Published in final edited form as:

Tob Control. 2015 March ; 24(2): 168–174. doi:10.1136/tobaccocontrol-2013-051121.

Association between Clean Indoor Air Laws and Voluntary Smokefree Rules in Homes and Cars

Kai-Wen Cheng, PhD¹ [Assistant Professor], Cassandra A. Okechukwu, MSN, ScD² [Assistant Professor], Robert McMillen, PhD³ [Associate Professor], and Stanton A. Glantz, PhD⁴ [Professor]

¹College of Public Health, Institute of Health Policy and Management, National Taiwan University, No. 17 Xu-Chow Rd. Room 621, Taipei 100, Taiwan, kwcheng19@ntu.edu.tw, Phone: 011-886-2-33668060, Fax: 011-886-2-23434200

²Society, Human Development, and Health, Department of Society, Human Development, and Health, Harvard School of Public Health, Boston, MA USA

³Department of Psychology and the Social Science Research Center, Mississippi State University, Starkville, MS USA

⁴Department of Medicine, University of California San Francisco, San Francisco, CA USA

Abstract

Objectives—This study examines the influence that smokefree workplaces, restaurants, and bars on the adoption of smokefree rules in homes and cars and whether the adoptions of home and car smokefree rule are associated.

Methods—Bivariate probit models were used to jointly estimate the likelihood of living in a smokefree home and having a smokefree car as a function of law coverage and other variables. Household data are from the nationally representative Social Climate Survey of Tobacco Control 2001, 2002, and 2004–2009; clean indoor air law data comes from the American Nonsmokers' Rights Foundation Tobacco Control Laws Database.

Results—Both “full coverage” and “partial coverage” smokefree legislations are associated with an increased likelihood of having voluntary home and car smokefree rules compared with “no coverage”. The association between “full coverage” and smokefree rule in homes and cars is 5% and 4%, respectively, and the association between “partial coverage” and smokefree rule in homes and cars is 3% and 4%, respectively. There is a positive association between the adoption of home and car smokefree rules.

Conclusions—Clean indoor air laws provide the additional benefit of encouraging voluntary adoption of smokefree rules in homes and cars.

Corresponding author: Kai-Wen Cheng, PhD.

Conflict of interest: Nothing to declare.

Contributorship:

K-W Cheng led the analyses and prepared the first draft of the article. CA Okechukwu and SA Glantz contributed to review and interpretation of results. R McMillen and SA Glantz initiated the study and acquired the data. All authors contributed to defining the goal of the study and analytical approach. All authors contributed to the writing, revision, and approval of the final draft of the article.

Keywords

Secondhand Smoke; Public Policy; Prevention

INTRODUCTION

The prevalence of cigarette smoking in the US has decreased from 50% in 1940s to around 20% in 2000s.^[12] The widespread knowledge of the health risks associated with cigarette smoking and secondhand smoke (SHS) as well as the implementation of anti-smoking programs and legislation restricting public smoking have been credited with this decrease.^[34] Nevertheless, there were still 88 million nonsmokers aged three and above who were exposed to SHS in 2007–2008.^[5]

Epidemiologic and laboratory studies have concluded that the SHS exposure causes cardiovascular disease, lung cancer, acute respiratory illness, sudden infant death syndrome, as well as other health consequences in infants and children.^[6–11] Due to state and local smoking restrictions, the proportion of people being protected by a comprehensive smokefree legislation in workplaces, restaurants, and bars has increased dramatically between 2000 and 2009 from less than 1% to 36%.^[12] With an extension of smokefree legislation into many public areas, private places such as homes and cars have become the primary setting for exposure to SHS,^[13] especially for children.^[514]

A growing body of literature has found that smokefree laws in public places are associated with an increase in the adoption and support of voluntary smokefree rules in homes.^[15–24] Most studies investigating the relationship between smokefree laws and SHS exposure in private places such as homes have been conducted in Europe; one US study found similar associations between county-level adoption of smokefree rules and household-level adoption of home smokefree rules.^[18] It remains unknown whether the influence of smokefree laws extends to SHS exposure in cars and whether there is an association between adoption of home and car smokefree rules. Our study extends previous research by examining the influence of smoking restrictions in workplaces, restaurants, and bars on the adoption of smokefree rules in homes and cars. In addition, we investigate whether such car smokefree rules may simply be an extension of home rules, or vice versa by taking into account the underlying factors that may be both correlated with the adoption of home and car smokefree rules.

