally, comparing the 2000 estimates among households with children to this study population, it is noted that proportionally there are less Caucasians, African Americans, and Other, and more Hispanics. Considering all this, it is possible that a more accurate racial/ethnic distribution among Texas households with children for 2004 would be closer to that found in this study population.

This was a young population, with over 60% of the respondents being between the ages of 18 and 39 years; the mean age of the adult respondents was 37 years. Education was nearly split one quarter across all education categories, which included less than high school, high school graduate, some college, and college graduate. Most respondents were employed for wages or self-employed (66.7%, n=1,540) with the remaining reporting unemployment (19.2%) or that they were homemakers (14.1%).

The majority had at least two adults living in the household (91%) and a mean number of children per household of two (± 0.03). While the stratified means for Caucasians (1.9 ± 0.03), African Americans (1.8 ± 0.07), and Other adults (1.8 ± 0.12) were similar, Hispanics reported a slightly higher mean at 2.2 children (± 0.05).

Distribution of Smoking-Related Variables

Over 90% of adults agreed that ETS is harmful to those exposed to it. No significant racial/ethnic variation was observed. Contrary to current literature (Federal, Provincial and Territorial Advisory Committee on Population Health, 1999; Johansson,

Hermansson, and Ludvigsson, 2004b; Minnesota Department of Health, 2000), education level was not statistically associated with perceived harmfulness of ETS exposure in this study population.

Despite the fact that over 90% of adults in this sample noted the harmfulness of ETS, 25% (n=520) of adult respondents reported that they currently smoke tobacco products, including cigarettes, cigars, pipes, and other forms of tobacco (see Table 2). Smoking status was statistically associated with perceived harmfulness ($p<0.01$) with smoking adults reporting higher rates of not at all harmful/not very harmful (data not shown in the tables). Smoking behavior was also significantly associated with race/ethnicity ($p<0.001$), with Caucasians having the highest rate of current smokers (31.3%), followed by African Americans with 25%. Hispanics and adults of Other ethnicity had similar rates of smoking (approximately 18% each). Finally, smoking status was statistically associated with education level ($p<0.0000$) with higher rates of smoking seen in adults with less than a college education (15.7% current smokers with a college education compared to 26.4% with some college, 32.3% being a high school graduate, and 25.5% with less than a high school education).

Child Asthma Status

Analysis on childhood asthma was limited by the lack of personal information of the household children. A total of 434 adults (18.7%) reported that at least one child in their household had ever been diagnosed with or currently has asthma (see Table 2). Adults in the Other race/ethnicity group reported the highest proportion of an asthmatic

child in the house (27.7%), followed by African Americans (20.3%), Caucasians (19%), and Hispanics (17.3%), but the difference did not reach statistical significance ($p>0.05$).

The number of children residing in a household who had ever been diagnosed with asthma ranged from one to four, for an overall total of 525 asthmatic children (data not shown in the tables). Given that there were 4,698 total children in the sample households, the proportion of children who had ever been diagnosed with asthma was 11.2%. Stratified by the race/ethnicity of the adult respondent, which was used as a proxy-indicator of the child's race/ethnicity, African Americans had the highest rate of childhood asthma with 14.7%, followed by Other (13.9%), and Caucasians (11.8%). Hispanics had the lowest rate with 10.6%. Again, these are not to be considered accurate estimates of childhood asthma in this study population because the race/ethnicity of the children was unknown.

Among households reporting at least one asthmatic child, 28.3% of adults were current smokers, compared to 21.7% who did not have an asthmatic child in the home ($p<0.05$, see Table 3). Regarding perceived harmfulness of ETS exposure, a lower proportion of adults with an asthmatic child (4.7%) believed that ETS exposure is not at all/not very harmful compared to adults with no asthmatic children in the home (6.4%).

Home Smoking Ban

While compliance with a home smoking ban was high (82.9%, n=1,805), 17.1% (n=384) of households reported some degree of non-compliance. Approximately 6% of adults said that smoking is allowed at some times or some places inside and 1.6% said that smoking is allowed anywhere. However, nearly 10% of respondents (n=211)

reported that there were no household rules about smoking. This represented over half of those adults who reported non-compliance.

African American adults had the highest proportion of non-compliance (30%), followed by Caucasians (19%), and Other (13.8%) (see Table 4). Hispanic adults had the lowest rate of non-compliance (12.4%), and thus were the highest proportion reporting that smoking is not allowed anywhere inside at any time. This relationship between race/ethnicity and home smoking ban status was statistically significant.

The proportion of non-compliance increased with increasing age, with adults ages 60 years and older having the highest rate of non-compliance (27.5%) which was nearly 2 times that of adults ages 18-29 years (15.1%) and adults ages 30-39 years (14.7%). The proportion of non-compliance was lower among those with less than a high school education (18.4%) compared to 10% of those who are college graduates. High school graduates had the highest report of non-compliance (21.2%). By employment status, those who were unemployed reported the highest rate of non-compliance (26.7%) compared to 15.1% of adults who were employed. Adults who were homemakers had the lowest rate of non-compliance (13.7%). Single adult households had a significantly higher proportion of non-compliance compared to those who had two or more adult household members (24.1% versus 16.4%). Gender was the only adult sociodemographic variable that was not statistically significantly associated with home smoking ban status in bivariate analysis (females, 17.8%; males, 16.2%).

