Second Hand Smoke Exposure and Cigarette Smoking

Among Latino Ethno-cultural Groups in the United States

BY

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DISSERTATION

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I dedicate this thesis to my beloved family in the United States, Colombia, Paraguay, and France. Their unwavering support throughout this journey made its completion possible. I dedicate it to my sons Sébastien and Arturo Nacher Navas, who were my main source of inspiration towards reaching this important step in my career path and personal life. I also dedicate it to Thomas Nacher Prizer, whose hard work and dedication to our sons allowed me to pursue this degree in the first place, and bring it to an end.

I also dedicate this thesis to my immediate family. My parents J. Alberto Navas Sierra and Lucía Aparicio Laserna were also a source of inspiration for this thesis project. They have guided me since birth, and instilled in me great courage, curiosity for learning, a privileged education, and compassion and love towards disadvantaged communities in Colombia and abroad. All of these qualities have allowed me to reach this academic goal, and will continue to drive my dreams and aspirations as a public health servant. My siblings Joaquin and Carolina Navas Aparicio also kept me going in times of doubt and despair. Nora Colella, our adopted grand-mother in the United States also provided great support with childcare throughout the years. I would not have been able to accomplish this academic milestone without the everlasting support, advice and patience from all of these very spetly individual individuals.

Last but not least, I dedicate it to my grandparents, Arturo Aparicio Jaramillo, Nora Sierra de Navas, Elena Laserna Pinzon and Olimpo Navas Navarro for their pioneer and visionary work in the fields of medicine, sociology and community engagement among underserved Colombian communities. Their work as public health advocates and practitioners focused on addressing the socioeconomic inequities of health and access to health care deeply inspired since a very early age to pursue a career in the biological sciences and community-engaged work.
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to contribute to the improvement of health among international populations, particularly those who are sociodemographically disadvantaged.

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Last but not least, I thank all individuals who made the Hispanic Community Health Study/Study of Latinos (HCHS/SOL) possible, particularly the study participants. I would not have been able examine social influences of cigarette smoking (CSMK) among Latinos populations residing in the United States without your participation in this landmark study of Latino health.
CONTRIBUTION OF AUTHORS

Chapter I provides an introduction on my dissertation topic that frames my specific aims in the context of the larger field of tobacco use and highlights the significance of my research questions. Chapter II provides a thorough literature review on the study’s main topics, i.e., cigarette smoking, secondhand exposure, gender, and acculturation. It includes Figure 2 which was previously published by Richard Edwards in the British Medical Journal. See copy of the publisher website granting authors’ permission to reuse their work in Appendix C. Chapter III describes the study methodology, including an overall description of the Hispanic Community Health Study/Study of Latinos (HCHS/SOL), data analysis and the study’s potential limitations. Chapter IV includes three separate manuscripts which will be co-authored by my dissertation committee members and other HCHS/SOL investigators. My academic advisor (Dr. Michele Kelley) and committee members (Drs. Daviglus, Chavez, Johnson and Giachello) contributed to the writing of these manuscripts. I will be first author in all three manuscripts. Chapter V provides a synthesis of my research, and discusses its public health significance and implications for future research in the topic of tobacco use among ethnoculturally diverse Hispanics/Latinos residing in the United States.
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LIST OF ABBREVIATIONS

AA      African American
BRFSS   Behavioral Risk Factor Surveillance System
CARMELA Cardiovascular Risk Factor Multiple Evaluation in Latin America
CC      Coordinating Center
CCSMK   Current Cigarette Smoking
CSMK    Cigarette Smoking
CHD     Coronary Heart Disease
CVD     Cardiovascular Disease
DMS     Data Management System
FCTC    Framework Convention on Tobacco Control (→WHO)
GATS    Global Adult Tobacco Survey (→WHO/CDC)
HBP     High Blood Pressure
HCHS/SOL Hispanic Community Health Study/Study of Latinos
HSHS    Home Second Hand Smoke
IRB     Institutional Review Board
MA      Mexican American
NHIS    National Health Interview Survey
NHW     Non-Hispanic White
NIH     National Institutes of Health
OSHS    Occupational Second Hand Smoking
OR      Odds Ratio
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<td>PR</td>
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<td>SASH</td>
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<td>SHS</td>
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<td>WHO</td>
<td>World Health Organization</td>
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SUMMARY

The current study examined the association between home and occupational exposure with secondhand smoke (SHS) adult cigarette smoking (CSMK) behavior among a diverse Hispanic/Latino population living in four U.S. urban centers. Additionally, it evaluated the effect of gender on this association. The study’s conceptual framework was based on social cognitive and socio- and behavioral ecological theories. At this time, there is a paucity of research on the effect of SHS exposure on CSMK among Hispanics/Latinos residing in the United States, and how gender impacts this association. To address these gaps in the tobacco literature, the current cross-sectional observational study utilized baseline data from the Hispanic Community Health Study/Study of Latinos (HCHS/SOL) (n=16,354, ages 18–74 years) using logistic regression. The findings showed that past and current SHS exposure was positively and significantly associated with adult current cigarette smoking (CCSMK). In addition, gender moderated this association. These data provide insight into the role played by past and current SHS exposure in the home and work environments on adult CSMK behavior, as well as the effect of gender, among ethno-culturally diverse Hispanics/Latinos.
I. INTRODUCTION

A. Background

Tobacco use is the single most prevalent cause of death and disease in the United States (Giovino, 2007). Cigarette smoking is a major contributor to morbidity and mortality in this country, accounting for over 400,000 premature deaths, of which almost 50,000 are among nonsmokers as a result of exposure to SHS (Adhikari, 2008; Giovino, 2007; U.S. Surgeon General, 2006). It also accounts for nearly $200 billion in health-care expenditures and productivity losses annually. Among Hispanics/Latinos, the largest growing minority group in the United States, the adverse public health consequences are pronounced, as three out of four leading causes of death (heart disease, cancer, and stroke) among Hispanics/Latinos are related to CSMK (Heron, 2009).

Secondhand smoke (SHS) exposure is defined as the smoke emitted from smokers’ burning cigarettes that is inhaled by surrounding nonsmokers. As a carcinogen, SHS represents a major health risk to nonsmokers (U.S. Environmental Protection Agency, 1992). Extensive epidemiologic and clinical evidence from cohort case-control designs and meta-analysis has shown that SHS increases the risk of major chronic diseases such as cardiovascular disease (CVD), lung cancer, and respiratory diseases (U.S. Environmental Protection Agency, 1992; U.S. Surgeon General, 2006).

Healthy People 2020 Objectives target tobacco use with the specific goal of reducing illness, disability, and death related to tobacco use and SHS (CDC, 2010). The objectives for social and environmental changes include reducing the proportion of nonsmokers exposed to SHS, and increasing the proportion of smoke-free homes (CDC, 2010). Despite efforts to reduce tobacco use and environmental SHS, current national SHS exposure prevalence remains high: national data showed that close to 40% of nonsmoking adults aged 18 years and older were exposed to SHS in 2005–2008, and that 20% of individuals in this age group smoked cigarettes (Kaufmann, 2010). While Hispanic/Latinos have lower overall rates of exposure to SHS (20%) than other racial/ethnic groups, limited data show that these
rates differ for certain Hispanic/Latino ethnic subgroups. Nationally, Hispanics/Latinos report lower CSMK rates (13%) than non-Hispanic Whites (NHWs) (21%), although rates vary by age, gender, and ethnic subgroups (Kaufman, 2010; CDC, 2011h). In 2010, the overall percent of Hispanic/Latino men who smoked (16%) was closer to those of White men (22%), and almost double that of Hispanic/Latino women (9%) (CDC, 2011h; CDC, 2012b). In addition, limited data show that there is significant heterogeneity in CSMK prevalence rates across Hispanic/Latino ethno-cultural, age, and gender subgroups. For example, Cubans (22%), Mexican Americans (MA) (20%) and Puerto Ricans (PR) (18%) have higher CSMK rates, compared to Mexicans (11%) and Dominicans (10%). Puerto Ricans are the only Hispanic/Latino group with a smoking rate that is higher for women (20%) than men (16%) (CDC, 2010a). Moreover, the estimate for CCSMK among Hispanic/Latino adolescents (grades 9–12) is 22%, which is similar to the national prevalence rate for similar age youth (23%) (CDC, 2010a).

Cigarette smoking is a complex behavior influenced by numerous biological, behavioral, and environmental factors operating at multiple levels. They include individual (physiological and psychological factors), demographic (age, gender, socioeconomic factors), sociocultural (norms, attitudes, beliefs, country of origin, nativity, and acculturation level) and environmental influences (familial, occupational, social, mass media, and political) (Giovino, 2007). Although biological factors such as susceptibility to nicotine addiction are important, they are not the focus of this investigation.

Exposure to SHS in the home and work environments, and social influences (e.g., parental, sibling, peers, and colleagues) have also been shown to play a role in the onset and maintenance of CSMK behavior (Hill, 2005). Findings from two prospective studies showed that parental CSMK significantly increased the risk of daily CSMK behavior among adolescents (Hill, 2005). Based on this evidence and that of other investigations focusing on the sociocultural etiology of CSMK, this study’s evaluation of the role played by past and/or current social influences/exposure to SHS in the home and work environments on CCSMK behavior will be informed by the Social Cognitive Theory (SCT), and the Socio-Behavioral Ecological Theories (SBET) (Bandura, 2001; Emery, 2000).
In addition, disparities and inequities in CSMK and SHS exposure exist in relation to racial/ethnic groups as well as gender, income and educational level. Secondhand smoke exposure tends to be higher for males and females with low income and educational level: 60% of persons living below the poverty level in the United States were exposed to SHS in 2007–2008 (Kaufmann, 2010). However, no large studies have determined how the SHS rates vary across representative and diverse Hispanic/Latino subgroups.

Furthermore, acculturation and length of stay in the United States have also been associated with increased CSMK and exposure to SHS among Hispanics/Latinos (Bethel, 2005; Wilkinson, 2005). Within the Hispanic/Latino population (mostly MAs), the scientific evidence on the relationship between acculturation and CSMK has yielded conflicting results (Bethel, 2005; Wilkinson, 2005). Overall, the findings suggest that smoking behavior, knowledge, and beliefs about CSMK are related to both gender and level of acculturation with a number of studies showing that higher levels of acculturation are consistently associated with increased CSMK prevalence among women but not men. This evidence supports the idea that as Hispanics/Latinos become more acculturated, their CSMK behavior becomes more similar to that of NHWs (Bethel, 2005; Wilkinson, 2005). These data are particularly worrisome for Hispanic/Latino women, particularly adolescent Latinas, as they acculturate to United States norms and values. Acculturation and nativity have also been shown to influence the exposure to SHS in the home environment (Gonzales, 2006). For example, 95% of Mexican-born mothers ban CSMK in their homes, compared with 78% of U.S.-born Hispanic/Latino mothers (Gonzales, 2006). This may indicate that as length of stay in the United States increases, CSMK increases and SHS exposure becomes a more serious problem for family members.

There is a paucity of research on the effect of exposure to SHS in the home and work environments on CSMK behavior across Hispanic/Latino subgroups. No previous studies evaluated the relationship between exposure to SHS in the home and work environments (as proxy for social influences) and CSMK among a population representative of the diverse heritage, socioeconomic
position, and acculturation status of the U.S. Hispanic/Latino population. The current study will address gaps in the literature by examining the association between exposure to SHS in the home and work environments (as proxy for social influences) and CCSMK status among a large national sample of diverse Hispanic/Latino ethno-cultural groups. It will utilize data from the HCHS/SOL, a multicenter community based cohort study of adult Hispanics/Latinos, ages 18 to 74 years. It will use SCT and SBET (Bandura, 2001; Emery, 2000) as a conceptual framework to evaluate the association between familial and occupational influences (e.g., parental and peer CSMK behavior) and CCSMK status among Hispanics/Latinos of diverse ethno-cultural backgrounds.

B. **Statement of the Problem**

Although national data suggest that the prevalence of CSMK and exposure to SHS is lower among Hispanics/Latinos living in the United States, there is very limited information on how CSMK varies across diverse Hispanic/Latino ethno-cultural groups. Differences in CSMK behavior and exposure to SHS across Hispanic/Latino subgroups defined by national heritage and gender have not been thoroughly studied. It is not clear whether CSMK in the home and work environments and familial/occupational influences play protective or deleterious roles in the CSMK behavior of these population. Understanding the conditions by which social influences in the home and work environments and other factors (e.g., gender and acculturation status) may be associated with CCSMK status is an important component of factors shown to influence CSMK behavior among Hispanics/Latinos residing in this country.

C. **Significance of the Problem**

Current cigarette smoking is a major contributor to morbidity and mortality in the United States (Adhikari, 2008). For the Hispanic/Latino population in this country, tobacco use is the leading preventable cause of death, and accounts for at least 30% of all cancer deaths (Heron, 2009). Current cigarette smoking behavior and exposure to SHS among diverse Hispanic/Latino subgroups is largely unknown. Disparities and social inequities in CSMK and SHS exposure exist in relation to gender,
racial/ethnic groups, income, and educational level. Secondhand smoke exposure tends to be higher for men and individuals with low income and educational level.

Current cigarette smoking is a complex behavior influenced by individual, demographic, socioeconomic status (SES), and environmental factors. In addition to these factors, cultural characteristics, such as degree of acculturation (e.g., language use-preference, nativity, length of stay in the United States, generational status, and media/social preferences), *familismo, respeto,* and *simpatía* have been shown to play a key role in the CSMK behavior among Hispanics/Latinos.

Exposure to SHS in the home and work environments, and familial/occupational influences (e.g., family/peer CSMK behaviors) have also been shown to play a role on the onset and maintenance of CSMK behavior (Hill, 2005). Family and peer CSMK behavior appear to influence smoking behavior among individuals of certain Hispanic/Latino ethno-cultural groups (e.g., MAs and PRs) but its effect on other groups warrants further investigation.

D. **Significance of the Study**

Further investigation of the association between exposure to SHS in the home and work environments (as a proxy for social influences) and CSMK behavior among diverse Hispanic/Latino subgroups is strategic in terms of understanding how CSMK behavior differs across Hispanics/Latinos by gender, ethno-cultural background, SES, and level of integration with mainstream U.S. culture. Understanding the conditions by which family/peer influences and other factors (e.g., gender, nativity, acculturation status, income, and occupational type) may be associated with CCSMK status could suggest points for intervention and prevention, and may help to target tobacco-control resources more effectively. This study is warranted since CSMK in the home has become the most important environmental source of SHS exposure following enforcement of tobacco-control policies in work settings and public places, and a large number of non-skilled workers are still not fully protected by tobacco-control policies in public places (U.S. Surgeon General, 2006; Shopland, 2004; Arheart, 2008).
E. **Purpose of the Study**

The purpose of this cross-sectional study is to evaluate the association between exposure to SHS in the home and work environments (as proxy for social influences) and CCSMK in Hispanic/Latino populations. It will use baseline data from the HCHS/SOL study, a diverse Hispanic/Latino ethno-cultural groups. Approximately 16,000 men and women ages 18–74 living in four urban U.S. regions were recruited. In addition, it examined whether or not gender moderates the association between exposure to SHS in the home and workplace and CCSMK status. The consumption of other tobacco products (e.g., cigars, pipes, and smokeless tobacco) by Hispanics/Latinos is of concern but will not be examined in this study.

F. **Aims of the Study and Research Questions**

The overall aim of this study is to describe the association between past and current exposure to SHS in the home and work environments (as a proxy for social influences) and CCSMK status across diverse Hispanic/Latino subgroups living in four U.S. urban areas. Secondarily, this study inquires whether gender moderates this association in these specific population groups.

1. **Specific aims**

The specific aims (SAs) are:

**SA 1:** Describe variation in past and current SES exposure (as proxy for social influences) in the home and work environments among Hispanic/Latino groups defined by age, gender, Hispanic/Latino ethno-cultural group (Mexican, Cuban, PR, Dominican, Central American, and South American), education level, income, occupational status, acculturation measures, health insurance, asthma diagnosis, and/or geographic location (defined as a specific HCHS/SOL field center).

**SA 2:** Examine the association between exposure to SHS (past exposure in the home environment) and CCSMK status across Hispanic/Latino ethno-cultural groups.

**SA 3:** Examine the association of SHS exposure with CCSMK status across Hispanic/Latino ethno-cultural groups.
SA 4: Test for a possible moderating effect of gender on the association of SHS exposure (past and/or current exposure in the home and work environments) with CCSMK status.

2. **Specific research questions**

   The specific research questions (RQs) for this study are:

   **RQ1**: How does past and/or current exposure to SHS in the home and work environment vary across Hispanic/Latino groups defined by age, gender, SES, ethno-cultural group, and degree of acculturation? (→ SA1)

   **RQ2**: What is the association between past and current SHS exposure in the home environment and CCSMK status? (→ SA2)

   **RQ3**: Does this association vary across Hispanic/Latino ethno-cultural groups defined by age, gender, SES, ethno-cultural group, and degree of acculturation? (→ SA2)

   **RQ4**: What is the association between current SHS exposure and CCSMK status? (→ SA3)

   **RQ5**: Does this association vary across Hispanic/Latino ethno-cultural groups defined by age, gender, SES, ethno-cultural background, and degree of acculturation? (→ SA3)

   **RQ6**: Does gender moderate the association of home and SHS exposure with CCSMK status? (→ SA4)

   The relationships between SAs and RQs are summarized in Figure I below.

   Based on existing literature, it is hypothesized that prevalence of exposure to SHS and CSMK will vary across the above described Hispanic/Latino subgroups. Younger, male, lower SES, and more acculturated women will report higher prevalence of SHS exposure and CCSMK compared to their respective counterparts—i.e., older, female, higher SES, and less-acculturated women. Very limited investigations have examined differences in SHS exposure and CSMK among large, representative, and ethno-culturally diverse Hispanic/Latino populations residing in the United States. Hence, that aspect of this study will be carried out on an exploratory basis.
Based on this study’s conceptual framework supported by SCT and SBET theories, exposure to SHS in home and work environments will likely be associated with current cigarette use among the various Hispanic/Latino demographic and ethno-cultural groups described above. Furthermore, and also based on existing literature, we hypothesize that gender will act as a moderator in the association of home and SHS exposure (as a proxy for social influences) with CCSMK.
II. LITERATURE REVIEW

The following section provides an overview of the literature related to the prevalence rates and trends of CSMK in this country and Latin America. First, an overview of health risks and outcomes related to CSMK and exposure to SHS will be provided. This will be followed by a discussion of the main sociocultural factors related to CSMK and SHS exposure among Hispanics/Latinos (e.g., gender roles and acculturation). Third, a review of health disparities and inequities related to CSMK and SHS exposure among Hispanics/Latinos will be described. Last, an overview of SCT and SBET theories and their applicability to the study will also be included.

A. Cigarette Smoking

1. Cigarette smoking rates and trends among Hispanic/Latinos in the United States

In the United States, the prevalence of CSMK among adults (aged >18 years) slightly declined between 2005 (20.9%) and 2010 (19.3%), representing approximately 3 million fewer smokers. However, CSMK remains a continuing and serious public health problem in this country; in 2010, an estimated 45.3 million people, approximately 1 in 5 U.S. adults, were current cigarette smokers (CDC, 2011h). Data from the National Health Interview Surveys (NHIS, 2005–2010), and the Behavioral Risk Factor Surveillance System (BRFSS, 2010) survey showed that CSMK prevalence rates differed by age, gender, educational attainment, poverty status, U.S. census region, and race/ethnicity (CDC, 2011h). In general, CSMK prevalence varied by age; adults ≥ 65 years showed the lowest prevalence (9.5%), while those aged 25–44 years had the highest prevalence (22%). This pattern of CSMK by age group was seen for both men and women. With regard to gender, the percentage of current smokers was higher among men (21.5%) than women (17.3%). The overall CSMK prevalence decreased with increasing years of education; CSMK estimates were highest for individuals who had a high school diploma (45%) or some education (9–11 years, 33.8%), and lowest for those who had completed an undergraduate (9.9%) or graduate college degree (6.3%). Adults living below the poverty level were more likely to be current cigarette smokers (28.9%) compared to those at or above the poverty level (18.3%).
These prevalence patterns suggest that socially disadvantaged populations, including Hispanics/Latinos, are disproportionately affected by CSMK-related morbidity and mortality, further exacerbating health disparities and inequities. In terms of geographic region, prevalence was highest in the Midwest (21.8%) and South (21%), and lowest in the West (15.9%) (CDC, 2011h). With regard to the states where HCHS/SOL study sites are located, data from the 2009 BRFSS survey showed that while Illinois, New York, and Florida have similar overall prevalence rates (around 18%), California had the lowest rate (13%) (CDC, 2011h).

Comparisons across racial/ethnic groups showed that Hispanics/Latinos had lower CSMK rates (13%) than NHWs (21%). However, the overall percent of Hispanic/Latino men who smoke (16%) was closer to that of White men (22%), and almost double that of Hispanic/Latino women smokers (9%) (CDC, 2011h). These data suggest that the overall lower national prevalence of CSMK among Hispanics/Latinos is in part a result of the lower proportion of women who report CSMK (e.g., Mexican and Central American women). In addition, limited evidence shows that there is significant heterogeneity in CSMK prevalence rates across Hispanics/Latinos of different heritages and countries of origin (CDC, 2011h). Compared to prevalence rates reported for Mexicans (11%), Dominicans (10%), and Central/South Americans (12%), Cubans (22%), MAs (20%) and PRs (18%) have higher CSMK rates; the latter are comparable or higher than the overall U.S. 2010 prevalence estimate (19.3%) (CDC, 2011h). In addition, PR women are nearly twice as likely to smoke cigarettes as women of other Hispanic/Latino ethnic groups.

Moreover, there is a growing concern regarding CSMK among Hispanic/Latino adolescents; in 2009, the U.S. national estimate for CCSMK among Hispanic/Latino adolescents (grades 9–12) was 18%, which is similar to the national prevalence rate for similar age NHW youth (19.5%) (CDC, 2011h). Data from the Youth Risk Behavior Survey showed that 19.4% of male and 16.7% of female Hispanic/Latino high school students currently smoked cigarettes. These rates were higher than those for their African American (AA) counterparts (10.7% for boys, 8.4% for girls), and closer to the proportions of NHW
adolescents (22.3% for boys, 22.8% for girls) (CDC, 2011h). In addition, the youth gender difference in CSMK prevalence rates (2.7%) was much smaller than that observed for adult Hispanic/Latino men and women (7%), suggesting that CSMK is a growing problem among Hispanic/Latina adolescents.

Studies evaluating CSMK among diverse Hispanic/Latino ethno-cultural groups also showed that, similar to NHWs, CSMK prevalence rates among Hispanic/Latino varied by age, gender, education, and income (CDC, 2011h). In general, individuals older than 55 years were less likely to smoke than those in younger age groups (18–54 years) (CDC, 2011h). Overall, Hispanic/Latino men living in the United States were more likely to be cigarette smokers than Hispanic/Latino women. As mentioned above, the gender gap in CSMK prevalence is wider between Hispanic/Latino men (16%) and women (9%) than for their NHW counterparts (22% and 19%, respectively) (CDC, 2012b). The gender difference was true for Hispanics/Latinos of various ethnic heritages, with the exception of PRs who had a CSMK rate higher for women (20%) than men (16%) (CDC, 2011h). With regards to education, Hispanics/Latinos who had lower educational attainment (less than high school) had a higher prevalence rate (19%) than those with more than high school (16%) (Winkleby, 1995). Similar to overall U.S. CSMK estimates, Hispanic/Latino who reported lower annual household incomes (<$25,000) were more likely to be smokers (19%) than those with higher incomes (>=$25,000, 16%) (Winkleby, 1995).

Together, these data provide evidence that CSMK prevalence varies widely among Hispanics/Latinos of different heritage and country of origin, and support the need to further investigate CSMK behavior across various Hispanic/Latino ethno-cultural groups. These data also corroborate the notion that, overall, the CSMK prevalence for U.S. Hispanics/Latinos (based largely on data from Mexicans and Central Americans) is likely to be an underestimate of the real CSMK prevalence among the diverse groups of Hispanics/Latinos living in this country.

2. **Cigarette smoking rates and trends among Latinos in Latin America**

Many developing countries are experiencing the tobacco epidemic and consequently, an increased burden of chronic diseases. The World Health Organization (WHO) estimates that there are
more than one billion smokers worldwide, and that 82% of current smokers reside in middle- or low-income nations. Cigarette smoking has been on the rise in developing countries, including Latin America. In 2005, the WHO Framework Convention on Tobacco Control (FCTC) came into force as the first global public health treaty designed to adopt evidence-based measures aimed at reducing tobacco consumption worldwide (Shibuya, 2003).

Data from the WHO/Centers for Disease Control and Prevention’s (CDC) Global Adult Tobacco Survey (GATS) and from international reports indicate that worldwide, 29% of the population aged >15 years and older smoke tobacco. Although variable by country, the overall adult CSMK prevalence in Latin America has been estimated to be 32%. In general, men smoke more (40%) than women (24%). The prevalence rates of CSMK vary greatly across the various countries of North, Central, and South America (Shibuya, 2003). In 2010, a WHO report summarized the CSMK prevalence rates for the Latin American countries for which WHO data are available. The findings showed that CSMK prevalence was higher in Chile (36%), Cuba (32%), Bolivia (30%), Argentina (29%), and Mexico (24%), and lower in Dominican Republic (13%), Ecuador (14%), Guatemala (14%), and Costa Rica (16%). Similar to the overall U.S. population and Hispanics/Latinos living in this country, the CSMK estimates were higher for men than women. The gender gap in CSMK prevalence was wider among residents of Costa Rica, Ecuador, Guatemala, and Mexico (WHO, 2011).

Recent findings from the Cardiovascular Risk Factor Multiple Evaluation in Latin America (CARMELA) study also revealed large differences in CSMK prevalence in urban Latin America (Champagne, 2010). This cross-sectional epidemiological study of 11,550 adults (ages 25–64 years) evaluated CSMK behavior in seven major Latin American cities (Barquisimeto, Venezuela; Bogota, Colombia; Buenos Aires, Argentina; Lima, Peru; Mexico City, Mexico; Santiago, Chile; and Quito, Ecuador). Overall, 32% of participants reported CSMK. The highest overall prevalence rates were found in Buenos Aires (38.6%) and Santiago (45.4%), with similar rates for men and women. In contrast, CSMK estimates were higher for men than women in all other cities. Consistent with WHO data, the
gender difference was highest in Quito, where the CSMK prevalence for men (49.4%) was almost five times higher than for women (10.5%). In general, CSMK was more frequent in the youngest two age groups (25–34 and 35–44 years), and declined with increasing age (Champagne, 2010).

The variation in CSMK rates among the various Latin American countries could be due to differences in Hispanic/Latino subcultures and heritage, the country’s economic development level, and/or tobacco marketing and control policies. Findings from the CARMELA study support these possible explanations. For example, in terms of differences in Hispanic/Latino ethnic and cultural diversity, residents of Buenos Aires (where the majority of the population is of European descent) had significantly higher CSMK prevalence (38.6%) than those in Quito (29%) and Lima (26%), both Andean cities, where a considerable percentage of the population is indigenous (Champagne, 2010). The authors argue that the relatively high tobacco consumption in Buenos Aires could also be explained by the fact that, of the CARMELA’s countries, Argentina is the one with the highest gross domestic product per capita. This observation is consistent with international trends toward increased cigarette consumption with higher disposable income. In terms of differences in tobacco-control policies, a lack of them in Argentina could also partly explain the high CSMK prevalence. Fifteen out of nineteen Latin America countries have ratified the WHO FCTC and are committed to implementing policies to reduce tobacco consumption and its negative health-related consequences. Argentina, Cuba, Dominican Republic, and El Salvador are the exceptions (Shibuya, 2003).

This international evidence highlights the importance of evaluating CSMK prevalence among ethno-culturally diverse Hispanics/Latinos residing in the United States. The HCHS/SOL study is comprised of an ethnically diverse large sample and provides an opportunity to further examine the reported heterogeneity in CSMK prevalence among immigrant Hispanics/Latinos from various North, Central, and South American countries and heritages.

3. **Health risks and outcomes associated with cigarette use**
Although not directly measured in this study, the health risks and outcomes associated with CSMK are well documented in the public health literature (Adhikari, 2008; Heron, 2009). Worldwide, it is estimated that tobacco causes 5.4 million deaths per year. Based on current trends, the annual mortality from CSMK is expected to increase to 8.3 million by 2030, with 80% of deaths occurring in low- and middle-income countries. Current cigarette smoking is responsible for half of all avoidable deaths worldwide due to its association with CVD, cancer, stroke, and respiratory diseases. Currently, CVD accounts for nearly half of CSMK-related deaths in developed countries and more than a quarter in developing regions.

In the United States, tobacco use is the single most prevalent cause of death and disease. It is a major contributor to morbidity and mortality in this country, accounting for over 400,000 premature deaths (Adhikari, 2008). Among Hispanics/Latinos (the largest growing minority group in the United States), the adverse public health consequences are very large, as three out of four leading causes of death (i.e., heart disease, cancer, and stroke) are related to CSMK (Heron, 2009). Coronary heart disease (CHD) is the leading cause of death among Hispanics/Latinos living in the United States (Shibuya, 2003). The death rates from CHD vary among Hispanic/Latino ethno-cultural groups, with PRs and Cubans experiencing higher mortality from CHD (92.5 per 100,000 and 68.5 per 100,000, respectively), compared to MAs (63 per 100,000). In 2010, the overall prevalence of CHD among Hispanics/Latinos was 6.1%, which was slightly higher than the prevalence for NHWs (5.8%). Coronary heart disease prevalence was greater among Hispanic/Latino men (7.2%) than women (4.2%) (CDC, MMWR 2011; U.S. Surgeon General, 2006). In addition, CSMK causes several types of cancer, including lung, reproductive, and oral/esophageal cancers. Lung cancer is the leading cause of cancer deaths among Hispanics/Latinos living in the United States, with men experiencing mortality rates three times higher than women (23.1 per 100,000 and 7.7% per 100,000, respectively) (Heron, 2011). Similar to CHD mortality, the rate of lung cancer deaths per 100,000 also varied by Hispanic/Latino ethnic subgroup;
Cuban men have a higher rate (33.7%) than PR (28.3%) and MA (21.9%) men (U.S. Surgeon General, 2006).

Cigarette smoking has also been shown to increase the risk of stroke by two to four times in smokers compared to nonsmokers (U.S. Surgeon General, 2006). Among U.S. Hispanics/Latinos, stroke is the third major cause of death. In 2008, NHIS data showed that the prevalence of high blood pressure (HBP) for MAs (28%) was comparable to that for NHWs (30%) (CDC, 2010a). However, there were racial/ethnic differences in terms of HBP awareness and control; compared to NHWs and AAs, Hispanics/Latinos were less likely to be aware of their HBP, be treated with medication, and have controlled blood pressure (CDC, 2010a). These health inequalities are likely contributing to the stroke-related mortality rates among Hispanics/Latinos.

Together, these findings highlight the diversity of the health effects caused by CSMK, and how significantly smoking affects the risk of premature mortality related to three out of four leading causes of death among Hispanics/Latinos living in the United States. The variation in CHD, lung cancer, and stroke mortality is likely to be partly due to the reported variation in CSMK prevalence among Hispanic/Latino ethno-cultural groups.

4. Disparities and inequities related to cigarette smoking

Disparities and inequities related to CSMK among Hispanics/Latinos have been linked primarily to the lack of smoking prevention programs and resources for Hispanics/Latinos (e.g., health education, prevention, and cessation interventions) (CDC, 2010a; CDC, 2009c; Kaplan, 2014). Some of these disparities and health inequities can be attributed to differences in access to health care. For example, findings from an HCHS/SOL manuscript on the prevalence of CSMK showed that health-care insurance status was a significant and independent risk factor for being a current smoker (Kaplan, 2014).

An important issue specific to Hispanic/Latino populations is that they tend to deny and/or underreport CSMK. Several studies focusing on Hispanics/Latinos showed that this methodological issue was common among these populations (mostly Mexicans). Underreporting is probably due to the
Hispanic/Latino cultural collectivistic characteristics (further discussed in section below “Cultural and Environmental Influences of CSMK”), and probably also contribute to the lower rates of CSMK prevention services delivered to Hispanics/Latinos, as well as fewer health-education initiatives targeting them.

5. **Cigarette smoking behavior**

It is well established that CSMK acquisition is a childhood/adolescent phenomenon worldwide. The vast majority of adult smokers began smoking before the age of 18 years (U.S. Surgeon General, 2006; WHO, 2010). Cigarette smoking is a complex behavior influenced by numerous biological, behavioral, and environmental factors operating at multiple levels. They include individual (age, gender, race/ethnicity, SES factors, immigrant status, and physiological and psychological factors); sociocultural (norms, attitudes and beliefs, country of origin, nativity, and acculturation level); environmental (family, peers, work, community); and societal (media-based and sociopolitical) influences (Giovino, 2007). Although biological factors such as susceptibility to nicotine addiction are important, they are not the focus of this investigation.

a. **Individual factors**

As previously discussed, a number of well-established individual risk factors have been identified within the general population. They include younger age, male gender, NHW race, lower educational attainment, and lower income level (U.S. Surgeon General, 2006; Giovino, 2007; Winkleby, 1995). In light of the documented racial and ethnic differences in CSMK, a number of studies have aimed to identify individual characteristics associated with CSMK in a variety of adult and youth racial/ethnic populations, including Hispanics/Latinos (Wilkinson, 2005; Cox, 2005; Hill, 2005).

Evidence shows that predictors of CSMK initiation among diverse racial/ethnic populations include a number of common, as well as ethnic-specific, risk factors (Kande, 2004). In general, the scientific data indicate that individual characteristics (e.g., age and gender), and proximal social influences (e.g., family and peers’ CSMK behavior) are the major predictors of CSMK initiation and persistence (Kandel, 2004).
Based on SCT and SBET theories, these findings are not surprising given that family members and peers represent proximal factors, as they constitute an important part of an individual’s immediate social environments (Bandura, 2001; Hovell, 2009a; Wahlgren, 1997; Adams, 2009b).