METHODS

Data

Person-level data are from the 2001, 2002 and 2004 through 2009 Social Climate Survey of Tobacco Control (SCS-TC), an annual, cross-sectional nationally representative telephone survey conducted by the Social Science Research Center at the Mississippi State University. Eligible respondents were non-institutionalized and English-speaking people aged 18 or over living in a household with a landline telephone. The sample was weighted according to race and gender within each census region, to be representative of the US population, on the

basis of US Census estimates. Once a household was contacted, the interviewer requested to speak with the person in the household 18 years of age who would be having the next birthday. Five attempts were made to contact selected adults who were not home.

The cooperation rate for the survey was about 85% for surveys in 2001–2007, 77% in 2008 and 60% in 2009. The cooperation rate was calculated by the number of respondents who completed interviews divided by number of eligible respondents successfully contacted. The sample size was about 3,000 for each wave 2001–2004 and about 1,500 for each wave 2005–2009. The 2006 survey randomly asked the question about home smokefree rules in two different ways with 883 respondents being asked the version that is consistent with the surveys in other years, and these respondents were included in the study. We did not include the 2000 and 2003 surveys because the 2000 survey did not provide information on smoking restrictions in cars, and neither the 2000 or 2003 surveys included information on smoking status for household members to identify whether the household included a smoker. The surveys were reviewed by the Institutional Review Board at Mississippi State University. Verbal informed consent was obtained from participants.

The SCS-TC 2001, 2002, 2004–2009 included information on self-reported smokefree rules in homes and cars, self-reported SHS exposure in several areas (home, own car, someone else's car, indoor public places, other indoor areas, public sidewalk, and the doorway of the building.); smoking behaviors (smoking status and intensity), household composition (living with children), and demographics.

In addition, the dataset provided information on whether there was anyone living in the household who currently smoked cigarettes. The questions of which household member smoked (spouse or significant other, children, adult children, and other adults) allow researchers to identify whether the respondent lived with any smokers.

The data on clean indoor air laws comes from the American Nonsmokers' Rights Foundation (ANRF) US Tobacco Control Laws Database. This database provides the information on when smoking laws are introduced, the coverage (i.e. workplaces, restaurants, or bars), the strength of the laws (i.e. 100% smokefree, some coverage, and no coverage), and whether the laws are at the city, county, or state level. As described previously,^[18] a county was categorized as having a “full coverage”, “partial coverage”, or “no coverage” laws based on whether there was a 100% smokefree law for either workplaces, restaurants, or bars, and whether the law covered the entire county population due to state, county or municipal laws singly or in combination. This categorization allows for discernment of cases whereby local jurisdictions (municipalities or counties) may have implemented smokefree laws prior to county-wide (or state-wide) adoption. If a 100% smokefree law covered the entire county population, that county was categorized as having a “full coverage.” If a 100% smokefree law covered only part of county population, that county was categorized as having a “partial coverage”. If there was no 100% smokefree law at any jurisdiction level, that county was categorized as “no coverage”.

Using county of residence provided in SCS-TC, the law coverage in 2001, 2002, 2004–2009 was linked to respondents' answers to the SCS-TC survey to identify coverage by smokefree laws for each respondent in each year of the survey.

Variables

Respondents were asked, "Which of the following best describes your household's rules about smoking?" If respondents answered "not allowed in any part of home," they were classified as having a home smokefree rule; for those who answered "allowed in some areas" or "allowed in all areas" were classified as not having a home smokefree rule. Respondents were also asked, "Please tell me which best describes how cigarette smoking is handled in your car?" If respondents answered "no one allowed to smoke in my car," they were classified as having a car smokefree rule; for those who answered "only special guests are allowed to smoke in my car" or "people are allowed to smoke in my car" or "not sure" were classified as not having a car smokefree rule. The respondents with missing data on the smokefree rule in homes ($N = 17$, 0.11% of survey sample) and the respondents with missing data on the smokefree rule in cars ($N = 1,189$, 7.81% of survey sample) were excluded from the analysis. Respondents who did not own a car account for all the missing data for the smokefree rule in cars.