Of those who currently smoke, 38.2% did not comply compared with 10.7% among non-smokers (see Table 5). Additionally, 28.2% of adults who believed that ETS

exposure was not at all/not very harmful reported non-compliance versus 16.1% of those adults who believed it is somewhat/very harmful. Both adult smoking status and adult's perceived harmfulness of ETS exposure were significantly associated with home smoking ban status.

Rates of non-compliance were similar among adults who reported having at least one child in the household who ever had or currently has asthma compared to adults who reported non-asthmatic children in the household (approximately 16% for both groups) (see Table 5). Thus, the association between having at least one asthmatic child in the household and home smoking ban status was not statistically significant.

The Moderating Effect of Race/Ethnicity

As stated above, there was no significant association between child asthma status and home smoking ban. However, rates and patterns of non-compliance varied when this analysis was stratified by the adult's race/ethnicity (see Table 6). Caucasians were the only group who had higher rates of non-compliance among households with an asthmatic child (22.3% compared to 18%). Among the other racial/ethnic groups, who demonstrated lower non-compliance in households with asthmatic children, the largest difference was observed in African Americans. Over twice as many African American adults with no asthmatic children reported non-compliance (33.3%) compared to those with an asthmatic child (14.7%). The relationship between child asthma status and home smoking ban was significant only among African American adults. This suggests that race/ethnicity moderates the effect between child asthma status and home smoking ban status.

Across all racial/ethnic groups, smokers reported higher proportions of non-compliance (see Table 6). Adult smoking status was statistically associated with home smoking ban status overall and this significant relationship held in all racial/ethnic groups except those categorized as Other. Regarding the adult's perception of the harmfulness of ETS exposure, the association with home smoking ban only remained significant among Caucasian adults, with 38.5% non-compliance among adults who believed ETS exposure is not at all/not very harmful to only 16.3% of those Caucasian adults who believed that ETS exposure is somewhat/very harmful.

Predictors of Non-Compliance With a Home Smoking Ban

Several adult sociodemographic and smoking-related variables significantly predicted non-compliance with a home smoking ban (see Table 7). African Americans were over 2 times more likely (OR=2.31; 95% CI=1.41-3.79) than Caucasians to not comply. Conversely, Hispanics were less likely, meaning they were more likely to comply with a complete home smoking ban than Caucasians. While the relationship with African Americans was statistically significant, it was not with Hispanics. Compared to those who were 18-29 years old, adults 30-39 were 1.72 times (95% CI=1.12-2.65), adults 40-49 were 2.14 times (95% CI=1.36-3.37), and adults 50-59 were 2.08 times more likely (95% CI=1.17-3.72) to not comply. Adults who were separated/divorced/ widowed were 1.72 times more likely (95% CI=1.19-2.47) than married/cohabitating adults to not comply. Odds ratios increased with decreasing education level when compared to adults who have a college degree: Some college: OR=1.61, 95% CI=1.04-

2.48; High school diploma/GED: OR=1.80, 95% CI=1.14-2.85; and Less than high school: OR=2.09, 95% CI=1.18-3.69.

Employment status was not found to be a significant predictor of non-compliance but was left in the model for two reasons. First, it was statistically significant at the bivariate level. Second, gender was significantly associated with employment status and with 14% of the study population reporting being a homemaker, of which all were female, the decision was made to leave employment status in the model to control for this effect. While the number of household children was significantly associated in the bivariate analysis, it was not a significant predictor of non-compliance. Additionally, gender was not a significant predictor of non-compliance.

Adults who currently smoke tobacco products were nearly 5 times more likely (OR=4.65, 95% CI=3.33-6.49) to not comply compared to their non-smoking counterparts. Those who believed that ETS exposure is not at all/not very harmful were twice as likely (OR=2.07, 95% CI=1.15-3.72) to not comply than those who believed that it is somewhat/very harmful.

Asthma status of household children was not a significant predictor of non-compliance. This suggests that adults who report having at least one asthmatic child in their household were no more likely to comply than adults who do not report any asthmatic children. This regression analysis (R^2) explained approximately 13% of the variance in not complying with a home smoking ban (Note: this is not a report of OLS R^2).

Testing Effect Modification

To further explore the role of race/ethnicity in the relationship between child asthma status and home smoking ban, the next level of the logistic regression analysis included an interaction term in the model to test if the effect modification was statistically significant.

The hypothesized interaction was confirmed in this regression analysis, ($p<0.05$, see Table 8). The betas and subsequent odds ratios produced in the analysis containing this interaction term can not be directly interpreted, thus the next step was to create an eight-level combination variable. The categories of this variable corresponded to all possible combinations of child asthma status (at least one asthmatic child and no asthmatic children) and race/ethnicity (Caucasian, Hispanic, African American, and Other). The regression analysis was then conducted replacing the main effect variables for child asthma status and race/ethnicity with the combination variable. The odds ratios and 95% confidence intervals produced with this analysis are easily interpreted to describe the relationship between child asthma status, race/ethnicity, and non-compliance (see Table 9).