More recently, studies have further evaluated CSMK predictors specific to Hispanic/Latino populations (Wilkinson, 2008; Cox, 2005; Hill, 2005). Wilkinson et al. (2008) investigated correlates of susceptibility to CSMK among Mexican-born youth in Texas, where Hispanic/Latino youth exhibit higher rates of susceptibility to CSMK than children from other racial/ethnic groups. Their findings showed that overall, 22% of the never-smokers were susceptible to CSMK, with age and gender differences in susceptibility to CSMK. Boys were more likely to be susceptible (25.6%) than girls (18.9%), and susceptible children were older than non-susceptible ones (12 versus 11 years) (Wilkinson, 2008). These studies have a number of limitations that are related primarily to lack of Hispanic/Latino ethno-cultural groups representation (data limited mostly to Mexicans and Central Americans), and small sample sizes that raise concerns regarding generalizability to other Hispanic/Latino subpopulations. They support the need to further evaluate correlates of susceptibility to CSMK among a large and ethno-culturally diverse sample of Hispanics/Latinos living in the United States.

Psychological factors (e.g., low self-esteem/self-efficacy, socioeconomic stress, and depression) represent another important set of individual risk factors for CSMK behavior. A limited number of studies have evaluated the role some of these factors play in CSMK behavior among Hispanic/Latino (Cox, 2005).

b. Contextual factors

1) Social environment

In addition to individual risk factors, social environmental factors have been shown to play a major role in the onset and maintenance of CSMK behavior (Cox, 2005). They include the home, school, work, community, and societal environments, which constitute the key large domains whereby individuals learn, socialize, and conduct daily activities. Consistent with SCT and
SBET theory (further discussed below), extensive scientific evidence (Bandura, 2001; Hovell, 2009b) shows that of these, more proximal factors such as the home environment/family and school/work/peer influences are stronger predictors as they reflect the more immediate social environments. For this reason, the current study will mainly focus on these correlates of CSMK, specifically in the home and work environments.

2) Home and family influences
A number of studies indicate that the home environment and family influences are an important influence in the acquisition and maintenance of CSMK among racial and ethnically diverse populations. Some investigations have evaluated the role played by specific household characteristics (e.g., parental and sibling CSMK behavior, and parental expectations/monitoring of CSMK), and have documented their effect on youth and adult CSMK behavior (Hill, 2005). Markides et al. (1987) conducted a three-generation study of CSMK among MAs to test for evidence of intergenerational transmission of smoking. Within-family analyses showed that familial transmission of CSMK between the second and third generation occurred, and identified gender differences; younger women were more likely to be influenced by the smoking behavior of their parents than were younger boys. This notion finds some support from the literature on the effect of acculturation on CSMK behavior among Hispanic/Latino women.

Most studies evaluating the association between parental smoking and youth smoking have used cross-sectional observational designs (Wilkinson, 2008). Findings from two prospective studies further support the evidence suggesting that parental smoking significantly increased the risk of CSMK behavior among adolescents (Hill, 2005). These authors examined family influences on the risk of daily CSMK from adolescence to young adulthood among an ethnically diverse urban population (Hill, 2005).

The Hill study participants (n=808, 46% NHWs, 21% AAs, 21% Asians, and 3% other) were part of the Seattle Social Development Project, a longitudinal study. They were originally surveyed as children (ages 10–11 years) in 1985, and were prospectively followed to age 21 in 1996. The study collected data
on several family factors shown to be associated with CSMK behavior at baseline and follow-up, including sociodemographic factors (ethnicity, gender, income, and family structure), parental and child smoking status, sibling smoking behavior, parental attitudes around smoking, and family bonding. Using discrete-time survival analyses the data showed that parental smoking was significantly associated with daily smoking initiation controlling for sociodemographic variables; family influences on smoking were consistent from age 12 to 21 years (Hill, 2005).

In addition, CSMK risk significantly decreased with stricter family monitoring and rules, and with stronger family bonding. These findings provide evidence that parental smoking increases the risk of smoking in their teenagers, even in cases where the parents hold norms against teen CSMK, do not involve their children in their own tobacco use, and practice good family management (Hill, 2005). One of the study’s limitations was that the sample included very few Hispanic/Latino children, who were grouped with the “other racial/ethnic” category; therefore the findings could not be generalized to Hispanic/Latino youth.

More recently, a population-based cohort study investigated the nine-year prediction of adolescent smoking by number of smoking parents among mostly NHW boys and girls who were part of the Hutchinson Smoking Prevention Project. The cohort of children (n=3,012, ages 8–9 years at baseline) and their parents were prospectively followed through the end of the smoking acquisition period (12th grade).

Study measures included sociodemographic factors and the CSMK status of the mother, father, and child. The findings showed that having one parent who smokes significantly increased the risk of adolescent smoking compared to families with no smoking parents. The results also showed a “dose-response” effect, with the risk of child smoking significantly increasing with the number of smoking parents (Odds Ratio [OR]=1.90 for families with one smoking parent, and OR=2.65 for those with two parent smokers). This study did not include minority populations (including Hispanic/Latino), and
participants were recruited from small town and rural populations, limiting the generalizability of the findings.

The two most common limitations of the studies that examined the effect of home environment/family influences on CSMK behavior among Hispanic/Latino are: (1) the study populations did not include Hispanic/Latino of diverse ethnic subgroups (they were mostly limited to Mexicans and Central Americans); and (2) the sample size was small. The current study using data from HCHS/SOL, a large and ethnically diverse Hispanic/Latino sample, aims at addressing these two limitations.

3) **School and work influences**

Peer influence at school and in work environments also constitute another important predictor of smoking initiation and persistence across various ethnic groups. Most studies examining social influences of CSMK have primarily included adolescents (Wilkinson, 2008; Cox, 2005; Hill, 2005). A likely explanation is that CSMK experimentation and early onset take place during adolescence and early adulthood (U.S. General Surgeon, 2006, WHO 2011h). The majority of current adult smokers began CSMK before the age of 18 years (U.S. General Surgeon, 2006, WHO 2011h). Adult data on social influences of CSMK have mostly focused on the effect of family and peer CSMK behavior around CSMK cessation interventions (U.S. Surgeon General, 2006; Hopkins, 2010). Overall, the evidence shows that individuals who are surrounded by smoking family members and peers are less likely to succeed in the efforts to quit CSMK (Hopkins, 2010).

While data on social influences of adult CSMK are sparse, there is a body of literature related to tobacco-control policy and CSMK cessation programs. For example, the Task Force on Community Preventive Services evaluated scientific evidence on the effectiveness of tobacco-control policies in reducing CSMK (Hopkins, 2010). Their systematic review of 37 studies concluded that enforcement of smoke-free policies in the workplace contributed to decreased CSMK among workers who smoked and an increase in cessation attempts among working populations (Hopkins, 2010). These data indirectly suggest that exposure to CSMK and its associated SHS exposure represent social influences of CSMK. The
review is consistent with findings from previous studies examining peer influences among adolescents of diverse racial and ethnocultural backgrounds, including Hispanics/Latinos (Wilkinson, 2008; Cox, 2005; Hill, 2005). Overall, these studies show that peers’ smoking behavior (particularly that of peers close to the individual) play a significant role in influencing CSMK experimentation and maintenance.

However, none of the adult-focused studies directly evaluated the effect of colleagues’ CSMK. To our knowledge, this investigation is the first one designed to examine the association of occupational SHS exposure and CSMK among a diverse sample of Hispanics/Latinos residing in the United States.

4) **Cultural and environmental influences**

Beyond the individual-, family-, school-, and work-level influences, there are broader cultural and societal factors that also play a role in an individual’s risk of CSMK. With regards to cultural factors, a number of studies have aimed at identifying norms, attitudes, beliefs, and knowledge around CSMK among Hispanics/Latinos. Evidence shows that cultural traits such as *familismo, respeto, and simpatía* are tied to the collectivistic nature of Hispanic/Latino individuals and families. These traditional group-oriented cultural traits appear to serve as protective factors against initiating and maintaining CSMK behavior among Hispanics/Latinos.

These cultural characteristics fall under the “deep structure” category described by Resnikow (1999); strong beliefs are likely to decrease their CSMK behavior in the home and work environment. Hispanics/Latinos may be concerned with exposing other family members, peers, and/or co-workers to culturally unacceptable behavior (i.e., inadequate role modeling, lack of respect for family elders), as well as exposing them to SHS and its toxic effects. Limited data suggest that the above-described collectivistic traits vary by Hispanic/Latino country of origin, national heritage, nativity, and generational status. For example, a study on the attitudes and beliefs about CSMK among Hispanic/Latino youth residing in the United States showed that those of Cuban descent were more likely to describe CSMK as part of their “national heritage and pride.” The same study indicated that these attitudes were not common to youth of other Hispanic/Latino ethno-cultural groups. However, there is evidence showing that these “protective
attitudes and behaviors” decrease as Hispanics/Latinos become more acculturated or belong to second and third Hispanic/Latino generations.

B. **Second Hand Smoke**

1. **Rates and trends of secondhand smoke exposure among Latinos in the United States**

   The prevalence of SHS exposure in the United States has steadily decreased over time in recent years (Kaufmann, 2010). National data showed that in 1991, 88% of nonsmokers were exposed to SHS (Kaufmann, 210). Since then the prevalence has declined to 50% in 2000 and 40% in 2008 (Kaufmann, 2010). In 2010, the U.S. overall prevalence of exposure to SHS among adults (>18 years) was 40%. The decrease in SHS exposure during the last twenty years is probably due to the growing number of tobacco-control laws (e.g., Smoke Free Act) in public and workplaces (e.g., hospitality industry including restaurants and bars) and a decrease in adult smoking rates (Kaufmann, 2010). Despite these societal changes, exposure to SHS remains a continuing and serious public health problem in this country; an estimated 88 million nonsmokers were exposed to SHS in 2007–2008.

   As in the case of CSMK, exposure to SHS prevalence rates differed by age, gender, poverty status, education attainment, race/ethnicity, and U.S. Census region. In general, exposure to SHS varied by age: children (ages 3–11 years) were at particular risk of exposure to SHS (54%) compared to adults (5.4%), with women carrying a bigger burden of SHS exposure. However, exposure to occupational secondhand smoking (OSHS) exposure tends to be higher among men, particularly those in low-skill occupations (CDC, 2011e; Howard, 2004; Shopland, 2004).

   Comparisons among racial/ethnic groups in the United States showed that MAs (29%) were less exposed to SHS than NHWs (40%) and Blacks (56%). However, in terms of occupational exposure to SHS, Hispanics/Latinos are more likely to be exposed compared to other racial/ethnic groups (American Lung Association, 2010). According to the 2010 American Lung Association report, “In 2006, Hispanics reported being protected from SHS less often than any other racial or ethnic group besides American
Indians and Alaska Natives. Only 68.4% of Hispanics worked in a place where smoking was not allowed, a significantly lower percent than the national rate of 75.3%.” (American Lung Association, 2010).

These data corroborate CSMK prevalence data among adults in the United States. They indicate that socially disadvantaged populations (including Hispanics/Latinos) are disproportionally affected by current exposure to SHS, further exacerbating health disparities and inequities. There is very limited information on the prevalence rates of SHS exposure among Hispanics/Latinos from various ethno-cultural groups living in the United States. This study aims to address this gap in the literature.

2. **Rates and trends of SHS exposure among Hispanic/Latinos in Latin America**

   Exposure to SHS is common to many countries but the magnitude of the world-wide problem is poorly understood (Shibuya, 2003). The joint WHO/CDC GATS was launched in 2007. It was designed to systematically collect data on tobacco use and exposure to SHS among adults comparable across countries with targeted data collection in Brazil, Mexico, and Uruguay. However, collection of surveillance data has faced numerous barriers and at present, limited comprehensive statistics exist.

   Exposure to SHS is common in Latin American countries. In 2003–2004, high levels of SHS were found in public places in various Latin American cities, particularly Argentina and Uruguay. The previously cited CARMELA study explored the prevalence of SHS exposure in the home and work environments in seven major cities in Latin America. High exposure to SHS in both settings was reported in most cities (Champagne, 2010). The findings for home secondhand smoke (HSHS) exposure showed that among individuals living with one smoker, Buenos Aires (13.5%) and Barquisimeto (13.4%) reported the lowest percentage of smoking bans at home, while participants in Quito (43.3%) and Santiago (44.9%) reported higher home smoking bans. With regard to occupational exposure, the study also reported extensive SHS exposure at work (>5 days), which was more common by residents of Santiago, Barquisimeto, and Buenos Aires (25%), compared to those in Bogota, Mexico City, Lima, and Quito ranging between 3.9% and 14.5%).
Together these data indicate that the high prevalence rates of exposure to SHS in the home and work environments need to be addressed. The majority of Latin American countries (15/19, except Argentina, Cuba, Dominican Republic, and El Salvador) are committed to tobacco-control policies designed to decrease CSMK and its associated morbidity and mortality. Yet only four nations (Colombia, Uruguay, Panama, and Guatemala) have implemented 100% smoke-free policies at the national level. According to WHO, in Latin American countries, local policy makers lack enough information to implement tobacco control measures in accordance to specific economic and cultural milieus (WHO, 2011).

3. **Health risks and outcomes associated with exposure to secondhand smoke**

Similar to CSMK, the Healthy People 2020 Objectives target SHS with the specific goal of reducing illness, disability, and death related to exposure to tobacco’s toxic substances (U.S. DHHS, 2010). In 2006, the U.S. Surgeon General declared that any SHS exposure is likely to cause culture premature morbidity and mortality among nonsmoking individuals (U.S. Surgeon General, 2006). Secondhand smoke contains over 4,000 toxic substances and represents a major health risk to nonsmokers as it increases the risk of major chronic diseases such as CVD, lung cancer, and respiratory diseases (e.g., asthma). In the United States, 50,000 out of the approximately 400,000 premature deaths caused by tobacco use are in nonsmokers as a result of exposure to SHS (WHO, 2011a; Champagne, 2010; U.S. Surgeon General, 2006). While Hispanics/Latinos have lower overall rates of SHS exposure (20%) than other racial/ethnic groups, limited data show that these rates differ for certain Hispanic/Latino ethno-cultural groups.

4. **Disparities and inequities related to exposure to secondhand smoke among Hispanics/Latinos**

Disparities and inequities in SHS exposure in the home and work environment exist in relation to racial/ethnic groups as well as income and educational level. In general, SHS exposure tends to be higher for persons with low income and educational level. In 2008, 61% of persons living under the poverty level in the United States were exposed to SHS. Disparities in SHS occupational exposure still
exist in relation to type of occupation, which is closely related to income, educational level, racial/ethnic background, and immigration status.

In 2008, substantial differences in SHS exposure among workers were reported; minority male workers, construction workers, persons in the hospitality service, and blue- and pink-collar workers (e.g., housekeepers, cleaning staff) continued to experience particularly high levels of SHS exposure relative to other workers (Kaufmann, 2010; Pirkle, 2006). In general, blue-collar workers and self-employed workers are less likely to benefit from tobacco-control policies in the workplace. This is particularly true for cities and states not protected by tobacco-control policies. In addition, limited evidence shows that disparities in SHS exposure also exist with regards to Hispanic/Latino cultural heritage group and length of stay in the United States. According to the American Lung Association, in 2006, Hispanics/Latinos reported being protected from SHS less often (68.4%) than the national rate of 75.3%. (American Lung Association, 2010).

However, the above statistics and findings are limited by the lack of representation from various Hispanic/Latino ethno-cultural groups; no large studies have determined how the SHS exposure rates vary across representative and culturally diverse Hispanic/Latino groups living in the United States. This study aims to address these gaps in the literature and provide prevalence rates of SHS exposure in the home and work environments for diverse Hispanics/Latinos living in four U.S. urban areas. It could inform prevention and intervention strategies among these populations. This study’s findings may help health officials and policy-makers better target SHS exposure control programs and policies among underserved Hispanics/Latinos, as well as other minority populations who carry a similar overburden of home and OSHS exposure.

5. **Correlates of exposure to secondhand smoke**

The correlates of exposure to SHS are similar to the factors described as correlates to CSMK. They include individual factors (e.g., younger age, lower educational attainment, lower income level, and psychological factors); contextual factors (social environment, home/family influences, work
setting, and type of occupation); cultural, and societal factors. In addition to these correlates of SHS exposure, there are sociodemographic factors that disproportionately affect Hispanic/Latino populations. They include suboptimal living conditions as many Hispanic/Latino households in the United States are overcrowded and include immediate and extended family members; and environmental factors related to the fact that Hispanics/Latinos commonly reside and/or work in old buildings or houses with poor or no ventilation systems designed to trap toxins found in SHS and recirculate them into these environments (Environmental Protection Agency, 1993).

6. **Cultural issues related to exposure to secondhand smoke**

Cultural issues related to exposure to SHS mirror the correlates of CSMK. A number of studies have shown that broader cultural characteristics common to various Hispanic/Latino ethnocultural groups influence their sociocultural environment and generally protect them from exposure to SHS. These cultural traits (e.g., *familismo*, *respeto*, and *simpatía*) are tied to the collectivistic nature of Hispanic/Latino individuals and families. As in the case of CSMK, the individual restricts his/her smoking behavior (and likely addiction) for the good of other older and younger family members. In the case of exposure to SHS, studies have shown that Hispanic/Latino mothers (mostly of Mexican or Central American heritage) are more likely to ban CSMK from their homes than NHWs or AAs.

However, there is evidence showing that these “protective attitudes and behaviors” decrease as Hispanics/Latinos become more acculturated or belong to second and third Hispanic/Latino generations (Marin, 1989). A major limitation of Marin’s study is that it does not include large numbers of diverse Hispanic/Latino ethno-cultural groups (e.g., Cubans and South Americans who tend to have higher rates of CSMK and exposure to SHS). Therefore, it fails to provide a full-spectrum picture of the likely variation in cultural knowledge, beliefs and attitudes towards exposure to SHS among various Hispanic/Latino ethnic groups.

C. **Gender**
As highlighted throughout this literature review on CSMK behavior, SHS exposure, and social influences of tobacco use, gender has consistently been identified as an important determinant of CSMK in the United States and Latin America (CDC, 2011; WHO, 2011). Extensive national and international scientific evidence documents a persistent gender gap between men and women on various Hispanic/Latino ethno-cultural backgrounds. In general, men carry an overburden of CSMK and OSHS exposure (Winkleby, 1995; CDC, 2011h; WHO, 2011; Champagne, 2010).

Studies on the tobacco-use epidemic identified gender as an important factor in the etiology and prevalence of CSMK in the United States and Latin America (U.S. Surgeon General, 2006; WHO Infobase, 2011). As shown in preceding sections of this chapter, gender has been shown to be a significant and independent risk factor. For example, men are more likely to report higher prevalence of CSMK, and exposure to SHS (U.S. Surgeon General, 2006; WHO Infobase, 2011).

Studies evaluating patterns and trends of tobacco use worldwide have identified a series of stages of the pandemic (Lopez, 1994; Edwards 2004). As shown in Figure 2, the patterns of CSMK vary by gender and the sociodemographic and historical contexts of each geographic region and/or individual country. The evidence shows that the CSMK epidemic in a given country develops in four distinct stages. The initial epidemic is characterized by an initial rise in CSMK prevalence, followed by a decline (Figure 2). The latter is followed by a similar trend in CSMK related negative health outcomes, which typically take place two to three decades later (Lopez 1994; Edwards, 2004). As clearly indicated in Figure 2, the onset of CSMK and its consequent adverse health effects tend to occur earlier in life, and to a greater extent among men than women, documenting clear gender differences.

In Latin American countries, the CSMK epidemic is classified in Stage 2 corresponding to a more recent tobacco-use epidemic as compared to Western Europe and the United States. In contrast, in this country the CSMK epidemic is classified under Stage 4 (Figure 2). As nicely stated by Edwards on the observed reduction in CSMK in Stage 4 countries (e.g., United States): “… this reduction in overall prevalence during stage 4 of the epidemic disguises relatively static levels of smoking among
sociodemographically disadvantaged groups, making smoking one of the most important determinant of social inequalities in health in the developed world. Smoking has also declined much more slowly among young adults in the young adults….” (Edwards, 2010, pg. 217).

Figure 2. Stages of worldwide tobacco-use pandemic.

Source: (Edwards, 2004); (cf. Lopez et al, 1994).

Based on the above-described evidence, it is important to examine variation in prevalence of CSMK and SHS exposure by gender and country of origin among immigrant Hispanics/Latinos in this country. Interestingly, existing data on CSMK among Hispanics/Latinos in the United States corroborate with this international time trends (CDC, 2011h; WHO 2011h). The current investigation offers the opportunity to further examine CSMK patterns among ethnoculturally diverse Hispanics/Latinos residing in the United States.
As described in the following section on acculturation, Hispanics/Latinos adapt to and adopt U.S. mainstream culture to differing degrees. Numerous studies on Hispanics/Latinos (mostly MAs) indicate that men and women differ in the adoption of health behaviors, including CSMK (Bethel, 2005). However, previous studies have been limited by small sample size and lack of Hispanic/Latino ethnocultural representation. The current study provides a unique opportunity to further examine gender patterns of CSMK and SHS exposure among a diverse population of Hispanics/Latinos residing in the United States.

The gender gap is further accentuated among Hispanics/Latinos of low SES, and low acculturation level. Men who earn lower incomes (e.g., below poverty level), are employed in low-skill occupations (e.g., laborers and those employed by small businesses), and newer immigrants (usually less acculturated to U.S. culture) report higher levels of CSMK and SHS exposure than women with similar characteristics.

As described in the preceding paragraphs, the reasons behind these gender-based disparities and inequities remain largely unknown. A few investigators have hypothesized a number of factors that are thought to contribute to these inequities. Factors such as sociocultural traits that date back to indigenous cultures in Latin America, differences in gender roles, issues related to immigration status and discrimination, acculturative stressors and larger societal issues (e.g., faulty tobacco-control policies) have all been postulated as possible contributors to these persistent disparities and inequities.

Recent investigations have focused on issues related to the intersection of race, ethnicity, and gender around various exposures Mintz et al. (2010). Mintz et al. (2010) examined trends in type of occupations entered by racial/ethnic (NHWs, AAs, and Hispanics/Latinos) and gender groups. Their findings showed that more progress was made by NHW men and women who maintained their higher status in the occupational hierarchy than any other ethnic/racial group. In addition, the data indicated that rewards resulting from education were not equally bestowed for minority versus NHW women (Mintz,
Based on this study and other existing literature, gender is hypothesized to be a significant and independent risk factor of CSMK and SHS exposure.

A theory-grounded framework is necessary in order to better evaluate the association between SHS exposure in the home and work environments and CSMK. This study uses the SCT and the SBET models as its theoretical basis. The following section will provide an overview of both of these theories and their applicability to the current study.

D. **Acculturation**

1. **Acculturation as a construct and key definitions**

   Culture is defined as a set of beliefs, values, and practices that individuals share and pass down from generation to generation. (Hamilton, 1996). Over the years, extensive evidence has shown culture’s important role in shaping an individual’s sense of self (e.g., ethnic identity), values, beliefs, and practices (e.g., health-related behaviors). The concept of acculturation dates back to the nineteenth century, and has been widely used by behavioral and social sciences (e.g., anthropology) (Marín, 2003). Cross-cultural psychology has demonstrated significant associations between individual behavioral development and cultural context. This observation led cross-cultural researchers to investigate what happens to individuals who have grown up in one cultural context when they relocate to another location and attempt to reestablish their lives in a different one ( Berry, 2002).

   The classical definition of acculturation is “phenomena which result when groups of individuals having different cultures come into continuous first hand contact with subsequent changes in the original culture patterns of either or both groups” (Marín, 2003, p.13). As described by Berry, acculturation takes place in both ethnic groups but it usually results in higher change in one of the two groups. The latter is termed “acculturating group.” The course of acculturation is characterized by three phases: contact, conflict, and adaptation.

   Evidence has shown that assimilation is not the only kind of acculturation; it can be: (1) creative—i.e., stimulating new forms of culture new to both groups; (2) reactive, triggering resistance to
change in both groups; and (3) delayed, leading to cultural changes that appear more fully years later (Berry, 2002). Finally, acculturation occurs at two levels: a collective or group level (social), and a psychological level (individual).

Graves emphasizes the importance of this distinction for two main reasons: first, it needs to be taken into consideration when examining the systemic relationships between these two sets of variables. Second, because it is well documented that acculturation is an individual process and varies among members of a given ethnic group (Berry, 1970). Berry subsequently described four acculturation strategies based on the immigrants’ communication and socialization with individuals from both the same ethnic group and the host society (Berry, 1970).

The four possible results from acculturation are: (1) assimilation, when individuals chose not to maintain their cultural identity and socialize primarily with individuals from the host culture. In this pattern, immigrants incorporate more elements of the host culture (e.g., language, values, practices, and interpersonal relations), which are likely to enable the person to achieve a satisfactory adaptation at the expense of his/her own culture, including better physical/mental health through reduced life stress. (2) Separation, when persons chose to retain their culture of origin and refuse to interact with individuals from the other cultural group; (3) integration, when persons chose to maintain their culture of origin while interacting with individuals from other culture. In this pattern, the same satisfactory adaptation outcomes achieved through assimilation (i.e., better health and reduced stress), can be achieved by blending the host native culture, while losing few central elements of the culture of origin. (4) Marginalization, in the case of immigrants who are not interested in neither maintaining their cultural norms and beliefs nor establishing a relationship with members from the dominant culture (Berry, 1970).

Based on these well-established characteristics of acculturation, it can be concluded that acculturation is a very complex and multidimensional process. The psychological consequences of this process are therefore highly variable depending on personal (e.g., age of migration and gender) and social (e.g., SES status, immigration issues, and specific neighborhood) variables that reside in the culture and
society of origin, and the new cultural milieu (Berry, 1970). Culture is relatively constant and plays a significant role in every aspect of an individual’s life and sense of self. Therefore, it is difficult to change, particularly for adults.

The concept of acculturation among immigrants to the United States from different ethnic/racial groups has been widely researched in order to understand its relationship with many health behaviors, including CSMK. Studies focusing on Hispanic/Latino populations have shown that when immigrants come in contact with the new U.S. society, they face many challenges such as adjusting to a foreign language, customs, social interactions (often times their family and social networks are fragmented), and lifestyle (Caplan, 2007; Berry, 1970; Marin, 1989). These adaptation challenges and acculturative stressors have been shown to lead to changes in health-related behaviors such as CSMK behavior, eating fast food more often and lack of physical activity.

2. **Effect of acculturation on cigarette smoking behavior**

Over two decades, numerous studies have investigated the effect of acculturation to the U.S. culture on CSMK behavior of immigrants, including Hispanics/Latinos. Findings from research studies that investigated the association of acculturation on smoking patterns among Hispanic/Latino adult men and women living in the United States showed diverse findings by gender, nativity, and country of origin (Bethel, 2005; Wilkinson, 2005; Marin, 1989; Markides, 1987). Overall, the evidence shows a consistent positive association between acculturation and smoking among Hispanic/Latino women (nine out of 11 studies) but not men (one of the eight showed a negative association), indicating a differential association of acculturation and smoking status by gender.

Possible explanations for these gender discrepancies include low CSMK prevalence among women of Mexican descent (approximately 10%) and may provide an explanation for the association of acculturation with CSMK among Hispanic/Latino women in this country. This rate is lower than U.S. NHW women and more acculturated women found in these studies. Researchers have suggested these findings may simply mirror current CSMK social norms in this country. As new immigrant women
acculturate, they are more likely to take up CSMK in their desire to “fit in” with norms and practices of the dominant group. Therefore, their smoking rates will become closer to those of the U.S. NHW population.

It remains unknown why Hispanic/Latino women are more likely to begin CSMK than men. Two possible explanations have been hypothesized: They include the following: (1) Hispanic/Latino women may use CSMK as a way to establish their independence in this country; (2) CSMK may also represent upward mobility (e.g., greater equality of status and employment opportunities), as well as changing gender roles; (3) distancing from Hispanic/Latino social norms, which traditionally serve as a protective factor against CSMK among women only; and (4) gender-based differences in terms of acculturative stress have also been hypothesized as a possible explanation.

The lack of association of acculturation and CSMK among Hispanic/Latino men in this country may also be due to the high prevalence of CSMK among men in Mexico (51%). These rates are much higher than the overall CSMK prevalence of NHW men in the United States (24%). Based on evidence showing that immigrants’ CSMK rates tend to become similar to those of the dominant cultural group, it is not surprising to see CMSK behavior decrease among Hispanic/Latino men who migrated to the United States.

3. Methodological issues

The above mentioned studies examined CSMK rates across acculturation groups defined based on measures that included either a validated scale, the participant’s country of birth, language preference, and/or time of living in the United States (Bethel, 2005). An important overall observation from these studies was that methodological differences among these studies did not appear to yield contradictory findings.

The results were consistent despite the use of different acculturation measures. The positive association of acculturation with CSMK was observed among all studies, independent of the type of acculturation indicators, i.e., formal scales or proxy measures (e.g., language use-preference, country of
birth, time living in the United States). Furthermore, the use of various methodologies (e.g., single variable adjustment or logistic regression) led to similar results. These observations suggest that the various studies’ targeting various Hispanic/Latino populations in this country were externally valid.

Limitations of these studies include: (1) acculturation was measured in a linear scale placing U.S. culture at one end and Mexican heritage at the other end. Doing so assumes that acculturation is a linear continuum. The assumption is that as ties with the culture of origin weaken, ties with the new culture strengthen. These measures do not account for those bicultural individuals, who are more likely to score highly in both cultures. Two-dimensional models such as ARSMA-II were not used by any of the studies; (2) some studies used only proxy measures of acculturation and so they were limited in their ability to adequately assess an individual’s level of acculturation; and (3) all of these studies used self-reporting of cigarette use. This can be a problematic issue since cigarette use has been falsely and/or underreported among Hispanics/Latinos in other studies (Marin, 1990).

4. **Effect of acculturation on exposure to secondhand smoke**

The effect of acculturation on exposure to SHS has been less extensively studied, particularly in minority populations, including Hispanics/Latinos (U.S. Surgeon General, 2006). Based on limited data available, acculturation appears to increase the exposure to SHS among some Hispanic/Latino populations and decrease it among others. With regards to the home environment, family members of recent immigrant populations are less likely to be exposed to SHS than those of second and third generations of Hispanics/Latinos (U.S. Surgeon General, 2006). A possible explanation for this difference is that, as mentioned above, new immigrant mothers are more likely to ban CSMK from their home than those who were born in the United States (Gonzales, 2006).

With respect to SHS exposure in the work environment, as discussed above, individuals holding occupations associated with lower SES (e.g., blue- and pink-collar workers and laborers) are more likely to be exposed to SHS compared to those in white-collar and professional occupations. Recent
Hispanic/Latino immigrants to the United States are often employed in low-skill occupations, which increases their likelihood of being exposed to occupational SHS (American Lung Association, 2010).

E. **Conceptual Framework and Related Literature**

1. **Social Cognitive Theory**
   a. **Social Cognitive Theory as a construct**

   The concepts of SCT date back to 1962, when Albert Bandura first published “Social Learning through Imitation.” Subsequently in 1995, Bandura proposed self-efficacy as the construct undergirding numerous aspects of social change. Shortly after, he advanced SCT from the domain of learning mechanistic theories of human behavior to the views of the individual in control of her/his own life (Bandura, 2001).

   Bandura conceptualized SCT as a reciprocal and triadic relationship between personal factors (e.g., an individual’s cognition, affect, and biological state); human behavior (e.g., CSMK); and environmental influences (e.g., social and physical environments). Social Cognitive Theory has been widely used for its relevance to understanding health-related behaviors. It posits that humans have the capacity to exercise control over the nature and quality of one’s life. Human agency is characterized by various core features that operate through phenomenal and functional consciousness. According to Bandura’s Agentic Perspective, personal agency operates within a broad network of socio-structural influences (Bandura, 2001).

   Social cognitive theory includes three types of agency: (1) *direct personal agency*; (2) *proxy agency* that refers to relying on other individuals to act authoritatively to get desired outcomes; and (3) *collective agency* carried out through interrelated efforts (Bandura, 2001). All of these are relevant to CSMK behavior and its risk factors.

   b. **Key definitions and conceptual framework**

   Environment, situation, observational learning, and reinforcement are the most relevant SCT premises to the proposed study. Environment is defined as the objective factors that can
affect a person’s behavior but that are physically external to that person. Environments that apply to this study are the home and work settings, which as formerly mentioned, play an important role in the CSMK behavior of individuals. The term situation is defined as a person’s cognitive representation of his/her surroundings that may influence his/her behavior. Together, environment and situation provide an ecological framework for understanding human behavior. In the proposed study the behavior of interest is CSMK.

Observational Learning occurs when a person watches the actions of another person, and the reinforcement that the person receives. In SCT the environment is important in part because it provides models for behavior—i.e., a person can learn from other individuals by observing them and not only by receiving reinforcements from them. This concept is particularly relevant to the proposed study as it evaluates childhood exposure to CSMK (before and after the age of 13 years) by the participant’s mother/maternal figure, as well as other household members. For example, someone who was exposed to CSMK in the home environment (e.g., had a smoking mother/maternal figure) may be more likely to have been influenced by the environment and associated situations, and therefore more likely to have engaged in CSMK.

Reinforcement represents the primary construct in the operant form of learning theory. Positive reinforcement, defined as the response to someone’s behavior that encourages the repetition of such behavior (Bandura, 2001). Negative reinforcement also increases the likelihood of a behavior but by the withdrawal of a negative stimulus when the desired behavior is performed. Cigarette smoking is a good example of negative reinforcement because the inhaled nicotine removes negative affect (e.g., anxiety, anger, and depression), withdrawal, and craving.

As described in the Cultural and Environmental Correlates of CSMK section above, role modeling of parents, siblings, and peers around CSMK influences an individual’s smoking behavior. Data from the two prospective studies evaluating the association between parental smoking and youth CSMK support the SCT in that they predict that children of smokers are more likely to begin smoking
themselves, and show a strong social influence from their parents. The degree to which the influence of household and occupational smoking behavior and exposure to SHS influence the CSMK behavior among HCHS/SOL participants is yet to be determined. This study will contribute to the Hispanic/Latino literature on SCT factors that have been shown to play an important role in the acquisition and maintenance of CSMK behavior among ethno-culturally diverse Hispanics/Latinos.

2. **Socio-ecological and behavioral theories**

The SBET also provide a theoretical framework to research concerning CSMK behavior and exposure to SHS (Hovell, 2009a). The Behavioral Ecological Model (BEM) is particularly relevant to investigating the proposed study’s specific aims and research questions. It is based on principles of behavior but extends them to the role of cultural factors in a complex web of influence that integrates concepts from ecology, biology, and Darwinian selection (Hovell, 2009a).