A respondent was identified as a current smoker if he or she had smoked over 100 cigarettes in their lifetime and currently smoked cigarettes. Demographic variables included age cohort (aged 18–24, 25–44, 45–64, and 65+), education attainment (high school below, some college, and college and above), race (Caucasians, African American, and others), gender (male, female), marital status (married, not married), and employment status (employed, not employed).

For household information, respondents were asked "How many children under 18 years of age currently live in your household?" Those who answered "at least one" were classified as living in a household with children, others were classified as not living in a household with children. Respondents were also asked "Whether your spouse or significant other living in your household currently smoke cigarettes," "Whether your adult children living in your household currently smoke cigarettes," "Whether your children living in your household currently smoke cigarettes," "Whether other adults living in your household currently smoke cigarettes." If a respondent answered "yes" in any of above question or oneself is a current smoker, he or she was classified as living in a smoker household.

Data analysis

The bivariate associations of each independent variable with a smokefree rule in homes and cars were examined using Pearson's chi-square test. The multivariate analysis applied a bivariate probit model which jointly estimated the likelihood of living in a smokefree home and having a smokefree car by taking into account that the adoption of the two rules may be correlated. The multivariate analysis included the respondents who had information for both the smokefree rules in homes and cars. The covariates include law coverage (full, partial, and none coverage), age cohort, education attainment, race, gender, marital status, employment status, whether child < 18 years old exists in the household, whether any

smoker living in the household, and year variables. The estimated ρ from the model indicates whether the unexplained influences in the likelihood of having a home smokefree rule and the likelihood of having a car smokefree rule are correlated, and the sign direction of the estimated ρ indicates whether the unexplained influences in home and car rule are positively or negatively correlated. In the bivariate probit model, the Marginal Effect (ME) of each independent variable on the outcome is provided. If the independent variable is continuous, ME indicates the partial effect of independent variable on the outcome for an average hypothetical person. With a categorical independent variable, ME indicates a comparison of outcomes for a hypothetical person evaluated at the average covariates in different categorical situations. In the bivariate probit model, standard errors were robust to heteroskedasticity and clustered in the state level.

Alternative model specifications

The primary analysis treated year as a continuous variable. We conducted an alternative analysis that treated year as a categorical variable (using dummy variables) to avoid having to make any assumptions about the shape of the underlying secular trends. In addition, we conducted alternative multivariate analyses using bivariate probit models included several interaction terms: smoker household $\times$ partial coverage, smoker household $\times$ full coverage, year $\times$ partial coverage, and year $\times$ full coverage were added into the model to estimate whether the influences of smokefree laws on a smokefree rule in homes and cars differ by types of households, and whether the influences of smokefree laws on a smokefree rule in homes and cars differ by year.

Statistical Calculations

All analyses were weighted by sex, race, age, and census region to produce nationally representative estimates. Analyses were conducted using STATA/SE 12 in 2012–2013.

RESULTS

Sample description

The prevalence of people indicating that they lived in a smokefree home increased from 74% in 2001 to 79% in 2009. Smokefree home prevalence among people living in a nonsmoker household was consistently high, reaching 90% in 2009, while the prevalence among people living in a smoker household ranged from 32% in 2001 to only 45% in 2009 (Figure 1).

The prevalence of having a car smokefree rule hovered around 75% among people living in all households and around 89% for people living in nonsmoker households from 2001 to 2009 (no significant time trend; Figure 2). Among people living in smoker households, the prevalence of smokefree car policies fell from 47% in 2001 to a low of 28% in 2006 before rebounding to 34% in 2009 (A quadratic regression against time yielded significant negative linear and positive quadratic terms; $p < 0.01$ for both).

People living in a county with partial or full coverage of smoking restrictions in public places have a higher rate of a smokefree rule in homes and cars compared to those living in

a county without any law coverage (full: 81.0%, partial: 81.2%, none: 74.3% for home smokefree; full: 81.5%, partial: 83.7%, none: 76.7% for car smokefree).