Compared to Caucasian adults with no asthmatic child, African Americans with no asthmatic children were nearly 3 times more likely (OR=2.86, 95% CI=1.68-4.90) to not comply. This was the interaction term that was statistically significant ($p<0.001$). When African Americans with no asthmatic children were compared to Hispanics with no asthmatic children, the risk for non-compliance increased to 3.79 times (95% CI=2.07-6.92, data not shown in tables). Additionally, African Americans were the only group in

which adults with an asthmatic child were significantly less likely to not comply than adults with no asthmatic children when compared within its own racial/ethnic group (OR=0.29, 95% CI=0.12-0.72, $p<0.01$, data not shown in the tables).

Separate logistic regression analyses were then conducted on each racial/ethnic subpopulation, with the exception of the Other group because the subpopulation size was too small to support this analysis. It is also important to note that results should be interpreted with caution because some are interpretations of weighted numbers that are based on a small, unweighted number of respondents. Because of this, the reader may be misled about the precision of the findings (CDC, 2006a).

The stratified analyses were consistent with the previous regression findings regarding the role of race/ethnicity in the relationship between child asthma status and home smoking ban status (see Table 10). Child asthma status was a significant predictor of non-compliance only among African Americans. The odds ratio again indicated that child asthma status was a protective factor against non-compliance. A 75% decrease in risk (OR=0.25, 95% CI=0.08-0.73) of non-compliance was seen in African American adults with an asthmatic child compared to African American adults who do not have an asthmatic child in the household.

CHAPTER 5

DISCUSSION

This study explores the relationship between household characteristics, adult sociodemographics, and non-compliance with a home smoking ban among Texas households with children. Identifying those characteristics that predict non-compliance provides useful information to guide future interventions to increase the adoption of home smoking bans.

Overall, non-compliance with a home smoking ban was low (17% of the study population). The proportion of non-compliance in this sample of Texas households with children is lower than those found in other studies in households with children, including those in Oregon with 29% non-compliance (Pizacani et al., 2003), in California with 20% (Norman et al., 1999) and in areas in the midwestern United States with 27% (Yousey, 2006). The rate of non-compliance in this population is similar to that published by Gonzales, Malcoe, Kegler, and Espinoza (2006) in a study for which non-compliance was reported in 15% of their sample of U.S. and Mexico-born Hispanic women. Considering the large proportion of Hispanics (43%) in this study, to see this similarity is not surprising.

However, nearly 10% of respondents do not have any rules restricting smoking in the home; this constitutes over half of those respondents who do not comply with a home smoking ban. This is concerning because even if a complete ban in not observed, partial bans restricting smoking at sometimes or places can help reduce ETS exposure in

household children. Efforts should be made to advise parents and caregivers that any means of protection is beneficial, especially if smoking cessation or complete bans are not successful.

This study found that the racial/ethnic group with the largest proportion of non-compliance with a home smoking ban was African Americans, followed by Caucasians, Other, and finally Hispanics. These findings were similar to other studies (including Gonzales et al., 2006; Norman et al., 1999; Shavers et al., 2006; Yousey, 2006). Compliance in Hispanics could be related to the low rates of smoking in the Hispanic population, since current smokers are more likely to not comply, as shown in this and other studies. In this study population, only 18% of Hispanic adults, compared to the overall rate of 25%, were current smokers. Even among those who smoke, Hispanic smokers had the lowest rate of non-compliance than all the other groups. African Americans did have a high rate of smoking in this study population with 25% (second to Caucasians). Among smokers, African Americans had the highest rate of non-compliance.

Regarding non-compliance and child asthma status, the current findings support Yousey's (2006) report of no significant difference in complying with a home smoking ban between households based on the presence of an asthmatic child. In the current study, slightly more than 16% of adults who reported at least one asthmatic child resident also reported non-compliance. This suggests that the presence of an asthmatic child in the home does not increase the rates of compliance. Adults with an asthmatic child in the home do not appear to take additional measures beyond those taken by adults with no

asthmatic children in the use of a home smoking ban to reduce ETS exposure. While asthmatic children appear to be protected at least as much as non-asthmatic children, ideally rates of compliance should be higher among asthmatic child households in an effort to further protect this vulnerable population from ETS exposure.

While overall childhood asthma status was not associated with home smoking ban status, nor does it predict non-compliance with a home smoking ban, the results were different when the race/ethnicity was considered as a moderator. When rates of non-compliance were stratified by child asthma status, African Americans had the highest rate in those with no asthmatic children (33.3%) and the second highest rate in those who had at least one asthmatic child (14.7%). The difference in the rates of non-compliance based on child asthma status was the highest among this African American population. When regression analysis was conducted to consider the interaction of child asthma status and race/ethnicity, African American adults with no asthmatic children were over 3 times more likely to not comply than African American adults with at least one asthmatic child. This suggests that having an asthmatic child in the household did increase the odds of complying with a home smoking ban among African Americans. This finding was not supported in other racial/ethnic groups.

African Americans protecting their asthmatic children by complying with a home smoking ban may stem from the increased risk and prevalence of childhood asthma in this population. In general, African American children suffer disproportionately from asthma. In this study population, this may also be true. While exact rates of childhood asthma could not be calculated due to limitations in the data, an estimate by using the

adult's race/ethnicity as a proxy-indicator of child ethnicity did suggest that African Americans in this study had the highest rates of childhood asthma. Complying with a home smoking ban may be the adults' way of recognizing that the asthmatic children need to be protected from ETS exposure. Despite this positive finding, African Americans still had the highest rates of non-compliance among those with and without asthmatic children.