This model assumes interrelated social contingencies of reinforcement (e.g., punishments and rewards), from the individual physiological reactions to nicotine to the highest level of society (e.g., cigarette sales taxes and tobacco-control policies) (Hovell, 2009a). The BEM posits that influences from genetics, and biological and socially learned behavior (CSMK) interact with social influences in the home, social contacts and society at large. This theoretical framework provides a different perspective of CSMK behavior and provides investigators with an alternative mechanism of how these contingencies interact among themselves across various societal levels (Hovell, 2009a).

The proposed study’s design recognizes that individuals do not live in a vacuum and therefore all of the above-mentioned influences and social contingencies are important to evaluate. Adult individuals spend most of their time at home and at work and therefore these two environments became the focus of this investigation.

3. **Conceptual framework**

Together, SCT and the SBET offer a framework from which the association between SHS exposure (as a proxy for social influences) in the home and work environments and CSMK behavior
can be explored. These theories share conceptual constructs related to personal factors, the environment, and behavior, all of which are relevant to the onset and maintenance of CSMK. Informed from the literature review discussed above, the conceptual framework guiding this study is presented in Figure 3.

As illustrated, exposure to SHS and the role modeling of parents, siblings, and peers around CSMK are likely to influence an individual’s smoking behavior (pathway A). As evidenced by the literature, individuals who were exposed to parental and peer CSMK in the home or work environments were more likely to become or remain cigarette smokers. Personal sociodemographic factors such as age, gender, Hispanic/Latino ethno-cultural background, education, income, employment status, type of occupation, health-care insurance, and geographic location are also likely to exert influence on exposure to SHS in the home and work environments (pathway B), as well as directly on CSMK behavior (pathway G). Therefore, they need to be adjusted for in logistic regression and moderation models. As shown in Figure 3, some factors such as age and gender (as defined in the HCHS/SOL study, marked with an *) are immutable, while the others may be modifiable based on individual and acculturative experiences.

As depicted, gender and other sociodemographic factors are likely to be bi-directionally related to an individual’s level of acculturation (pathway C). Of all risk factors for CSMK onset and maintenance, gender has been consistently identified as a major risk factor. Young and adult males have historically been at higher risk of beginning CSMK and maintaining in the United States and Latin America. The process of acculturation has been shown to vary by factors such as gender, age, SES, and country of origin. An individual’s acculturation level is also likely to play a role in determining sociodemographic factors such as income, employment status, and type of occupation. In addition, acculturation may also have a direct effect on exposure to SHS status, as well as CSMK behavior (pathways D and E). The literature shows that both gender and acculturation influence exposure to SHS, and likely moderate the relationship between exposure to SHS and CSMK (pathway F). For example with regard to gender, as discussed extensively in previous sections, boys and men are more likely to be exposed to SHS and social influences of CSMK.
Furthermore, they are more susceptible to high-risk behaviors (e.g., alcohol and illegal drug consumption), which are also highly correlated to CSMK. In terms of acculturation, evidence shows that new immigrant Hispanic/Latino mothers are more likely to ban CSMK from their homes than those born in the United States. Therefore, family members of recent immigrant populations are less likely to be exposed to HSHS. Lower exposure to family-based social influences of CSMK (e.g., role models) may also lead to less CSMK behavior. In terms of CSMK in the work environment, acculturation level may also influence a person’s employment status and type of occupation (pathway D). For example, low-acculturated new immigrant Hispanics/Latinos may hold occupations associated with lower SES status (blue- and pink-collar workers, and laborers), some of which take place in occupational settings, which are less or not protected by tobacco-control policies (U.S. Surgeon General, 2006).

Therefore, they may be more likely to be exposed to OSHS compared to individuals in white-collar and professional occupations whose work settings typically ban CSMK in public areas. Acculturation has also been shown to be associated with CSMK behavior among Hispanics/Latinos living in the United States (pathway E). Its relation with CSMK is likely to be influenced by gender and ethno-cultural Hispanic/Latino background. Overall, the evidence to date shows a consistent positive association between acculturation and CSMK among Hispanic/Latino women but not men. In addition, evidence indicates that the association of acculturation on CSMK patterns among U.S. Hispanics/Latinos varies by nativity and country of origin. Given the unique opportunities presented with these data, relationships between the variables in this framework can be tested and further explicated, adding to the body of knowledge on the exposure to SHS and CSMK among ethno-culturally diverse Hispanic/Latino populations residing in four U.S. urban centers.

4. **Hypotheses**

Using the above-described theory and theoretical framework as a guide, this study’s hypotheses are as follows: For manuscript 1, it is hypothesized that the prevalence of SHS exposure in the home environment (past and current) and CCSMK will vary among ethno-cultural groups of
Hispanics/Latinos participating in the HCHS/SOL study. Additionally, based on the CSMK literature, SHS exposure and CSMK will vary by gender, age, income, education, Hispanic/Latino ethno-cultural groups, geographical location, and acculturation. Based on existing literature, individuals who are men, younger in age, have lower SES status (e.g., lower income and who are employed in low-skill occupations), and/or higher acculturation level will show a higher prevalence of SHS exposure in the home environment and CSMK.

Given the paucity of scientific data on the prevalence of CSMK and SHS exposure among large and representative samples of U.S. Hispanics/Latinos, findings related to these topics will be exploratory in nature. As mentioned in the preceding sections of this chapter, national and international studies on prevalence of CSMK and SHS exposure have several limitations, including low sample size and lack of representation from diverse North-, Central-, and South-American ethno-cultural backgrounds. To the author’s knowledge, the HCHS/SOL study is first study to include a large, diverse, and representative sample of Hispanics/Latinos residing in the United States.

Second, it is hypothesized that exposure to SHS (as a proxy for social influences) in the home environment will be positively associated with CSMK behavior. Individuals who were exposed to household cigarette smokers (particularly during childhood) will be more likely to be current cigarette smokers. For manuscript 2, it is hypothesized that the prevalence of OSHS exposure and CCSMK will vary across groups of HCHS/SOL participants (e.g., gender, age, income, education, occupation type, Hispanic/Latino ethno-cultural group, geographic location, and acculturation). Based on existing literature, individuals who are men, younger in age, have lower SES status, and/or higher acculturation level will show higher prevalence of OSHS exposure and CSMK. As in the case of HSHS exposure (manuscript 1), analyses related to variation of prevalence in CSMK and SHS exposure will be exploratory in nature.

In addition, it is hypothesized that OSHS exposure will be positively associated with CCSMK behavior, and those exposed to SHS in the work environment will be more likely to smoke cigarettes than
those who were not exposed to OSHS at the time of HCHS/SOL’s baseline interview. For manuscript 3, it is hypothesized that gender will act as a moderator in the association of home and OSHS exposure with CCSMK—i.e., the association will vary by gender. Informed by the literature, it is predicted that the association between SHS exposure and CCSMK will be more robust among men than women.
Figure 3. Conceptual framework at the individual level.
III. METHODS

A. HCHS/SOL Study Overview

The HCHS/SOL is a comprehensive multicenter community-based cohort study of Hispanics/Latinos in the United States. The study is sponsored by the National Institutes of Health (NIH). The study’s overall aim is to identify the prevalence of risk factors for diseases, disorders, and conditions in Hispanic/Latino populations living in the United States.

1. Study design

The current study is a cross-sectional observational study that utilizes baseline data collected during the first patient visit for the HCHS/SOL study. The study’s target population consists of 16,415 men and women (ages 18–74 years) who self-identify as Hispanic or Latino (Hispanic/Latino). More than 4,000 participants were enrolled at each HCHS/SOL field center. The study’s baseline data collection began in March 2008 and ended in June 2011. Data collection procedures consisted of a comprehensive baseline visit that included a thorough medical examination, and collection of survey data on current and past demographic, health related, and sociocultural factors.

2. Research setting

Hispanic Community Health Study/Study of Latinos four field centers are located in Chicago, Illinois; The Bronx, New York; Miami, Florida; and San Diego, California. The study sites were selected with consideration of geographical balance and so that the overall sample would consist of a diverse Hispanic/Latino population. It aimed at enrolling at least 2,000 individuals in each of the following origin designations: Mexican, Cuban, Puerto Rican, Dominican, and Central and South American.

The HCHS/SOL used a random sample of households in defined communities in the above-mentioned cities. A diverse participant sample was used with two main objectives in mind: (1) obtain representative sample of the target population; and (2) select participants who were likely to remain engaged during follow-up (in order to minimize attrition rates). A two-stage area probability
sample of households was selected for interview. Stratification and over-sampling were used to: (1) provide diversity with respect to SES; (2) promote efficiencies in field operations; and (3) ensure target age distribution with 62.5% of participants being ages 45 to 74 years to support inferences about disease incidence during follow-up. Inclusion criteria included being 18 to 74 years of age, and randomly selected and/or residing in the same household as the selected index person. Individuals who were pregnant or likely to leave the United States were excluded.

3. **Data collection procedures**

All study questionnaires were interviewer-administered and collected participants’ sociodemographic information (e.g., age, gender, income, education level), country of birth, length of stay in the United States, health and medical history, occupational measures (e.g., type of occupation), history of tobacco use, exposure to SHS (in the home and work environments), and acculturation status, among others. Study surveys were translated into Spanish and certified by independent translators. They were tested at each field center by focus groups to identify relevant differences in word usage by nationality or country/region of origin. All data were collected using a direct computer-based Data Management System (DMS) developed and programmed by the Coordinating Center at the University of North Carolina (UNC).

4. **Survey measures**

This study’s main outcome measure is CSMK status. Information on the participants’ CSMK status was collected using HCHS/SOL’s Tobacco Use questionnaire. The survey included questions on past and current cigarette use, ever use of cigars and pipes (not included in this study), cessation attempts (not included in this study), and exposure to SHS (See copy of questionnaire in Appendix A).

The exposure variables included: (1) sociodemographic data; (2) SHS exposure; (3) occupational history; (4) health insurance; (5) asthma diagnosis; and (6) acculturation.
5. **Sociodemographic data**

The participants’ sociodemographic data were collected using the HCHS/SOL Personal Identifiers and Personal Information questionnaires (See Appendix A).

a. **Exposure to SHS**

Information was collected using HCHS/SOL’s Tobacco Use questionnaire. The survey included questions on past and current exposure to SHS in the home environment (See copy of questionnaire in Appendix). Exposure to SHS in the work environment was collected using the Occupation Classification and Exposures Questionnaire (questions 27 and 37 in copy of questionnaire in Appendix A).

b. **Occupational Measures**

Data on employment status, history, and type of occupation were obtained via the Occupation Classification and Exposures Questionnaire (questions 1 through 20 in copy of questionnaire in Appendix A).

c. **Acculturation**

Indicators of acculturation were measured using the Short Acculturation Scale (SASH) previously validated for diverse Hispanic/Latino populations. The indicators included language use, media, and social networks preferences (questions 1 through 10 of copy in Appendix).

d. **Health insurance**

Variables related to health insurance were collected using the Health Care Use Questionnaire, question 10 (see questionnaire in Appendix). This exposure variable was included because it was determined to be a significant predictor of CSMK in a HCHS/SOL manuscript looking at the association between CSMK and acculturation (Kaplan, 2014). As expected, Hispanics/Latinos who had health insurance and increased access to health care were significantly less likely to be current smokers.
and more likely to have been advised to quit smoking. Therefore, it is important to control for this possible confounder in this study’s analyses.

e. **Asthma diagnosis**

Hispanics/Latinos are disproportionately affected by asthma (U.S. Surgeon General, 2006). Cigarette smoking and exposure to SHS have been shown to be important risk factors in the etiology of asthma (U.S. Surgeon General, 2006). It is therefore important to control for this important variable.

f. **Research staff**

The study’s staff consisted of epidemiologists, psychologists, biostatisticians, participant recruiters, health interviewers, clinicians, nurses, and nutritionists. They were bilingual (Spanish and English) and bicultural. They were all highly trained and certified in the study’s procedures and protocol to ensure standardized data collection across the four nationwide field sites.

g. **Data management and storage**

All data were managed and stored using the above-mentioned direct computer-based DMS. Quality assurance included: (1) central training of all HCHS/SOL staff; (2) standardized certification of staff across study sites; (3) all recruitment and data collection procedures were monitored via direct observation and (4) measurement variability was determined through repetition of procedures.

6. **Protections from research risks**

The HCHS/SOL is conducted under the oversight of Northwestern University’s institutional review board (IRB), as well as the IRBs at the other field sites and the coordination center universities. Following federal contracts’ regulations, all data collection forms were cleared by the Office of Management and Budget. A copy of University of Illinois at Chicago approval is included as part of the Appendix B.
B. Data Analysis

The overall analysis population was defined as HCHS/SOL participants with complete baseline data for age, gender, Hispanic/Latino ethno-cultural background, CSMK, SHS exposure (home and work environment), acculturation measures, education level, income, occupational status and type, health insurance, and geographic location (HCHS/SOL field center). Due to the sampling design and strategies described above, all data analyses weighted following HCHS/SOL recommendations and guidelines.

Data analyses are organized by specific aim as follows:

1. Specific aim 1
   a. Exposure variables
      Primary independent variables of interest include those related to current and past exposure to SHS in the home environment defined as: (1) none; (2) having lived with a regular smoker before the age of 13 years; (3) having lived with regular smoker after the age of 13 years; (4) growing up with a smoking mother or primary female caregiver; or (5) currently living with regular cigarette smoker (from Tobacco Questionnaire). Indicators of current and past exposure to SHS in the work environment were collected using HCHS/SOL Occupational Exposures questionnaire (See the Appendix A for additional details).

   b. Outcome variable
      The outcome variable of interest was current cigarette smoking.

   c. Covariates
      Age, gender, Hispanic/Latino ethnic group (Mexican, Cuban, PR, Dominican, Central American, and South American), acculturation score, education level, income, OSHS exposure, occupational status, health insurance, asthma diagnosis, and geographic location (HCHS/SOL field center).

   d. Statistical analyses
Exploratory analyses were carried out. Descriptive statistics were computed for the total cohort and by Hispanic/Latino ethnic group. The prevalence of CSMK is described for men and women separately, by SHS exposure at home and work, age, education level (less than high school, high school or equivalent, greater than high school or equivalent), income (tertiles), acculturation indicators, occupational status, health insurance, and HCHS/SOL field center.

2. **Specific aim 2**
   a. **Exposure variables**

   Primary independent variables of interest included those related to current and past exposure to SHS in the home environment defined as: (1) none; (2) having lived with a regular smoker before the age of 13 years; (3) having lived with regular smoker after the age of 13 years; (4) growing up with a smoking mother or primary female caregiver; (5) currently living with regular cigarette smoker (from the Tobacco Use Questionnaire, the Appendix A).

   b. **Outcome variable**

   The outcome variable was CCSMK.

   c. **Covariates**

   Age, gender, Hispanic/Latino ethnic group (Mexican, Cuban, PR, Dominican, Central American, and South American), education level (less than high school, high school or equivalent, greater than high school or equivalent), income (tertiles), acculturation indicators, occupational status, OSHS, health insurance, asthma diagnosis, and HCHS/SOL geographic location/field center.

   d. **Statistical analyses**

   Multivariable analyses used logistic regression to describe the association between SHS exposure indicators in the home environment (past and current) and CSMK adjusting for the above-listed covariates.
3. **Specific aim 3**

a. **Exposure variable**

   Current exposure to OSHS (the Occupational Exposures Questionnaire, Appendix A).

b. **Outcome variable**

   The outcome variable was CCSMK.

c. **Covariates**

   Age, gender, Hispanic/Latino ethnic group (Mexican, Cuban, PR, Dominican, Central American, and South American), education level (less than high school, high school or equivalent, greater than high school or equivalent), income (tertiles), acculturation indicators, occupational status, OSHS, health insurance, asthma diagnosis, and HCHS/SOL geographic location/field center.

d. **Statistical analyses**

   Multivariable analyses used logistic regression to describe the association between SHS exposure indicators in the work environment (past and current) and CSMK adjusting for the above listed covariates.

4. **Specific aim 4**

a. **Exposure variables**

   Primary independent variables of interest include those related to current and past exposure to SHS in the home (for Specific Aim 2) and work (for Specific Aim 3) environments, as defined above from the Tobacco Use and Occupational Exposures Questionnaires, respectively.

b. **Outcome variable**

   The outcome variable was CCSMK.

c. **Covariates**
Age, gender, Hispanic/Latino ethnic group (Mexican, Cuban, PR, Dominican, Central American, and South American), education level (less than high school, high school or equivalent, greater than high school or equivalent), income (tertiles), acculturation indicators, occupational status, OSHS, health-care use measures, asthma diagnosis, and HCHS/SOL geographic location/field center.

d. **Statistical analyses**

Multivariable analyses using logistic regression similar to those described for Specific Aims 2 and 3 were repeated testing for interaction between gender and indicators of SHS exposure (See additional details on Results Section, Manuscript 3). Briefly, a series of logistic regression models were fitted to describe the association of SHS exposure with CCSMK with adjustment for age, gender, education level, income, Hispanic/Latino heritage groups, health insurance, asthma diagnosis, and acculturation level. The models were as follows:

\[
Y_{CCSM} = \mu + \beta_{HSHS\text{ exposure}} + \beta_{age} + \beta_{gender} + \beta_{education} + \beta_{income} + \beta_{H/L\text{ group}} + \beta_{health\ text{ insurance}} + \beta_{asthma\ diagnosis} + SE
\]

For OSHS exposure the model was \( Y_{CCSM} = \mu + \beta_{OSHS\text{ exposure}} + \beta_{age} + \beta_{gender} + \beta_{education} + \beta_{income} + \beta_{H/L\text{ group}} + \beta_{health\ text{ insurance}} + \beta_{asthma\ diagnosis} + \beta_{SASHscore} + \beta_{OSHS\text{ exposure}} + SE \)

In addition to these covariates, model 2 included interaction terms between SHS exposure indicators and gender. The logistic regression models were as follows:

\[
Y_{CCSM} = \mu + \beta_{HSHS\text{ exposure}} + \beta_{age} + \beta_{gender} + \beta_{education} + \beta_{income} + \beta_{H/L\text{ group}} + \beta_{health\ text{ insurance}} + \beta_{asthma\ diagnosis} + \beta_{SASHscore} + \beta_{OSHS\text{ exposure}} + \beta_{gender \times HSFS\text{ exposure}} + SE
\]

For OSHS exposure the model was \( Y_{CCSM} = \mu + \beta_{OSHS\text{ exposure}} + \beta_{age} + \beta_{gender} + \beta_{education} + \beta_{income} + \beta_{H/L\text{ group}} + \beta_{health\ text{ insurance}} + \beta_{asthma\ diagnosis} + \beta_{SASHscore} + \beta_{HSHS\text{ exposure}} + \beta_{gender \times OSHS\text{ exposure}} + SE \)

All statistical analyses were performed using SAS (V. 9.2, SAS Institute, Inc.).
5. **Rigor of research**

   a. **Validity**

      A number of measures were taken to ensure internal and external validity of this study’s findings. They included the following: (1) all survey data were collected through widely used and validated questionnaires, which have been previously administered to diverse racial/ethnic populations. They were pilot-tested through individual interviews, as well as focus groups Hispanics/Latinos of various ethnocultural heritages. (2) Cultural and language issues were addressed by developing all questionnaires in English and Spanish. They were administered in the participant’s preferred language by fully bilingual and bicultural trained interviewers. (3) All data were collected electronically using a direct computer based data entry system designed to ensure completeness of various data points. (4) With regard to external validity, the majority of the questionnaires used in the proposed study were the same as those routinely used in other national level epidemiological studies such as NHIS and the BRFSS.

   b. **Bias**

      This study includes a number of potential biases. For example, it relies on self-reported data. Bias may arise from issues related to “social desirability” around CSMK behavior (Tourangeau, 2007). Extensive literature has documented that Hispanics/Latinos tend to respond to survey items regarding CSMK with responses they consider will satisfy the interviewer. More specifically, they tend to underreport frequency and intensity of CSMK, underestimate their level of addiction, and not consider “social smoking” as part of their CSMK habits. Therefore, it is possible that participants may have underreported CSMK behavior and/or exposure to SHS. Therefore the prevalence rates obtained may be an underestimate of true prevalence rates. In addition, some survey questions on exposure to SHS asked about exposure as a child, and therefore, data may be subject to recall-bias.

   c. **Generalizability**

      The sample was drawn from four selected U.S. urban centers. Although the community-based sampling design permits inferences to the larger population from which it is drawn,
findings on the prevalence of risk factors or disease cannot be generalized to the larger Hispanic/Latino community across the United States. The HCHS/SOL used many procedures common to NHIS and other studies, and analysis was conducted to compare this study’s findings to those of other investigations.

C. **Study’s potential limitations**

The HCHS/SOL is the most comprehensive study of Hispanic/Latino in the United States to date. However, as mentioned in the above section, the proposed research has a number of potential limitations, which are as follows: (1) It is a cross-sectional study and only baseline data will be used to evaluate the association between exposure to SHS in the home environment/family influences and CSMK. (2) The sample was drawn from four selected U.S. urban centers. Although the community-based sampling design permitted inferences to the larger population from which was drawn, findings on the prevalence of risk factors of disease cannot be generalized to the larger Hispanic/Latino community (e.g., rural populations) across the United States. The HCHS/SOL used many procedures common to NHIS and other studies, and analysis was conducted to compare this study’s findings to those of other investigations. (3) This study relied on self-reported data, and participants may underreport CSMK behavior and/or exposure to SHS. (4) Some survey questions on exposure to SHS asked about exposure as a child, and therefore, data may be subject to recall-bias.
IV. RESULTS

A. **Manuscript 1: Association of Exposure to Secondhand Smoke Exposure in the Home Environment with Cigarette Smoking in the Hispanic Community Health Study/Study of Latinos**

1. **Background**

   Tobacco use is a major contributor to morbidity and mortality in the United States. Secondhand smoke exposure is defined as the smoke emitted from smokers’ burning cigarettes that is inhaled by surrounding nonsmokers, and represents a major health risk to nonsmokers (U.S. Environmental Protection Agency, 1992).

   Extensive epidemiologic and clinical evidence from cohort, case-control designs, and meta-analysis has shown that SHS increases the risk of major chronic diseases such as CVD, lung cancer, and respiratory diseases (U.S. Environmental Protection Agency, 1992; U.S. Surgeon General, 2006; IOM, 2010). Healthy People 2020’s objectives target tobacco use with the specific goal of reducing illness, disability, and death related to tobacco use and SHS (U.S. Department of Health and Human Services, 2013).

   Despite efforts to reduce environmental SHS, the current national SHS exposure prevalence remains high: national data showed that close to 40% of nonsmoking adults aged 18 years and older were exposed to SHS in 2005–2008, and that 20% of individuals in this age group smoked cigarettes (Kaufmann, 2010; CDC, 2012b). While Hispanics/Latinos have lower overall rates of SHS exposure (20%) than other racial/ethnic groups, limited data show that these rates differ across Hispanic/Latino ethnic subgroups (Kaufmann, 2010; CDC, 2012b; Pérez-Stable, 2001). A study evaluating attitudes and beliefs around CSMK showed that Cubans and PRs reported a higher acceptability of CSMK compared to Hispanics/Latinos of other ethnic backgrounds (Pérez-Stable, 2001).
Moreover, disparities in SHS exposure exist in relation to racial/ethnic groups as well as with income and educational level. Secondhand smoke exposure tends to be higher for persons with low income and educational levels: 60% of persons living below the poverty level in the United States were exposed to SHS in 2007–2008 (Kaufmann, 2010). However, no large studies have determined how the SHS rates vary across representative and diverse Hispanic/Latino ethno-cultural groups.

Exposure to SHS in the home environment and familial influences (e.g., parental and sibling smoking behaviors) have also been shown to play a role on the onset and maintenance of smoking behavior. For example, epidemiologic prospective studies showed that children whose family members smoked cigarettes were socially influenced by their relatives, and were significantly more likely to begin smoking themselves (Hill, 2005). These findings support this study’s theoretical model in the sense that observational learning of CSMK in the home environment may influence children and youth to become smokers by observing their parents or other relatives smoke cigarettes.

None of the previous studies have examined the association of exposure to SHS in the home environment with CSMK among a representative population of Hispanics/Latinos with diverse cultural heritage and socioeconomic position. Understanding the association between HSHS exposure/social influences and CSMK among Hispanics/Latinos living in the United States is important because of three main reasons: (1) very little is known about the influence of family members’ influence on smoking behavior among Hispanics/Latinos of diverse ethno-cultural heritage; most studies have focused mainly on MAs and PRs; (2) the increasing prevalence rates of CSMK among Hispanic/Latino adolescents living in the United States (particularly Latinas), which are higher than those for AAs and closer to those of NHW adolescents (CDC, 2010); and (3) CSMK in the home has become the most important environmental source of SHS exposure following enforcement of SHS control policies (U.S. Surgeon General, 2006)

The purpose of this study is to examine the association of HSHS exposure with adult CSMK behavior among a diverse Hispanic/Latino population living in four U.S. urban centers. This study’s first
specific aim is to examine variation in SHS exposure (past and current exposure in the home environment) and CSMK among Hispanic/Latino subgroups—i.e., gender, age, SES, geographic location, ethno-cultural heritage, and acculturation. It is hypothesized that variation in SHS exposure in the home environment (past and current) and CSMK will be observed among Hispanic/Latino groups. Secondhand smoke exposure and CSMK will vary by gender, age, income, education, geographic location, ethno-cultural heritage, and acculturation. Based on existing literature, individuals who are men, younger in age, have lower SES status, and/or higher acculturation level will show higher prevalence of SHS exposure and CSMK. Due to the ethno-cultural diversity among Hispanics/Latinos of various countries and heritages and the lack of data on HSHS exposure across Hispanic/Latino groups, the analyses on the variation in prevalence will be exploratory in nature.

The second specific aim is to examine the association HSHS exposure with CCSMK status across Hispanic/Latino ethno-cultural groups. Based on the literature and this study’s theoretical model, it is hypothesized that HSHS exposure will be positively associated with CCSMK among Hispanic/Latino ethno-cultural groups. The following study research questions guided this analysis: (1) How do exposure to SHS in the home environment (past and current) and CSMK vary across Hispanic/Latino subgroups defined by age, gender, SES, geographic location, ethno-cultural heritage, and acculturation? (2) What is the association between HSHS exposure with CCSMK status? (3) Does this association vary across Hispanic/Latino ethno-cultural groups?

2. Methods
   a. Study design and sample

   The proposed study is a cross-sectional observational study that uses baseline data collected during the first patient visit for the HCHS/SOL, which aimed to examine risk and protective factors for chronic diseases such as CVD. The study’s methodology has been previously described (Sorlie, 2012; LaVange, 2010). Briefly, 16,415 individuals (self-identified as Hispanic/Latino) aged 18–74 years were recruited from randomly selected households in defined communities in four U.S.
urban centers (The Bronx, New York; Chicago, Illinois; Miami, Florida; San Diego, California) between March 2008 and June 2011. The study used a stratified two-stage area probability sample design to select the households (LaVange, 2010). The IRBs at each participating institution approved the study, and informed consent was obtained from all participants.

b. Study population and setting

The study population for this analysis consisted of 13,231 men and women (ages 18–74 years) who self-identified as Hispanic/Latino; approximately 3,000 participants were included from each HCHS/SOL field center. The study sites were selected with consideration of geographical balance and so that the overall sample would consist of a diverse Hispanic/Latino population. Inclusion criteria included being 18 to 74 years of age, randomly selected and/or residing in the same household as the selected index person, and having complete data for the variables of interest. Individuals who were pregnant or likely to relocate outside of these selected communities were excluded.

c. Data collection procedures

A comprehensive baseline visit included a medical examination, as well as survey data collection on current and past demographic, health-related, and sociocultural factors. The HCHS/SOL questionnaires were interviewer-administered and collected participant’s sociodemographic information (age, gender, income, and education), occupational status, health insurance, asthma diagnosis, history of tobacco use, and exposure to SHS (in the home and work environments). Study surveys were translated into Spanish and certified by independent translators. They were tested at each field center by focus groups to identify relevant differences in word usage by nationality or country/region of origin. All data were collected using a direct computer-based DMS developed and programmed by the CC at the UNC (Sorlie, 2012; LaVange, 2010).
d. **Survey measures**

This study’s main outcome measure was CCSMK status. Information on the participants’ CSMK behavior was collected using HCHS/SOL’s Tobacco Use questionnaire. The survey included questions on past and current CSMK, ever use of cigars and pipes, and cessation attempts (the latter two measures were not included in this analysis; see copy of questionnaire in Appendix A). The exposure variables include sociodemographic data, SHS exposure, acculturation measures, health-care insurance, and asthma diagnosis. All of the variables were included because they have consistently been identified as important factors for both CSMK and SHS exposure.

Sociodemographic data were collected using the HCHS/SOL Personal Identifiers, Personal Information and Economic Questionnaires (See the Appendix A). Exposure to SHS information was collected using HCHS/SOL’s Tobacco Use questionnaire. The survey included questions on past and current exposure to SHS in the home environment (questions 12–15 in copy of questionnaire in Appendix A).

Current exposure to SHS in the work environment was collected using the Occupation Classification and Exposures Questionnaire (questions 27.1. in copy of questionnaire in Appendix A).

Employment Status was obtained via the Occupation Classification and Exposures Questionnaire (questions 5 and 16 in copy of questionnaire in Appendix A).

Health insurance coverage was collected using the Health Care Use Questionnaire (question 10.a. in copy of questionnaire in Appendix A). This exposure variable was included because it was determined to be a significant predictor of CSMK in an HCHS/SOL manuscript looking at the prevalence and risk factors for CSMK (Kaplan, 2014).

Asthma diagnosis was determined using the Respiratory Health Questionnaire (questions 32, 34, and 35 in copy of questionnaire in Appendix A). Acculturation: language preference, length of stay in the United States, and SASH score were used as measures of acculturation.
e. Data analyses

The analysis population included HCHS/SOL participants with complete baseline data for age, gender, Hispanic/Latino ethno-cultural background, CSMK, SHS exposure, education level, income, health insurance, asthma diagnosis, language preference, length of stay in the United States, SASH score, and geographic location (HCHS/SOL field center). The study population included similar numbers of participants from the four HCHS/SOL field centers in order to capture the nation wide Hispanic/Latino diversity.

1) Exposure variables

Primary independent variables of interest included those related to current and past exposure to HSHS defined as: (1) none; (2) having lived with a regular smoker before the age of 13 years; (3) having lived with a regular smoker after the age of 13 years; (4) growing up with a smoking mother or primary female caregiver; (5) currently living with regular cigarette smoker.

2) Outcome variable

The outcome variable was CCSMK.

3) Covariates

The covariates included age, gender, Hispanic/Latino ethno-cultural background (Mexican, Cuban, PR, Dominican, Central American, and South American), education level, income, employment status, OSHS exposure, health insurance, asthma diagnosis, language preference, length of stay in the United States, and geographic location (HCHS/SOL field center).

4) Statistical analysis

First, exploratory data analyses were performed for the exposure and outcome variables across Hispanic/Latino groups. Descriptive statistics were computed for the total cohort and for Hispanic/Latino groups. All reported values (means, prevalence values, and ORs) in this analysis were weighted to adjust for sampling probability and nonresponse (Sorlie, 2012; LaVange, 2010). P-values for overall group comparisons were calculated using $X^2$ tests for categorical variables, and F-tests for continuous variables.
Second, the prevalence of HSHS exposure was determined for men and women separately by age, income, education level, geographical location, Hispanic/Latino ethno-cultural group, language preference, and length of stay in the United States. Third, the prevalence of CSMK was determined separately for men and women, by HSHS exposure, age, income, education level, Hispanic/Latino ethno-cultural group, language preference, length of stay in the United States, and geographic location.

Fourth, logistic regression was used to describe the association of past HSHS exposure indicators with CSMK adjusting for age, gender, education level, income, and HCHS/SOL field center, overall and stratified by Hispanic/Latino ethno-cultural groups (model 1). In addition to these covariates, model 2 adjusted for other potential confounders that included OSHS exposure, health insurance, current asthma diagnosis, language preference, length of stay in the United States. Due to the small numbers of participants currently exposed to HSHS, the related-data analyses were not reliable. For this reason, only the findings for past HSHS exposure are presented. All statistical analyses were performed using SAS (V. 9.2, SAS Institute, Inc.).

3. Results
   a. Participants’ characteristics

   The final sample of 13,231 adults included 7,810 women (51%), and 5,421 men (49%). The mean age was 41 years. Demographic information is summarized in Table I. Close to half of the participants (47%) reported a household income lower than $20,000 and only a minority (12%) had an income higher than $50,000. Approximately one-third of participants had less than a high school degree, and 40% had education beyond high school. Fifty-three percent of participants were employed. In terms of geographic location, 17% of participants resided in Chicago, 27% in The Bronx, 28% in Miami, and the remaining 28% in San Diego. Half of them had health insurance. Fifteen percent reported having asthma at some point in their lives, while 7% had asthma at the time of the data collection interview.

   b. Ethno-cultural characteristics
As shown in Table I, the study population was very diverse. It included Mexicans (5,643), PRs (2,237), Cubans (1,847), Central Americans (1,412), Dominicans (1,191), and South Americans (901). The majority of participants had lived in the United States ten years or more (73%), and preferred to speak Spanish (76%).

Sections 3 through 6 will address findings from data analyses in relation to hypothesis 1: the prevalence of SHS exposure in the home environment (past and current) and CSMK will vary across sociodemographic and Hispanic/Latino ethnocultural groups.