Respondents living in a household with smokers have a lower rate of a smokefree rule in homes and cars compared to those living in a household without any smokers. People aged 18–24 have the lowest rate of a smokefree rule in cars compared to older aged categories. African Americans have the lowest rate of a smokefree rule in homes compared to Caucasians and other races, while the Caucasians have the lowest rate of a smokefree rule in cars compared to African Americans and other races. People who are employed have a higher rate of smokefree home rules than those who are not employed.

Female, nonsmoker, and married respondents have a higher rate of a smokefree rule in homes and cars than male, smokers, and unmarried people. Higher educated respondents have a higher rate of a smokefree rule in homes and cars compared to less educated ones.

Bivariate analysis

Bivariate analysis (Table 1) indicated that a smokefree rule in homes and cars are significantly associated with law coverage, household type, respondent's smoking status, and respondent's socioeconomic status and demographics, such as gender, marital status, age, education, and ethnicity (all p-values <0.01).

Multivariate analysis: a bivariate probit model

The bivariate probit model adjusted for all covariates (Table 2) indicated that compared with a “no coverage” by smokefree law at the area level, “full coverage” smokefree legislation is associated with an increased likelihood of having a home and car smokefree rule by 5% and 4%, respectively (Marginal Effect, ME = 0.05, 95% CI 0.03–0.08 for smokefree home; ME = 0.04; 95% CI 0.02–0.07 for smokefree car), and “partial coverage” is associated with the smokefree rule in homes and cars by 3% and 4%, respectively (Marginal Effect, ME = 0.03, 95% CI 0.00–0.06 for smokefree home; ME = 0.04; 95% CI 0.01–0.07 for smokefree car).

Compared to those living in nonsmoker households, people living in smoker households are significantly less likely to report that they have a smokefree rule in homes and cars by 37% and 32%, respectively (ME = −0.37, 95% CI −0.41, −0.33 for smokefree home; ME = −0.32; 95% CI −0.35, −0.28 for smokefree car).

The positive ρ estimated from the bivariate probit model indicated that the decisions to have a smokefree home and car are positively correlated ($\rho = 0.57$, 95% CI 0.54–0.61), reflecting some underlying influences causing a common behavioral change in smokefree rule adoption in homes and cars.

College graduation and above is associated with an increased likelihood of having a home and car smokefree rule (ME = 0.05, 95% CI 0.03–0.07 for home smokefree; ME = 0.06, 95% CI 0.04–0.07 for car smokefree). Being a smoker is associated with a decreased likelihood of reporting a smokefree home and car (ME = −0.18, 95% CI −0.21, −0.14 for home smokefree; ME = −0.25, 95% CI −0.30, −0.20 for car smokefree).

Some different predictors of having a smokefree rule in homes and cars are present. The presence of children in home significantly increased the likelihood of having a home smokefree rule but not a car smokefree rule. African Americans are less likely to be protected by a home smokefree rule, while Caucasians are less likely to have a car smokefree rule than other race. Younger people are more likely to report having a home smokefree environment, but less likely to report a smokefree car.

Alternative model specifications

When year was alternatively treated as a categorical variable the model yielded essentially the same results to the model treating year as a continuous variable, with coefficients varying after the third decimal place.

The interactions we tested (smoker household $\times$ partial, smoker household $\times$ full) in the equations for smokefree home and smokefree car indicated that the associations between smokefree law coverage and smokefree rules in homes and cars are not significantly different between people living in smoker and nonsmoker households. Likewise, the non-significant estimates of the interactions between law coverage and year variable (year $\times$ partial, year $\times$ full) in the equations for smokefree home and smokefree car indicated that there is no significant evidence such that the associations change by year.

