



## Research Article

## Changes in and Factors Affecting Second-hand Smoke Exposure in Nonsmoking Korean Americans in California: A Panel Study



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## SUMMARY

**Purpose:** We evaluated changes in and factors affecting second-hand smoke (SHS) exposure in a panel study of nonsmokers.

**Methods:** This study was based on data from a larger study of tobacco use among a representative sample of adults of Korean descent residing in California. Participants included 846 males and 1,399 females who were nonsmokers at baseline (2005–2006) and at follow-up (2007–2009). Participants were selected by probability sampling and were interviewed by telephone.

**Results:** At baseline, 50.0% were exposed to any SHS, and at follow-up 2 years later, 60.4% were exposed to any SHS ( $p < .001$ ). SHS exposure at baseline was associated with acculturation, employment, spousal smoking, and having a friend who smoked ( $p < .001$ ). Employment, spousal smoking, and other family members smoking were associated with SHS at follow-up ( $p < .001$ ). The odds ratio of SHS in the employed group declined from 2.01 at baseline to 1.53 at follow-up, that of the group having a smoking spouse increased from 1.88 to 2.36, and that of the group having other family members smoking increased from 1.20 to 1.69.

**Conclusions:** We showed that SHS exposure increased among Korean American nonsmokers in California, and the most important variables explaining the change in SHS exposure involved smoking among others with whom the subject is associated. These findings could be used as objective evidence for developing public health policies to reduce SHS exposure.

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## Introduction

Second-hand smoke (SHS) exposure can lead to heart disease and lung cancer in adults and sudden infant death syndrome, acute respiratory infections, middle ear disease, exacerbated asthma, respiratory symptoms, and decreased lung function in children (US Department of Health and Human Services, 2006). In addition to these health problems, disability-adjusted life years due to SHS exposure amounted to 10.9 million, representing 0.7% of the total worldwide burden of disease in disability-adjusted life years in 2004 (Oberg, Jaakkola, Woodward, Peruga, & Prüss-Ustün, 2011). In

the United States alone, SHS exposure resulted annually in over 5 billion dollars in direct medical costs and over 5 billion dollars in indirect medical costs such as disability, lost wages and related benefits (Behan, Eriksen, & Yijia, 2005).

Many countries have introduced laws prohibiting smoking in specific areas to reduce SHS exposure in nonsmokers. In 1998, California became the first state in the US to implement a comprehensive state-wide smoking ban that prohibited smoking in most public places, including restaurants and bars (Callinan, Clarke, Doherty, & Kelleher, 2010).

As the population of Korean Americans increased in the United States, so did their involvement in health research for a variety of health issues (Allem et al., 2012; Ayers et al., 2010; Hofstetter, Ayers, et al., 2010; Hofstetter et al., 2004; Hughes, Corcos, Hofstetter, Hovell, & Irvin, 2008; Hughes, Usita, Hovell, Hofstetter, 2011). The population of Korean Americans in the United States is about 1.7 million.

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Approximately 30% of these Koreans live in California (Hoeffel, Rastogi, Kim, & Shahid, 2010). They have been recognized as one of the most rapidly growing minority groups in the United States. Smoking has declined sharply in Korean Americans with immigration. The smoking prevalence during 1994–1995 in Alameda County, California, was 39% among Korean males and 6% among Korean females (Centers for Disease Control and Prevention [CDC], 1997). Hofstetter et al. (2004) reported CDC smoking prevalences of 31.2% for men and 3.7% for women among Koreans in California during 2001–2002. The male smoking rate was higher but dropping, and the Korean female smoking rate was lower but increasing compared with comparable groups in the Californian population (CDC, 2010a; Pierce, Messer, White, Cowling, & Thomas, 2011).

SHS exposure among Koreans in California was reported to be 31% during 2001–2002 (Hughes, Corcos, Hofstetter, Hovell, & Irvin, 2008), and it increased to 50.2% during 2005–2006 (Hofstetter, Ayers, et al., 2010). Another study found that SHS exposure was 62% for Korean males and 54% for Korean females in California in 2002 (Hughes, Corcos, Hofstetter, Hovell, Seo, et al., 2008). The SHS exposure rates were even higher among Koreans in California who were more acculturated, married, and socially involved with smokers (Hughes, Corcos, Hofstetter, Hovell, & Irvin, 2008). Few studies of SHS exposure among Koreans have been reported, and those that exist have used cross-sectional designs, producing weak evidence for causation.