Sections 3 through 6 will address findings from data analyses in relation to hypothesis 1: the prevalence of SHS exposure in the home environment (past and current) and CSMK will vary across sociodemographic and Hispanic/Latino ethnocultural groups.
### TABLE I
DESCRIPTIVE CHARACTERISTICS FOR ALL PARTICIPANTS AND BY HISPANIC/LATINO GROUP

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Overall (n=13,231)</th>
<th>Dominican (n=1,191)</th>
<th>Central (n=1,412)</th>
<th>Cuban (n=1,847)</th>
<th>Mexican (n=5,643)</th>
<th>Puerto (n=2,237)</th>
<th>South (n=901)</th>
<th>P-valueb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>41.3 (40.8,41.9)</td>
<td>40.1 (38.7,41.5)</td>
<td>39.9 (38.8,40.9)</td>
<td>46.7 (45.6,47.8)</td>
<td>38.5 (37.7,39.2)</td>
<td>43.3 (42.2,44.4)</td>
<td>42.6 (41.1,44.1)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Men</td>
<td>48.9 (47.8,50.1)</td>
<td>39.7 (35.7,43.8)</td>
<td>49.5 (45.7,53.4)</td>
<td>55.9 (53.7,58.1)</td>
<td>47.4 (45.4,49.4)</td>
<td>51 (47.9,54.0)</td>
<td>45.7 (41.7,49.8)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Women</td>
<td>51.1 (49.9,52.2)</td>
<td>60.3 (56.2,64.3)</td>
<td>50.5 (46.6,54.3)</td>
<td>44.1 (41.9,46.3)</td>
<td>52.6 (46.0,52.1)</td>
<td>49 (50.2,58.3)</td>
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<td></td>
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<tr>
<td>Income ($)</td>
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<tr>
<td>&lt;20,000</td>
<td>46.8 (44.7,48.8)</td>
<td>54.8 (50.1,59.5)</td>
<td>53.3 (48.9,57.7)</td>
<td>55.2 (51.9,58.6)</td>
<td>38.9 (35.7,42.0)</td>
<td>49.8 (45.9,53.7)</td>
<td>43.7 (39.1,48.2)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>20,000–$50,000</td>
<td>40.8 (39.4,42.3)</td>
<td>37.4 (33.1,41.7)</td>
<td>38.6 (34.6,42.6)</td>
<td>36.5 (33.5,39.5)</td>
<td>45.6 (43.2,48.0)</td>
<td>35.8 (32.0,39.6)</td>
<td>44.9 (40.6,49.1)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>&gt;50,000</td>
<td>12.4 (10.8,14.0)</td>
<td>7.8 (5.4,10.2)</td>
<td>8.1 (5.7,10.4)</td>
<td>8.3 (6.2,10.4)</td>
<td>15.6 (12.6,18.5)</td>
<td>14.4 (11.9,16.8)</td>
<td>11.5 (8.5,14.4)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Less Than High School</td>
<td>31.7 (30.2,33.2)</td>
<td>34.5 (30.9,38.2)</td>
<td>37.4 (33.7,41.4)</td>
<td>20.6 (18.2,23.0)</td>
<td>35.3 (32.7,38.0)</td>
<td>34.5 (31.2,37.7)</td>
<td>21.7 (17.6,25.7)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>High School or Equivalent</td>
<td>28.6 (27.4,29.8)</td>
<td>24.5 (20.4,28.6)</td>
<td>26.7 (23.5,29.9)</td>
<td>29.9 (26.7,33.1)</td>
<td>29.8 (27.7,31.9)</td>
<td>28 (25.4,30.5)</td>
<td>26.6 (22.7,30.5)</td>
<td>0.1</td>
</tr>
<tr>
<td>Beyond High School or</td>
<td>39.7 (38.0,41.4)</td>
<td>41 (37.2,44.8)</td>
<td>35.9 (32.4,39.4)</td>
<td>49.4 (46.2,52.7)</td>
<td>34.9 (31.7,38.1)</td>
<td>37.6 (34.1,41.0)</td>
<td>51.7 (47.3,56.2)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Employed</td>
<td>52.9 (51.3,54.4)</td>
<td>51.1 (46.2,56.0)</td>
<td>61.5 (58.1,64.8)</td>
<td>45.7 (42.4,48.9)</td>
<td>58.1 (55.9,60.2)</td>
<td>41.8 (38.7,45.0)</td>
<td>64.5 (60.3,68.8)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Characteristic</td>
<td>Overall</td>
<td>Dominican</td>
<td>Central</td>
<td>Cuban</td>
<td>Mexican</td>
<td>Puerto</td>
<td>South</td>
<td>P-value(^b)</td>
</tr>
<tr>
<td>----------------</td>
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<tr>
<td></td>
<td>(n=13,231)</td>
<td>(n=1,191)</td>
<td>(n=1,412)</td>
<td>(n=1,847)</td>
<td>(n=5,643)</td>
<td>(n=2,237)</td>
<td>(n=901)</td>
<td></td>
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<tr>
<td>HCHS/SOL Site</td>
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<td></td>
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<tr>
<td>Bronx</td>
<td>26.8</td>
<td>94.1</td>
<td>18.0</td>
<td>1.3</td>
<td>7.3</td>
<td>70.6</td>
<td>23.3</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>(24.0,29.6)</td>
<td>(91.5,96.8)</td>
<td>(13.1,22.8)</td>
<td>(0.7,1.9)</td>
<td>(5.1,9.5)</td>
<td>(66.4,74.7)</td>
<td>(17.8,28.9)</td>
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</tr>
<tr>
<td>Chicago</td>
<td>16.9</td>
<td>0.9</td>
<td>15.6</td>
<td>1.0</td>
<td>25.6</td>
<td>22.4</td>
<td>21.6</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>(14.8,18.9)</td>
<td>(0.4,1.4)</td>
<td>(11.6,19.5)</td>
<td>(0.0,1.9)</td>
<td>(21.8,29.3)</td>
<td>(18.7,26.2)</td>
<td>(16.3,27.0)</td>
<td></td>
</tr>
<tr>
<td>Miami</td>
<td>27.9</td>
<td>4.5</td>
<td>62</td>
<td>97.2</td>
<td>1.2</td>
<td>4.8</td>
<td>50.2</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>(23.7,32.0)</td>
<td>(2.0,7.0)</td>
<td>(54.9,69.2)</td>
<td>(95.8,98.6)</td>
<td>(0.6,1.7)</td>
<td>(3.2,6.4)</td>
<td>(43.0,57.4)</td>
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<tr>
<td>San Diego</td>
<td>28.5</td>
<td>0.4</td>
<td>4.4</td>
<td>0.5</td>
<td>66</td>
<td>2.2</td>
<td>4.8</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>(24.9,32.1)</td>
<td>(0.0,1.0)</td>
<td>(2.5,6.4)</td>
<td>(0.0,1.2)</td>
<td>(61.7,70.4)</td>
<td>(0.9,3.5)</td>
<td>(1.7,8.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>49.9</td>
<td>70.3</td>
<td>30.8</td>
<td>41.2</td>
<td>42.4</td>
<td>77.9</td>
<td>41.7</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

a: Values are weighted for study design and nonresponse.

b: P-values for overall group comparisons were calculated using \(X^2\) tests for categorical variables, and F-tests for continuous variables.
c. **Prevalence of secondhand smoke exposure exposure**

The prevalence of SHS exposure is summarized in Table II. Secondhand smoke exposure in the home environment was common, with about 40% of participants reporting being exposed to SHS before and after the age of 13 years. About one-quarter reported maternal smoking during childhood (23%), and 20% of the participants were currently exposed to HSHS. Comparisons by Hispanic/Latino ethno-cultural groups showed that Dominicans were more exposed to SHS before the age of 13 years only (14%), while the prevalence of HSHS exposure after the age of 13 only was higher for South Americans (15%), Central Americans (14%), and Mexicans (14%). The prevalence of SHS exposure before and after 13 years was significantly higher for Cubans (59%) and PRs (47%) than other Hispanic/Latino groups, and ranged from 30% (Central Americans) to 37% (Dominicans), p-value<.01. Maternal CSMK was also more common among these two ethnic groups (Cubans 35% and PRs 30%) than other Hispanic/Latino groups, p<.01.

In terms of SHS exposure in the work environment, 7% of participants reported current exposure to OSHS. Comparisons by Hispanic/Latino ethno-cultural groups showed that the prevalence was higher for Central Americans (10%) than other Hispanic/Latino groups (ranging from 4% Dominicans to 8% (MAs and PRs).
### TABLE II
**PREVALENCE OF SHS EXPOSURE AND CSMK BY HISPANIC/LATINO GROUP**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Overall (n=13,231)</th>
<th>Dominican (n=1,191)</th>
<th>Central American (n=1,412)</th>
<th>Cuban (n=1,847)</th>
<th>Mexican (n=5,643)</th>
<th>Puerto Rican (n=2,237)</th>
<th>South American (n=901)</th>
<th>P-value^b</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Home SHS Exposure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>≥13 years old</td>
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<td>26</td>
<td>15.8</td>
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<td><strong>Current Number of Household Smokers</strong></td>
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<td>One or More</td>
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<td>(12.1,20.5)</td>
<td>(13.9,19.6)</td>
<td>(19.8,24.7)</td>
<td>(16.4,21.0)</td>
<td>(24.7,30.6)</td>
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<td><strong>Current Occupational SHS Exposure</strong></td>
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<td>Characteristic</td>
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<td>Dominican (n=1,191)</td>
<td>Central American (n=1,412)</td>
<td>Cuban (n=1,847)</td>
<td>Mexican (n=5,643)</td>
<td>Puerto Rican (n=2,237)</td>
<td>South American (n=901)</td>
<td>P-value&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>Home SHS Exposure</td>
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<td>Cigarette Smoking</td>
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<tr>
<td>Never</td>
<td>61.7 (60.3,63.0)</td>
<td>76.8 (73.2,80.3)</td>
<td>71.5 (68.1,74.8)</td>
<td>53.7 (50.5,56.9)</td>
<td>64.0 (61.7,66.3)</td>
<td>50.3 (47.1,53.4)</td>
<td>65.9 (61.7,70.1)</td>
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<td>Former</td>
<td>17.7 (16.7,18.6)</td>
<td>11.8 (9.4,14.2)</td>
<td>14.3 (12.2,16.4)</td>
<td>20 (17.8,22.2)</td>
<td>18.2 (16.5,19.9)</td>
<td>17 (14.3,19.7)</td>
<td>22.4 (19.0,25.8)</td>
<td>&lt;.001</td>
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<tr>
<td>Current</td>
<td>20.7 (19.5,21.9)</td>
<td>11.0 (8.1,14.8)</td>
<td>14.3 (11.5,17.0)</td>
<td>26.3 (23.5,29.0)</td>
<td>17.8 (15.9,19.6)</td>
<td>32.7 (29.9,35.6)</td>
<td>11.7 (9.0,14.3)</td>
<td>&lt;.001</td>
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<tr>
<td>Cigarette Pack/Year</td>
<td>5.1 (4.7,5.6)</td>
<td>3.0 (2.4,3.7)</td>
<td>2.8 (2.3,3.3)</td>
<td>11.0 (9.7,12.2)</td>
<td>2.4 (2.2,2.7)</td>
<td>7.8 (7.0,8.7)</td>
<td>3.7 (2.6,4.7)</td>
<td>&lt;.001</td>
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</table>

a: Values are weighted for study design and nonresponse.

b: P-values for overall group comparisons were calculated using $X^2$ tests for categorical variables, and F-tests for continuous variables.
d. **Gender, social factors and home secondhand smoke exposure**

The prevalence of HSHS exposure by social factors associated with increased risk of exposure to SHS was examined for men and women separately (Table III). Comparisons by gender showed that in general, the prevalence of former and current HSHS exposure was similar for men and women of various age groups; overall, participants younger than 65 years had higher former and current SHS exposure than their older counterparts. In terms of income, men who reported a household income below $50,000 had a significantly higher HSHS exposure prevalence (around 19.5% for former and 8.5% for current exposure) than those who earned $50,000 or more (6.7% and 2.1%, respectively, p<.01). For women, a similar pattern was observed: those in the lower income categories had a higher HSHS exposure prevalence (around 18.7% for former and 9.7% for current), compared to those in the >$50,000 category (3.6% and 1.6%, respectively, p<.01). Men of different educational levels had similar prevalence of HSHS exposure (around 15% for former and 6.5% for current). A similar pattern was observed for women, with SHS exposure prevalence ranging from 14% for former and 7% for current.

The prevalence of exposure to SHS smoke also varied by geographical site—i.e., HCHS/SOL field center. In general, men and women residing in Chicago had lower former and current HSHS exposure prevalence than participants residing in The Bronx, Miami, and San Diego (Table III). However, the prevalence of current and former HSHS exposure varied by Hispanic/Latino ethno-cultural group; men and women of Mexican, Cuban, and PR descent had a higher prevalence of former and current SHS exposure than participants in other Hispanic/Latino groups (Table III). In terms of acculturation level, men and women who preferred to speak Spanish had a higher prevalence of former (34%) and current (14%) HSHS exposure compared to English-speaking participants (8% and 6%, respectively). In contrast, the prevalence of former (12%) and current (5%) HSHS exposure for participants who had lived in the United States for less than 10 years were lower compared to those with 10 or more years of U.S. residence (31% and 14%, respectively; table III).
### TABLE III
PREVALENCE OF HOME EXPOSURE TO SHS BY SOCIAL FACTORS AMONG HISPANIC/LATINO PARTICIPANTSa

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<tr>
<th>Characteristic</th>
<th>Men</th>
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<th>Women</th>
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<tr>
<td></td>
<td>Never</td>
<td>Former</td>
<td>Current</td>
<td>P-valueb</td>
<td>Never</td>
<td>Former</td>
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<tr>
<td></td>
<td>1.903</td>
<td>2,528</td>
<td>990</td>
<td>&lt;.001</td>
<td>2,829</td>
<td>3,426</td>
<td>1,555</td>
<td>&lt;.001</td>
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<tr>
<td></td>
<td>-35.00%</td>
<td>-46.70%</td>
<td>-18.30%</td>
<td>&lt;.001</td>
<td>-36.10%</td>
<td>-44.00%</td>
<td>-20.00%</td>
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<td>Age Group</td>
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<tr>
<td>18–39 yrs</td>
<td>18.6 (0.8)</td>
<td>18.8 (0.9)</td>
<td>11.1 (0.8)</td>
<td>&lt;.001</td>
<td>20.5 (0.9)</td>
<td>14.6 (0.6)</td>
<td>11.0 (0.7)</td>
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<td>40–64 yrs</td>
<td>13.6 (0.6)</td>
<td>23.1 (0.8)</td>
<td>7.3 (0.5)</td>
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<tr>
<td>65–74 yrs</td>
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<td>4.0 (0.4)</td>
<td>1.1 (0.2)</td>
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<td>2.8 (0.4)</td>
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<td>&lt; 20,000</td>
<td>11.8 (0.6)</td>
<td>20.1 (0.9)</td>
<td>9.7 (0.6)</td>
<td>&lt;.001</td>
<td>18.8 (0.7)</td>
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<td>20,000–50,000</td>
<td>16.3 (0.8)</td>
<td>19.1 (0.8)</td>
<td>7.6 (0.5)</td>
<td>&lt;0.01</td>
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<td>&gt;50,000</td>
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<td>6.7 (0.7)</td>
<td>2.1 (0.4)</td>
<td>&lt;0.01</td>
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<td>3.6 (0.3)</td>
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<td>Less Than High School</td>
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<td>High School or Equivalent</td>
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<td>13.0 (0.6)</td>
<td>6.7 (0.5)</td>
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<td>10.4 (0.5)</td>
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<td>Beyond High School or Equivalent</td>
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### TABLE III (Continued)
PREVALENCE OF HOME EXPOSURE TO SHS BY SOCIAL FACTORS AMONG HISPANIC/LATINO PARTICIPANTS

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<td>Current SHS Exposure</td>
<td>P-value&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Never</td>
<td>Former SHS Exposure</td>
<td>Current SHS Exposure</td>
<td>P-value&lt;sup&gt;b&lt;/sup&gt;</td>
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<tr>
<td></td>
<td>1,903</td>
<td>2,528</td>
<td>990</td>
<td>-.35.00%</td>
<td>-46.70%</td>
<td>-18.30%</td>
<td>2,829</td>
<td>3,426</td>
<td>1,555</td>
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<td>Mexican</td>
<td>16.3 (1.0)</td>
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<td>7.2 (0.7)</td>
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<td>19.0 (1.0)</td>
<td>15.5 (0.9)</td>
<td>8.3 (0.7)</td>
<td>&lt;.001</td>
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<td>Puerto Rican</td>
<td>4.9 (0.4)</td>
<td>7.4 (0.6)</td>
<td>4.9 (0.5)</td>
<td>&lt;.001</td>
<td>4.7 (0.4)</td>
<td>6.9 (0.5)</td>
<td>4.2 (0.4)</td>
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<td>Cuban</td>
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<td>English</td>
<td>9.5 (0.7)</td>
<td>9.2 (0.7)</td>
<td>6.6 (0.6)</td>
<td>&lt;.001</td>
<td>9.0 (0.6)</td>
<td>7.6 (0.5)</td>
<td>5.7 (0.5)</td>
<td>&lt;.001</td>
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<tr>
<td>Length of Stay in US</td>
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<tr>
<td>&lt; 10 years</td>
<td>8.5 (0.5)</td>
<td>13.1 (0.8)</td>
<td>5.0 (0.5)</td>
<td>0.104</td>
<td>9.9 (0.6)</td>
<td>11.1 (0.6)</td>
<td>6.0 (0.5)</td>
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<tr>
<td>≥ 10 Years</td>
<td>26.2 (0.9)</td>
<td>32.8 (0.9)</td>
<td>14.4 (0.8)</td>
<td>0.104</td>
<td>27.9 (0.9)</td>
<td>29.9 (0.8)</td>
<td>15.1 (0.8)</td>
<td>0.55</td>
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</tr>
</tbody>
</table>

<sup>a</sup>: Values are weighted for study design and nonresponse.

<sup>b</sup>: P-values for overall group comparisons were calculated using X² tests for categorical variables, and F-tests for continuous variables.
e. **Prevalence of cigarette smoking**

With respect to CSMK, 20% of participants were current smokers (averaging 5.1 cigarette pack per year, and 17% reported being former smokers (Table II). The prevalence of CCSMK was significantly higher for PRs (32%), and Cubans (26%) compared to other Hispanic/Latino groups ranging from 11% (Dominicans) to 17% (MAs) p < .01. The prevalence of former CSMK (17%) varied across participants of diverse Hispanic/Latino groups, ranging from 11.8% among Dominicans to 22.4% among South Americans (Table II).

f. **Gender, social factors, and cigarette smoking**

The prevalence of CSMK by home exposure to SHS and social factors associated with increased CSMK were examined for men and women separately (Table IV). Comparisons by gender showed that the prevalence of current smoking was higher for men (12%) than women (6%) who were formerly exposed to SHS in the home environment (p < .01). In contrast, the prevalence of CCSMK was similar for men (8%) and women (7%) who were exposed to HSHS at the time of the interview.

Within gender comparisons showed that men who were formerly exposed to HSHS had a significantly higher prevalence of CCSMK (12%) compared to those who had never been exposed to SHS (6%). A similar pattern was observed for women; those formerly exposed to SHS had a significantly higher prevalence of current smoking (6%) than women who did not report former exposure to SHS in the home environment (2%), p < .01.
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Men</th>
<th></th>
<th></th>
<th>P-value(^b)</th>
<th>Women</th>
<th></th>
<th></th>
<th>P-value(^b)</th>
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<tr>
<td>Never</td>
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<td>2.4 (0.2)</td>
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<td>12.0 (0.7)</td>
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<td>7.2 (0.6)</td>
<td>&lt; .001</td>
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<tr>
<td>18–39 yrs</td>
<td>28.6 (1.0)</td>
<td>6.5 (0.5)</td>
<td>13.4 (0.8)</td>
<td>&lt; .001</td>
<td>35.3 (0.9)</td>
<td>3.9 (0.4)</td>
<td>7.0 (0.6)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>40–64 yrs</td>
<td>19.7 (0.7)</td>
<td>12.8 (0.6)</td>
<td>11.5 (0.6)</td>
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<td>30.2 (0.8)</td>
<td>7.5 (0.4)</td>
<td>7.9 (0.4)</td>
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<td>65–74 yrs</td>
<td>3.3 (0.3)</td>
<td>3.3 (0.3)</td>
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<td>Income ($)</td>
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<td>&lt; 20,000</td>
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<td>9.1 (0.5)</td>
<td>12.9 (0.7)</td>
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<td>10.4 (0.6)</td>
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<td>&lt; .001</td>
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<td>Less Than High School</td>
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<td>8.4 (0.5)</td>
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<td>High School or Equivalent</td>
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<td>5.5 (0.4)</td>
<td>8.5 (0.6)</td>
<td>&lt; .001</td>
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<td>3.3 (0.3)</td>
<td>4.4 (0.5)</td>
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</tr>
<tr>
<td>Beyond High School or</td>
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<td>8.7 (0.6)</td>
<td>8.2 (0.6)</td>
<td>&lt; .001</td>
<td>30.0 (0.9)</td>
<td>5.7 (0.4)</td>
<td>5.6 (0.4)</td>
<td>&lt; .01</td>
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<td></td>
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<td>Bronx</td>
<td>14.4 (1.0)</td>
<td>4.3 (0.5)</td>
<td>6.4 (0.6)</td>
<td>&lt; .001</td>
<td>19.7 (1.1)</td>
<td>3.3 (0.3)</td>
<td>5.4 (0.5)</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Chicago</td>
<td>8.9 (0.7)</td>
<td>4.1 (0.3)</td>
<td>4.7 (0.4)</td>
<td>0.71</td>
<td>12.5 (0.9)</td>
<td>1.5 (0.1)</td>
<td>2.0 (0.2)</td>
<td>&lt; .001</td>
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<tr>
<td>Miami</td>
<td>14.1 (1.1)</td>
<td>7.4 (0.6)</td>
<td>8.4 (0.9)</td>
<td>&lt; .01</td>
<td>17.4 (1.4)</td>
<td>3.7 (0.3)</td>
<td>4.7 (0.5)</td>
<td>&lt; .01</td>
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<td>San Diego</td>
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<td>Puerto Rican</td>
<td>8.0 (0.6)</td>
<td>3.2 (0.4)</td>
<td>5.9 (0.5)</td>
<td>&lt; .001</td>
<td>8.5 (0.6)</td>
<td>2.4 (0.3)</td>
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<td>&lt; .001</td>
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<td>Central American</td>
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<td>1.6 (0.2)</td>
<td>&lt; 0.01</td>
<td>6.1 (0.5)</td>
<td>0.7 (0.1)</td>
<td>0.5 (0.1)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>South American</td>
<td>2.6 (0.3)</td>
<td>1.5 (0.2)</td>
<td>0.7 (0.1)</td>
<td>&lt; .001</td>
<td>4.2 (0.3)</td>
<td>0.8 (0.1)</td>
<td>0.5 (0.1)</td>
<td>0.01</td>
</tr>
<tr>
<td>Cuban</td>
<td>10.4 (0.9)</td>
<td>5.4 (0.5)</td>
<td>6.5 (0.7)</td>
<td>0.01</td>
<td>10.5 (1.1)</td>
<td>2.5 (0.3)</td>
<td>3.8 (0.4)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Dominican</td>
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<td>0.9 (0.2)</td>
<td>&lt; .001</td>
<td>9.3 (0.8)</td>
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<td>1.4 (0.3)</td>
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<td>37.8 (1.0)</td>
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<td>57.6 (1.0)</td>
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<tr>
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<td>13.8 (0.9)</td>
<td>3.7 (0.5)</td>
<td>7.8 (0.6)</td>
<td>&lt; .001</td>
<td>13.8 (0.7)</td>
<td>2.7</td>
<td>5.8 (0.5)</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

\(^{a}\) Table IV: PREVALENCE OF CSMK STATUS BY HOME EXPOSURE TO SECOND HAND SMOKE AND SOCIAL FACTORS AMONG HISPANIC/LATINO PARTICIPANTS.
TABLE IV (Continued)
PREVALENCE OF CSMK STATUS BY HOME EXPOSURE TO SECOND HAND SMOKE AND SOCIAL FACTORS AMONG HISPANIC/LATINO PARTICIPANTS

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Men</th>
<th>Women</th>
<th>P-value&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Men</th>
<th>Women</th>
<th>P-value&lt;sup&gt;b&lt;/sup&gt;</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Never</td>
<td>Former</td>
<td>Current</td>
<td>P-value&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Never</td>
<td>Former</td>
</tr>
<tr>
<td>Years in US</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;10 years</td>
<td>2,639</td>
<td>1,446</td>
<td>1,336</td>
<td>-47.80%</td>
<td>5,458</td>
<td>1,217</td>
</tr>
<tr>
<td>≥10 Years</td>
<td>14.0 (0.8)</td>
<td>6.2 (0.4)</td>
<td>6.4 (0.5)</td>
<td>0.47</td>
<td>20.1 (0.9)</td>
<td>3.5 (0.3)</td>
</tr>
<tr>
<td></td>
<td>37.6 (1.1)</td>
<td>16.4 (0.7)</td>
<td>19.4 (0.8)</td>
<td>&lt;.001</td>
<td>51.2 (1.0)</td>
<td>9.5 (0.5)</td>
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</tbody>
</table>

a: Percentages and (standard error). Values are weighted for study design and nonresponse.

b P-values for group comparisons were calculated using $X^2$ tests for categorical variables, and F-tests for continuous variables.
Comparisons by age groups showed that men who were younger than 65 years reported higher CSMK than older men. Among women, the prevalence of CCSMK was similar (around 7.5%) for participants ages 18–64 years, and lower for older women (0.9%). In terms of income, men who reported a household income below $50,000 had a significantly higher CSMK prevalence (11%) than those who earned $50,000 (2.6 %, p<.01). A similar pattern was observed for women. In terms of education, men of different educational levels had similar CCSMK prevalence (ranging from 8% to 9%). A similar pattern was observed for women, with smoking prevalence ranging from 4.4% to 5.7%.

Comparisons of CCSMK prevalence by gender and Hispanic/Latino ethno-cultural groups showed that men of Mexican (10%), Cuban (6%), and PR (5.9%) ethno-cultural heritage had the highest numbers. A similar trend was observed among Mexican (4.6%), PR (4.9%), and Cuban (3.8%) women. The prevalence of CSMK also varied by gender and geographical site—i.e., HCHS/SOL field center. Among men, the current smoking prevalence ranged from 4.7% for Chicago participants and 8.4% for those living in Miami.

Among women, the highest prevalence was among those living in The Bronx (5.4%), which was twice as high as that of women from Chicago (2%, p<.001). With regard to acculturation level, the prevalence of CCSMK was higher for Spanish-speaking men (18%) and women (10%) compared to English speakers (men=8% and women=6%). In contrast, the prevalence of CCSMK was higher for men (19%) and women (12%) who had lived in the United States longer than 10 years compared to that of newer immigrants (men=6.4% and women=3.5%).

g. Association of former home secondhand smoke exposure and cigarette smoking

Multivariate logistic regression models demonstrated that former exposure to HSHS was significantly associated with higher odds of CCSMK (Table V).
TABLE V
ASSOCIATION OF HOME SHS EXPOSURE WITH CCSMK AMONG H/L PARTICIPANTS BY HISPANIC/LATINO GROUPS

<table>
<thead>
<tr>
<th>Exposure to SHS</th>
<th>Overall (n=13,231)</th>
<th>Mexican (n=5,643)</th>
<th>Cuban (n=1,847)</th>
<th>Puerto Rican (n=2,237)</th>
<th>Dominican (n=1,191)</th>
<th>Central American (n=1,412)</th>
<th>South American (n=901)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>P-</td>
<td>(95% CI) Value</td>
<td>OR</td>
<td>P-</td>
<td>(95% CI) Value</td>
<td>OR</td>
</tr>
<tr>
<td></td>
<td>(95% CI) Value</td>
<td>(95% CI) Value</td>
<td>(95% CI) Value</td>
<td>(95% CI) Value</td>
<td>(95% CI) Value</td>
<td>(95% CI) Value</td>
<td>(95% CI) Value</td>
</tr>
<tr>
<td>Former</td>
<td>1.8</td>
<td>&lt;.001</td>
<td>(1.5, 2.2)</td>
<td>1.3</td>
<td>0.05</td>
<td>(0.9, 1.7)</td>
<td>2</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>&lt;.001</td>
<td>(1.4, 2.9)</td>
<td>2.3</td>
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<td></td>
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<td>2.3</td>
<td>&lt;.001</td>
<td>(1.5, 3.4)</td>
<td>4.4</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>4.4</td>
<td>&lt;.001</td>
<td>(2.1, 9.2)</td>
<td>1.9</td>
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<td>1.9</td>
<td>&lt;.001</td>
<td>(1.2, 3.0)</td>
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<td>2</td>
<td>&lt;.001</td>
<td>(1.1, 3.5)</td>
<td>0.01</td>
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<td>Model 1</td>
<td></td>
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<tr>
<td>Former</td>
<td>1.8</td>
<td>&lt;.001</td>
<td>(1.5, 2.2)</td>
<td>1.2</td>
<td>0.1</td>
<td>(0.9, 1.7)</td>
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<tr>
<td></td>
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<td>2.1</td>
<td>&lt;.001</td>
<td>(1.4, 3.1)</td>
<td>2.2</td>
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<td>2.2</td>
<td>&lt;.001</td>
<td>(1.4, 3.4)</td>
<td>5.3</td>
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<td>5.3</td>
<td>&lt;.001</td>
<td>(2.4, 11.5)</td>
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<td>1.9</td>
<td>&lt;.01</td>
<td>(1.2, 2.9)</td>
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<td>2</td>
<td>&lt;.01</td>
<td>(1.1, 3.6)</td>
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<tr>
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</tbody>
</table>

a: Odd Ratios are weighted for study design and nonresponse.

Model 1: Analyses were adjusted for age, gender, education level, income and HCHS/SOL field center.

Model 2: Analyses were adjusted for age, gender, education level, income, occupational SHS exposure, health insurance, current asthma diagnosis, language preference, length of stay in the United States, and HCHS/SOL field center.
Analyses adjusting for age, gender, educational level, income, and HCHS/SOL field center showed that individuals who were formerly exposed to SHS in the home environment had 1.8 the odds of being current cigarette smokers compared to those who were never exposed (CI=1.5, 2.2, p<.001, Model 1).

The association of HSHS exposure with CSMK was not attenuated (OR=1.80, CI=1.5, 2.2, p<.001) with additional adjustment for other variables (i.e., OSHS exposure, health insurance, current asthma diagnosis, language preference, and length of stay in the United States) in Model 2. We were not able to reliably evaluate the association of current exposure to SHS with CSMK due to the low number of participants who reported current HSHS exposure, particularly when broken down by Hispanic/Latino ethno-cultural groups (data not shown).

Comparisons across Hispanic/Latino ethno-cultural groups indicated that the association of former exposure to HSHS with CSMK was similar for participants of the different Hispanic/Latino backgrounds. Dominicans who were formerly exposed to HSHS had higher odds of being current cigarette smokers compared to other Hispanic/Latino ethno-cultural groups (Table V; Models 1 and 2). These findings need to be interpreted with caution since they may be partly due to the fact that the prevalence of smokers within the never exposed to SHS group is very small compared to the prevalence within the former SHS exposure group.

4. Discussion

The current study examined the prevalence of exposure to HSHS and its association with CSMK among adult Hispanic/Latino men and women living in the United States. Baseline data from the HCHS/SOL study was used. We focused on the association of previous exposure to HSHS and familial smoking with CSMK for two main reasons. First, it is well established that CSMK initiation is a childhood and adolescent phenomenon worldwide; it begins at an early age when the consequences to morbidity and mortality seem distant or irrelevant (U.S. Surgeon General, 2006; WHO Infobase, 2011).
In the United States, the vast majority of smokers began smoking before the age of 18 years (U.S. Surgeon General, 2006).

With respect to the first specific aim, the findings showed that the overall prevalence of HSHS exposure before and after the age of 13 years was high (40%) among HCHS/SOL participants. The overall prevalence of CCSMK was 20%. Before specific findings are discussed, it is helpful to recall why we chose to focus on former SHS exposure.

While this paper did not examine CSMK initiation, early exposure to CSMK is an important risk factor for CSMK behavior. Second, the prevalence of current HSHS exposure (20%) was evaluated and found to be significantly lower than former SHS exposure in both age groups (Table II). The prevalence of current SHS exposure was particularly low for certain Hispanic/Latino ethno-cultural groups (Dominicans and South Americans, prevalence of 11%). This low sample size limited the ability to perform multivariate analyses to evaluate the association of current HSHS exposure with CSMK across Hispanic/Latino ethno-cultural groups.

The next overall important point in this discussion is the place of former exposure. This study collected data on lifetime exposure (before and after 13 years of age) to SHS in the home environment. Since the majority of HCHS/SOL participants (78%) were foreign-born and the mean age of migration to the United States was 27 years (data not shown), it can be implied that part of the former exposure (particularly during childhood) took place in their country of origin. Data from WHO and international studies show that prevalence of CSMK and SHS exposure varied markedly across countries in Latin America ranging from approximately 30% in Cuba, Chile, and Argentina to around 12% in Ecuador, Guatemala, and Costa Rica (WHO, 2011a; Champagne, 2010).

The current study’s findings are consistent with this reported variation in CSMK and prevalence of SHS exposure across Latin American countries. More specifically, as hypothesized, the prevalence of HSHS exposure and CCSMK varied markedly across Hispanic/Latino ethno-cultural groups; Cubans and PRs reported higher overall SHS exposure than other Hispanic/Latino ethno-cultural groups.
Previous studies evaluating the prevalence of SHS exposure and CSMK in the United States among Hispanics/Latinos have primarily involved MAAs, and have not included a representative sample of Hispanic/Latino individuals from diverse ethnic, geographic, and cultural backgrounds. In addition, they have typically classified Hispanics/Latinos as a single ethnic group failing to capture the ethno-cultural diversity within this population (Kaufmann, 2010; U.S. Surgeon General, 2006). To the author’s knowledge, this is the first study to examine the prevalence of SHS in the home environment across a large and diverse sample of Hispanics/Latinos.

The observed overall SHS exposure prevalence in this study is comparable to the current U.S. national prevalence (40%) but higher than that reported for Hispanics/Latinos (29%). A possible explanation for this discrepancy may be the fact that, as stated above, most studies of U.S. Hispanic/Latino individuals have primarily included MAAs (Kaufmann, 2010; U.S. Surgeon General, 2006). Compared to other Hispanic/Latino background, individuals of Mexican descent (particularly recent immigrants) are less likely to smoke cigarettes or to allow CSMK in the home environment (Gonzales, 2006).

The study found significant variation in prevalence of HSHS exposure and CSMK across Hispanic/Latino ethno-cultural groups living in the United States, which is consistent with limited data showing significant heterogeneity in CSMK prevalence across Hispanic/Latino of different ethno-cultural backgrounds and country of origin (Pérez-Stable, 2001; Winkleby, 1995).