DISCUSSION

Using a different data source we confirmed our previous study that smokefree laws were associated with increased voluntary smoking restrictions at home.^[18] In addition, we found that being covered by smokefree legislation that protects one from exposure to cigarettes smoke in public places is associated with individuals enacting smokefree rules in their private homes and cars. This adds to the already strong evidence that fears that enacting smokefree laws in public places will lead to increased exposure of vulnerable populations to SHS due increased smoking in private spaces are unfounded.^[25–27] This finding of a positive association between comprehensive smokefree legislation and car smokefree rule adoption is consistent with the finding from Hitchman and colleagues who used the International Tobacco Control Four Country Survey (Australia, United Kingdom, Canada, and United States) to show that countries with the most widespread comprehensive smokefree laws and tobacco control programs have the lowest prevalence of smoking in cars with nonsmokers.^[28]

Importantly, this study provided the first nationally representative prevalence of car smokefree rule over time, from 2001 to 2009. Our results show that the prevalence of smokefree rules in cars among people living in a smoker household is consistently as low as 35% from 2001 to 2009. Given the scarcity of the data on smoking in cars, existing studies have only focused on the prevalence of car smokefree rules for specific state, ethnicity, children subgroup, or a certain year^[28–32] While previous studies indicated that around 23% of children were exposed to SHS in cars in 2009 and 44% of smokers smoked in cars with nonsmokers in 2007/2008,^[2830] our findings indicated that in general 66% of people living with smokers reported that smoking was allowed in their cars in 2009. This evidence

indicated a higher prevalence of potential SHS exposure in cars, and tobacco control efforts are urgently needed to promote smokefree cars, especially when children are present.

Limitations

One limitation is that the sequential cross-sectional nature of the data does not allow us draw strict cause and effect conclusions. The information on home and car smokefree rule is self-reported, and subject to recall bias and social desirability. Mumford and colleagues reported that in 12% of their sample, members of the same household provided inconsistent answers to questions about 100% smokefree restriction inside the home.^[33] This result might reflect an inconsistent attitude toward or noncompliance with smokefree rule within the household. This inconsistency and noncompliance may lead to a misclassification of SHS exposure in home by using home smokefree rule adoption as its proxy variable. If the misclassification of SHS exposure mainly comes from the social desirability such that people living in places with strong smokefree laws in public places may be more likely than people living in places without smokefree laws to answer that they have a smokefree rule in their homes and cars, when they really do not, this may lead to our estimated association being biased upward.

In addition, public attitudes about cigarette smoking, a common determinant of smokefree laws and voluntary smokefree rules in homes and cars may lead to a positive association between the likelihood of living in a place with strong smokefree laws and having a smokefree rule in private places. For example, people living in places with strong attitudes against (or toward) cigarette smoking are more likely to support (or against) the smokefree bill and voluntarily adopt (or not adopt) smokefree rules in homes and cars.

We have data on coverage by, but not compliance with, smokefree laws. Neither the ANRF nor the SCS-TC provides information on compliance, and thus it is not possible to include the compliance in the analyses. The changing distribution of landline telephones during the study period creates another potential limitation. In the mid 2000's, wireless substitution of landline for wireless telephones began to increase. By 2009, 24.5% of households were wireless telephone only and thus not included in the sample.^[34] Although, the sampling and weighting methodology did not change from 2001–2009, the unweighted sample characteristics changed as wireless substitution increased during the latter years of the study period.

Finally, this study could only draw conclusions about the relationship between smokefree law coverage and a smokefree rule in homes and cars for people who own a car, because our multivariate analysis only included those respondents with both information on the smokefree rule in homes and cars.

Conclusions

Homes and cars are usually seen as one of the last places that smokers can smoke without interference. This study found that the clean indoor air laws provide the additional benefit of encouraging a voluntary adoption of smokefree rules in homes and cars.

Acknowledgments

Funding:

This research was supported in part by several grants: Cheng: 5R25CA113710 (NIH), NSC-101-2410-H-002-207 (Taiwan National Science Council); McMillen: the American Academy of Pediatrics Julius B. Richmond Center of Excellence, funded by grants from the Flight Attendant Medical Research Institute and Legacy. Glantz: National Cancer Institute CA-061021.

The findings and conclusions are those of the authors and do not necessarily represent the official position of any of these institutions. The funding agencies played no role in the conduct of the research or preparation of the manuscript.