Limitations

This study has several limitations, including the cross-sectional design of the BRFSS. This study design allows for the investigation of associations but causality cannot be established. It cannot be determined if having an asthmatic child leads to the compliance of a home smoking ban in an effort to reduce the child's symptoms or if having a home smoking ban reduces the child's ETS exposure, thus reducing the risk of developing asthma or exacerbating symptoms that would lead to an asthma diagnosis.

Another design limitation is the sampling method. The BRFSS uses a random-digit dial telephone survey design which includes only those individuals who have residential telephone service at the time of the interview (CDC, 2006a; Coffey, Ho, Adamson, Matthews, & Sewell, 2006). This introduces the potential to under-sample individuals from lower socioeconomic status (SES) because they are less likely to have phone service (Anderson, Nelson, & Wilson, 1998). Since African American children are more likely to live in a lower-SES household (ALA, 2006b), are disproportionately affected by asthma, and are less likely to live in a household that complies with a home

smoking ban (Norman et al., 1999), a negative bias toward the null might occur, with the odds ratio understating the risk for not complying with a home smoking ban among asthmatic children.

A similar effect on the odds ratio might occur because households without landline telephones are more likely to have a smoker present (CDC, 2006d). An under-representation of children living in these households, who have an increased risk of asthma due to ETS exposure, could lower the prevalence of asthma leading again to a negative bias toward the null.

Telephone surveys tend to have higher refusal rates than surveys that use in-person interviews (Groves & Kahn, 1979). Since older individuals have higher rates of refusal (Groves & Lyberg, 1988), this study might over sample younger individuals, who have higher rates of smoking (CDC, 2006e). These adults might be more likely to not comply with a home smoking ban and to have an asthmatic child because of their smoking status. This would be reflected in a positive bias away from the null, inflating the risk for not complying with a home smoking ban among asthmatic children.

Additionally, individuals with lower educational attainment are more likely to refuse participation in telephone surveys (Groves & Lyberg, 1988). Since lower education level generally coincides with lower SES, as well as with higher rates of smoking (CDC, 2004a), an inflated odds ratio might occur in a similar fashion described previously regarding the under sampling of lower SES individuals.

Previous literature has shown that a small sample size can be a limitation of BRFSS state-level data which may "increase the variance of estimates and decrease the size of the difference between two subpopulations that can be detected through the survey responses" (Coffey et al., 2006, p. 113). This could influence the results when conducting statistical tests of differences.

Variations in the BRFSS interviewer protocol may affect the quality of the data. There is standard training for all BRFSS staff and interviewers; however, their skill level or degree of experience administering telephone surveys may vary. Under-reporting or over-reporting might occur based on how well the interviewer is able to handle refusals and the extent to which they are able to probe for answers (Coffey et al., 2006). The odds ratios might be influenced in similar ways described above regarding refusal rates.

While the focus of this study is on children's ETS exposure through compliance with a home smoking ban, all available sociodemographic information is restricted to the adult respondent rather than the children. However, it is the adult who is responsible for adopting and complying with a home smoking policy and it is the adult who is responsible for their own smoking behavior, thus, it is appropriate to focus on adult-level variables when planning future interventions.

There are several issues related to the self-report nature of the BRFSS survey. First, the responses are subjective and reflect the perceptions of the adult chosen for the interview (Coffey et al., 2006; Powell-Griner, 1998). This introduces social desirability as a potential threat to the validity of the study. This type of misclassification would lend to participants falsely reporting the practice of a partial or complete smoking ban because

they think it is the more sociably acceptable response, especially if there is an asthmatic child in the house or if the respondent is a smoker. In both scenarios, the odd ratios could be negatively biased toward the null, understating the risk of not practicing a home smoking ban among households with asthmatic children and households with adult smoking respondents. In analyses of the households with an asthmatic child, this effect of smoking adults over-reporting the practice of a home smoking ban on the odds ratio might be more pronounced than in analyses only on the group without asthmatic children.

Another major concern with using a self-report method in health-related surveys is that the accuracy of the data is dependent on the honesty of the respondent and they cannot be visually verified by the interviewer (Powell-Griner, 1998). However, studies investigating this issue have generally reported high reliability and validity (Powell-Griner, 1998).

There are several limitations regarding the measurement of variables, including child asthma, adult smoking status, and ETS exposure. The questions regarding child asthma ask specifically if the child has ever been diagnosed with the condition, implying that they have been formally diagnosed by a health care provider, and that the adult respondent is aware of this diagnosis. As discussed previously, there is a considerable population of children who suffer from undiagnosed asthma and who would be misclassified as not having asthma according to the question structure of this survey.

Regarding undetected asthma, individuals who do not have health insurance and/or access to adequate health care may be more likely to go undiagnosed, particularly minorities of lower SES. However, there is evidence suggesting similar prevalence rates

of undiagnosed asthma across racial/ethnic groups (Quinn et al., 2006). If children with undiagnosed asthma are more likely to live in households that do not comply with a home smoking ban, the odds ratio would underestimate the risk of not non-compliance among asthmatic children.