Various studies have evaluated the role played by sociocultural factors on the onset and maintenance of CSMK in Hispanic/Latino individuals (Foraker, 2005; González, 2009; Wen, 2009). The results show that differences in norms, attitudes, and beliefs around CSMK exist across Hispanic/Latino ethno-cultural groups, and that they influence CSMK behavior (Foraker, 2005; González, 2009). A qualitative study by Foraker et al. (2005) evaluated attitudes and beliefs among young adults of diverse ethno-cultural backgrounds. They showed that compared to other Hispanic/Latino ethnic groups, Cubans
and PRs reported higher cultural acceptability of CSMK and described it as part of their “national ethnocultural and pride” (Foraker, 2005, pgs. 126–133).

Other investigations have examined the role played by other group-oriented cultural traits such as *familismo, respeto, and simpatía* in CSMK behavior among Hispanics/Latinos. The overall evidence shows that these “deep-structure” cultural characteristics (Resnicow, 1999) act as protective factors against initiating and maintaining CSMK. Hispanics/Latinos may be concerned with exposing other family members to culturally unacceptable behavior (e.g., inadequate role modeling and lack of respect for elders), as well as exposing them to SHS and its toxic effect.

In addition, as hypothesized, exposure to HSHS and CSMK also varied by sociodemographic factors including gender, age, income, and geographic location among HCHS/SOL participants. In general and as shown in Tables III and IV, men of younger age, with lower income and who did not reside in Chicago reported higher exposure to HSHS and CSMK behavior compared to their respective counterparts.

However, educational level did not seem to influence the prevalence of HSHS exposure or CSMK. Overall, these results are consistent with national and international data showing that individuals of lower SES status carry an overburden of exposure to SHS (Kaufmann, 2010; U.S. Surgeon General, 2006; WHO, 2011). The fact that prevalence of HSHS exposure was much higher during childhood in their home country is very significant in terms of prevention.

For the second aim, data from descriptive and logistic regression analyses suggest that former exposure to HSHS was positively associated with CCSMK among HCHS/SOL participants. As shown in Table IV, the prevalence of CSMK by HSHS exposure and gender indicated that men and women who were exposed to HSHS had a higher prevalence of CSMK compared to individuals who were never exposed (p<.01). In addition, results from multivariate logistic regression models showed that individuals who were formerly exposed to HSHS had close to twice the odds of being current cigarette smokers.
compared to those who were never exposed, after controlling for relevant sociodemographic variables (Table V).

These findings support the association of HSHS exposure as a proxy for family influences with CCSMK identified in the theoretical framework used to guide the current study (see Figure 3). More specifically, etiological theories of CSMK initiation include social learning theory, which emphasizes the importance of the learning process early in life concomitant with social interactions with family members. As a result, children who grow up in a smoking household environment are more likely to initiate CSMK through observation and imitation. Our data showed that close to a quarter (23%) of HCHS/SOL participants reported maternal smoking during childhood, and 40% reported smoking by other household members before and after the age of 13 years.

Comparisons across Hispanic/Latino ethno-cultural groups showed that the prevalence of both maternal and household CSMK was higher for Cubans (35% and 59%, respectively) and PRs (30% and 47%, respectively) compared to other Hispanic/Latino ethno-cultural groups. Interestingly, these two ethnic groups also had the highest prevalence of CCSMK (Cubans 26% and PRs 32%).

These findings suggest that HCHS/SOL participants who were exposed to CSMK in the home environment from an early age were likely to be influenced by the household environment and presumably more likely to have engaged in CSMK. These results are also consistent with previous cross-sectional and longitudinal studies evaluating the association of parental/sibling CSMK with youth smoking (Kandel, 2004; Wen, 2009; Hill, 2005; Peterson, 2006).

Kandel and colleagues investigated racial/ethnic differences in CSMK initiation and progression to daily smoking using data from the National Longitudinal Study for Adolescent Health (Add Health, n=9,848) (Kandel, 2004). Their results showed that parental smoking was a risk factor for progression to daily smoking across all three racial/ethnic groups. A more recent study also using the Add Health data examined the role played by various life domains (family, school, neighborhood, and society) on determining CSMK among adolescents (Kandel, 2004). Their research indicated that the family
environment was the most influential and that household member smoking was a significant and independent predictor of adolescent smoking. Having a household member who smoked was associated with 63% higher risk of smoking (Kandel, 2004).

Results from two longitudinal studies further support the association of familial smoking with onset of adolescent CSMK. Using data from an ethnically diverse urban population, Hill and colleagues examined family influences on the risk of CSMK from adolescence to adulthood. Their findings showed that parental smoking was significantly associated with daily smoking initiation, controlling for sociodemographic variables (e.g., ethnicity, gender, income) (Hill, 2005).

More recently, a population-based study examined the nine-year prediction of adolescent CSMK by parental CSMK (Peterson, 2006). The mostly NHW cohort of children and their parents were prospectively followed through the end of the smoking acquisition period (12th grade). Their data showed that having one parent who smoked significantly increased the risk of adolescent smoking compared to families with no smoking parents. Moreover, a “dose-response” effect was observed with the risk of child smoking significantly increasing with the number of smoking parents (Peterson, 2006). Findings from these two prospective studies support evidence on the influence of familial smoking on the onset of CSMK, and demonstrate that CSMK behavior tracks from childhood to adulthood (Hill, 2005; Peterson, 2006).

Finally, acculturative status must be considered in any discussion of SHS exposure and CSMK among U.S. immigrants. This study’s findings showed that Spanish speakers had a higher prevalence of former exposure and CSMK compared to English speakers. In contrast, participants who had lived in the United States for less than 10 years had lower former HSHS exposure and CSMK compared to those with ≥10 years of residence. The mechanisms of acculturative processes are complex and deserve attention in future studies.
a. **Study’s limitations and strengths**

This study used a cross-sectional study design to evaluate the association of former exposure to HSHS as a proxy for family influences with CCSMK and causality could not be determined. Second, the sample was drawn from four selected U.S. urban centers. Although the community-based sampling design permits inferences to the larger population from which it is drawn, our findings cannot be generalized to the larger Hispanic/Latino community across the United States.

Third, this study relied on self-reported data, and participants may have underreported exposure to SHS and/or CSMK behavior. And fourth, some of the survey questions on HSHS exposure asked about exposure as a child, and therefore, data may have been subject to recall-bias.

The major strengths of this study lie within the inclusiveness of the HCHS/SOL study population, a large sample of ethno-culturally diverse Hispanics/Latinos living in the United States: this allowed us to assess variations in exposure to HSHS and CSMK across various Hispanic/Latino ethno-cultural backgrounds. In addition, participants were recruited from four geographically diverse U.S. urban centers capturing a more complete picture of the prevalence of HSHS and its association with adult CSMK across the United States. Moreover, the assessment of household exposure to HSHS included smoking behavior by household members other than the mother, reflecting the household structure of Hispanics/Latinos which often includes extended family members.

b. **Public health importance and relevance of findings**

Previous studies have not evaluated the prevalence of exposure to HSHS and its association with adult CSMK among Hispanics/Latinos living in the United States. In addition, national data and other studies have been limited by an underrepresentation of Hispanics/Latinos from multiple ethno-cultural backgrounds, and/or by aggregating Hispanic/Latino ethnic groups into a single category (Marin 1989). These study characteristics have obscured important differences in the magnitude of the problem of exposure to HSHS and CSMK among Hispanics/Latinos living in the United States. In
addition, they may also partially explain the documented lower overall prevalence of SHS exposure and CSMK among U.S. Hispanics/Latinos compared to other ethnic groups.

To the best of our knowledge, this is the first study to examine the association of HSHS exposure and adult CSMK in a large U.S. sample of Hispanics/Latinos from diverse ethno-cultural, sociodemographic, and geographic backgrounds. The current findings contribute to the tobacco-use literature by demonstrating a significant heterogeneity in the prevalence of HSHS exposure and CSMK across Hispanic/Latino ethno-cultural groups. It highlights the importance of disaggregating Hispanics/Latinos in multiple categories based on geographic and cultural backgrounds. In addition, this study’s results are consistent with existing literature documenting the role played by familial influences on the onset and tracking of adolescent CSMK behavior into adulthood across diverse ethnic groups. These data also support the theoretical framework of the current study in that they showed that socio-environmental and social learning premises represent important factors in CSMK behavior.

Additional investigations on these topics are warranted to further explore differences in HSHS exposure and CSMK among diverse Hispanic/Latino groups. Future research studies should also evaluate knowledge, attitudes, and beliefs about tobacco use in the home environment among diverse Hispanic/Latino groups. Identifying possible differences in attitudes and beliefs on the influence that Hispanic/Latino parents and other household members are likely to have on the onset and maintenance of CSMK behavior by their younger generations would be instrumental in developing culturally tailored tobacco-control interventions for the home environment, and more effectively targeting resources where they are most needed. For example, the Affordable Care Act mandates community-based health assessments for all hospitals, and offers an opportunity for community stakeholders (e.g., health systems, and departments, community organizations, faith community, and local members) to collectively work to improve health. This collaborative approach could inform tobacco-control and smoking-cessation programs in Hispanic/Latino communities across the United States (Robert Wood Johnson Foundation, 2012).
In conclusion, while cumulative progress has been made in reducing exposure to SHS and CSMK in the United States and Latin America, these findings suggest that additional efforts are needed to reach Hispanics/Latinos in this country and abroad. Multilevel tobacco-control initiatives targeting individuals, households, and communities are particularly needed among certain Hispanic/Latino ethnocultural groups (e.g., PRs and Cubans), as well as socioeconomically disadvantaged communities.
B. Manuscript 2: Association of Occupational Exposure to Home Secondhand Smoke with Cigarette Smoking in the Hispanic Community Health Study/Study of Latinos.

1. Background

Occupational secondhand smoke exposure (defined as the smoke emitted from smokers’ burning cigarettes that is inhaled by surrounding nonsmoking co-workers) represents a major health risk (U.S. Environmental Protection Agency, 1992; U.S. Surgeon General, 2006). It is well established that SHS increases the risk of major chronic diseases such as CVD, lung cancer, and respiratory diseases, significantly contributing to morbidity and mortality in the United States (U.S. Surgeon General, 2006; IOM, 2010).

Over the past decades, tobacco-control initiatives and legislation have resulted in a substantial decline in nonsmoker exposure to environmental SHS in the work environment and public venues (e.g., restaurants and bars) (U.S. Surgeon General, 2006). Despite these efforts, the workplace remains a significant source of SHS exposure for millions of U.S. workers. The current U.S. OSHS exposure prevalence remains high: national data showed that close to 50% of nonsmoking adults aged 18 years and older were exposed to work-related SHS in 2005–2008 (Howard, 2004; CDC, 2010).

Furthermore, disparities in OSHS exist in relation to type of occupation, which is closely related to income, educational level, racial/ethnic background, and immigration status. Secondhand smoke exposure tends to be higher for persons in the hospitality service, construction, and blue-collar labor occupations, as well as among those of low income and educational level (U.S. Surgeon General, 2006; Shopland, 2004). Blue-collar workers, service employees, and self-employed individuals are disproportionally exposed to SHS, and less likely to benefit from tobacco-control policies in the workplace: 65% of workers in these occupations were exposed to OSHS in 2007–2008 (CDC, 2010; U.S. Surgeon General, 2006; Shopland, 2004).

This is particularly true for cities and states not protected by tobacco-control policies (U.S. Surgeon General, 2006; CDC, 2010). Moreover, limited evidence shows that disparities in SHS exposure also exist in relation to racial/ethnic background. According to a 2010 American Lung Association report, Hispanics/Latinos were more likely to be exposed to OSHS compared to other racial/ethnic groups; only
68.4% of Hispanics worked in a place protected by tobacco-control policy, a significantly lower percent than the national rate of 75.3% (American Lung Association, 2010).

Socio-environmental factors (e.g., peer CSMK-behavior) have been shown to play a major role in the onset and maintenance of CSMK behavior (Cox, 2005; Wilkinson, 2008). A study that investigated peer influences on CSMK behavior among young Hispanics/Latinos showed that peers’ smoking patterns (particularly that of close peers to the individual) played a significant role in influencing CSMK experimentation and maintenance (Wilkinson, 2008). Less is known about peer’s influence during adulthood. The Task Force on Community Preventive Services evaluated scientific evidence on the effectiveness of tobacco-control policies in reducing CSMK (Hopkins, 2010). The systematic review of 37 studies concluded that enforcement of smoke-free policies in the workplace contributed to a decrease in CSMK among workers who smoked, and an increase in cessation attempts among working populations (Hopkins, 2010). These findings are consistent with socio-environmental and behavioral models (Hovell, 2009) used to guide the conceptual framework of the current study, which posit that individuals do not operate in a vacuum and are subject to influences from multiple sociocultural environments (e.g., workplace) that shape health behaviors, such as CSMK.

The BEM is based on principles of behavior but extends them to the role of cultural factors (Hovell, 2009). It assumes interrelated social contingencies of reinforcement (e.g., punishments and rewards) from the individual physiological reactions to nicotine to the highest level of society (e.g., tobacco-control policies in the workplace) that influence CSMK and OSHS exposure. After the home, the work environment represents the major source of CSMK and involuntary SHS exposure for most adults (U.S. Surgeon General, 2006), and therefore is the focus of this investigation.

To the author’s knowledge, no large studies have examined the prevalence of OSHS among Hispanics/Latinos with diverse ethno-cultural and SES living in the United States. Furthermore, the association of OSHS with CCSMK among Hispanics/Latinos remains largely unknown. Investigating the prevalence of OSHS exposure and its association with CCSMK behavior among Hispanics/Latinos is
important because the workplace is a major source of involuntary SHS exposure (American for Nonsmokers’ Rights, 2006; American Lung Association, 2010), and the evidence shows that Hispanics/Latinos are overburdened by OSHS exposure compared to other ethnic groups in the United States (American for Nonsmokers’ Rights, 2006; American Lung Association, 2010). In addition, very little is known about the peers/colleagues influence on CSMK behavior among Hispanics/Latinos of diverse ethno-cultural and SES groups.

The current study examined the effect of OSHS exposure (as a proxy for social influences at the workplace) on adult CCSMK behavior among a diverse Hispanic/Latino population living in four U.S. cities. The study’s first specific aim is to examine variation in current OSHS exposure and CCSMK among Hispanic/Latino subgroups—i.e., gender, age, SES, ethno-cultural heritage, geographic location, and acculturation. Based on limited evidence, individuals who are men, younger, have lower SES status and occupational level, and/or lower acculturation will report higher prevalence of OSHS exposure and CSMK. Due to the ethno-cultural diversity among Hispanics/Latinos of various countries and heritages and the lack of data on OSHS exposure across Hispanic/Latino groups, the analyses on the variation in prevalence will be exploratory in nature.

The second specific aim is to evaluate the association of OSHS exposure with CCSMK status across Hispanic/Latino subgroups. Based on published evidence and the theoretical framework of this study, it is hypothesized that current OSHS exposure will be positively associated with CCSMK among HCHS/SOL participants. This analysis was guided by the following research questions: (1) How does occupational exposure to SHS and CSMK vary across Hispanic/Latino subgroups defined by gender, age, SES, ethno-cultural heritage, geographic location, and acculturation; and (2) what is the association between occupational exposure to SHS and CCSMK status?
2. **Methods**

a. **Study design and sample**

This is a cross-sectional observational study that uses baseline data collected during the initial patient visit for HCHS/SOL. The study’s main objectives were to examine risk and protective factors for chronic diseases such as CVD. Its methodology has been previously described (Sorlie, 2012; LaVange, 2010). Briefly, 16,415 individuals (self-identified as Hispanic/Latino) aged 18–74 years were recruited from randomly selected households in defined communities in four U.S. urban centers (The Bronx, New York; Chicago, Illinois; Miami, Florida; San Diego, California) between March 2008 and June 2011.

The HCHS/SOL used a stratified two-stage area probability sample design to select the households (LaVange et al. 642-649) (LaVange, 2010). Sampling weights were generated to reflect the probabilities of selection at each stage. Hispanic Community Health Study/Study of Latinos Study population included individuals from Mexican, PR, Cuban, Dominican, Central American, and South American backgrounds. The IRB at each participating institution approved the study, and informed consent was obtained from all participants.

b. **Target population**

This study’s target population consisted of 6,764 men and women (ages 18–74 years) who self-identify as Hispanic/Latino. Approximately 1,500 participants were enrolled at each HCHS/SOL field center. Inclusion criteria included: (1) being randomly selected and/or residing in the same household as the selected index person; (2) being 18 to 74 years of age; (3) being employed at the time of the baseline interview; and (4) having complete data for the variables of interest. Persons who were likely to relocate, pregnant or reported multiple Hispanic/Latino backgrounds were excluded from the study.

c. **Data collection procedures**

Questionnaires for the HCHS/SOL were interviewer-administered and collected participant sociodemographic information (age, gender, Hispanic/Latino ethnocultural group, income, and education), occupational status, health insurance, asthma diagnosis, and tobacco use and exposure to SHS (in
the work and home environments). Study surveys were translated into Spanish and certified by independent translators. Each field center tested them via focus groups to identify relevant differences in word usage by country/region of origin or nationality. All data were collected using a direct computer-based DMS developed and programmed by the CC at the UNC (Sorlie, 2012; LaVange, 2010).

d. **Survey measures**

This study’s main outcome measure was CCSMK status. The HCHS/SOL’s Tobacco Use questionnaire was used to collect information on the participants’ CSMK behavior. The survey included questions on past and current cigarette use (See copy of questionnaire Appendix A). The exposure variables included: (1) sociodemographic data; (2) SHS exposure; (3) health-care insurance; (4) asthma diagnosis; and (5) acculturation.

Sociodemographic data were collected using the HCHS/SOL Personal Identifiers and Personal Information Questionnaires (See Appendix A).

Current exposure to OSHS was collected using the Occupation Classification and Exposures Questionnaire (question 27.I. in copy of questionnaire in Appendix A).

Exposure to HSHS was collected using HCHS/SOL’s Tobacco Use questionnaire; the survey included questions on past and current exposure of HSHS (questions 12–15 in copy of questionnaire in Appendix A).

Occupational History (employment status and type of occupation) was obtained via the Occupation Classification and Exposures Questionnaire (questions 5 and 16 in copy of questionnaire in Appendix A). Based on exploratory analyses, occupations were classified into three categories: (1) lower-skilled occupations, which included non-skilled workers, office staff, service workers, and drivers; (2) medium-skilled occupations, which included skilled workers, army officers, ordinary soldiers, police officers, and policemen; and (3) other occupations, which included higher-skilled, farmers, hunters, fishermen, musicians, athletes, actors, and “other occupations.” The higher-skilled workers were included in the “Other
Occupations” category because there were too few higher-skilled workers to create a separate category for them.

In addition, asthma diagnosis was determined using the Respiratory Health Questionnaire (questions 32, 34, and 35, in copy of questionnaire Appendix A. This variable was included based on evidence reporting high prevalence of asthma among Hispanics/Latinos and its association with the CSMK. Health insurance coverage was collected using the Health Care Use Questionnaire (question 10.a. in copy of questionnaire in Appendix). This variable was included because it was determined to be independently related to CSMK in a HCHS/SOL paper looking at the prevalence and risk factors of CSMK (Kaplan, 2014). Acculturation was measured using two measures (language preference and length of stay in the United States).

e. **Data analyses**

The analysis population was defined as HCHS/SOL participants with complete baseline data for age, gender, education level, income, occupation type, CSMK, OSHS exposure, other SHS exposure (at home), health insurance, asthma diagnosis, Hispanic/Latino ethno-cultural group, language preference, length of stay in the United States, and geographic location (HCHS/SOL field center). Participants who were unemployed at the time of the baseline interview were excluded (n=6,261).

1) **Exposure variable**

The exposure variable was current exposure to occupational.

2) **Outcome variable**

Current cigarette smoking was the outcome variable.

3) **Covariates**

Covariates included age, gender, education level, income, occupation type, HSHS exposure, health insurance, asthma diagnosis, Hispanic/Latino ethno-cultural group (Mexican, PR, Cuban, Dominican, Central American, and South American), language preference, length of stay in the United States, and geographic location (HCHS/SOL field center).
4) **Statistical analyses**

First, exploratory data analyses were performed for the exposure and outcome variables across Hispanic/Latino ethno-cultural groups. Descriptive statistics were computed for the total cohort and for each Hispanic/Latino group. All reported values (means, prevalence, and ORs in this report) were weighted to adjust for sampling probability and nonresponse (Sorlie, 2012; LaVange, 2010). The P-values for overall group comparisons were calculated using $X^2$ tests for categorical variables, and F-tests for continuous variables.

Second, the prevalence of OSHS exposure and CSMK were determined for men and women separately, by OSHS exposure, age, income, education level, type of occupation, Hispanic/Latino ethno-cultural group, HCHS/SOL field center, language preference, and length of stay in the United States. It is important to stratify by gender because CSMK rates have been shown to vary for men and women (U.S. Surgeon General, 2006; WHO, 2011; CDC, 2010).

Third, logistic regression was used to describe the association of current OSHS exposure with CCSMK adjusting for age, gender, educational level, income, and HCHS/SOL center, overall and stratified by Hispanic/Latino ethno-cultural groups (Model 1). Model 2 adjusted for additional potential confounders including HSHS exposure, health insurance, current asthma diagnosis, language preference, length of stay in the United States, and HCHS/SOL field center. SAS (V. 9.2., SAS Institute, Inc.) was used to perform all statistical analyses.

3. **Results**

   a. **Participants’ characteristics**

   The final study sample of 6,970 adults included 3,067 women (44%) and 3,903 men (56%). The mean age was 39.4 years. Table VI summarizes the demographic information for the overall sample, as well as by Hispanic/Latino ethno-cultural groups. About half of the participants (47%), reported an annual household income between $20,000 and $50,000, 36% less than $20,000, and 17% earned over $50,000. About one quarter (27%) had less than a high school education, 28% had completed high school or
equivalent, and 44% had additional education beyond high school. All participants were employed; 54% were employed in lower-skilled occupations, followed by medium-skilled (23%) and “other occupations” (22%). Forty-six percent of participants had medical insurance and 5% reported having a current asthma diagnosis.

b. Ethno-cultural characteristics

The study population was ethno-culturally diverse. As shown in Table VI, it included Mexicans (3217), PRs (874), Cubans (830), Central Americans (841), Dominicans (629), and South Americans (579). The majority of participants (71%) had lived in the United States for 10 or more years, and reported Spanish as their language of preference (77%).
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Overall (n=6,970)</th>
<th>Dominican (n=629)</th>
<th>Central American (n=841)</th>
<th>Cuban (n=830)</th>
<th>Mexican (n=3,217)</th>
<th>Puerto Rican (n=874)</th>
<th>South American (n=579)</th>
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<td>39.4 (38.9,39.9)</td>
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<td>38.9 (37.8,40.1)</td>
<td>43.2 (42.0,44.3)</td>
<td>38 (37.2,38.8)</td>
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<td><strong>Gender</strong></td>
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<td>Men</td>
<td>56.2 (54.6,57.9)</td>
<td>41.4 (36.1,46.7)</td>
<td>50.7 (45.8,55.6)</td>
<td>64 (60.7,67.3)</td>
<td>56.6 (53.9,59.2)</td>
<td>61.8 (57.4,66.2)</td>
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<td>Women</td>
<td>43.8 (42.1,45.4)</td>
<td>58.6 (53.3,63.9)</td>
<td>49.3 (44.4,54.2)</td>
<td>36 (32.7,39.3)</td>
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<td>38.2 (38.0,40.3)</td>
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<td>&lt;20,000</td>
<td>36 (33.8,38.2)</td>
<td>46 (40.8,51.2)</td>
<td>47.9 (42.5,53.3)</td>
<td>37.8 (33.9,41.8)</td>
<td>32.1 (28.7,35.6)</td>
<td>31.1 (26.2,36.0)</td>
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<tr>
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<td>43.8 (38.9,48.7)</td>
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<td>47.7 (43.1,52.3)</td>
<td>48.9 (46.0,51.8)</td>
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<td>19 (15.8,22.1)</td>
<td>26.5 (22.0,31.1)</td>
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<td><strong>Education</strong></td>
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<tr>
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<td>32.8 (29.8,35.9)</td>
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<td>High School or</td>
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<td>21.6 (17.5,25.8)</td>
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<td>29.1 (25.1,33.0)</td>
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<td>Beyond High School or</td>
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<td>46.7 (41.4,52.0)</td>
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</tr>
<tr>
<td>Lower Skilled</td>
<td>54.6 (52.6,56.7)</td>
<td>49.7 (44.4,55.1)</td>
<td>64.9 (60.2,69.5)</td>
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<td>55.6 (52.1,59.1)</td>
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<td>23.4 (21.7,25.0)</td>
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<td>16.8 (12.9,20.7)</td>
<td>16.2 (13.2,19.2)</td>
<td>25 (22.3,27.7)</td>
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<td>27.5 (22.8,32.1)</td>
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<td>Overall (n=6,970)</td>
<td>Dominican (n=629)</td>
<td>Central American (n=841)</td>
<td>Cuban (n=830)</td>
<td>Mexican (n=3,217)</td>
<td>Puerto Rican (n=874)</td>
<td>South American (n=579)</td>
<td>P-value(^b)</td>
</tr>
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<td><strong>HCHS/SOL Site</strong></td>
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</tr>
<tr>
<td>The Bronx</td>
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<td>95.2</td>
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<td>7.9</td>
<td>65.7</td>
<td>19.2</td>
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<td></td>
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<td>(17.9,31.0)</td>
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<td>Miami</td>
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<td>3.4</td>
<td>61.3</td>
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<td>(95.1,99.2)</td>
<td>(0.5,2.3)</td>
<td>(2.3,6.3)</td>
<td>(44.6,61.1)</td>
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<tr>
<td>San Diego</td>
<td>29.3</td>
<td>0</td>
<td>4.8</td>
<td>0.8</td>
<td>61.4</td>
<td>4.1</td>
<td>3.5</td>
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</tr>
<tr>
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<td>(25.3,33.3)</td>
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<td>(56.4,66.4)</td>
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<td>(0.7,6.4)</td>
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</tr>
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<td><strong>Health Insurance</strong></td>
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<tr>
<td>(Yes)</td>
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<td>68.9</td>
<td>27.4</td>
<td>31.2</td>
<td>42.2</td>
<td>75.4</td>
<td>39.4</td>
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<td>(43.5,48.1)</td>
<td>(63.8,74.1)</td>
<td>(22.5,32.2)</td>
<td>(27.5,34.9)</td>
<td>(38.9,45.5)</td>
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<td>(33.9,45.0)</td>
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</tr>
<tr>
<td>Ever</td>
<td>12.8</td>
<td>15.6</td>
<td>9.6</td>
<td>20.1</td>
<td>6.7</td>
<td>27.6</td>
<td>6.6</td>
<td>&lt;.001</td>
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<td>(11.5,14.0)</td>
<td>(12.1,19.2)</td>
<td>(7.0,12.1)</td>
<td>(17.1,23.0)</td>
<td>(5.1,18.2)</td>
<td>(23.3,32.0)</td>
<td>(3.8,9.3)</td>
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<tr>
<td>Current</td>
<td>4.9</td>
<td>6.5</td>
<td>2.8</td>
<td>6</td>
<td>2.6</td>
<td>12.2</td>
<td>3.2</td>
<td>&lt;.001</td>
</tr>
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<td>(4.1,5.6)</td>
<td>(4.3,8.6)</td>
<td>(1.5,4.2)</td>
<td>(3.9,8.1)</td>
<td>(1.6,3.6)</td>
<td>(9.6,14.8)</td>
<td>(1.5,5.0)</td>
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<tr>
<td>≥ 10 Years in U.S.</td>
<td>70.9</td>
<td>70</td>
<td>59.4</td>
<td>51.5</td>
<td>76</td>
<td>92.8</td>
<td>56.9</td>
<td>&lt;.001</td>
</tr>
<tr>
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<td>(68.7,73.0)</td>
<td>(64.4,75.6)</td>
<td>(53.8,65.1)</td>
<td>(46.8,56.3)</td>
<td>(73.1,78.9)</td>
<td>(89.6,95.9)</td>
<td>(50.6,63.3)</td>
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<tr>
<td>Spanish Language</td>
<td>77.5</td>
<td>84.5</td>
<td>87.2</td>
<td>92.6</td>
<td>79</td>
<td>34.7</td>
<td>91.7</td>
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<tr>
<td></td>
<td>(75.7,79.4)</td>
<td>(80.1,88.8)</td>
<td>(83.2,91.2)</td>
<td>(90.0,95.1)</td>
<td>(76.4,81.5)</td>
<td>(29.6,39.7)</td>
<td>(88.3,95.1)</td>
<td></td>
</tr>
</tbody>
</table>

a: Values are weighted for study design and nonresponse.

b: P-values for overall group comparisons were calculated using \(X^2\) tests for categorical variables, and F-tests for continuous variables.
c. **Prevalence of secondhand smoke exposure**

Fourteen percent of participants reported being exposed to SHS in their current work environment (Table VII). Comparisons by Hispanic/Latino groups showed that the prevalence of OSHS exposure varied across Hispanic/Latino groups, and was significantly higher for PRs (20%) than other Hispanic/Latino groups (ranged from 16% [Central Americans] to 9% [Dominicans], p<.01). Eighteen percent of participants reported current household SHS exposure.

d. **Gender, social factors and occupational secondhand smoke exposure**

The prevalence of OSHS exposure by gender and social factors is summarized in Table VIII. Comparison by gender showed that men ages 18 to 64 had significantly higher current OSHS exposure compared to women of similar ages (p<.01). Among men, younger participants (18–39 years) reported the highest current occupational exposure (12%) followed by those ages 40–64 years (8%), and 65–74 (0.2%). The prevalence of current occupational exposure was similar for women ages 18–64 years (approximately 3.5%) followed by older women (0.1%).
TABLE VII
PREVALENCE OF OCCUPATIONAL SHS EXPOSURE AND CIGARETTE SMOKING BY HISPANIC/LATINO GROUPa

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Overall (n=6,970)</th>
<th>Dominican (n=629)</th>
<th>Central American (n=841)</th>
<th>Cuban (n=830)</th>
<th>Mexican (n=3,217)</th>
<th>Puerto Rican (n=874)</th>
<th>South American (n=579)</th>
<th>P-valueb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Occupational SHS Exposure</td>
<td>14.3 (13.1,15.6)</td>
<td>9.6 (6.5,12.6)</td>
<td>16.5 (13.4,19.7)</td>
<td>11.9 (9.4,14.4)</td>
<td>14.4 (12.4,16.4)</td>
<td>20.6 (16.6,24.6)</td>
<td>11.9 (8.5,15.2)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Current Home SHS Exposure</td>
<td>18 (16.4,19.5)</td>
<td>13.4 (9.4,17.4)</td>
<td>16.7 (13.0,20.4)</td>
<td>18.4 (14.8,22.0)</td>
<td>16.3 (14.0,18.7)</td>
<td>28.2 (23.8,32.5)</td>
<td>16 (10.7,21.2)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Cigarette Smoking</td>
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<td></td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Never</td>
<td>64.2 (62.5,66.0)</td>
<td>81.4 (77.6,85.3)</td>
<td>73.9 (70.0,77.7)</td>
<td>58.1 (53.9,62.2)</td>
<td>63.5 (60.6,66.3)</td>
<td>54.2 (49.4,59.1)</td>
<td>67.2 (61.8,72.6)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Former</td>
<td>17.8 (16.6,19.0)</td>
<td>10.4 (7.9,12.9)</td>
<td>13.9 (11.1,16.7)</td>
<td>22.1 (19.1,25.1)</td>
<td>18.7 (16.6,20.7)</td>
<td>15 (11.9,18.1)</td>
<td>22.9 (18.4,27.3)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Current</td>
<td>17.9 (16.4,19.5)</td>
<td>8.2 (5.4,11.0)</td>
<td>12.2 (9.3,15.2)</td>
<td>19.9 (16.3,23.4)</td>
<td>17.8 (15.3,20.4)</td>
<td>30.8 (26.0,35.5)</td>
<td>9.9 (6.7,13.2)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Cigarettes/Day</td>
<td>3.8 (3.4,4.1)</td>
<td>2.6 (1.7,3.4)</td>
<td>2.2 (1.6,2.7)</td>
<td>8 (6.7,9.3)</td>
<td>2.3 (2.0,2.7)</td>
<td>5.9 (5.1,6.8)</td>
<td>2.6 (1.9,3.4)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

a: Values are weighted for study design and nonresponse.

b: P-values for overall group comparisons were calculated using X2 tests for categorical variables, and F-tests for continuous variables.
Men who reported a household income of less than $50,000 had significantly higher current OSHS exposure than those earning more than $50,000 (p<.01). Men of various educational levels had similar current OSHS exposure (around 7%). In contrast, women with additional education beyond HS or equivalent had the highest prevalence (3.9%). Current OSHS exposure also varied by type of occupation; both men and women employed in lower-skilled occupations reported higher SHS exposure (10% and 4.5%, respectively) compared to those holding medium-skilled or “other” occupation types (Table VIII).

