# Durable Disparity: The Emergence and Entrenchment of the Great American Smoking Gap

by

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## DEDICATION

To Daniel and Steve, who set me on the right course.

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My mentors' and colleagues' wisdom and levity of spirit were the renewable sources of energy that powered me while I completed this project. I promise to pay it forward.

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## ABSTRACT

This dissertation consists of three chapters that investigate how inequalities in health behaviors originate and how they are maintained, using cigarette smoking as a case.

In Chapter II, I examine the associations between parental and adult child smoking and consider how they may be modified by the adult child's socioeconomic attainment and social mobility. Using data collected by the Panel Study of Income Dynamics in 1968, 1986, and 2011, I find that having a smoking parent as a child is associated with a 9 percent to 10 percentage point increase in the probability of smoking as an adult in 1986 and 2011, respectively. However, the parental contribution to an adult child's smoking likelihood decreased to 7 and 5 percentage point and is no longer statistically significant in 2011 after accounting for the adult child's own socioeconomic attainment. Children of 1968 parents (themselves interviewed in 1986) are more likely to reproduce their parents' smoking behavior if they maintain their parents' economic position or are downwardly mobile than if they are upwardly mobile. For children of 1986 parents (interviewed in 2011), adult children who are downwardly mobile with respect to parental education show a larger effect of parental smoking on their own behavior than those who maintain their parents' education or are upwardly mobile.

In Chapter III, I evaluate the contribution of smoke-free laws to the socioeconomic inequality in smoking. Using a state-level dataset constructed from multiple sources, I show that states with lower smoking rates are more likely to adopt smoke-free laws. Lower unemployment rates and higher educational attainment in a state are positively associated with smoke-free workplace and bar laws, respectively. I then use a person-level survey dataset, the Behavioral Risk Factor Surveillance Survey, to estimate the effect of the laws' implementation on individuals' probability of smoking. Smoke-free laws are associated with a decline in smoking among women. The decline is concentrated among women who have high school diplomas or are college graduates. Taken together, the results suggest that smoke-free laws may contribute to between-state smoking inequalities and that they may contribute to gender disparities.

In Chapter IV, I examine the associations between tobacco control policy change and smoking cessation and smoking intensity of older adults, and how they vary by education and race. I use geocoded longitudinal data from the 1992 to 2014 waves of the Health and Retirement Study including smokers 51 and older to assess the relationship between the implementation of 100 percent smoke-free nonhospitality and hospitality workplace laws at local and state levels, average cigarette pack price at the state level, and the likelihood of an individual's smoking cessation or change in the number of cigarettes smoked daily. The implementation of a non-hospitality workplace law was associated with an increased likelihood of cessation among men, but not among women. Implementation of restaurant and bar smoke-free laws was not associated with increased cessation or lowered intensity. White men, nonwhite women,

and high school graduates decreased their smoking intensity in response to cigarette price change more than others. These results suggest that the sensitivity of older U.S. adults to changes in smoke-free laws and cigarette prices is limited. I close the dissertation by discussing promising future research direction on health behavior disparities and smoking

# CHAPTER I

## Introduction

Population health disparities along socioeconomic lines are larger in the United States than in almost every other wealthy country (Hero, Zaslavsky and Blendon 2017). Americans with below average income, education, and in unskilled occupations live shorter lives than the rest, and tend to experience more pain and disease along the way (Poleshuck and Green 2008). Today the question of how disparities originate is the subject of a large literature, but the intensive research focus is a recent development. The 1980's and 1990's saw the publication of fewer than 30 scientific articles concerned with the topic. Health disparity research proliferated in the first two decades of the twenty first century, and divergent, and at times conflicting, conceptual frameworks from a variety of disciplines came along with it (Adler and Rehkopf 2008). In spite of their many divergences, these conceptual frameworks usually agree on one key point: inequality in health behaviors is central to both creating and maintaining health disparities.

The most frequently examined negative health behaviors; smoking, alcohol use, sedentary lifestyle, and excessive eating, dramatically increase the probabilities of developing a wide range of diseases, including various cancer, cardiovascular conditions, and others. Health behavior research concerned with the formation of

disparities centers on two processes: initiation, or who acquires the habit in question and when they do so, and cessation, or who succeeds in quitting and when they do so. The distribution of the joint probabilities of initiation and cessation determines the extent of health behavior-related disparities found in a population. In the pattern most commonly found in the United States we observe disadvantaged youths initiating into a negative health behavior sooner and at greater rates, and then quitting later and at lower rates, leading to a gradually magnifying differences in health by socioeconomic status over the life course. Unequally distributed health behaviors account for about a quarter of socioeconomic disparities in life expectancy in the United States (Pampel, Krueger and Denney 2010).