The use of proxy-response for child-related asthma questions could also introduce bias. If the adult respondent is not the primary caregiver of the child, this person may not be aware of the child's health status and could misclassify the child's asthma status. Proxy-report of child asthma may also introduce the potential bias for under-reporting asthma in school age children. Younger children are more likely to have close supervision and symptoms are more likely to be observed. With less time spent at home and in the supervision of household adults, school aged children may be less likely to have their symptoms identified (Mannino, Moorman, Kingsley, Rose, & Repace, 2001; Theunissen et al., 1998).

Measurement of ETS exposure could be biased through several avenues. First, smoking status is assessed for the adult respondent, but it is unknown whether any other household members smoke. This is especially problematic if a non-smoking adult respondent lives with a smoking adult, household children would have an increased risk for asthma due to the other household member's smoking status. In analyses of the influence of adult smoking status on compliance among households with asthmatic children, the odds ratio might underestimate the risk of not complying among smoking adults.

Also, ETS exposure is only addressed in the home environment and does not include any exposure the child might receive outside their primary home, for example in public places or other private locations. Children with this increased ETS exposure are at greater risk of asthma, and if they lived with a non-smoking adult respondent who is more likely to report compliance, an over-estimation of the risk of non-compliance among smoking adults would occur in the analyses of households with asthmatic children.

This survey does not include information on the quantity of tobacco products smoked by the adult respondent or any other household smoker. Similarly, there is no information on the length of time that the child has been exposed to ETS in the home. Both of these issues could affect the risk of the child having asthma or the extent of the child's asthma symptoms.

Using compliance with a home smoking ban to assess ETS exposure rather than a biological marker may inaccurately classify exposure level. The most widely used biomarker is cotinine, a relatively stable product of nicotine metabolism which has a serum half-life of approximately 15-21 hours (Wilson, Kahn, Khoury, & Lanphear, 2005). Cotinine reflects ETS exposure that the individual experienced over the prior three to four days. While it tends to be the preferred method, recent evidence suggests that there may be racial differences in the metabolism of tobacco toxins, thus relying only on biomarker alone as a measure of ETS exposure may not be representing the true exposure across racial groups (Wilson et al., 2005).

Compliance with a home smoking ban is based on the report of the one randomly selected adult (Mumford, Levy, & Romano, 2004). Thus, measuring true compliance to a home smoking ban may be contingent on two factors. First, all household members need to be aware of the existence of such a policy, especially the adult respondent. Second, smokers might tend to report the rules more in line with their habits and practices rather than on the true policy of the household (Pizacani et al., 2003). The risk of not complying with a home smoking ban in smoking adults could be influenced in several ways, dependent on the specific context of the situation. This could also compromise the validity of using compliance with a home smoking ban as a proxy measure of ETS exposure. Also, non-smokers might not be aware of rule infractions by their smoking housemate(s). Mumford et al. (2004) reported significant inconsistencies in the reporting of compliance when more than one individual from a household was interviewed, especially among households with smokers.

Additionally, only the current status of a home smoking ban is assessed, with no information collected regarding the length of time that the smoking ban has been in place. If the ban has been practiced for an extended period of time, the beneficial effects, such as reduction in asthma symptoms, are more likely to have occurred by the time of the interview. While this might characterize the child from a current to ever asthma status, the classification of the child for the purpose of this study would not be effected if the adult accurately indicates the child as having ever been diagnosed with asthma. However, if a long standing home smoking ban prevented the occurrence of asthma in household children who would have otherwise developed asthma with more ETS exposure, then the

odds ratio would inflate the risk of not having a home smoking ban among non-asthmatic children.

Over all, there is a potential for this study to underestimate the relationship between various adult and household characteristics and non-compliance with a home smoking ban, particularly regarding adult smoking status and child asthma status. Lacking information about the smoking status of other household members as well as the lack of detailed information regarding the quantity of smoking that occurs in the presence of household children could lead to an underestimation of the risk of non-compliance. Additionally, the issue of social desirability, especially among smoking adults with asthmatic children could greatly influence the observed reporting of non-compliance, again, leading to an overall underestimation of the risk of non-compliance.

Conclusion

Despite the large number of Texas adults surveyed in the 2004 Texas BRFSS who do comply with a home smoking ban, 17% of the respondents do not. Of which, over half have no rules at all regarding smoking in the house. These results support increased efforts to promote home smoking bans as a means of protecting household members from ETS exposure in this environment. Ideally, interventions should be geared toward achieving compliance with a complete ban; however, the benefits of even a partial ban (restricting place or time of smoking) should not be overlooked. When smoking cessation or compliance with a complete ban is unsuccessful, a partial ban should be encouraged to promote strategies such as refraining from smoking while the child is present in the room or not smoking in rooms where the child spends most of his/her time.

In this study, having an asthmatic child in the household does not appear to be a predictor for not complying with a home smoking ban. However, roughly 16% of households with at least one asthmatic child do not comply with a home smoking ban, and it is important to remember that in some cases, there were more than one asthmatic child in the house, thus the proportion of children not being protected is greater than 16%. Efforts should be directed at increasing compliance among households with asthmatic children, especially when there is a smoker present.