REFERENCES

1. Agaku I, King B, Dube SR. Current cigarette smoking among adults - United States, 2011. *MMWR*. 2012; 61:889–894. [PubMed: 23134971]
2. Haenszel W, Shimkin MB, Miller HP. Tobacco smoking patterns in the United States. *Public Health Monogr*. 1956; (45):1–105.
3. Warner, K. Tobacco Control Policy. San Francisco: Jossey-Bass; 2006. Tobacco Policy Research: Insights and Contributions to Public Health Policy; p. 3-86.
4. Schroeder S. Tobacco control in the wake of the 1998 Master Settlement Agreement. *New Engl J Med*. 2004; 350(3):293–301. [PubMed: 14715919]
5. Centers for Disease Control and Prevention. Vital signs: nonsmokers' exposure to secondhand smoke -- United States, 1999 – 2008. *MMWR*. 2010; 59(35):1141–1146. [PubMed: 20829748]
6. Anderson H, Cook D. Passive smoking and sudden infant death syndrome: review of the epidemiologic evidence. *Thorax*. 1997; 52:1003–1009. [PubMed: 9487351]
7. Barnoya J, Glantz S. Cardiovascular effects of secondhand smoke: Nearly as large as smoking. *Circulation*. 2005; 111:2684–2698. [PubMed: 15911719]
8. Glantz S, Parmley W. Passive smoking and heart disease: Epidemiology, physiology, and biochemistry. *Circulation*. 1991; 83:1–12. [PubMed: 1984876]
9. He J, Vupputuri S, Allen K, et al. Passive smoking and the risk of coronary heart disease a meta-analysis of epidemiologic studies. *New Engl J Med*. 1999; 340(12):920–926. [PubMed: 10089185]
10. Hofhuis W, Jongste Jd, Merkus P. Adverse health effects of prenatal and postnatal tobacco smoke exposure on children. *Arch Dis Child*. 2003; 88:1086–1090. [PubMed: 14670776]
11. McMartin KI, Platt MS, Hackman R, et al. Lung tissue concentrations of nicotine in sudden infant death syndrome (SIDS). *J Pediatr*. 2002; 140(2):205–209. [PubMed: 11865272]
12. Gonzalez M, Sanders-Jackson A, Song A, et al. Strong smokefree law coverage in the US by race/ethnicity: 2000–2009. *Am J Public Health*. 2013; 103(5):e62–e66. [PubMed: 23488507]
13. U.S. Department of Health and Health Services. The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Coordinating Center for Health Promotion, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and health; 2006.
14. Dove MS, Dockery DW, Connolly GN. Smoke-free air laws and secondhand smoke exposure among nonsmoking youth. *Pediatrics*. 2010; 126:1–8. [PubMed: 20566603]
15. Callinan JE, Clarke A, Doherty K, et al. Legislative smoking bans for reducing secondhand smoke exposure, smoking prevalence and tobacco consumption. *Cochrane Database Syst Rev*. 2010; (4):CD005992. [PubMed: 20393945]
16. Akhtar PC, Haw SJ, Currie DB, et al. Smoking restrictions in the home and secondhand smoke exposure among primary schoolchildren before and after introduction of the Scottish smoke-free legislation. *Tob Control*. 2009; 18(5):409–415. [PubMed: 19671536]
17. Borland R, Yong HH, Cummings KM, et al. Determinants and consequences of smoke-free homes: findings from the International Tobacco Control (ITC) Four Country Survey. *Tob Control*. 2006; 15(Suppl 3):iii42–iii50. [PubMed: 16754946]