Comparisons by gender and Hispanic/Latino ethno-cultural backgrounds indicated that men (9%) and women (3.4%) of Mexican heritage, and PR men (3.8%) had the highest current OSHS exposure. No within-gender variation was observed by geographical location for either men or women (Table VIII). Men and women who preferred to speak in Spanish reported significantly higher current OSHS exposure (15% and 5%, respectively) compared to their English-speaking counterparts. In contrast, men and women who had lived in the United States 10 years or longer reported higher current OSHS exposure than those with less than 10 years of United States residence (14% versus 6%, and 5% versus 2%, respectively; Table VIII).
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No SHS Exposure</td>
<td>Current SHS Exposure</td>
</tr>
<tr>
<td></td>
<td>2,591</td>
<td>644</td>
</tr>
<tr>
<td><strong>Age Group</strong></td>
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<td></td>
</tr>
<tr>
<td>18–39 yrs</td>
<td>42.0 (1.3)</td>
<td>11.8 (0.9)</td>
</tr>
<tr>
<td>40–64 yrs</td>
<td>35.8 (1.1)</td>
<td>8.1 (0.5)</td>
</tr>
<tr>
<td>65–74 yrs</td>
<td>2.2 (0.3)</td>
<td>0.2 (0.1)</td>
</tr>
<tr>
<td><strong>Income ($)</strong></td>
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<tr>
<td>&lt;20,000</td>
<td>24.3 (1.3)</td>
<td>6.8 (0.7)</td>
</tr>
<tr>
<td>20,000–50,000</td>
<td>39.1 (1.3)</td>
<td>9.8 (0.7)</td>
</tr>
<tr>
<td>&gt;50,000</td>
<td>16.6 (1.2)</td>
<td>3.5 (0.4)</td>
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<tr>
<td><strong>Education</strong></td>
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<td>Less Than High School</td>
<td>21.9 (1.1)</td>
<td>6.5 (0.7)</td>
</tr>
<tr>
<td>High School or Equivalent</td>
<td>24.1 (1.1)</td>
<td>6.1 (0.6)</td>
</tr>
<tr>
<td>Beyond High School or Equivalent</td>
<td>34.0 (1.3)</td>
<td>7.4 (0.6)</td>
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</tr>
<tr>
<td>Lower-Skilled</td>
<td>41.0 (1.2)</td>
<td>9.8 (0.8)</td>
</tr>
<tr>
<td>Medium-Skilled</td>
<td>20.7 (1.1)</td>
<td>5.9 (0.5)</td>
</tr>
<tr>
<td>Other</td>
<td>18.3 (1.1)</td>
<td>4.3 (0.7)</td>
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<tr>
<td><strong>H/L Group</strong></td>
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</tr>
<tr>
<td>Mexican</td>
<td>36.8 (1.9)</td>
<td>9.0 (0.8)</td>
</tr>
<tr>
<td>Puerto Rican</td>
<td>10.5 (1.0)</td>
<td>3.8 (0.5)</td>
</tr>
<tr>
<td>Central American</td>
<td>5.7 (0.6)</td>
<td>2.1 (0.3)</td>
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</tbody>
</table>

<sup>a</sup> Table VIII: Prevalence of Occupational Exposure to SHS Exposure by Social Factors among H/L Participants.
**TABLE VIII (Continued)**

PREVALENCE OF OCCUPATIONAL EXPOSURE TO SHS EXPOSURE BY SOCIAL FACTORS AMONG H/L PARTICIPANTS\(^a\)

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<th>Characteristic</th>
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<td>No SHS Exposure</td>
<td>Current SHS Exposure</td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.591 (80.20%)</td>
<td>644 (-19.80%)</td>
</tr>
<tr>
<td>South American</td>
<td>5.0 (0.5)</td>
<td>0.9 (0.2)</td>
</tr>
<tr>
<td>Cuban</td>
<td>16.0 (1.5)</td>
<td>3.1 (0.5)</td>
</tr>
<tr>
<td>Dominican</td>
<td>5.9 (0.8)</td>
<td>1.1 (0.3)</td>
</tr>
<tr>
<td><strong>HCHS/SOL Site</strong></td>
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</tr>
<tr>
<td>The Bronx</td>
<td>18.2 (1.4)</td>
<td>5.1 (0.7)</td>
</tr>
<tr>
<td>Chicago</td>
<td>17.6 (1.2)</td>
<td>4.0 (0.4)</td>
</tr>
<tr>
<td>Miami</td>
<td>21.3 (1.8)</td>
<td>5.7 (0.7)</td>
</tr>
<tr>
<td>San Diego</td>
<td>22.9 (2.1)</td>
<td>5.3 (0.6)</td>
</tr>
<tr>
<td><strong>Language Preference</strong></td>
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<tr>
<td>Spanish</td>
<td>61.9 (1.3)</td>
<td>15.0 (0.9)</td>
</tr>
<tr>
<td>English</td>
<td>18.0 (1.1)</td>
<td>5.0 (0.6)</td>
</tr>
<tr>
<td><strong>Length of Stay in U.S.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 10 years</td>
<td>23.8 (1.2)</td>
<td>6.2 (0.6)</td>
</tr>
<tr>
<td>≥10 years</td>
<td>56.2 (1.3)</td>
<td>13.8 (0.9)</td>
</tr>
</tbody>
</table>

\(^a\) Percentages and (standard error). Values are weighted for study design and nonresponse.

\(^b\) P-values for group comparisons were calculated using \(X^2\) tests for categorical variables, and F-tests for continuous variables.
e. **Prevalence of cigarette smoking**

The overall prevalence of CCSMK was 18%, with an average of 3.8 cigarettes per day (Table VII). Comparisons by Hispanic/Latino groups showed that PRs (31%) had significantly higher prevalence compared to all other Hispanic/Latino groups (ranged from 20% for Cubans to 8% for Dominicans, p<.01).

f. **Gender, social factors, and cigarette smoking**

Table IX summarizes the prevalence of CSMK by OSHS and social factors associated with increased CSMK for men and women separately. Gender comparisons showed that the prevalence of CCSMK was significantly higher for men (9.7%) than women (1.9%) who were currently exposed to OSHS (p<.001). The prevalence of CCSMK was lower for both men (2.3%) and women (0.3%) who were formerly exposed to OSHS.
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never 1,674</td>
<td>Former 866</td>
</tr>
<tr>
<td><strong>Occupational SHS Exposure</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current</td>
<td>6.9 (0.6)</td>
<td>3.5 (0.4)</td>
</tr>
<tr>
<td>Former (^{c})</td>
<td>1.7 (0.4)</td>
<td>1.0 (0.2)</td>
</tr>
<tr>
<td><strong>Age Group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18–39 yrs</td>
<td>32.5 (1.2)</td>
<td>8.1 (0.7)</td>
</tr>
<tr>
<td>40–64 yrs</td>
<td>20.9 (0.9)</td>
<td>13.6 (0.8)</td>
</tr>
<tr>
<td>65–74 yrs</td>
<td>1.3 (0.3)</td>
<td>0.8 (0.2)</td>
</tr>
<tr>
<td><strong>Income ($)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;20,000</td>
<td>15.4 (1.0)</td>
<td>6.6 (0.6)</td>
</tr>
<tr>
<td>20,000–50,000</td>
<td>26.2 (1.1)</td>
<td>11.8 (0.7)</td>
</tr>
<tr>
<td>&gt;50,000</td>
<td>13.0 (1.0)</td>
<td>4.1 (0.5)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less Than High School</td>
<td>13.1 (0.9)</td>
<td>7.4 (0.6)</td>
</tr>
<tr>
<td>High School or Equivalent</td>
<td>16.9 (1.0)</td>
<td>5.9 (0.5)</td>
</tr>
<tr>
<td>Beyond High School or Equivalent</td>
<td>24.6 (1.1)</td>
<td>9.2 (0.7)</td>
</tr>
<tr>
<td>Characteristic</td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>--------------------</td>
<td>----------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td></td>
<td>Never</td>
<td>Former</td>
</tr>
<tr>
<td></td>
<td>1,674</td>
<td>866</td>
</tr>
<tr>
<td>Type of Occupation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower-Skilled</td>
<td>27.5</td>
<td>11.1</td>
</tr>
<tr>
<td>Medium-Skilled</td>
<td>14.3</td>
<td>6.5</td>
</tr>
<tr>
<td>Other</td>
<td>12.9</td>
<td>5.0</td>
</tr>
<tr>
<td>H/L Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexican</td>
<td>24.0</td>
<td>10.9</td>
</tr>
<tr>
<td>Puerto Rican</td>
<td>7.2</td>
<td>2.4</td>
</tr>
<tr>
<td>Central American</td>
<td>5.0</td>
<td>1.5</td>
</tr>
<tr>
<td>South American</td>
<td>3.2</td>
<td>1.9</td>
</tr>
<tr>
<td>Cuban</td>
<td>9.7</td>
<td>5.0</td>
</tr>
<tr>
<td>Dominican</td>
<td>5.6</td>
<td>0.9</td>
</tr>
<tr>
<td>HCHS/SOL Site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Bronx</td>
<td>14.1</td>
<td>3.4</td>
</tr>
<tr>
<td>Chicago</td>
<td>11.0</td>
<td>5.1</td>
</tr>
<tr>
<td>Miami</td>
<td>13.6</td>
<td>7.3</td>
</tr>
<tr>
<td>San Diego</td>
<td>16.0</td>
<td>6.7</td>
</tr>
</tbody>
</table>
### TABLE IX (Continued)
PREVALENCE OF CSMK BY OCCUPATIONAL EXPOSURE TO SHS AND SOCIAL FACTORS AMONG HISPANIC/LATINO PARTICIPANTS

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Men</th>
<th>Women</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never 1,674</td>
<td>Former 866</td>
<td>Current 695</td>
</tr>
<tr>
<td></td>
<td>-47.80%</td>
<td>-27.30%</td>
<td>-24.90%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Language Preference</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spanish</td>
<td>40.8 (1.3)</td>
<td>19.3 (0.9)</td>
<td>16.9 (1.0)</td>
</tr>
<tr>
<td></td>
<td>60.6 (1.3)</td>
<td>9.5 (0.6)</td>
<td>8.1 (0.7)</td>
</tr>
<tr>
<td>English</td>
<td>13.8 (1.0)</td>
<td>3.2 (0.4)</td>
<td>6.0 (0.6)</td>
</tr>
<tr>
<td></td>
<td>15.9 (1.0)</td>
<td>2.2 (0.3)</td>
<td>3.6 (0.4)</td>
</tr>
<tr>
<td>Length of Stay in US</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 10 years</td>
<td>16.1 (1.0)</td>
<td>7.2 (0.6)</td>
<td>6.7 (0.6)</td>
</tr>
<tr>
<td></td>
<td>21.7 (1.2)</td>
<td>3.6 (0.4)</td>
<td>2.8 (0.6)</td>
</tr>
<tr>
<td>≥10 years</td>
<td>38.5 (1.2)</td>
<td>15.4 (0.8)</td>
<td>16.1 (1.0)</td>
</tr>
<tr>
<td></td>
<td>54.9 (1.3)</td>
<td>8.2 (0.5)</td>
<td>8.8 (0.6)</td>
</tr>
</tbody>
</table>

a: Percentages and (standard error). Values are weighted for study design and nonresponse.

b: P-values for group comparisons were calculated using $X^2$ tests for categorical variables, and F-tests for continuous variables.

c: Occupational SHS exposure in former longest held job.
Comparisons by age groups indicated that younger men (ages 18–39 years) had the highest CSMK prevalence (13%), followed by the middle-aged group (40–64 years, 9%), and the oldest participants (65–74 years, 0.2%). In contrast, women between the ages of 18 and 64 years had similar prevalence of CCSMK (around 6%). Men of different educational levels had comparable CCSMK prevalence (around 7.5%). Among women, those with additional education beyond high school had a higher smoking prevalence (5.5%) than those who were less educated (around 3.1%, p<.01). In terms of income, men who reported an annual household income of <$20,000 or between $20,000 and $50,000 had a significantly higher current smoking prevalence (9% and 11%, respectively) than men who reported earning more than $50,000 (3%, p<.01). A similar pattern was observed for women; those who reported an annual household income of less than $50,000 had a significantly higher current smoking prevalence (around 5%) compared to those who earned above $50,000 (1%, p<.01) (Table IX).

The prevalence of CCSMK also varied by type of occupation for men and women (Table IX). Among men, those who were employed in lower-skilled occupations had a smoking prevalence twice as high as men who held medium-skilled or other occupations (12%, 6%, and 5%, respectively, p<.01). A similar pattern was observed among women; 6% for those employed in lower-skilled occupations compared to women who had medium-skilled or other occupations (2.4% and 3%, respectively, p<.01). Comparisons of current smoking prevalence by gender and Hispanic/Latino ethno-cultural group showed that among men, Mexicans (11%), PRs (4.7%), and Cubans (5%) had the highest values. This trend was also observed for women of Mexican (4.5%), PR (3.1%), and Cuban (2%) descent. In contrast, there was very little variation in current smoking prevalence values by geographical location for either men (all around 5.5%) or women (all around 3%). Both men and women who preferred to speak in Spanish reported significantly higher CCSMK prevalence compared to their English-speaking counterparts (17% versus 6%, and 8% versus 3.6%, respectively; p<.01). In contrast, the prevalence of CCSMK was significantly higher for men (16%), and women (9%) with 10 or more years of U.S. residence than for those with shorter length of stay (p<.01).
g. **Association of occupational SHS exposure with cigarette smoking**

Data from multivariate logistic regression models demonstrated that current exposure to OSHS was significantly associated with higher odds of CCSMK (Table X). Analyses that adjusted for age, gender, education level, income, and geographical location (HCHS/SOL field center) showed that participants who were currently exposed to OSHS had 4.2 the odds of smoking cigarettes compared to those who had no current OSHS exposure (Model 1). The association of OSHS exposure with CCSMK was slightly attenuated when additional adjustments were made for other potential confounders (occupation type, HSHS exposure, health insurance, current asthma diagnosis, language preference, and length of stay in the United States, Model 2).

Comparisons among Hispanic/Latino ethno-cultural groups showed that the association of current OSHS exposure with CSMK was overall similar across Hispanic/Latino backgrounds. Cubans who were exposed to OSHS seemed to have higher odds of being cigarette smokers (models 1 and 2 in Table X). However, the elevated ORs obtained for Cubans may be partly due to the fact that the prevalence of smokers within the not-currently-SHS-exposed group was very small compared to the prevalence within the currently exposed group.
<table>
<thead>
<tr>
<th>Exposure to SHS</th>
<th>Overall (n=6,970)</th>
<th>Mexican (n=3,217)</th>
<th>Cuban (n=830)</th>
<th>Puerto Rican (n=874)</th>
<th>Dominican (n=629)</th>
<th>Central (n=841)</th>
<th>South (n=579)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (95% CI)</td>
<td>P Value</td>
<td>OR (95% CI)</td>
<td>P Value</td>
<td>OR (95% CI)</td>
<td>P Value</td>
<td>OR (95% CI)</td>
</tr>
<tr>
<td>Current</td>
<td>4.2 (3.4, 5.3)</td>
<td>&lt;.001</td>
<td>6.7 (4.0, 11.1)</td>
<td>&lt;.001</td>
<td>3.5 (2.1, 5.8)</td>
<td>&lt;.001</td>
<td>1.8 (1.0, 3.2)</td>
</tr>
<tr>
<td>Current</td>
<td>3.6 (2.9, 4.6)</td>
<td>&lt;.001</td>
<td>4 (2.8, 5.9)</td>
<td>&lt;.001</td>
<td>7.2 (4.1, 12.6)</td>
<td>&lt;.001</td>
<td>2.1 (1.2, 3.8)</td>
</tr>
<tr>
<td>Current</td>
<td>3.6 (2.9, 4.6)</td>
<td>&lt;.001</td>
<td>4 (2.8, 5.9)</td>
<td>&lt;.001</td>
<td>7.2 (4.1, 12.6)</td>
<td>&lt;.001</td>
<td>2.1 (1.2, 3.8)</td>
</tr>
</tbody>
</table>

Model 1 (reference group: no current occupational SHS exposure)

Model 2 (reference group: no current occupational SHS exposure)

a: Odd Ratios are weighted for study design and nonresponse.

Model 1: Analyses were adjusted for age, gender, education level, income and HCHS/SOL field center.

Model 2: Analyses were adjusted for age, gender, education level, income, home SHS exposure, health insurance, current asthma diagnosis, language preference, length of stay in the U.S., and HCHS/SOL field center.
4. **Discussion**

The present study’s main objective was to examine the prevalence of OSHS exposure and its association with CCSMK among Hispanic/Latino adults residing in the United States. This section will discuss salient findings obtained using baseline data from the HCHS/SOL study. The discussion will describe how these findings relate to existing evidence on this topic, and how they may contribute to inform future public health initiatives.

Results related to this study’s first specific aim showed that the overall prevalence of current occupational exposure (14%) was lower than the U.S. national prevalence (50%), while the overall prevalence of CCSMK (18%) was more comparable to the U.S. national smoking rates (Howard, 2004; CDC, 2010). A possible explanation for the observed lower OSHS prevalence may lie in the fact that all four HCHS/SOL field centers are located in cities and states that enforce tobacco-control policies in public areas, including the workplace.

Previous studies indicate that smoke-free legislation is highly effective for reducing SHS exposure in the work environment (Task Force, 2001; U.S. Surgeon General, 2006; Hopkins, 2001; Allwright, 2008). In 2001, the Task Force on Community Preventive Services (supported by the U.S. Department of Health and Human Services) evaluated the scientific evidence on the effectiveness of CCSMK bans and restrictions for decreasing exposure to SHS. Their systematic literature review found strong evidence that these interventions led to a decline in nonsmoker SHS exposure in a variety of worksite and community settings (Taks Force, 2001; Hopkins, 2001). Based on these findings, the lower OSHS exposure reported in the current study may have also resulted in part from smoke-free legislation implemented in work sites of HCHS/SOL participants.

In addition, as hypothesized, our data indicated that the prevalence of SHS exposure in the workplace varied across Hispanic/Latino groups, including gender, age, income, type of occupation, ethno-cultural heritage, and acculturation level. However, education did not seem to influence either the prevalence of current OSHS exposure or CCSMK. As shown in Tables VIII and IX, men and younger (18–39 years)
participants reported higher current OSHS exposure and CSMK compared to women and older (40–74 years) individuals, respectively.

Furthermore, our findings showed that HCHS/SOL participants who reported household incomes lower than $50,000 and/or were employed in lower-skilled occupations showed a higher prevalence of current SHS exposure in the workplace. These results are consistent with existing literature on work-related SHS exposure (U.S. Surgeon General, 2006; Shopland, 2004). Although the overall prevalence rates of OSHS exposure have declined over the last two decades, numerous studies have documented various disparities and inequities related to the exposure of SHS in the workplace among lower-skilled workers (U.S. Surgeon General, 2006; Shopland, 2004).

Disparities can be thought of as having multiple origins such as the type of occupation and work environment. In terms of the occupational type, the evidence shows that OSHS exposure is not equally distributed across different worker groups (Shopland, 2004; Howard, 2004; Arheart, 2008). For example, a 2004 study by Shopland and colleagues examined recent trends in workplace smoke-free policies among the major occupational groups in the United States using Census data. The study also assessed the degree of compliance with the tobacco-control policies. Their findings showed that only 43% of blue-collar and service workers were covered by smoke-free policies, compared to white-collar workers (75%). The overall lower rate of smoke-free policies among lower-skilled workers coupled with the higher rates of noncompliance with such policies, resulted in a disproportionate exposure to the well established harmful effects of OSHS among blue-collar and service workers (Shopland, 2004).

Studies focusing on U.S. Hispanics/Latinos indicated that individuals who were part of the hospitality workforce (e.g., restaurants, bars, casinos, and food manufacturers) reported the lowest level of smoke-free protection, and greater exposure to OSHS compared to the U.S. general population (Americans for Nonsmokers' Rights. (2006). Moreover, compared to NHWs, Hispanics/Latinos are almost twice as likely to work in the service industry and labor sector (23% versus 41%, respectively), where they are least likely to be
protected by smoke-free legislation. Therefore, they are at increased risk of being exposed to SHS exposure in the workplace, further exacerbating these racial/ethnic disparities (Americans for Nonsmokers' Rights. (2006).

The second set of disparities and inequities pertaining to exposure to OSHS exposure among lower-skilled employees relates to the fact that they often work for employers (e.g., small businesses) who are less likely to provide comprehensive health insurance benefits and wellness programs. Tobacco-control policies differ for public and private sectors. While the former enforce a complete smoke-free ban, the latter are less regulated and may choose to only partially enforce smoking bans (e.g., allow smoking in designated outdoor areas). In addition, small businesses and contractors are less likely to adopt a smoke-free policy in combination with a wellness program to support smoking cessation interventions among employees who smoke. These disparities are further exacerbated by the fact that lower-skilled workers generally earn lower wages and may lack financial resources to afford health insurance or care should they need it as a result to exposure of OSHS. A separate study using HCHS/SOL baseline data supports these findings. Kaplan and colleagues (2014) showed that less than half of participants reported health insurance coverage, and lack of health insurance was determined to an independent predictor of CSMK.

The current study’s findings also showed that current OSHS exposure and CSMK varied by Hispanic/Latino ethno-cultural background. Overall, PRs reported higher prevalence of OSHS exposure compared to other Hispanic/Latino ethnic groups (Table VII). Comparisons by gender showed that men of Mexican, PR, and Cuban descent had higher prevalence of current OSHS exposure and CSMK compared to those of other Hispanic/Latino ethno-cultural backgrounds (Tables VIII and IX). Among women, Mexicans and PRs reported higher OSHS exposure and CCSMK compared to other Hispanic/Latino groups. These data are consistent with limited evidence on the variation of OSHS exposure among ethno-culturally diverse Hispanics/Latinos living in the United States (Pletsch, 1994). Despite differences in prevalence values, our data are generally consistent with these national data in that HCHS/SOL participants from Mexican, PR, and Cuban backgrounds had higher prevalence of OSHS exposure compared to other groups.
The role played by sociocultural factors on the acceptability of CSMK among Hispanics/Latinos has been evaluated by previous studies (Pérez-Stable, 1998; Foraker, 2005; González, 2009). The evidence shows that differences in attitudes, norms, and beliefs exist across Hispanic/Latino ethnic groups. For example, a qualitative study showed that Cubans and PRs reported a higher acceptability of CSMK (e.g., considered as part of their national heritage and pride) compared to participants of other Hispanic/Latino ethno-cultural groups (Foraker, 2005). Our data are in line with the latter findings, and suggest that cultural differences among Hispanic/Latino groups may partially contribute to the reported increased prevalence of OSHS exposure, as well as CCSMK among PRs and Cubans. For instance, more managers and owners of small businesses belonging to these Hispanic/Latino ethno-cultural groups may opt not to restrict CSMK in their work settings, and further, workers may not have a preference and/or choice for a smoke-free workplace.

For the study’s second aim hypothesis, current exposure to SHS in the work environment was positively associated with current smoking behavior among HCHS/SOL participants. Men and women who were currently exposed to OSHS had a significantly higher prevalence of CCSMK compared to those who were not currently exposed (Table IX). In addition, results from multivariate logistic regression models indicated that overall, participants who reported current OSHS exposure had 4.2 times the odds of being current cigarette smokers compared to those who had no current work-related SHS exposure, after controlling for relevant sociodemographic variables (Table X).

Results for comparisons across Hispanic/Latino ethno-cultural groups were limited by smaller sample sizes and lower occupational exposure for certain Hispanic/Latino groups such as South Americans and Dominicans. Our findings for the overall sample support the SBET models used to inform this study’s theoretical framework (see Figure 3). More precisely, socio-environmental factors, such as peer CSMK behavior, have been shown to contribute to the onset and maintenance of CSMK behavior. For adults, the work environment represents a major source of sociocultural influence. Consequently, individuals who are surrounded by smoking colleagues in a work setting that has permissive CSMK policies and culture may be
more likely to smoke cigarettes, compared to those who work in a workplace protected by smoke-free policies.

Based on a similar conceptual model, the Task Force on Community Preventive Services recently evaluated 37 scientific reports on the effectiveness of smoke-free policies in reducing tobacco use. Their systematic review concluded that various studies provided consistent evidence of reduction in CSMK in working populations exposed to smoke-free policies. Overall they showed that workers who smoked and work in smoke-free settings reported lower levels of daily CSMK and more cessation attempts, compared to workers who smoked but were not exposed to such policies (Hopkins, 2010).

The evidence suggests that smoke-free policies provide motivation for smokers to initiate cessation efforts. Moreover, these policies reduce opportunities to smoke and are likely to increase the success rate of cessation attempts. Hence, they may improve the work sociocultural environment by having fewer continuing smokers, and lower exposure to peer influence and OSHS (Hopkins, 2010).

a. **Study’s limitations and strengths**

This study had a number of limitations. Causality could not be determine due to the fact that it used a cross-sectional study design to examine the association of OSHS exposure as a proxy for work-related influences and CCSMK. For instance, patterns of CSMK and how the work environment may have undermined smoking cessation attempts could not be determined. For instance, someone who had quit smoking may have relapsed by working at a workplace not protected by smoke-free policies. Second, all responses were by self-report, and participants might have underreported exposure to SHS and/or CSMK behavior. Third, the HCHS/SOL sample was drawn from four selected U.S. cities. Therefore the findings cannot be generalized to the larger U.S. based Hispanic/Latino community. Fourth, all four HCHS/SOL field centers were located in cities and states protected by tobacco-control policies in public areas/workplaces, including the hospitality industry. This likely contributed to the observed lower prevalence of current OSHS exposure among HCHS/SOL participants compared to the U.S. national prevalence, and that of Hispanics/Latinos residing in other geographic locations not protected by smoke-free policies. In addition, we
do not have information on workplace tobacco-control regulations. Fifth, smaller sample sizes and lower occupational exposure prevalence for certain Hispanic/Latino ethno-cultural groups such as South Americans and Dominicans limited the study’s capacity to draw firm conclusions on the variation of the association of current OSHS exposure with CCSMK across Hispanic/Latino background groups.

This study also has a number of strengths. It included Hispanics/Latinos from diverse ethno-cultural and sociodemographic backgrounds, which made possible the assessment of variations in exposure to OSHS exposure and CSMK. Previous studies and national surveys have typically included mostly MAs, and/or have classified Hispanic/Latino individuals as a single group, which has limited their capacity to document variation in OSHS exposure and CSMK across Hispanic/Latino diverse ethno-cultural groups within this population. Second, participants resided in four very different U.S. urban centers, which allowed us to examine any possible differences by geographical location, and obtain a more complete national picture of OSHS exposure and its association with CCSMK.

b. **Public health importance and relevance of findings**

To the best of the author’s knowledge, this is the first study to evaluate the prevalence of OSHS exposure and its association with CCSMK among a large sample of U.S. Hispanics/Latinos from diverse ethnocultural and sociodemographic backgrounds. Our findings are consistent with existing literature on the role played by socio-environmental influences (e.g., peer smoking behavior and lack of protection from smoke-free policies) on CSMK behavior. They also support the theoretical framework used to guide this research in that they showed that exposure to OSHS increased the likelihood of being a current cigarette smoker among HCHS/SOL participants.

In addition, the current study’s results address gaps in the literature on exposure to SHS in the workplace among Hispanics/Latinos. They emphasize the importance of evaluating the prevalence of occupational exposure across diverse Hispanic/Latino ethno-cultural groups, income level, and occupation
type. Our data confirm and further document work-related disparities and inequities experienced by Hispanics/Latinos of lower income and occupational strata.

Additional research on these topics is necessary to further characterize variations in exposure to SHS in the workplace and its effect on CSMK among diverse Hispanic/Latino groups. Future studies should examine sociocultural and policy factors that contribute to the increased OSHS exposure among certain ethnocultural groups and socioeconomically disadvantaged Hispanics/Latinos. Data from these investigations may be used to inform health promotion initiatives that aim at reducing existing occupational and health-care disparities and inequities. For example, the 2010 Affordable Care Act (ACA), Title IV on Prevention of Chronic Diseases and Improving Public Health is designed to promote wellness in the workplace and strengthen the vital role of communities in promoting health (Koh 2010b). With regard to tobacco use and dependence, a recognized substantial public health threat in this country, the ACA offers various funds (e.g., Community Transformation Grants) designed to promote community-based tobacco-use counseling and cessation interventions. In addition, the legislation provides grants for small business to provide comprehensive workplace wellness programs to their employees. The latter would likely benefit underserved Hispanics/Latinos who are often employed by independent private businesses that are less likely to offer their employees access to this type of preventive services.

In conclusion, although the prevalence of OSHS exposure has significantly declined following the introduction of tobacco-control legislation in the workplace, results from this study suggest that additional efforts are warranted to ensure a smoke-free work environment, and access to employer-based smoking cessation/wellness programs among low-SES and underserved Hispanics/Latinos in the United States.
C. Manuscript 3: The Role of Gender in the Association of Exposure to Second Hand Smoke with Cigarette Smoking: Findings from the Hispanic Community Health Study/Study of Latinos

1. Background

Tobacco use is the single most prevalent cause of death and disease in the United States (U.S. Surgeon General, 2006). Classified as a carcinogen, SHS represents a major health risk to nonsmokers (U.S. Surgeon General, 2006). Current cigarette smoking accounts for nearly $200 billion in health-care expenditures and over 400,000 premature deaths, of which close to 50,000 are in nonsmokers as a result to exposure to SHS (U.S. Surgeon General, 2006; Giovino, 2007; Adhikari, 2008). Among Hispanics/Latinos, the largest growing minority group in the United States, the adverse health consequences of tobacco use are very large, as three out of four leading causes of death (i.e., stroke, heart disease, and cancer) among Hispanics/Latinos are related to CSMK (Heron, 2009).

The U.S. prevalence of CCSMK among adults is 19.3% (CDC, 2010). National and state-level data from 2005–2010 indicated that CSMK rates varied by gender, with the percentage of current smokers higher for men (21.5%) than women (17.3%). Nationally, Hispanics/Latinos (mostly MAs) report lower smoking rates (16%) than NHWs (21%), although rates also vary by gender. In 2010, the overall percent of Hispanic/Latino men who smoked (16%) was closer to that of NHW men (22%), and almost double that of Hispanic/Latino women smokers (9%). These data suggest that the overall national prevalence of CSMK among Hispanics/Latinos is in part a result of the lower proportion of women who report smoking (e.g., Mexican and Central American women).

In addition, limited data show significant heterogeneity in CSMK prevalence rates exists across Hispanics/Latinos of different heritage and country of origin (CDC, 2011; Perez-Stable, 2001; American Lung Association, 2010). For example, Cubans (22%), MAs (20%), and PRs (18%) have higher CSMK rates (comparable to the U.S. rate of 19.3%), compared to Mexicans (11%) and Dominicans (10%).
Gender differences have also been reported for Hispanics/Latinos of various ethno-cultural backgrounds (CDC, 2011; American Lung Association, 2010; Pérez-Stable, 2001; Champagne, 2010; WHO, 2011).

The prevalence of SHS exposure in the United States is currently estimated to be 40% (Kaufman, 2010; U.S. Surgeon General, 2006). Data from national health surveys and various studies show that men of various racial/ethnic groups including Hispanics/Latinos, have higher exposure to SHS than women (Ellis, 2009; Max, 2009; Americans for Nonsmokers' Rights, 2006; Shopland, 2004; U.S. Surgeon General, 2006). Comparisons among racial/ethnic groups in the United States showed that MAs (29%) were less exposed to SHS than NHWs (40%) and AAs (56%). However, in terms of OSHS, Hispanics/Latinos (particularly men) are more likely to be exposed compared to other racial/ethnic groups (American Lung Association, 2010).

Previous investigations on the etiology of CSMK indicate that the smoking behavior of family members and peers are among socio-environmental factors that have been shown to influence the onset and maintenance of CSMK (Cox, 2005; Wilkinson, 2008). The evidence indicates that individuals who live or work in proximity to cigarette smokers are more likely to initiate and maintain CSMK compared to those who do not. Some of these studies have identified gender differences with respect to the role played by this type of socio-environmental influence.

Findings from these investigations support the current study’s conceptual framework. According to the SBET models (Hovell, 2009) used to guide this study, individuals operate in multiple sociocultural environments that influence health-related behaviors, including CSMK (Hovell, 2009). The home and workplace are among the most proximal milieus where the majority of adults operate on a daily basis, and represent the two main sources of exposure to CSMK and SHS (U.S. Surgeon General, 2006). They are therefore the focus of this study which seeks to investigate the role played by gender in the association of exposure to SHS (as a proxy for social influences of smoking) with CCSMK among Hispanics/Latinos living in the United States.
Previous studies have not examined the effect of gender on the association between SHS exposure (at home and work environments) and CSMK among U.S. ethno-culturally diverse Hispanics/Latinos. It is important to understand the role played by gender on this association among Hispanics/Latinos to help address: (1) the existing gender gap in CSMK and SHS exposure that overburdens minority underserved working men; and (2) the increasing prevalence rates of CSMK among U.S. Hispanic/Latino adolescents, which have surpassed those of AAs and are approaching those of NHW youth (CDC, 2010). These trends are particularly worrisome for adolescent Latinas whose recently high CSMK prevalence rate (23%) is comparable to those of Hispanic/Latino adolescent males, reflecting a narrowing in the gender gap among Hispanics/Latinos residing in the United States.

The purpose of this study is to examine the moderating effect of gender on the association of SHS exposure and CCSMK behavior among an ethno-culturally diverse Hispanic/Latino population residing in four U.S. cities. The study’s first objective is to examine variation in SHS exposure (in the home and work environments) and CCSMK among men and women. Based on the literature, it is hypothesized that men will report higher prevalence of SHS exposure and CCSMK than women. The second objective is to determine if the relationship between SHS exposure and CCSMK varies by gender. It is hypothesized that gender will act as a moderator in the association of home- and occupational-SHS exposure with CCSMK. Informed by the literature and this study’s theoretical model, the association between SHS exposure and CCSMK will be more robust for men than women.

2. Methods
   a. Study design and sample
      
      This is cross-sectional observational study that uses baseline data collected during the first patient visit for HCHS/SOL. The study’s main objectives were to examine risk and protective factors for chronic diseases such as CVD. Its methodology has been previously described (Sorlie, 2012; LaVange, 2010).
Briefly, 16,415 individuals (self-identified as Hispanic/Latino) aged 18–74 years were recruited from randomly selected households in defined communities in four U.S. urban centers (The Bronx, New York; Chicago, Illinois; Miami, Florida; San Diego, California) between March 2008 and June 2011. The HCHS/SOL used a stratified two-stage area probability sample design to select the households (LaVange, 2010). The IRB at each participating institution approved the study, and informed consent was obtained from all participants.

b. **Study population and setting**

The study population for this analysis consisted of 13,231 men and women (ages 18–74 years) who self-identified as Hispanic/Latino. The study sites were selected with consideration of geographical balance, and so that the overall sample would consist of a diverse Hispanic/Latino population. Each HCHS/SOL field center recruited approximately 3,000 participants. Inclusion criteria included being 18 to 74 years of age, randomly selected and/or residing in the same household as the selected index person, and having complete data for the variables of interest. Individuals who were pregnant or likely to leave their residential area were excluded.

c. **Data collection procedures**

A comprehensive baseline visit included a medical examination and a survey data collection on current and past demographic, health-related, and sociocultural factors. All participants’ sociodemographic information (e.g., age, gender, income, and education), occupational status, type of occupation, health insurance, asthma diagnosis, history of tobacco use and exposure to SHS (in the home and work environments) was collected using interviewer-administered HCHS/SOL questionnaires. Study surveys were translated into Spanish and certified by independent translators. They were tested at each field center by focus groups to identify relevant differences in word usage by nationality or country/region of origin. All data were collected using a direct computer-based DMS developed and programmed by the CC at the UNC (Sorlie, 2012; LaVange, 2010).
d. **Survey measures**

This study’s main outcome measure was CCSMK status. Information on the participants’ CSMK behavior was ascertained using HCHS/SOL’s Tobacco Use questionnaire. The survey included questions on past and current cigarette use, ever use of cigars and pipes, and cessation attempts (the latter two measures were not included in this analysis; see copy of questionnaire in Appendix A). The exposure variables include: (1) sociodemographic data; (2) SHS exposure at home and in the workplace; (3) health-care insurance; (4) asthma diagnosis; and (5) acculturation.