Concerning smoking status of the adult, a clear association is seen with home smoking ban status. Overall, smokers are nearly 5 times more likely to not comply than non-smoking adults. Individuals should be screened regarding their smoking status and that of other household members, home smoking ban status, presence of children in the house, and asthma status of those children. Health care providers should use this screening as an opportunity to provide educational information and to discuss the benefits of complying with a home smoking ban, especially when smoking cessation is unsuccessful.

Future research should continue to explore the role of race/ethnicity in not complying with a home smoking ban, particularly as it appears to moderate the effects between child asthma status and home smoking ban status. With high rates of non-compliance, African Americans without asthmatic children are greatly increasing their children's risk for future health problems, including the development of asthma. This is especially concerning given the susceptibility for childhood asthma and high rates of smoking in the African American population. Results of this study also showed that

among adults with an asthmatic child, African Americans again had the highest rates of non-compliance. Together, these findings suggest that the African American population as a whole should have continued, focused efforts for reducing ETS exposure.

Since rates of non-compliance vary considerably across race/ethnic group, studies should investigate the ethnic-specific pathways to identify the characteristics related to compliance among each racial/ethnic group. This knowledge would be important in contributing to intervention planning in subpopulations. Overall, home smoking bans, both complete and partial, should continue to be promoted as strategies in reducing and eliminating ETS exposure in children.

Table 1

Adult Sociodemographics and Household Characteristics

	%	*n*
Gender		
Male	44.9	762
Female	55.1	1,575
Race/Ethnicity		
Caucasian	43.5	1,065
African American	9.8	231
Hispanic	43.3	962
Other	3.4	68
Age (years)		
18-29	29.1	567
30-39	33.0	815
40-49	25.6	638
50-59	8.8	225
60+	3.5	79
Marital status		
Married/Cohabitating	74.8	1,633
Divorced/Widowed/Separated	13.9	454
Never married	11.3	239
Education		
< High school	25.7	509
High school graduate	26.2	616
Some college	23.2	576
College graduate	24.9	632
Employment status		
Employed	66.7	1,540
Homemaker	14.1	378
Unemployed	19.2	410
Number of household adults		
One adult	9.0	471
Two or more adults	91.0	1,866
Number of household children [a]	2.0 ± 0.03	

Note. Percentages are weighted and *n*'s are unweighted. [a] Presented as mean ± standard error.

Table 2

Distribution of Adult Smoking-Related Variables and Child Asthma Status by Race/Ethnicity

	Total	Caucasian	African American	Hispanic	Other	χ^2 (df)
Current smoking status	*n*=2,225	*n*=1,037	*n*=216	*n*=911	*n*=61	31.12 (3) ***
Current smoker	24.6	31.3	25.0	18.0	18.6	
Non-smoker	75.4	68.7	75.0	82.0	81.4	
Perceived harmfulness of ETS	*n*=2,067	*n*=982	*n*=198	*n*=834	*n*=53	0.90 (3)
Not at all/Not very harmful	6.1	6.3	5.1	6.3	3.9	
Somewhat/Very harmful	93.9	93.7	94.9	93.7	96.1	
Child asthma status	*n*=2,183	*n*=1,017	*n*=211	*n*=893	*n*=62	2.57 (3)
At least one asthmatic child	18.7	19.0	20.3	17.3	27.7	
No asthmatic children	81.3	81.0	79.7	82.7	72.3	

Note. Percentages are weighted and *n*'s are unweighted denominators. *** $p<0.001$

Table 3

Distribution of Adult Smoking-Related Variables by Child Asthma Status

	Child asthma status			
	Total	At least one asthmatic child	No asthmatic children	χ^2 (df)
Current smoking status	*n*=2,183	*n*=430	*n*=1,753	4.70 (1) *
Current smoker	23.0	28.3	21.7	
Non-smoker	77.0	71.7	78.3	
Perceived harmfulness of ETS	*n*=2,062	*n*=406	*n*=1,656	1.51 (1)
Not at all/Not very harmful	6.1	4.7	6.4	
Somewhat/Very harmful	93.9	95.3	93.6	

Note. Percentages are weighted and *n*'s are unweighted denominators. * $p<0.05$

Table 4

Proportion of Non-Compliance With a Home Smoking Ban by Adult Sociodemographics and Household Characteristics

	% (*n*)	χ^2 (df)
Gender		0.68 (1)
Male	16.2 (707)	
Female	17.8 (1,482)	
Race/Ethnicity		24.73 (3) ***
Caucasian	19.0 (1,015)	
African American	30.0 (212)	
Hispanic	12.4 (890)	
Other	13.8 (61)	
Age (years)		10.33 (4) *
18-29	15.1 (521)	
30-39	14.7 (778)	
40-49	20.5 (600)	
50-59	20.4 (207)	
60+	27.5 (72)	
Marital status		26.80 (2) ***
Married/Cohabitating	14.1 (1,544)	
Divorced/Widowed/Separated	28.7 (420)	
Never married	24.4 (215)	
Education		27.06 (3) ***
< High school	18.4 (454)	
High school graduate	21.2 (572)	
Some college	18.9 (557)	
College graduate	10.0 (603)	
Employment status		16.22 (2) ***
Employed	15.1 (1,448)	
Homemaker	13.7 (352)	
Unemployed	26.7 (381)	
Number of household adults		8.78 (1) **
One adult	24.1 (439)	
Two or more adults	16.4 (1,750)	