18. Cheng KW, Glantz SA, Lightwood JM. Association Between Smokefree Laws and Voluntary Smokefree-Home Rules. *Am J Prev Med.* 2011; 41(6):566–572. [PubMed: 22099232]
19. Galan I, Mata N, Estrada C, et al. Impact of the "Tobacco control law" on exposure to environmental tobacco smoke in Spain. *BMC Public Health.* 2007; 7:224. [PubMed: 17760974]
20. Hyland A, Higbee C, Hassan L, et al. Does smoke-free Ireland have more smoking inside the home and less in pubs than the United Kingdom? Findings from the international tobacco control policy evaluation project. *Eur Journal Public Health.* 2008; 18(1):63–65.
21. Lee JT, Glantz SA, Millett C. Effect of smoke-free legislation on adult smoking behaviour in England in the 18 months following implementation. *PLoS One.* 2011; 6(6):e20933. [PubMed: 21698295]
22. Mons U, Nagelhout GE, Allwright S, et al. Impact of national smoke-free legislation on home smoking bans: findings from the International Tobacco Control Policy Evaluation Project Europe Surveys. *Tob Control.* 2012
23. Norman GJ, Ribisl KM, Howard-Pitney B, et al. The relationship between home smoking bans and exposure to state tobacco control efforts and smoking behaviors. *Am J Health Promot.* 2000; 15(2):81–88. [PubMed: 11194699]
24. Thomson G, Wilson N, Howden-Chapman P. Population level policy options for increasing the prevalence of smokefree homes. *J Epidemiol Community Health.* 2006; 60(4):298–304. [PubMed: 16537345]
25. Adda J, Cornaglia F. The Effect of Bans and Taxes on Passive Smoking. *Am Econ J-Appl Econ.* 2010; 2(1):1–32.
26. Ho SY, Wang MP, Lo WS, et al. Comprehensive smoke-free legislation and displacement of smoking into the homes of young children in Hong Kong. *Tob Control.* 2010; 19(2):129–133. [PubMed: 20378586]
27. Yao TT, Lee AH, Mao ZZ. Potential Unintended Consequences of Smoke-Free Policies in Public Places on Pregnant Women in China. *Am J Prev Med.* 2009; 37(2):S159–S164. [PubMed: 19591756]
28. Hitchman S, Fong G, Borland R, et al. Predictors of smoking in cars with nonsmokers: Findings from the 2007 wave of the International Tobacco Control Four Country Survey. *Nicotine Toba Res.* 2010; 12(4):374–380.
29. Kegler M, Malcoe L. Smoking restrictions in the home and car among rural native American and White families with young children. *Prev Med.* 2002; 35:334–342. [PubMed: 12453710]
30. King B, Dube S, Tynan M. Secondhand smoke exposure in cars among middle and high school students -- United States, 2000–2009. *Pediatrics.* 2012; 129:446–452. [PubMed: 22311992]
31. King G, Mallett R, Kozlowski L, et al. Personal space smoking restrictions among African American. *Am J of Pre Med.* 2005; 28(1):33–40.
32. Norman G, Ribisl K, Howard-Pitney B, et al. Smoking bans in the home and car: Do those who really need them have them? *Prev Med.* 1999; 29:582–589.
33. Mumford EA, Levy DT, Romano EO. Home smoking restrictions - Problems in classification. *Am J Prev Med.* 2004; 27(2):126–131. [PubMed: 15261899]
34. Blumber, S.; Luke, J. Wireless substitution: Early release of estimates from the National Health Interview Survey, July–December 2012. *Statistics NCfH.* , editor. National center for Health Statistics; 2013.

What's known on this subject

Smoking restrictions in public places and homes protect people from the health risks of secondhand smoke exposure as well as reduce cigarette smoking.

What this study adds

Enactment of laws making public places and workplaces smokefree is a powerful stimulus for adopting voluntary smokefree policies in the homes and cars.

Figure 1. Smokefree home prevalence among people living in nonsmoker households was consistently high and the prevalence among people living in smoker households was low. Error bars are 95% CI's for individual prevalence estimates.

Figure 2.

The prevalence of people in all households having a car smokefree rule from 2001–2009 does not present a significant time trend, while a significant negative linear and positive quadratic trends of car smokefree rule prevalence present among people in smoker households. Error bars are 95% CI's for individual prevalence estimates.

Table 1

Profiles of respondents having a smokefree rule in their homes or cars 2001, 2002, 2004–2009