Sociodemographic data were collected using the HCHS/SOL Personal Identifiers, Personal Information, and Economic Questionnaires (See the Appendix A).

Information on exposure to SHS was collected using HCHS/SOL’s Tobacco Use questionnaire. The survey included questions on past and current HSHS (questions 12–15 in copy of questionnaire in Appendix A). Current exposure to OSHS was collected using the Occupation Classification and Exposures Questionnaire (questions 27.l. in copy of questionnaire in Appendix A). Employment Status was obtained via the Occupation Classification and Exposures Questionnaire (questions 5 and 16 in copy of questionnaire in Appendix A). Health insurance coverage was ascertained using the Health Care Use Questionnaire (question 10.a. in copy of questionnaire in Appendix A). This exposure variable was included because it was determined to be a significant predictor of CSMK in a HCHS/SOL manuscript looking at the prevalence and risk factors for CSMK (Kaplan, 2014). Asthma diagnosis was determined using the Respiratory Health Questionnaire (questions 32, 34, and 35 in copy of questionnaire in Appendix A). Acculturation was determined by an abbreviated 10-question version of the SASH previously validated for Hispanics/Latinos of diverse ethno-cultural heritages (Marin, 1987). The indicators included language use, media, and social networks preferences (questions 1–11 in copy of appendix A). The range of scores was one to five. Average scores of less than two indicated lower acculturation, and average scores of two or higher indicated higher acculturation. The overall scale reliability was acceptable (α=.90).

e. **Data analyses**

The analysis population included HCHS/SOL participants with complete baseline data for age, gender, Hispanic/Latino heritage group, CSMK, SHS exposure, education level, income, health insurance, asthma diagnosis, language preference, length of stay in the United States, and geographic location (HCHS/SOL field center).

1) **Exposure variables**

Primary independent variables of interest included those related to current and past exposure to SHS in the home and work environment defined as: (1) never; (2) former in the home environment; (2) current in the home environment; and (3) current in the workplace.

2) **Outcome variable**

The outcome variable was CCSMK.

3) **Covariates**

The covariates included age, gender, Hispanic/Latino heritage (Mexican, Cuban, PR, Dominican, Central American, and South American), education level, income, employment status, health insurance, asthma diagnosis, HCHS/SOL field center, and SASH score. These variables were included because they have been shown to be independently related to CSMK (Kaufmann, 2010; CDC, 2012b; CDC, 2011; Pérez-Stable, 2001; Kaplan, 2014).

4) **Statistical analysis**

First, exploratory data analyses were performed for the exposure and outcome variables across gender groups. Descriptive statistics were computed for the total cohort and by gender. All reported values (means, prevalence and ORs) in this analysis were weighted to adjust for sampling probability and nonresponse (Sorlie, 2012; LaVange, 2010). The P-values for overall group comparisons were calculated using $\chi^2$ tests for categorical variables, and F-tests for continuous variables.

Second, the prevalence of HSHS and OSHS exposure were determined for men and women separately. Third, the prevalence of CSMK was evaluated separately for men and women, by HSHS
exposure and Hispanic/Latino background group. Fourth, the prevalence of CSMK was examined by OSHS exposure and type of occupation for men and women. Although it is important to consider cultural background and heritage in studies involving Hispanics/Latinos, this analysis mainly focused on gender specific differences.

Fifth, logistic regression was used to describe the association of SHS exposure indicators with CCMK with adjustment for age, gender, education level, income, Hispanic/Latino heritage groups, health insurance, asthma diagnosis, and acculturation level. The models were as follows:

\[ Y_{CCSM} = \mu + \beta_{HSHS\ exposure} + \beta_{age} + \beta_{gender} + \beta_{education} + \beta_{income} + \beta_{H/L\ group} + \beta_{health\ insurance} + \beta_{asthma\ diagnosis} + \beta_{SASH\ score} + \beta_{OSHS\ exposure} + SE \] for HSHS exposure, and
\[ Y_{CCSM} = \mu + \beta_{OSHS\ exposure} + \beta_{age} + \beta_{gender} + \beta_{education} + \beta_{income} + \beta_{H/L\ group} + \beta_{health\ insurance} + \beta_{asthma\ diagnosis} + \beta_{SASH\ score} + \beta_{HSHS\ exposure} + SE \] for OSHS exposure.

In addition to these covariates, model 2 included interaction terms between SHS exposure indicators and gender. The logistic regression models were as follows:

\[ Y_{CCSM} = \mu + \beta_{HSHS\ exposure} + \beta_{age} + \beta_{gender} + \beta_{education} + \beta_{income} + \beta_{H/L\ group} + \beta_{health\ insurance} + \beta_{asthma\ diagnosis} + \beta_{SASH\ score} + \beta_{OSHS\ exposure} + \beta_{gender\ x\ HSHS\ exposure} + SE \] for HSHS exposure. For OSHS exposure the model was
\[ Y_{CCSM} = \mu + \beta_{OSHS\ exposure} + \beta_{age} + \beta_{gender} + \beta_{education} + \beta_{income} + \beta_{H/L\ group} + \beta_{health\ insurance} + \beta_{asthma\ diagnosis} + \beta_{SASH\ score} + \beta_{HSHS\ exposure} + \beta_{gender\ x\ OSHS\ exposure} + SE. \]

All statistical analyses were performed using SAS (V. 9.2, SAS Institute, Inc).

3. **Results**

a. **Participants’ characteristics**

The participants’ characteristics for men and women are summarized in Table XI. Overall, men and women had similar sociodemographic characteristics in term of age, education,
income, and geographical location. A higher proportion of men were employed, while more women reported having health insurance, and asthma diagnosis. The level of acculturation, as measured by the SASH score, was similar for men and women (Table XI).

b. **Prevalence of home secondhand smoke exposure by gender**

The prevalence of HSHS exposure by gender is summarized in Figures 4A and 4B. Comparisons by gender showed that the prevalence of former and current HSHS exposure was similar for men and women. This observation was true across the various Hispanic/Latino ethno-cultural groups (data not shown).

c. **Prevalence of Occupational SHS Exposure by Gender**

The prevalence of current OSHS exposure was examined for men and women separately (Figures 5A and 5B). Data analyses were limited to participants who reported being employed at the time of the study’s baseline interview (n=6,970). The prevalence of current OSHS exposure was significantly higher for men (19.8%) than women (6.9%, p <.001). The gender difference was observed across all Hispanic/Latino ethno-cultural groups (data not shown).

Comparisons by occupational skill-level indicated that the prevalence of CCSMK for men who worked in lower-skilled (12%) and medium-skilled (5.8%) occupations was twice as high as that of women employed in these types of occupations (6.2% and 2.4%, respectively, p<.01; Figures 6A and 6B).
### TABLE XI
PARTICIPANTS CHARACTERISTICS BY GENDER

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Overall (n=13,231)</th>
<th>Men (n=5,421)</th>
<th>Women (n=7,810)</th>
<th>P-Value b</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;20,000</td>
<td>46.8 (44.7, 48.8)</td>
<td>41.6 (39.8, 43.4)</td>
<td>51.7 (49.5, 53.9)</td>
<td>p &lt; 0.01</td>
</tr>
<tr>
<td>20,000–$50,000</td>
<td>40.8 (39.4, 42.3)</td>
<td>43.0 (42.0, 45.0)</td>
<td>38.7 (37.1, 40.3)</td>
<td>NS</td>
</tr>
<tr>
<td>&gt;$50,000</td>
<td>12.4 (10.8, 14.0)</td>
<td>15.4 (13.6, 17.2)</td>
<td>9.5 (8.1, 10.9)</td>
<td>p &lt; 0.01</td>
</tr>
<tr>
<td><strong>Income ($)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than High School</td>
<td>31.7 (30.2, 33.2)</td>
<td>31.3 (30.0, 32.0)</td>
<td>32.0 (30.3, 33.7)</td>
<td>NS</td>
</tr>
<tr>
<td>High School or</td>
<td>28.6 (27.4, 29.8)</td>
<td>30.6 (29.2, 32.0)</td>
<td>26.8 (25.2, 28.4)</td>
<td>NS</td>
</tr>
<tr>
<td>Beyond High School</td>
<td>39.7 (38.0, 41.4)</td>
<td>38.1 (36.8, 39.4)</td>
<td>41.2 (39.7, 42.7)</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Employed</strong></td>
<td>52.9 (51.3, 54.4)</td>
<td>46.4 (45.0, 48.2)</td>
<td>53.5 (52.1, 54.9)</td>
<td>NS</td>
</tr>
<tr>
<td><strong>SASH Score</strong></td>
<td>2.2 (2.1, 2.2)</td>
<td>2.2 (2.1, 2.2)</td>
<td>2.0 (2.0, 2.1)</td>
<td>NS</td>
</tr>
</tbody>
</table>

a: Values are weighted for study design and nonresponse.

b: P-values for overall group comparisons were calculated using $X^2$ tests for categorical variables, and F tests for continuous variables.

c: Applies only to participants who were employed at the time of the baseline interview (n=6,970).
Figure 4A. Home SHS exposure and current cigarette smoking among men.

Figure 4B. Home SHS exposure and current cigarette smoking among women.
Figure 5A. Occupational SHS exposure and current cigarette smoking among men.
Figure 5B. Occupational SHS exposure and current cigarette smoking among women.
d. **Prevalence of current cigarette smoking by home secondhand smoke exposure**

Findings on the prevalence of CSMK by HSHS exposure by gender are shown on Figure 4. Among participants who were formerly exposed to HSHS, a higher proportion of men were current smokers (12%) compared to women (6%, p<.01). In contrast, the prevalence of CCSMK was similar for men (8%) and women (7%) who were exposed to HSHS at the time of HCHS/SOL baseline interview.

Comparisons of CCSMK prevalence across Hispanic/Latino ethno-cultural groups showed that the gender gap was larger for men and women of Mexican and Cuban descent (data not shown). Among women, PRs had the highest CCSMK prevalence (4.9%), which was similar to that of PR men (5.9%) (data not shown).

e. **Prevalence of current cigarette smoking by occupational secondhand smoke exposure**

The prevalence of CCSMK by OSHS was examined for men and women who were employed at the time of the study’s baseline interview (n=6,970, Figure 5). Gender comparisons indicated that the prevalence of CCSMK was significantly higher for men (9.7%) than for women (1.9%) who reported current exposure to OSHS (p <.001).

f. **Moderating Effect of Gender**

The following section addresses results from data analyses in relation to the second objective. As previously stated, this objective deals with examining the moderating effect of gender on the association of SHS exposure (as a proxy for social influences) with CCSMK. Multivariate logistic regression analyses demonstrated that all types of SHS exposure (former and current in the home, and current in the workplace) were significantly associated with higher odds of CCSMK.
After adjustment for age, gender, education, income, Hispanic/Latino group, health insurance, asthma diagnosis, SASH score, and gender x SHS exposure, individuals who were exposed to SHS had 1.8 times the odds of currently smoking cigarettes compared to those who were not exposed (CI=1.47 – 2.44, p<.01, Table XII). The gender x SHS exposure interaction terms was statistically significant (p<.01) indicating that gender acted as a moderator in the association of HSHS and OSHS exposure with CCSMK.

The association of HSHS exposure with CCSMK varied for men and women. Overall, men who were exposed to former and current HSHS were more likely to be current cigarette smokers compared to women (p-value <.01, Table XII). Gender differences were also observed among men and women who were exposed to OSHS at the time of the HCHS/SOL baseline interview. Men who reported current OSHS exposure were more likely to be current cigarette smokers than their female counterparts (Table XII, p-value <.01).
### TABLE XII
MODERATING EFFECT ON THE ASSOCIATION OF SHS EXPOSURE AND CURRENT CIGARETTE SMOKING

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Model 2&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Model 3&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Model 4&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Model 5&lt;sup&gt;ab&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (95% CI)</td>
<td>OR(95% CI)</td>
<td>OR(95% CI)</td>
<td>OR(95% CI)</td>
<td>OR(95% CI)</td>
</tr>
<tr>
<td>Past Home SHS Exposure</td>
<td>1.75 (1.46, 2.08)</td>
<td>1.66 (1.5, 2.05)</td>
<td>1.75 (1.47, 2.08)</td>
<td>1.74 (1.46, 1.86)</td>
<td>1.48 (1.18, 1.86)</td>
</tr>
<tr>
<td>Current Home SHS Exposure</td>
<td>3.83 (3.12, 4.69)</td>
<td>3.85 (3.14, 4.72)</td>
<td>3.21 (2.43, 4.24)</td>
<td>3.82 (3.12, 2.89)</td>
<td>2.89 (2.15, 3.90)</td>
</tr>
<tr>
<td>Current Occupational SHS Exposure</td>
<td>1.15 (1.00, 1.33)</td>
<td>1.15 (1.00, 1.33)</td>
<td>1.16 (1.00, 1.34)</td>
<td>1.32 (1.11, 1.58)</td>
<td>1.32 (1.1, 1.58)</td>
</tr>
<tr>
<td>Age</td>
<td>0.99 (0.99, 1.00)</td>
<td>0.99 (0.99, 1.00)</td>
<td>1.00 (0.99, 1.00)</td>
<td>1.00 (0.99, 1.00)</td>
<td>1.00 (0.99, 1.00)</td>
</tr>
<tr>
<td>Female</td>
<td>0.51 (0.44, 0.59)</td>
<td>0.48 (0.39, 0.59)</td>
<td>0.47 (0.40, 0.54)</td>
<td>0.64 (0.52, 0.87)</td>
<td>0.44 (0.32, 0.59)</td>
</tr>
<tr>
<td>Education (years)</td>
<td>0.97 (0.95, 0.99)</td>
<td>0.97 (0.95, 0.99)</td>
<td>0.97 (0.95, 0.99)</td>
<td>0.97 (0.95, 0.97)</td>
<td>0.97 (0.95, 0.99)</td>
</tr>
<tr>
<td>Income</td>
<td>0.90 (0.87, 0.93)</td>
<td>0.90 (0.87, 0.93)</td>
<td>0.90 (0.87, 0.93)</td>
<td>0.90 (0.87, 0.93)</td>
<td>0.90 (0.87, 0.93)</td>
</tr>
<tr>
<td>Cuban Heritage</td>
<td>1.62 (1.31, 2.00)</td>
<td>1.62 (1.31, 2.01)</td>
<td>1.62 (1.31, 2.00)</td>
<td>1.62 (1.31, 2.00)</td>
<td>1.62 (1.31, 2.00)</td>
</tr>
<tr>
<td>Puerto Rican Heritage</td>
<td>1.78 (1.39, 2.28)</td>
<td>1.78 (1.39, 2.28)</td>
<td>1.80 (1.41, 2.30)</td>
<td>1.77 (1.39, 2.28)</td>
<td>1.78 (1.40, 2.28)</td>
</tr>
<tr>
<td>Dominican Heritage</td>
<td>0.65 (0.46, 0.91)</td>
<td>0.65 (0.46, 0.92)</td>
<td>0.65 (0.46, 0.91)</td>
<td>0.66 (0.47, 0.91)</td>
<td>0.65 (0.47, 0.91)</td>
</tr>
<tr>
<td>Centro-American Heritage</td>
<td>0.73 (0.55, 0.95)</td>
<td>0.73 (0.56, 0.96)</td>
<td>0.73 (0.56, 0.95)</td>
<td>0.74 (0.56, 0.73)</td>
<td>0.73 (0.56, 0.96)</td>
</tr>
<tr>
<td>South-American Heritage</td>
<td>0.66 (0.48, 0.91)</td>
<td>0.66 (0.48, 0.91)</td>
<td>0.67 (0.49, 0.92)</td>
<td>0.67 (0.49, 0.67)</td>
<td>0.67 (0.48, 0.91)</td>
</tr>
<tr>
<td>Health Insurance</td>
<td>0.78 (0.62, 0.93)</td>
<td>0.78 (0.65, 0.94)</td>
<td>0.78 (0.65, 0.94)</td>
<td>0.78 (0.65, 0.78)</td>
<td>0.78 (0.65, 0.94)</td>
</tr>
<tr>
<td>Current Asthma Diagnosis</td>
<td>1.07 (0.82, 1.39)</td>
<td>1.07 (0.82, 1.39)</td>
<td>1.07 (0.82, 1.40)</td>
<td>1.07 (0.82, 1.06)</td>
<td>1.06 (0.81, 1.38)</td>
</tr>
<tr>
<td>SASH_all</td>
<td>1.31 (1.16, 1.48)</td>
<td>1.31 (1.16, 1.49)</td>
<td>1.31 (1.16, 1.49)</td>
<td>1.32 (1.17, 1.32)</td>
<td>1.32 (1.17, 1.49)</td>
</tr>
<tr>
<td>Female-Home-SHS5</td>
<td>1.14 (0.87, 1.48)</td>
<td>1.45 (0.99, 2.13)</td>
<td>0.66 (0.51, 0.86)</td>
<td>1.92 (1.21, 3.05)</td>
<td>0.67 (0.52, 0.86)</td>
</tr>
<tr>
<td>Female-Home-SHS6</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Female_OCP_SHS</td>
<td></td>
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</tbody>
</table>

<sup>a</sup>: Models related to Home SHS exposure  
<sup>b</sup>: Models related to Occupational SHS exposure  
<sup>a,b</sup>: Models related to both Home and Occupational exposure
Figure 6A. Type of occupation and current cigarette smoking among men.
4. Discussion

The current study investigated the effect of gender on the association of SHS exposure (in the home and work environments) with CCSMK among ethno-culturally diverse Hispanics/Latinos residing in the United States. This section will discuss salient findings obtained using baseline data from the HCHS/SOL study.

In terms of this study’s first objective dealing with gender comparisons of the prevalence of SHS exposure and CSMK, findings indicated that men and women had similar prevalence of former and SHS exposure in the home environment. However, gender differences were observed for current exposure to OSHS. These results are partially consistent with our first hypothesis based on previous studies documenting that Hispanic/Latino men (particularly those in lower-skilled occupations) experience higher
SHS exposure in the workplace (Americans for Nonsmokers’ Rights, 2006; Shopland, 2004; Max, 2009). Data from the NHIS (1999–2006) showed that the prevalence rates of exposure to SHS in the workplace were significantly higher for men than women over the combined time periods (Max, 2009). Other investigations have demonstrated gender differences in exposure of OSHS, particularly among lower-skilled workers (Americans for Nonsmokers' Rights, 2006; Shopland, 2004; Ellis, 2009). For example, a study that examined trends in workplace smoke-free policies among the major occupational groups using U.S. Census data showed that women were significantly more likely than men to work in a smoke-free environment, regardless of occupational class.

The largest gender difference in prevalence (10%) was observed for blue-collar men and women (Shopland, 2004). In addition, noncompliance with smoke-free regulations was higher among men, particularly blue-collar and service workers (Shopland, 2004). Hence, gender roles were implicated in disparities around CSMK and SHS exposure. Differences in implementation of tobacco-free laws (e.g., hospitality industry and laborers) are likely to lead to disproportionate exposure to OSHS and negative social influences in the workplace.

In this study, the overall prevalence of CCSMK among HCHS/SOL participants (20%) was similar to the U.S. national prevalence (19.3%), and higher than that reported for Hispanics/Latinos residing in this country (16%) (CDC, 2010). The observed discrepancies in prevalence of CSMK may be due to differences in Hispanic/Latino ethno-cultural characteristics of study participants. The majority of investigations on prevalence of SHS exposure and CSMK among Hispanics/Latinos residing in the United States have mainly involved MAs, and have not included a representative sample of Hispanic/Latino individuals from diverse ethno-cultural and geographical backgrounds (Kaufman, 2010; U.S. Surgeon General, 2006). It is well documented that individuals of Mexican descent (particularly recent immigrants and women) are less likely to smoke cigarettes. Therefore the reported level of CSMK for Hispanics/Latinos residing in the United States is likely an underestimate of the true prevalence for this ethnic group (Palinkas, 1993).
In addition, as hypothesized, significant differences in the prevalence of CCSMK were observed between men and women; a higher proportion of men were current cigarette smokers. The gender differences were observed between men and women who were formerly exposed to HSHS, and those who were currently exposed to OSHS. Moreover, the gender gap was observed for men and women across Hispanic/Latino ethno-cultural groups.

These findings are consistent with extensive literature documenting gender differences in the prevalence of CSMK in the United States and Latin America (ALA, 2010; Pérez-Stable, 2001; Palinkas, 1993; Haynes, 1990; Markides, 1987; WHO, 2011; Champagne, 2010). The evidence shows that prevalence of CSMK has been consistently higher among men than women of diverse Hispanic/Latino backgrounds (Pérez-Stable, 2001; WHO, 2011; Champagne, 2010). Numerous investigations have evaluated the influence of sociocultural factors on the onset and maintenance of CSMK in Hispanic/Latino individuals (Foraker, 2005; González, 2009; Wen, 2009; Mermelstein, 1999; Unger, 2009). These data document gender-related differences in attitudes, norms, and beliefs around CSMK, which may partially explain gender gaps in CSMK and exposure to SHS (Foraker, 2005; González, 2009; Mermelstein, 1999; Unger, 2009).

In general, CSMK is associated with gender roles and considered a less acceptable behavior for Hispanic/Latino women than men (particularly among new immigrants). A qualitative, multicenter study by Mermelstein and colleagues examined ethnic and gender differences in sociocultural factors associated with youth CSMK (Mermelstein, 1999). They reported strong differences between NHW and Hispanic/Latino participants about the appropriateness of CSMK among girls. More specifically, CSMK was uniformly viewed as “not right for a girl” and “not ladylike.” In addition, Hispanic/Latino participants cited notions of respect and reputation as reasons not to smoke; if they smoked, they feared being disrespectful to their parents, losing respect of others, and harsher consequences of CSMK (Mermelstein, 1999).
In relation to this study’s second objective, findings from descriptive and multivariate logistic regression demonstrated that, as hypothesized, all types of SHS exposures (i.e., former and current HSHS, and current OSHS) were positively associated with CCSMK. Compared to participants who were never exposed to SHS, those who were exposed had 1.8 times the odds of being current cigarette smokers, after controlling for relevant sociodemographic variables. Furthermore, and also in agreement with our hypothesis, gender moderated the association of home and OSHS exposure with CCSMK. The observed association of HSHS and OSHS exposure (as proxies for social influences) with CCSMK supports the theoretical framework guiding this analysis (Figure 3). Consistent with limited existing literature and this study’s theoretical model, the association between SHS exposure and CCSMK varied by gender.

Although extensive literature exists on familial and peer influences on CSMK among mostly NHWs (Avenevoli, 2003; Peterson, 2006; Hill, 2005), very limited data exist on Hispanic/Latino populations (Wilkinson, 2008). Furthermore, few studies have examined the role of gender as a moderator in the association between family and peer smoking behavior on CSMK (Swan, 1990; Byrne, 1993; Kandel, 2004). With a few exceptions (Peterson, 2006; Bricker, 2006), the evidence implicates gender as a moderating variable (Swan, 1990; Byrne, 1993; Kandel, 2004). However, findings on how gender moderates the effects of social influences on smoking behavior have been conflictive. While a number of studies show that females are more susceptible to family and peer pressures, others show that males are more likely to be influenced.

Although not the main focus of this analysis, acculturation is important to consider in studies evaluating risk behaviors among new immigrants, including Hispanics/Latinos (Gallo, 2003). Studies focusing on Hispanic/Latino populations have shown that when immigrants come in contact with the new U.S. society, they face many challenges such as adjusting to a foreign language, customs, social interactions (often their family and social networks are fragmented), and lifestyle (Berry, 1997; Caplan, 2007). These adaptation challenges and acculturative stressors have been shown to lead to changes in health-related behaviors such as CSMK (Bethel, 2005).
Over the last two decades, various studies have investigated the effect of acculturation to the U.S. culture on CSMK behavior and SHS exposure among Hispanics/Latinos (Bethel, 2005; Marin, 1989; Markides, 1987; Wilkinson, 2005). Overall, the findings suggest that acculturation is positively associated with CSMK among Hispanic/Latino women but not men (Bethel, 2005).

Acculturation has also been associated with increased HSHS exposure (Gonzales, 2006). For example, a study showed that 95% of Mexican-born mothers banned CSMK in their homes, compared to 78% of U.S.-born mothers (Gonzales, 2006). These findings support the current study’s theoretical model in that sociocultural influences in the new culture may influence CSMK behavior and SHS exposure among Hispanics/Latinos. The acculturation model posits that CSMK patterns would reflect the degree to which Hispanics/Latinos have adopted CSMK practices and norms of the U.S. society (Bethel, 2005).

The specific reason why Hispanic/Latino women (largely of Mexican or Central American origins) are more susceptible than men is unknown. Possible explanations for the gender discrepancy may lie in cultural characteristics, as well as low CSMK rates of new immigrant women (e.g., 10% among those of Mexican origin) and high CSMK rates of men in their countries of origin (e.g., 51% in Mexico). The evidence to date (mostly focusing on MAs) suggests that with increasing levels of acculturation, CSMK rates for women and men will eventually resemble those of NHWs (23%).

These findings are in agreement with recent national statistics showing a worrisome trend among young Latinas who have similar CSMK trends to those of NHWs. The latter are likely to have numerous adverse effects in terms of their health and future generations. Furthermore, based on existing evidence and findings from this study, they are also more likely to negatively influence the CSMK behavior of their children, grandchildren and peers.

a. Study’s limitations and strengths

This study is not without limitations. First, it used a cross-sectional study design that limits the capacity to establish causality. Second, it relied on self-reported data of SHS exposure and CSMK. Since former SHS exposure included exposure during childhood, recall bias cannot be excluded.
However, the use of self-reported data has been validated by previous studies. Third, this study did not collect data on other family influences (e.g., norms, attitudes, and beliefs) related to tobacco use. Therefore the possible influence of these sociocultural characteristics on the CSMK behavior of HCHS/SOL participants cannot be determined.

Fourth, no information was available on the type or implementation of tobacco-control policies at the worksites. Therefore, it is unknown whether they varied by type of occupation and gender. Fifth, all four HCHS/SOL field centers were located in urban centers and so these findings cannot be generalized to other Hispanic/Latino populations (e.g., those in rural communities) living in the United States.

The current study also demonstrates various strengths. It included a large number of men and women from diverse Hispanic/Latino ethno-cultural, socioeconomic and geographical backgrounds. This enabled us to capture a more complete picture of gender differences related to SHS smoke exposure and CSMK. Another strength lies in the fact that SHS exposure data were collected for two proximal sociocultural environments (home and work), which have been shown to influence the onset and maintenance of CSMK.

b. Public health importance and relevance of findings

Despite the fact that various national surveys and studies have documented gender differences in the prevalence of SHS exposure and CSMK (U.S. Surgeon General, 2006), very few investigations have focused on the role of gender in the association of social influences on the onset and maintenance of CSMK among Hispanics/Latinos. To the best of the author’s knowledge, this is the first investigation to document the moderating effect of gender on the association of SHS exposure (as a proxy for social influences in the home and work environments) with CCSMK among U.S. Hispanics/Latinos from ethnocultural and sociodemographic backgrounds.

Our findings address gaps in the tobacco-use literature. They highlight the importance of evaluating family members’ and colleagues’ influences in CSMK for Hispanic/Latino men and women
separately. These data further document gender differences in SHS exposure and CSMK, and support the 
theoretical framework guiding this analysis. They showed that socio-environmental premises represent 
important factors in CSMK behavior among diverse Hispanic/Latino men and women of diverse ethno-
cultural backgrounds.

Further research is necessary to better understand how gender moderates CSMK influences in the 
home and work settings. It is possible that multiple mechanisms exist through which gender may 
moderate CSMK among Hispanics/Latinos. Based on existent evidence, sociocultural characteristics (e.g., 
gender roles, familismo, respeto, and sympatía), the relative influence of family versus peers, and level of 
acculturation to U.S. culture are all likely to contribute to differences between men and women (Foraker, 
2005; González, 2009; Wen, 2009; Mermelstein, 1999; Unger, 2009).

Qualitative studies are needed to further examine Hispanic/Latino youth’s and adults’ perceptions 
and experiences of their social contexts (at home and work), as well as their broader environment around 
SHS exposure and CSMK. Identifying possible gender differences would be instrumental in designing 
culturally and gender-tailored tobacco-control interventions for the home and work settings of 
Hispanics/Latinos residing in the United States.

In conclusion, it is important to consider gender when evaluating social influences of CSMK 
among ethno-culturally diverse Hispanics/Latinos. Our findings suggest that gender issues related to 
tobacco use need to be elucidated and addressed in this often underserved, and rapidly growing U.S. 
minority population.
V. GENERAL DISCUSSION

Reducing morbidity and mortality related to CSMK and exposure to SHS represents one of the most important public health challenges the United States faces currently (U.S. Surgeon General, 2006; IOM, 2010). Nearly $200 billion in health-care expenditures and over 400,000 premature deaths (approximately 50,000 in nonsmokers as a result to SHS exposure) are attributed to CSMK in this country (U.S. Surgeon General, 2006; Giovino, 2007; Adhikari, 2008).

Numerous efforts to reduce CSMK and environmental SHS exposure have failed to fully contain the tobacco-use epidemic in the United States and Latin American countries (WHO, 2010). The current national prevalence of SHS exposure (40%) and CSMK (20%) remain high, making tobacco use the most prevalent cause of death and disease in this country (U.S. Surgeon General, 2006; Kaufmann, 2010).

In 2010, the United States, the Department of Health and Human Services targeted tobacco use as part of the Healthy People 2020’s objectives, with the specific goal of reducing illness, disability, and death due to CSMK and SHS exposure (U.S. DHHS, 2010). The etiology of CSMK behavior acquisition and maintenance is very complex and has been the focus of numerous investigations aiming to identify risk factors and underlying mechanisms driving the CSMK epidemic in the United States. Findings from these studies demonstrated that sociocognitive influences from family and peers represent major risk factors for the onset and maintenance of CSMK among ethno-culturally diverse populations residing in this country.

Despite this large body of evidence on the sociocultural influences of CSMK, very limited data are available for U.S. Hispanics/Latinos of diverse ethnocultural and sociodemographic backgrounds. Most research studies have mainly focused on MAAs, and have not included a representative sample of Hispanics/Latinos from a variety of ethnic, geographic and cultural backgrounds. Furthermore, they have typically classified Hispanics/Latinos as a single ethnic category. Hence, previous research has failed to capture important ethno-cultural diversity within this population.
The purpose of this investigation was to address some of these gaps in the literature, and examine the role of socio-environmental CSMK influences among a large and diverse sample of Hispanics/Latinos residing in four U.S. urban centers. The study’s objectives were accomplished in three stages: (1) by documenting significant differences in the prevalence of SHS exposure, and CSMK among sociodemographically and ethno-culturally diverse Hispanics/Latinos; (2) by examining the association of SHS exposure in the home and workplace (as a proxy for social influences) with CCSMK, and demonstrating that social influences in these two major environments increase the likelihood of CCSMK among Hispanics/Latinos; and (3) by evaluating the role of gender as a moderator in the association of home and OSHS exposure with CCSMK.

In terms of the prevalence of SHS exposure and CSMK, results from this investigation made a significant contribution to the existing literature. First, in terms of SHS exposure, our findings are first to document past and current SHS exposure in the home and work environments of ethno-culturally diverse U.S. Hispanics/Latinos. They document a wide variation in SHS exposure according to sociodemographic factors, including gender (men higher than women), age (younger more likely to be exposed), income (low-income was associated with higher SHS exposure), and ethno-cultural groups (PRs and Cubans had the higher SHS exposure levels).

Second, in terms of CSMK, our findings showed that the prevalence values for certain Hispanic/Latinos (e.g., Cubans and PRs) were significantly higher than those previously reported for Hispanics/Latinos (mostly MAs) residing in the United States. In addition, the CSMK prevalence significantly varied by sociodemographic factors including gender, age, income, and ethno-cultural groups. As hypothesized, CSMK was higher for men, younger age, and lower-income HCHS/SOL participants. These overall trends are in agreement with national and international reports (Kaufman, 2010; 11 U.S. Surgeon General, 2006; WHO, 2011).

It is notable that findings from this landmark and comprehensive study of Hispanics/Latinos are congruent with results from smaller scale studies (CDC, 2011h; Markides, 1987; Marin, 1989). Moreover,
these findings are consistent with limited evidence documenting significant heterogeneity in SHS exposure and CSMK prevalence across Hispanics/Latinos of different country of origin and ethno-cultural backgrounds (Pletsch, 1994; Winkleby, 1995; Pérez-Stable, 2001; Kaplan, 2014). Similar to previous studies, Cubans and PRs reported significantly higher prevalence of all types of SHS exposure and CSMK compared to other Hispanic/Latino ethno-cultural groups.

These data highlight the importance of disaggregating Hispanic/Latino ethnic background groups, which revealed important differences in the magnitude of the problem of SHS exposure, social influences related to CSMK, and CSMK behavior among Hispanics/Latinos living in this country. These findings also suggest that previous prevalence estimates of SHS exposure and CSMK for U.S. Hispanics/Latinos (largely based on data from MAs) are likely to be underestimates of the true national prevalence among ethno-culturally diverse Hispanics/Latinos. Our findings also demonstrated that exposure of former (e.g., during childhood) and current SHS exposure and social influences in the home and work environments are positively associated with CCSMK behavior. They support the SBET models used to inform the current study’s theoretical framework (See Figure 3). More specifically and in relation to former SHS exposure (as a proxy for social influences) in the home environment, etiological theories of CSMK initiation include social learning theory which emphasizes the importance of the learning process early in life concomitant with social interactions with family members. Our data are also congruent with previous cross-sectional and longitudinal studies evaluating the association of parental/sibling CSMK with youth smoking (Kandell 2004; Wilkinson, 2008; Hill, 2005; Peterson, 2006; Shih, 2010). They suggest that HCHS/SOL participants who were exposed to CSMK in the home environment from an early age were influenced by the household environment, and presumably are more likely to have engaged in CSMK.