Note. Percentages are weighted and *n*'s are unweighted denominators. * $p<0.05$; ** $p<0.01$; *** $p<0.001$

Table 5

Proportion of Non-Compliance With a Home Smoking Ban by Adult Smoking-Related Variables and Child Asthma Status

	% (*n*)	χ^2 (df)
Current smoking status		88.49 (1) ***
Current smoker	38.2 (479)	
Non-smoker	10.7 (1,707)	
Perceived harmfulness of ETS		6.02 (1) *
Not at all/Not very harmful	28.2 (124)	
Somewhat/Very harmful	16.1 (1,949)	
Child asthma status		0.08 (1)
At least one asthmatic child	16.3 (427)	
No asthmatic children	16.8 (1,743)	

Note. Percentages are weighted and *n*'s are unweighted denominators.
* $p<0.05$; *** $p<0.001$

Table 6

Proportion of Non-Compliance With a Home Smoking Ban by Race/Ethnicity by Child Asthma Status and Adult Smoking-Related Variables

		Caucasian % (*n*)	African Amer. % (*n*)	Hispanic % (*n*)	Other % (*n*)
Child asthma status					
At least one asthmatic child		22.3 (194)	14.7 (54)	10.6 (163)	10.9 (16)
No asthmatic children		18.0 (814)	33.3 (157)	12.1 (719)	15.6 (44)
	χ^2 (df)	1.12 (1)	6.77 (1) **	0.21 (1)	0.21 (1)
Current smoking status					
Current smoker		43.9 (277)	54.9 (41)	23.0 (150)	32.2 (10)
Non-smoker		7.9 (737)	22.4 (171)	10.3 (739)	10.3 (50)
	χ^2 (df)	78.65 (1) ***	9.52 (1) **	8.52 (1) **	1.96 (1)
Perceived harmfulness of ETS					
Not at all/Not very harmful		38.5 (56)	31.2 (9)	14.3 (55)	100.0 (2)
Somewhat/Very harmful		16.3 (923)	30.4 (189)	12.6 (777)	12.3 (52)
	χ^2 (df)	7.78 (1) **	0.002 (1)	0.07 (1)	1.94 (1)

Note. Percentages are weighted and *n*'s are unweighted denominators. * $p<0.05$; ** $p<0.01$; *** $p<0.001$

Table 7

Odds Ratios and 95% Confidence Intervals From the Logistic Regression Models Predicting Non-Compliance With a Home Smoking Ban (N=2,019)

	OR	95% CI
Male (Ref: Female)	0.75	0.53-1.07
Age (Ref: 18-29 years)		
30-39	1.72 *	1.12-2.65
40-49	2.14 **	1.36-3.37
50-59	2.08 *	1.17-3.72
60+	1.47	0.65-3.30
Race/Ethnicity (Ref: Caucasian)		
African American	2.31 ***	1.41-3.79
Hispanic	0.72	0.47-1.08
Other	1.46	0.55-3.80
Number of household children (Continuous)	0.92	0.78-1.10
Marital status (Ref: Married/Cohabitating)		
Separated/Divorced/Widowed	1.72 **	1.19-2.47
Never married	1.73	1.00-2.99
Education (Ref: College graduate)		
< High School	2.09 *	1.18-3.69
HS diploma/GED	1.80 *	1.14-2.85
Some college	1.61 *	1.04-2.48
Employment status (Ref: Employed)		
Homemaker	1.24	0.77-1.99
Unemployed	1.41	0.94-2.13
Child asthma status (Ref: No asthmatic children)		
At least one asthmatic child	0.76	0.51-1.13
Current smoking status (Ref: Non-smoker)		
Current smoker	4.65 ***	3.33-6.49
Perceived harmfulness of ETS (Ref: Somewhat/Very harmful)		
Not at all/Not very harmful	2.07 *	1.15-3.72
R-square	13.0%	

Note. Controlling for geographical location. * $p<0.05$; ** $p<0.01$; *** $p<0.001$

Table 8

Odds Ratios and 95% Confidence Intervals From the Logistic Regression Models Predicting Non-Compliance With a Home Smoking Ban, Including Interaction Term (N=2,019)

	OR	95% CI
Male (Ref: Female)	0.75	0.52-1.06
Age (Ref: 18-29 years)		
30-39	1.73 *	1.13-2.67
40-49	2.15 **	1.37-3.39
50-59	2.11 *	1.18-3.74
60+	1.54	0.68-3.46
Race/Ethnicity (Ref: Caucasian)		
African American	2.86 ***	1.68-4.90
Hispanic	0.75	0.49-1.17
Other	1.61	0.50-5.20
Number of household children (Continuous)	0.92	0.77-1.09
Marital status (Ref: Married/Cohabitating)		
Separated/Divorced/Widowed	1.75 **	1.21-2.53
Never married	1.81 *	1.04-3.14
Education (Ref: College graduate)		
< High School	2.11 *	1.20-3.74
HS diploma/GED	1.80 *	1.14-2.83
Some college	1.63 *	1.05-2.52
Employment status (Ref: Employed)		
Homemaker	1.23	0.77-1.98
Unemployed	1.36	0.90-2.06
Child asthma status (Ref: No asthmatic children)		
At least one asthmatic child	0.99	0.55-1.77
Current smoking status (Ref: Non-smoker)		
Current smoker	4.60 ***	3.29-6.43
Perceived harmfulness of ETS (Ref: Somewhat/Very harmful)		
Not at all/Not very harmful	2.05 *	1.14-3.72
Interaction (Ref: Non-asthmatic child/Caucasian)		
Asthma child/ African American	0.30 *	0.10-0.86
Asthma child/Hispanic	0.75	0.32-1.76
Asthma child/Other	0.66	0.10-4.19
R-square	13.2%	