	Living in home with 100% smokefree rule		Having a car with 100% smokefree rule	
	N = 15,198		N = 14,026	
	%	P	%	P
100% law coverage		<0.01		<0.01
None	74.3%		76.7%	
Partial	81.2%		83.7%	
Full	81.0%		81.5%	
Household composition		0.19		0.04
Living with children	77.1%		77.8%	
Not living with children	76.2%		79.3%	
Household type		<0.01		<0.01
Smoker household	34.2%		38.9%	
Not a smoker household	88.5%		89.4%	
SES and demographics				
Smoking status		<0.01		<0.01
A smoker	24.4%		26.8%	
A nonsmoker	85.6%		87.1%	
Age		<0.01		<0.01
Age 18~24	74.7%		73.2%	
Age 25~44	78.8%		77.4%	
Age 45~64	74.4%		77.7%	
Age 65+	78.5%		84.6%	
Missing	50		41	
Marital status		<0.01		<0.01
Married	81.3%		82.2%	
Not married	70.0%		72.6%	
Education		<0.01		<0.01
High school below	60.5%		65.0%	
High school graduates	70.6%		72.8%	
Some college	76.2%		77.3%	
College graduates	85.2%		85.9%	
Missing	221		159	
Race/ethnicity		<0.01		<0.01
Caucasian	77.0%		78.1%	
African American	70.9%		79.2%	
Other races	80.1%		82.1%	
Gender		<0.01		<0.01

	Living in home with 100% smokefree rule		Having a car with 100% smokefree rule	
	N = 15,198		N = 14,026	
	%	P	%	P
Male	74.7%		74.1%	
Female	77.8%		81.2%	
Missing	70		46	
Employment status		<0.01		0.30
Employed	77.8%		78.2%	
Not employed	75.3%		78.9%	

P values from chi-square tests.

The total number of observations for SCS-TC 2001,2002, 20004–2009 is 15,215. Excluding the missing data for home smokefree rule (N = 17) ends in the sample size with 15,198 respondents for the smokefree rule in homes; Excluding the missing data for car smokefree rule (N = 1,189) ends in the sample size with 14,026 respondents for the smokefree rule in cars.

Table 2

Multivariate analysis (bivariate probit model): predictors of living in a smokefree home or having a smokefree car 2001, 2002, 2004–2009 (N = 13,935)

	Smokefree home		Smokefree car	
	Marginal effect (95% CI)	p	Marginal effect (95% CI)	p
100% law coverage				
Partial (ref: no laws)	0.03 (0.00,0.06)	0.04	0.04 (0.01,0.07)	<0.01
Full	0.05 (0.03,0.08)	<0.01	0.04 (0.02,0.07)	<0.01
Household composition				
Living with children	0.04 (0.02,0.06)	<0.01	0.01 (−0.01,0.03)	0.26
Smoker household	−0.37 (−0.41,−0.33)	<0.01	−0.32 (−0.35,−0.28)	<0.01
SES and demographics				
Year	−0.00 (−0.00,−0.00)	0.84	−0.01 (−0.02,−0.01)	<0.01
A smoker	−0.18 (−0.21,−0.14)	<0.01	−0.25 (−0.30,−0.20)	<0.01
Age 18–24	0.04 (0.01,0.07)	<0.01	−0.08 (−0.12,−0.03)	<0.01
Age 25–44	0.04 (0.02,0.06)	<0.01	−0.04 (−0.07,−0.02)	<0.01
Age 45–64 (ref: 65+)	−0.02 (−0.04,0.01)	0.18	−0.04 (−0.07,−0.01)	0.02
Male (ref: female)	−0.03 (−0.05,−0.01)	<0.01	−0.07 (−0.09,−0.05)	<0.01
Married (ref: not married)	0.10 (0.08,0.12)	<0.01	0.09 (0.07,0.10)	<0.01
High school below (ref: high school graduates)	−0.04 (−0.08,0.00)	0.07	−0.01 (−0.04,0.02)	0.34
Some college	0.02 (0.00,0.04)	0.04	0.02 (0.00,0.03)	0.08
College graduates and above	0.05 (0.03,0.07)	<0.01	0.06 (0.04,0.07)	<0.01
Employed (ref: not employed)	0.03 (0.01,0.04)	<0.01	0.00 (−0.01,0.02)	0.75
Caucasians (ref: other races)	−0.02 (−0.04,0.01)	0.29	−0.06 (−0.07,−0.04)	<0.01
African American	−0.10 (−0.15,−0.06)	<0.01	−0.03 (−0.08,0.01)	0.10
RHO (ρ)	0.57 (0.54, 0.61)	<0.01		

Number of Observations = 13,935

Standard errors are robust to heteroskedasticity and clustered in state level.