In terms of current SHS exposure and social influences in the work environment, our findings support the SBET models used to inform this study’s theoretical framework. More precisely, socio-environmental factors, such as peer smoking behavior, have been shown to contribute to the onset and maintenance of CSMK behavior. The workplace represents a major source of sociocultural influence for
adults (Howard, 2004; Shopland, 2004; Hopkins, 2010). Consequently, individuals who work in a setting that has permissive CSMK policies and culture, and are surrounded by smoking colleagues may be more likely to smoke cigarettes, compared to those who work in a workplace protected by smoke-free policies.

The current study’s third stage documented significant gender differences in current OSHS exposure. These findings are congruent with data from the NHIS (1999–006), which indicated that compared to women, men had significantly higher prevalence rates of current OSHS exposure over the combined time periods (Max, 2009). In addition, the overall prevalence of CSMK was higher for men than women of various Hispanic/Latino ethno-cultural backgrounds. These data are consistent with extensive literature documenting gender differences in the prevalence of CSMK in the United States and Latin America (CDC, 2010; American Lung Association, 2010; Pérez-Stable, 2001; Palinkas, 1993; Champagne, 2010; WHO, 2011). Moreover, our data demonstrated that gender acted as a moderator in the association of SHS exposure (in the home and work environments) with CCSMK.

Finally, a number of disparities and inequities related to SHS exposure and CSMK were documented through all stages of this project. The first set of disparities and inequities related to SES level; HCHS/SOL participants with household incomes below $50,000 reported higher exposure to home and OSHS than those with higher income. The second set of inequities was linked to type of occupation, with lower-skilled workers reporting significantly higher exposure to SHS in the workplace compared to those in medium-skilled or other occupations. Lastly, and as previously discussed, men were over-burdened by higher prevalence of OSHS exposure, and CSMK influences and behavior.

These findings corroborate with existing scientific evidence, and emphasize the need to develop tobacco prevention and control interventions that take into consideration sociodemographic and gender factors in order to address these disparities and inequities. The following section will include a discussion of public health implications and recommendations for initiatives that are warranted to reduce morbidity and mortality resulting from CSMK among these disproportionally affected Hispanic/Latino populations.
A. **Study’s Limitations and Strengths**

This study is not without limitations. First, its cross-sectional study design limits the ability to determine causality in the association of either HSHS and/or OSHS exposure (as proxies for work- and home-related social influences), and CSMK. For instance, patterns of CSMK and how social influences around CSMK (in the home or work settings) may have undermined CSMK cessation attempts could not be determined. For example, someone who had quit CSMK may have relapsed by working at a workplace not protected by smoke-free policies.

Second, despite its community-based sampling design in four U.S. urban centers with differing Hispanic/Latino ethno-cultural distributions, these data cannot be generalized to the larger Hispanic/Latino community residing in this country. For example, our findings cannot be generalized to other increasingly common Hispanic/Latino populations living in U.S. rural areas in various states. In addition, and also related to geographic location of the HCHS/SOL field centers, the latter were located in cities and states protected by tobacco-control policies in public areas/workplaces, including the hospitality industry. The observed lower prevalence of current OSHS (compared to U.S. national values) among HCHS/SOL participants may be partially due to fact that the latter resided in cities protected by smoke-free policies. In addition, we do not have information on workplace tobacco-control regulations, and to the extent to which they were implemented.

In addition, this study relies on self-reported data, which may lead to underreporting of CSMK and SHS exposure among HCHS/SOL participants. This limitation is common to the majority of studies evaluating CSMK behavior and SHS exposure among diverse ethnic/racial groups in the United States and Latin America (U.S. Surgeon General, 2006; WHO, 2011, Carmela, 2009). Previous studies examined the validity and reliability of self-reported data related to tobacco use. Overall, the evidence showed that self-reported data of CSMK and SHS exposure were valid and reliable measures of CSMK consumption and SHS exposure.
Another limitation was that the survey questions on SHS exposure inquired about past exposure (e.g., during early childhood). Since HCHS/SOL participants are all adults, the data may be subject to recall-bias. Last, smaller sample sizes and lower SHS exposure prevalence for certain Hispanic/Latino ethno-cultural groups such as South Americans and Dominicans limited the study’s capacity to draw firm conclusions on the variation of the association of HSHS and OSHS exposure with CCSMK across Hispanic/Latino ethno-cultural groups.

In addition, this study omitted asking about HCHS/SOL participants’ sexual orientation. Like of most epidemiological research studies, gender was dichotomized into “male” and “female,” limiting our capacity to discern differences in SHS exposure and CSMK among Hispanic/Latino LGBT subgroups.

Despite the aforementioned limitations, this study also demonstrates a number of methodological strengths. The investigation’s major strength is the inclusion of a large sample of Hispanics/Latinos of diverse ethno-cultural and sociodemographic backgrounds. These characteristics allowed the assessment of variations in HSHS and OSHS exposure and CSMK among the largest minority group in the United States. Previous research studies and national surveys have typically included mostly MAs, and/or have classified Hispanics/Latinos as a single group. These methodological shortcomings have limited the capacity to document variation in SHS exposure and CSMK across Hispanic/Latino diverse ethno-cultural groups within this population. Second, participants resided in four distinct U.S. urban centers, which allowed us to examine any possible differences by geographical location, and obtain a more complete national picture of SHS exposure and its association with CSMK.

B. Public Health Implications and Directions for Future Research

The current project examined differing but interrelated research questions on tobacco use among diverse Hispanics/Latinos residing in the United States. First, findings from this landmark and comprehensive study of U.S. Hispanics/Latinos significantly contributed to the CSMK literature by demonstrating high levels of heterogeneity in the prevalence of SHS exposure and CSMK across sociodemographic (i.e., gender, income, and type of occupation), as well as ethno-cultural groups. These
data also highlight the importance of including Hispanic/Latino men and women from multiple SES and ethno-cultural backgrounds in future research investigations. Moreover, it demonstrates the need to disaggregate Hispanic/Latino ethnic backgrounds into separate categories based on country of origin and cultural heritage.

One of this study’s main contributions to the tobacco-use literature relates to the examination of past and current SHS exposure among U.S. Hispanics/Latinos. Prior to this investigation, data on SHS exposure in the home and work environments of ethno-culturally diverse Hispanics/Latinos residing in this country were nonexistent. Given the detrimental health effects of SHS exposure and its positive association with CSMK (consistently demonstrated in chapter IV, our findings emphasize the importance to further investigate SHS exposure among other Hispanic/Latino populations not represented in this study (e.g., rural communities) to determine if their levels of SHS exposure also vary by age, gender, socioeconomic status, and ethno-cultural heritage.

Future research needs to examine Hispanic/Latino ethnic-specific sociocultural factors known to contribute to lifetime exposure to SHS (in the home and work environments), as well as the onset and maintenance of CSMK behavior. Previous investigations have indicated that differences in norms, beliefs, and attitudes around CSMK exist across Hispanic/Latino ethno-cultural groups, and that they influence CSMK behavior (Perez-Stable 1998; Foraker, 2005; Castro 2009). The overall evidence shows that group-oriented and “deep structure” cultural characteristics (Resnicow, 1999) common among Hispanics/Latinos (e.g., familismo, respeto, and simpatía) act as protective factors against initiating and maintaining CSMK among Hispanics/Latinos (Marin, 1990; Perez-Stable, 1998; Kaplan, 2001). More specifically, Hispanics/Latinos may be concerned with exposing other family members to culturally unacceptable behavior (e.g., inadequate role modeling, and lack of respect for elders), as well as exposing them to the toxic effects of SHS.

However, there is also evidence suggesting that some of these cultural traits can also act as barriers in controlling CSMK and exposure to SHS. For example, a qualitative study evaluating norms,
attitudes, and beliefs around CSMK and exposure to SHS in multiunit housing buildings revealed that some of the residents were concerned about reporting or confronting other older neighbors about the lack of compliance with smoke-free policies. Participants listed respeto towards senior individuals who were addicted to CSMK, and simpatía toward those who could not control their long-term CSMK habits. These collectivistic characteristics (usually seen as protective risk factors against CSMK and SHS exposure among Hispanics/Latinos residing in the United States) prevented them from confronting a minority of building residents. Hence, individual safety and well-being for parents and their children were given up for collectivistic reasons.

Previous studies have been limited by methodological characteristics, such as lack of sociodemographic and ethno-cultural diversity, as well as small sample sizes. The HCHS/SOL was scientifically designed to address these widely present study limitations. This multistage, random-sample, and community-based landmark study of Hispanics/Latinos residing in the United States provides innovation in terms of public health science at many levels. As emphasized throughout this document, its greatest forte is the inclusion of large numbers of sociodemographic and ethno-culturally diverse Hispanics/Latinos from North-, Central-, and South America, as well as the Caribbean. These methodological strengths allowed us to examine SHS exposure (at home and workplace) and its association with CSMK behavior in multiple ways, shedding light into limited existing data on the tobacco use among United States Hispanics/Latinos. In addition, they allowed us to demonstrate a highly significant moderating effect of gender on the association of SHS exposure and CSMK.

Additional research is warranted to further explore how cultural acceptability of CSMK and SHS exposure vary across Hispanics/Latinos of diverse gender, socio-economic and ethno-cultural characteristics. For instance, mixed-methods studies that further examine the role played by sociocultural characteristics and factors involved in the mechanisms behind CSMK behavior among ethno-culturally diverse Hispanics/Latinos may inform public health interventions to prevent and/or treat CSMK behavior.
C. **Concluding Remarks**

Results from this investigation are congruent with extensive literature documenting social influences of CSMK among diverse racial/ethnic groups. Our data suggest that Hispanics/Latinos are also susceptible to home- and work-related SHS exposure, social influences, and role modeling. The documented gender differences are striking and highlight the importance of further evaluating CSMK-related disparities and inequities found among low SES and new Hispanic/Latino immigrants, particularly men employed in low-skill occupations. Future studies should focus on further characterizing the CSMK and SHS exposure trends and patterns among this rapidly growing population of first- and second-generations of Hispanics/Latinos residing in the United States.
CITED LITERATURE


APPENDICES
APPENDIX A

HCHS/SOL Questionnaires and Specific Items used in this Study.

HCHS/SOL Personal Information Questionnaire

ID NUMBER: □□□□ FORM CODE: PIE VERSION: A 11/21/08

A. Demographics
1. Gender: Male [ ] Female [ ]

2. Date of Birth: [ ]/ [ ]/ [ ] 19 [ ]

3. In what country or territory were you born? (Select location code from list) [ ]

5. Which of the following best describes your Hispanic/Latino heritage? (Mark only one)
   - Dominican or Dominican descent [ ]
   - Central American or Central American descent [ ]
   - Cuban or Cuban descent [ ]
   - Mexican or Mexican descent [ ]
   - Puerto Rican or Puerto Rican descent [ ]
   - South American or South American descent [ ]
   - More than one heritage [ ]
   - Other [ ]
   
   If other, please specify: ____________________________

6. In addition to being of Hispanic/Latino heritage, which of the following categories would you use to describe yourself? (Mark only one)
   - American Indian or Alaskan Native [ ]
   - Asian [ ]
   - Native Hawaiian or Other Pacific Islander [ ]
   - Black or African-American [ ]
   - White [ ]
   - More than one race [ ]
   - Unknown or Not reported [ ]

B. Residential History
7. From the time that you FIRST moved to the U.S. to today, about how many years have you lived in the mainland U.S. (50 states + DC)? (Round to the nearest full year)

   [ ] [ ] Number of years

C. Parents/Grandparents
11. Where was your mother born? (Select location code from list)

   [ ] [ ]
APPENDIX A (continued)

12. Where was your maternal grandmother born? (Select location code from list)

13. Where was your maternal grandfather born? (Select location code from list)

14. Where was your father born? (Select location code from list)

15. Where was your paternal grandmother born? (Select location code from list)

16. Where was your paternal grandfather born? (Select location code from list)

D. Education

17. How many years of schooling in total have you completed?

☐ ☐ Years

19. What was the highest grade/level of education achieved? If exact level is not listed, mark the closest equivalent. (Mark only one)

- Elementary/primary school (includes grades 1 – 5)
- Middle school/junior high (includes grades 6 – 8)
- High School/preparatory school
- Trade school/vocational school
- University/college
- Other

If other, please specify: ________________________________

Location Codes for Question 4, 11, 12, 13, 14, 15, 16:

17 Costa Rica 51 Panama
18 Cuba 52 Paraguay
19 Czech Republic 53 Peru
20 Denmark 54 Philippines
21 Dominican Republic 55 Poland
22 Ecuador 56 Portugal
23 El Salvador 57 Puerto Rico
24 Finland 58 Russia
25 France 59 South Africa
26 Germany 60 Spain
27 Great Britain 61 Sweden
28 Greece 62 Switzerland
29 Guam 63 United States
30 Guatemala 64 Uruguay
31 Haiti 65 Venezuela
32 Holland 66 Virgin Islands
33 Honduras 67 Other
34 Hungary 99 Unknown/refused

Back to
APPENDIX A (continued)

HCHS/SOL Economic Questionnaire

B. Annual Household Income
2. Counting the income of all the members of your household, was your household income for the year...
   (Include all money received from all sources)

   Less than $30,000  1 □  → GO TO QUESTION 3
   $30,000 or more  2 □  → GO TO QUESTION 4

3. Is that income...
   Less than $10,000  1 □
   $10,001-$15,000  2 □
   $15,001-$20,000  3 □
   $20,001-$25,000  4 □
   $25,001-$29,999  5 □

4. Is that income...
   $30,000-$40,000  1 □
   $40,001-$50,000  2 □
   $50,001-$75,000  3 □
   $75,001-$100,000  4 □
   More than $100,000  5 □

HCHS/SOL Tobacco Use Questionnaire

The following questions are about tobacco and tobacco use.

A. Cigarette Smoking
1. Have you ever smoked at least 100 cigarettes in your entire life?
   No  0 □  → GO TO QUESTION 10
   Yes  1 □

3. Do you NOW smoke daily, some days or not at all?
   Daily  1 □  → GO TO QUESTION 4
   Some days  2 □  → GO TO QUESTION 5
   Not at all  3 □  → GO TO QUESTION 6

B. Smoke Daily
4. How many cigarettes do you smoke per day now?
   □□ Cigarettes per day (1 = 1 or fewer per day)
H. Second-hand Smoke Exposure
12. Before age 13, did you live with a regular cigarette smoker who smoked in your home?
   - No 0 □  → GO TO QUESTION 14
   - Yes 1 □
   - Don’t know 9 □  → GO TO QUESTION 14

13. Did your mother (or the primary female caregiver who lived in your home) smoke in your home?
   - No 0 □
   - Yes 1 □
   - Don’t know 9 □

14. Not counting yourself, how many people currently living in your household smoke regularly in the home?
   - None 0 □
   - 1 person 1 □  → GO TO QUESTION 16
   - 2 people 2 □  → GO TO QUESTION 16
   - 3 people 3 □  → GO TO QUESTION 16
   - 4 or more people 4 □  → GO TO QUESTION 16

15. Since age 13 have you ever lived with a regular cigarette smoker (not including yourself) who smoked in your home?
   - No 0 □
   - Yes 1 □

---

HCHS/SOL Occupation Classification and Exposures Questionnaire

A. Current Employment Status
5. Please indicate your current employment status. *(Mark only one)*
   - Employed full time (>35 hours/week in one job or more than one job 1 □
   - Employed part time (≤35 hours/week) 2 □
   - Not currently employed 3 □  → GO TO QUESTION 28

B. Current Occupation(s)
16. In what job do you currently work the majority of your work hours per week?

   __________ Occupation

   □□ Occupation Code *(Select occupation code from list A)*

C. Occupational Exposures – Current Job(s)

27. In your current job(s), are you exposed to any of the following?
   I. tobacco smoke 0 □  1 □
APPENDIX A (continued)

List A: Occupational Codes for Question 16.

01 Senior professional/technical worker (doctor, professor, lawyer, architect, engineer)
02 Junior professional/Technical worker (midwife, nurse, teacher, editor, photographer)
03 Administrator/executive/manager (working proprietor, government official, section chief, department or bureau director, administrative cadre, village leader)
04 Office staff (secretary, office helper)
05 Farmer, fisherman, hunter
06 Skilled worker (foreman, group leader, craftsman)
07 Non-skilled worker (ordinary laborer, construction, yard, migrant laborer)
08 Army officer, police officer
09 Ordinary soldier, policeman
10 Driver
11 Service worker (housekeeper, cook, waiter, doorkeeper, hairdresser, counter salesperson, launderer, child care worker)
12 Athlete, actor, musician
13 Other
99 Don’t know/refused
APPENDIX A (continued)

HCHS/SOL Health Care Use

10. The next questions are about health insurance.
   a. Do you have health insurance or other health care coverage?  
      No 0 □  [F NO GO TO Q 11]  
      Yes 1 □

HCHS/SOL Respiratory Questionnaire

B. Respiratory Conditions

32. Have you ever had asthma?  
   No 0 □  → **GO TO QUESTION 38**  
   Yes 1 □  
   Don't know 9 □  → **GO TO QUESTION 38**

34. Was it diagnosed by a doctor or other health professional?  
   No 0 □  
   Yes 1 □  
   Don't know 9 □

35. Do you still have it?  
   No 0 □  → **GO TO QUESTION 37**  
   Yes 1 □  
   Don't know 9 □
A. Acculturation

Although you may speak many languages, the following questions refer to only English and Spanish.

1. In general, what language(s) do you read and speak?
   - Only Spanish
   - Spanish better than English
   - Both equally
   - English better than Spanish
   - Only English

2. What was the language(s) you used as a child?
   - Only Spanish
   - More Spanish than English
   - Both equally
   - More English than Spanish
   - Only English

3. What language(s) do you usually speak at home?
   - Only Spanish
   - More Spanish than English
   - Both equally
   - More English than Spanish
   - Only English

4. In which language(s) do you usually think?
   - Only Spanish
   - More Spanish than English
   - Both equally
   - More English than Spanish
   - Only English

5. In general, what language(s) are the movies, T.V. and radio programs you prefer to watch and listen to?
   - Only Spanish
   - More Spanish than English
   - Both equally
   - More English than Spanish
   - Only English

6. Your close friends are...
   - All Hispanic/Latino
   - More Hispanic/Latino than non-Hispanic/non-Latino
   - About half and half
   - More non-Hispanic/non-Latino than Hispanic/Latino
   - All non-Hispanic/non-Latino

7. You prefer going to social gatherings/parties at which people are...
   - All Hispanic/Latino
   - More Hispanic/Latino than non-Hispanic/non-Latino
   - About half and half
   - More non-Hispanic/non-Latino than Hispanic/Latino
   - All non-Hispanic/non-Latino

8. The persons you visit or who visit you are...
   - All Hispanic/Latino
   - More Hispanic/Latino than non-Hispanic/non-Latino
   - About half and half
   - More non-Hispanic/non-Latino than Hispanic/Latino
   - All non-Hispanic/non-Latino

9. If you could choose your children’s friends you would want them to be...
   - All Hispanic/Latino
   - More Hispanic/Latino than non-Hispanic/non-Latino
   - About half and half
   - More non-Hispanic/non-Latino than Hispanic/Latino
   - All non-Hispanic/non-Latino
APPENDIX B

IRB Research Protocol # 2012-0707

UNIVERSITY OF ILLINOIS
AT CHICAGO

Office for the Protection of Research Subjects (OPRS)
Office of the Vice Chancellor for Research (MC 672)
203 Administrative Office Building
1737 West Polk Street
Chicago, Illinois 60612-7227

Determination Notice

Research Activity Does Not Involve “Human Subjects”

September 28, 2012

Elena Navas-Nacher
Community Health Sciences
808 N. Judson Ave. #4A
Evanston, IL 60202
Phone: (312) 503-7250

RE: Research Protocol # 2012-0707

“Association between Exposure to Second Hand Smoke and Cigarette Smoking in a Ethno Culturally Diverse National Sample of Latinos”

Sponsor: National Institutes of Health

I. PAF#: Not available
II. Grant/Contract No: N01-HC-65236

Grant/Contract Title: Hispanic Community Health Study / Study of Latinos (PI og Grant: Dr. Martha L. Daviglus)

III. Dear Ms. Navas-Nacher:

IV. The above proposal was reviewed on September 28, 2012 by OPRS staff/members of IRB #2. From the information you have provided, the proposal does not appear to involve “human subjects” as defined in 45 CFR 46. 102(f).

The specific definition of human subject under 45 CFR 46.102(f) is:

Human subject means a living individual about whom an investigator (whether professional or student) conducting research obtains

(1) data through intervention or interaction with the individual, or

(2) identifiable private information.

Intervention includes both physical procedures by which data are gathered (for example, venipuncture) and manipulations of the subject or the subject’s environment that are performed for research purposes. Interaction includes communication or interpersonal contact between investigator and subject. Private information includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place, and information which has been provided for specific purposes by an individual and which the individual can reasonably expect will not be made public (for example, a medical record). Private information must be individually identifiable (i.e., the identity of the subject is or may readily be ascertained by the investigator or associated with the information) in order for obtaining the information to constitute research involving human subjects.

All the documents associated with this proposal will be kept on file in the OPRS and a copy of this letter is being provided to your Department Head for the department's research files.

If you have any questions or need further help, please contact the OPRS office at (312) 996-1711 or me at (312) 355-2908. Please send any correspondence about this protocol to OPRS at 203 AOB, M/C 672.

Sincerely,

Charles W. Hoehne, B.S., C.I.P.
Assistant Director, IRB # 2
Office for the Protection of Research Subjects

cc: Bernard Turnock, Community Health Sciences, M/C 923
Michele Kelley, Community Health Sciences, M/C 923
OVCR Administration, M/C 672
APPENDIX C

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VITA

Name: Elena Navas-Nacher, MS

EDUCATION

1985 IB Biological Sciences and Language International College Spain; Madrid, ES.
1989 BA Biochemistry, Cell and Molecular Biology Northwestern University; Evanston, IL.
2002 MS Epidemiology and Biostatistics University of Illinois at Chicago; Chicago, IL.
2013, PhD Community Health Sciences, Health Behavior/Promotion University of Illinois at Chicago; Chicago, IL.

TRAINING

October 2010 to present NIH- Diversity Supplement Fellowship Hispanic Community Health Study/Study of Latinos (HCHS/SOL); Northwestern University Feinberg School of Medicine Epidemiology and Community Health Sciences

ACADEMIC APPOINTMENTS

October 2010 to present Pre-doctoral Fellow, Visiting Scholar Hispanic Community Health Study/Study of Latinos (HCHS/SOL); Co-Investigator of HCHS/SOL NIH-Diversity Supplement; Northwestern University Feinberg School of Medicine
• Currently working on my dissertation project (graduating by Spring Semester, 2013)
• Collaborated with out of town Diversity Supplement Fellows in Miami and San Diego in Diversity Supplement Grant development and writing
• Designed and developed all participant recruitment materials which were subsequently submitted as part of the IRB application to NU’s Office for the Protection of Research Subjects
• Processed all Internal Review Board (IRB) application and continuation materials
• Recruited all study participants at Chicago’s field center
• Carried out extensive field work in various Chicago Hispanic/Latino communities. Conducted face to face interviews (in English or Spanish) with diverse Hispanic/Latino SOL study participants
• Worked closely with staff at the HCHS/SOL study’s Coordinating Center to create the study’s electronic forms using the Data Management System (DMS), and to strategize future data collection and management
• Created and managed the study’s databases using Excel and the Data Management System
• Currently analyzing data and preparing numerous manuscripts (see Publications Section below)
• Actively participated and contributed to various local and nationwide research meetings, seminars and workshops (e.g. at AHA Scientific meetings, NU and School of Public Health’s, UIC)

January 2010–September 2010
Epidemiologist and Program Evaluator,
Latino Tobacco Network

Midwest Latino Health Research, Training, and Policy Center, University of Illinois at Chicago

• Served as project evaluator in coordination with nationwide tobacco control network
• Developed health education and promotion materials (English and Spanish)
• Conducted in- and out-of state tobacco control workshops (English and Spanish)
• Designed and translated various recruitment documents and survey tools tailored to participants of diverse ethnic and cultural heritage (English and Spanish)
• Prepared IRB proposals necessary to conduct various research activities

August 2007–December 2009
Graduate Research Assistant

Midwest Latino Health Research, Training, and Policy Center; University of Illinois at Chicago

• Actively participated in the writing of manuscripts and grant progress reports, which ensured continued funding.
• Authored numerous research abstracts submitted to APHA and presented findings
• Contributed to the development of a health promoter program on Family Health History and conducted related workshops
• Prepared IRB proposals, necessary to conduct focus groups in various underserved Latino and African American communities
• Conducted focus groups in various African American and Latino communities
**August 2002–March 2003**

Research Associate - Northwestern University

- Served as internal evaluator of the research study
- Multiple-Center AIDS Cohort Study (MACS)
- Served as Co-Investigator in various on-going research projects
- Developed various molecular biology (sequencing) protocols designed to characterize various strains of the Human Immunodeficiency virus (HIV)

**June 2000–July 2002**

MS Candidate/Principal Investigator - University of Illinois at Chicago

- Acted as Principal Investigator and project coordinator for my Master of Science thesis research project based at the Women and Infants Transmission Study (WITS), a U.S. multi-center HIV/AIDS longitudinal study on mother and child health
- Designed, directed and ran data analyses related to the study, “The Effect of Mode of Delivery on Maternal HIV-1 Disease Progression The Women and Infants Transmission Study”
- Presented research findings at national and international meetings and was senior author of published manuscript

**July 1998–June 2000**

Research Associate Co-Investigator - Northwestern University; Epidemiology of Cardiovascular and Non-Cardiovascular Risk in Four Chicago Cohorts (NIH funded R01 grant)

- Co-investigator in several on-going research projects
- Coordinated the progress of the grant’s objectives
- Actively participated in the preparation of national and international presentations
- Contributed in the writing of abstracts submitted to conferences of various disciplines in the field of Chronic Disease Epidemiology
- Actively participated in the writing of grant progress reports -which ensured continued funding and manuscripts
- Supervised ancillary projects of cardiology fellows, data that were subsequently published in scientific journals

**June 1997–June 1998**

Outreach Worker - University of Illinois at Chicago; Community Outreach Intervention Project (COIP) – NIH and CDC funded

- Served as an outreach worker (field work) and was instrumental in the closing of language and cultural gaps between the research staff based at UIC and various Latino and African American minority communities
- Managed data sets for the various studies and performed qualitative and quantitative data analyses for grant progress reports, abstracts and manuscripts
• Actively participated in the writing of grant progress reports and manuscripts
• Translated tools routinely used by the bilingual interviewers which helped minimize the variation in the collection of data
• Served as evaluator of UIC based community outreach programs

August 1997–June 1998
Research Assistant
University of Illinois at Chicago; Acceptability of Male Circumcision to Prevent HIV Infection in Uganda - CDC funded Cooperative Agreement
• Managed data sets and performed qualitative and quantitative data analyses which were used for grant progress reports, abstracts submitted to scientific meetings, and manuscripts

September 1989–May 1997
Research Technologist I (September 1989–September 1991)
Research Technologist II (September 1991–May 1997)
Northwestern University; Host Factors in the Susceptibility of Urinary Tract Infections in Women and Girls NIH funded RO1 grant
• Prepared and wrote several research grants which were successfully funded
• Managed various grants’ budgets and was in charge of negotiating the cost and service contracts of laboratory supplies and equipment
• Supervised numerous ancillary projects of urology residents and medical students, data which were subsequently presented at conferences and published in scientific journals
• Presented research findings at departmental meetings within the university as well as at various scientific conferences
• Actively participated in the writing of manuscripts published in peer reviewed scientific journals
• Coordinated the enrolment and follow-up of patients in case control and cohort studies
• Developed laboratory protocols subsequently implemented to fulfil the grant’s basic science goals
• Developed laboratory protocols subsequently implemented to fulfil the grant’s basic science goals
• Carried out qualitative and quantitative data analyses for presentations, grant progress reports and scientific meetings

HOSPITAL APPOINTMENTS

March 2004–March 2005
Senior Research Scientist
Children’s Memorial Hospital; Consortium to Lower Obesity in Chicago Children (CLOCC)
• Managed and coordinated CLOCC’s seed grant award program
• Served as evaluator of internal and external research projects and programs developed by CLOCC’s seed grantees
• Conceptualized, developed, and assisted in the implementation of community based intervention programs designed to increase physical activity and improve nutritional status among African American and Latin American children and their families in various Chicago communities
• Acted as a cultural and ethnic liaison between various non-Spanish speaking public health officials and Spanish speaking communities. Helped in bridging cultural and language gaps between various clinical researchers and community leaders and members

OTHER EMPLOYMENT

Independent Research Consultant
Children’s Memorial Hospital and Northwestern University
• Collaborated in several research and community-based projects designed to improve the living conditions of underprivileged communities in the U.S. and abroad
• Served as evaluator of numerous research studies and programs based at these institutions

HONORS AND AWARDS

October 2010–Present
Recipient of NIH Pre-doctoral Diversity Supplement Fellowship
Northwestern University, Feinberg School of Medicine, Chicago, IL.

PROFESSIONAL SOCIETY MEMBERSHIPS

1998–2000/ 2010 to Present
Member of the
2007 to Present
Member of the
American Heart Association
American Public Health Association
American Association for the Advancement of Science
Minority Student Association for the Advancement of Public Health, School of Public Health, UIC
Urban Health Program, School of Public Health, UIC
Global Health Interest Group, School of Public Health, UIC
1998–2002
Member of the Society for Epidemiological Research

PROFESSIONAL AND COMMUNITY SERVICE

2008–Present
Advisory Board Member for the Chicago Beach Soccer Tournament, Illinois State Soccer Association/FIFA (Chair of Health Promotion Committee)

2010–2011
Chair Advisory Board Member of the Humboldt Park Senior Citizen Health Initiative

2010
Advisory Member for the Latino Strategic Committee for Cheryle Jackson, Candidate for US Senate

FOUNDATION WORK AND COMMUNITY DEVELOPMENT

2011–Present
Advisory Board Member Chair of Fundraising and Development Committee for La Isla Foundation (based in US, carrying out chronic disease prevention in Nicaragua)

External Advisory Board Member “Fundación Corona”, Colombia, South America

2008–Present
Advisory Board Member Director of Development for Health and Empowerment for African Lives (HEAL, a School of Public Health based foundation, UIC)

MENTORING AND SCIENTIFIC SERVICE

Committee Assignments

2007–Present
Member and Health Educator/Matched Mentor for the Urban Health and Diversity Program for Underserved Minority Children and Adolescents, School of Public Health, UIC

1995–Present
Member of the Mentoring Program for Latino and African American Students, School of Public Health, UIC

1989–Present
Member of the Mentoring Program for Minority Students, NU

Grant Review Bodies

2008–2010
Member, led Panel for CEED (Center of Excellence for the Elimination of Disparities), Midwest Latino Health Research, Training, and Policy Center, UIC

2004–2005
Director Seed Grant Program at the Consortium to Lower Obesity in Chicago Children (CLOCC)
TEACHING EXPERIENCE

January 2011–May 2011
Teaching Assistant
School of Public Health; Co-taught Social Determinants of Health (CHSC 401), an online course offered to graduate students at the School of Public Health

June 2010–August 2010
Teaching Assistant
Department of Preventive Medicine, Northwestern University Feinberg School of Medicine; Co-taught Introduction to Epidemiology (MSEB 301), a course offered to medical and graduate students in the DPM

January 2010–May 2010
Teaching Assistant
School of Public Health University of Illinois at Chicago; Co-taught Social Determinants of Health (CHSC 401), a course offered to graduate students at the School of Public Health

August 2001–December 2001
Teaching Assistant
School of Public Health University of Illinois at Chicago; Co-taught Principles of Epidemiology, a course offered to graduate students at the School of Public Health

September 1999–June 2000
Teaching Assistant
Department of Preventive Medicine, Northwestern University Feinberg School of Medicine;
• Co-taught course entitled Chronic Disease Epidemiology offered to medical students enrolled in the Master of Public Health program
• Served as tutor to the students and guided them in their project assignments conceptualization and development
• Assisted professor in grading student reports and papers

GRANTS AWARDS

October 2010–Present
Co-Investigator of
HCHS/SOL NIH- Diversity Supplement Fellow; Hispanic Community Health Study/Study of Latinos (HCHS/SOL); Northwestern University Feinberg School of Medicine

June 2000–July 2002
MS Candidate and Principal Investigator
Graduate College Academic Merit Award, University of Illinois at Chicago

INVITED LECTURES

2012, February
Chicago, Illinois
Navas-Nacher, E.L., and Estrella, M. “Introduction to Qualitative Research in Public Health.” Minority Health Program Meeting, Department of Preventive Medicine, Feinberg School of Medicine.

Navas-Nacher, E.L. “Preventing Youth Risk Behaviors and Leading Healthy Lifestyles among Residents of Underserved Chicago Communities.” Urban Health and Diversity Program, School of Public Health, UIC
2010, November
Chicago, Illinois
Navas-Nacher, E.L., and Daviglus, M.L. “Update on the Hispanic Community Health Study/Study of Latinos (HCHS/SOL), Research Seminar IDPH 595, Division of Epidemiology and Biostatistics, School of Public Health

2010, September
Washington, D.C.

2010, August
Chicago, Illinois
Navas-Nacher, E.L. “Diabetes Risk Factors and Prevention among Latinos.” Annual Health Fair, Humboldt Park Community

2008, October
San Diego, California

2004, June
Chicago, Illinois

PUBLICATIONS

Original Investigations

2013 Manuscript submitted to Psychological Assessment.

2013 Manuscript submitted for publication to Annals of Behavioral Medicine.

2013 Manuscript in progress.

Fernández-Rhodes, L. E., Cai J., Navas-Nacher, E. Smokovski, P., Gordon-Larsen, P. Acculturation and weight change within the Hispanic Community Health Study/Study of Latinos (HCHS/SOL)


Navas-Nacher, E. L., Birnbaum-Weitzman, O., Gonzales, P., Gallo, L. C., Johnson, T., and Daviglus, M. L. Evaluating reliability and factorial invariance of familism and fatalism measures across English and Spanish speakers in the Hispanic Community Health Study/Study of Latinos


Abstracts:


2012 Navas-Nacher, E. L., Astorga, B, Farberoff, F., Bulev, J., Muñoz, G., Ramirez, J., Estrella, E., and Vargas, P. Bringing Brazilian-Born Beach Soccer to Two Chicago Latino Communities Using Community Based Participatory Research Principles. Annual Student Competition, School of Public Health, University of Illinois at Chicago


[Author?] Office-based measures as risk factors for CAD. *Prevention Conference V. AHA Meeting*

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