Note. Controlling for geographical location. * $p<0.05$; ** $p<0.01$; *** $p<0.001$

Table 9

Odds Ratios and 95% Confidence Intervals From the Logistic Regression Model Predicting Non-Compliance With a Home Smoking Ban, Including Combination Interaction Term (N=2,019)

	OR	95% CI
Male (Ref: Female)	0.75	0.52-1.06
Age (Ref: 18-29 years)		
30-39	1.73 *	1.13-2.67
40-49	2.15 **	1.37-3.39
50-59	2.11 *	1.18-3.74
60+	1.54	0.68-3.46
Number of household children (Continuous)	0.92	0.77-1.09
Marital status (Ref: Married/Cohabitating)		
Separated/Divorced/Widowed	1.75 **	1.21-2.53
Never married	1.81 *	1.04-3.14
Education (Ref: College graduate)		
< High School	2.11 *	1.20-3.74
HS diploma/GED	1.80 *	1.14-2.83
Some college	1.63 *	1.05-2.52
Employment status (Ref: Employed)		
Homemaker	1.23	0.77-1.98
Unemployed	1.36	0.90-2.06
Current smoking status (Ref: Non-smoker)		
Current smoker	4.60 ***	3.29-6.43
Perceived harmfulness of ETS (Ref: Somewhat/Very harmful)		
Not at all/Not Very harmful	2.05 *	1.14-3.72
Interaction (Ref: Non-asthmatic child/Caucasian)		
Asthma child/Caucasian	0.99	0.55-1.77
Asthma child/African American	0.84	0.37-1.89
Non-asthmatic child/African American	2.86***	1.68-4.90
Asthma child/Hispanic	0.56	0.29-1.09
Non-asthmatic child/Hispanic	0.76	0.49-1.17
Asthma child/Other	1.04	0.27-4.05
Non-asthmatic child/Other	1.61	0.50-5.20
R-square	13.2%	

Note. Controlling for geographical location. * $p<0.05$; ** $p<0.01$; *** $p<0.001$

Table 10

Odds Ratios and 95% Confidence Intervals From the Logistic Regression Models Predicting Non-Compliance With a Home Smoking Ban by Race/Ethnicity

	Caucasian (N=1,065)		African American (N=231)		Hispanic (N =962)	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Male (Ref: Female)	0.58	(0.34-1.01)	0.87	(0.28-2.72)	1.06	(0.59-1.89)
Age (Ref: 18-29 years)						
30-39	1.64	(0.80-1.39)	2.15	(0.52-8.91)	2.27 *	(1.21-4.25)
40-49	2.26 *	(1.07-4.78)	3.19	(0.82-12.46)	2.80 **	(1.35-5.77)
50-59	2.62 *	(1.08-6.35)	9.88 **	(1.90-51.27)	0.78	(0.22-2.75)
60+	1.24	(0.32-4.81)	4.27	(0.69-26.40)	0.35	(0.04-3.21)
Number of household children (Continuous)	1.03	(0.80-1.33)	0.83	(0.50-1.37)	0.89	(065-1.22)
Marital status (Ref: Married/Cohabitating)						
Separated/Divorced/Widowed	1.71	(0.97-3.02)	1.73	(0.57-5.24)	1.82 *	(1.03-3.23)
Never married	3.15 *	(1.10-8.98)	1.60	(0.39-6.58)	1.72	(0.76-3.89)
Education (Ref: College graduate)						
< High School	3.74 **	(1.59-8.78)	2.40	(0.46-12.56)	1.05	(0.43-2.55)
HS diploma/GED	1.68	(0.91-3.08)	4.20	(0.90-19.70)	1.18	(0.50-2.78)
Some college	1.62	(0.93-2.83)	3.41	(0.67-17.3)	1.21	(0.51-2.86)
Employment status (Ref: Employed)						
Unemployed	1.04	(0.51-2.13)	2.42	(0.73-8.07)	1.46	(0.76-2.83)
Homemaker	0.98	(0.48-1.98)	2.66	(0.45-15.52)	1.31	(0.63-2.72)
Child asthma status (Ref: No asthmatic children)						
At least one asthmatic child	0.92	(0.47-1.80)	0.25 *	(0.08-0.734)	0.78	(0.43-1.42)
Current smoking status (Ref: Non-smoker)						
Current smoker	7.42 ***	(4.49-12.28)	6.56 **	(2.04-21.14)	2.16 *	(1.20-3.89)
Perceived harmfulness of ETS (Ref: Somewhat/Very harmful)						
Not at all/ Not very harmful	3.98 **	(1.70-9.35)	0.46	(0.07-3.12)	1.29	(0.43-3.88)
R-square	20.8%		27.7%		5.6%	

Note. Controlling for geographical location. * $p<0.05$; ** $p<0.01$; *** $p<0.001$

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