The aim of this study was to evaluate changes in SHS exposure using 2-year panel data among nonsmoking Korean Americans in California. We also assessed variables related to SHS exposure and changes in such exposure.

## Methods

### Study design

We used data from a larger study of health risks among California residents of Korean descent aged 18 years or older (Hofstetter, Hovell, et al., 2010; Hughes, Corcos, Hofstetter, Hovell, & Irvin, 2009; Hofstetter et al., 2008) who could be reached by residential telephone.

### Setting and samples

Participants were selected randomly using a surname-based sampling procedure (detailed in Hofstetter et al., 2004) and were initially interviewed by a team of bilingual professional interviewers by telephone between 2005 and 2006 ( $n = 3,358$ , of whom 1,150 were male nonsmokers, and 1,856 were female nonsmokers). Interviewing for both waves was conducted in the language of the respondent's choice. About 85.0% were conducted in Korean. Of the baseline participants, 74.7% were re-interviewed during 2007–2009 in a follow-up series (846 males, 1,399 females). The mean time interval between baseline and follow-up interviews was 2.3 years ( $SD = 0.5$ ).

### Ethical consideration

All procedures were approved by the San Diego State University Institutional Review Board.

### Measurements

The survey instrument was initially prepared in English and was then translated into Korean by bilingual staff. Repeated back and forward translations were conducted iteratively by senior faculty members at Myongji and Seoul National Universities (Song et al.,

2004). Two focus groups were held in California to review translations for culturally correct interpretation.

SHS exposure was measured by responses to the question, "About how many cigarettes are you exposed to (at home/at work/elsewhere) during a typical day or in any other place during a typical week?" Participants who reported having been exposed to cigarettes were coded as experiencing SHS exposure. We also calculated the amount of exposure to any SHS (no. of cigarettes).

Demographic and smoking-related variables were determined. Age was recorded as 18–44 years, 45–64 years, and 65 years or older, education as 0–12 years, 13–16 years, and 17 years or more, marital status as married/cohabiting or not, and employment as employed or not. The number of persons and the number of children in the household were also recorded. The percentage of one's life spent in the US was classified into four subgroups, 0–25%, 25–60%, 50–75%, and 75–100%. Acculturation was measured by responses to 10 questions taken from the scale developed by Suinn, Khoo, and Ahuna (1995). These items measured aspects of cultural preferences involving language, music, and social linkages, including the ethnicity of peers and preferred associations. The composite score was reliable: the alpha values among males and females were .860 and .845, respectively. Each item was standardized ( $M = 0$ ,  $SD = 1$ ) to equalize item variances and then summed to form the scale. Following Song et al. (2004), acculturation groups were established using cluster analysis ("PROC FASTCLUS"; SAS Institute, Cary, NC, USA) among subjects. Based on the content, the scale was trichotomized. The largest group was labeled as "Traditional," the second group as "Bicultural," and the third as "Acculturated." Additionally, subjects were asked whether their spouse, other family members, and friends smoked. Subjects were also asked if there was a complete smoking ban in their home.

### Data collection

Data in this study closely matched the demographic distributions from the 2000 census for California (US Department of Commerce, 2002). Potential respondents were filtered by interviewers to ensure that they were of Korean descent. Initial contact was made in Korean, and interviewers were instructed to shift to English according to the preference of the subjects. Respondents were stratified by gender and then selected in each household using the most recent birthday procedure (Frey, 1989). Ineligible subjects included non-Koreans, those at business telephone numbers, and persons who spoke neither Korean nor English. Disconnected telephone numbers, answering machines, unanswered calls, and continuous busy signals after up to 15 callbacks were also excluded.

### Data analysis

Statistical analyses were performed using the SAS software (version 9.2; SAS Institute, Cary, NC, USA). The McNemar test was used to evaluate changes in SHS exposure, and univariate and multiple logistic regression were used to identify variables that were significantly related to SHS exposure using a step-wise method. The odds ratios (OR) and 95% confidence intervals (CI) of the correlates with SHS exposure were calculated. Statistical significance was set at  $p < .05$ .

## Results

### General characteristics of study population

Characteristics of the study population are shown in Table 1. At baseline, the mean age was 51.2 years ( $SD = 17.0$ ), education was 14.1 years ( $SD = 4.3$ ), length of time in the US was 20.1 years ( $SD = 10.0$ ),

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