Negative health behaviors have captured scholars' attention not only because of their large death toll, but also because of their preventability. To a naïve observer there appears to be no reason for smoking or drinking to an excess when the associated risks are well-known. Yet, many do. Explanations for why some and not others engage in these risky behaviors have centered on two larger groups of factors: individual and structural determinants. While sociologists have preferred structural explanations that investigate the upstream origins of health disparities, such as unequal distribution of socioeconomic resources, public health scholars have directed their attention to the more immediate individual-level causes of the behavior, such as a tendency toward future discounting, and individual preference for risk more generally. The split focus of the two research communities originates in their divergent epistemological aims. Sociological studies of health behaviors have been guided by an interest in contributing to a general theoretical explanation of health. Public health scholars, on the other hand,

have focused on the more proximal causes at the individual level because their ultimate goal is to construct a body of knowledge that would enable society to develop evidence-based policies and interventions.

My dissertation draws on conceptual frameworks originating in both disciplines. I argue that the scholarships developed in each field are complementary to the other, and illuminate different parts of the pathway that connects socioeconomic inequality between social groups to the uneven distribution of salient risk factors at the individual level. A complete understanding depends on a firm grasp on both parts of the link. I present a study of the socioeconomic distribution of smoking, the largest preventable cause of death in the United States today. In three chapters, I investigate three processes essential to the formation and persistence of the socioeconomic smoking disparity: (1) uptake, and its relationship to intergenerational inequality in social class, (2) persistence, and how it may vary under different regimes of tobacco control, and (3) socioeconomic variation in cessation among those who have maintained the practice until old age.  Taken together, the chapters of this dissertation paint a complex picture of the relationship between individual risk factors and structural social mechanisms and how they have held back the efforts to eliminate smoking.

*US Smoking as a Case*

Nearly half a million of Americans die due to smoking-related causes each year (CDC 2016a). A smoker's lifespan is on average 10 years shorter than that of a non-smoker, and is more often punctuated by disease (Jha et al. 2013b). Americans know about the serious health consequences of cigarette use; a recent national survey showed that

97% of the population agreed with the statement that smoking poses a threat to health (Gallup 2014). Despite such widespread awareness, in 2016, approximately 16% of the U.S. adult population smoked cigarettes, and among smokers, the majority smoked daily (USHHS 2017). Nearly half of all smokers try to quit every year. However, the highly addictive nature of cigarettes keeps most from succeeding (USHHS 2014).

American men first started smoking cigarettes in the second half of the nineteenth century. A product initially popular only among a small group of users, the cigarette began to be aggressively marketed by tobacco product manufacturers after the invention of the mechanical rolling machine in 1880, an apparatus that drastically lowered assembly costs. The affordability of the cigarette led to a surge in sales and simultaneously elicited opposition from public health activists and temperance proponents who already suspected that smoking had negative health effects (Kluger 1996:37-41). In 1893, the state of Washington abolished the sale of cigarettes, and by the early 1900s, fourteen other American states had followed Washington's lead. Cigarettes were unpopular among federal lawmakers too. In 1908, sale to minors under sixteen was banned throughout the United States. However, despite vocal anti-cigarette social activism, the product continued to grow in popularity and its commercial profits soon overtook those of the cigar. In the second decade of the twentieth century, the cigarette entered mainstream society, and most laws restricting its distribution to adults were repealed (Brandt 2007:19-43).

Nicotine tightened its grip on Americans at several historic points in the first half of the twentieth century. In the First World War, for the first time, servicemen received cigarettes with their rations, and these veterans became the first generation to report high levels of addiction to tobacco. When the Great Depression struck, some tobacco smokers turned to roll-your-own cigarettes, and the sales of the manufactured product declined. Nevertheless, these product switches were temporary, and the tobacco industry suffered only a small setback during this economically troubled period (USHHS 1986). Cigarettes continued to grow in popularity during the Second World War. Their shipment to soldiers overseas was promoted as an act of gratitude and humanitarianism (Kennett 1987). In just a few decades, cigarettes had come to be viewed as a personal necessity and enjoyed a ubiquitous public presence. Tobacco companies competed to differentiate their rather similar cigarettes as being “the mildest,” “the richest,” or “the freshest,” and various marketing tools were adopted that portrayed the image of smokers loyal to a particular brand (Kluger 1996:72-73). Cigarettes’ popularity peaked in the early 1950s, when more than 55% of American men smoked (USHHS 2014). Cigarette smoking diffused more slowly among women. Although the use of tobacco by women was not unheard of before the twentieth century, users preferred snuff or pipes, which could be more easily concealed (Amos and Haglund 2000). Early cigarette smoking among women faced even greater public opposition than did smoking among men. In New York City, women could be arrested for smoking (Brandt 2007:57). Cigarette smoking began making headway among women in the 1920s when tobacco companies first started openly advertising to women. The US Department of Health and Human Services estimated that the rate of smoking by women increased from six to

16% in just five years between 1924 and 1929 (USHHS 2001). A turning point for women's smoking arrived thanks to a marketing ploy orchestrated by the American Tobacco Company in 1929, when young women were hired to smoke cigarettes during the annual Easter Sunday Parade in New York City. In its press release, the American Tobacco Company referred to cigarettes as "torches of freedom"— equating smoking with women's fight for equal rights (Amos and Haglund 2000). In the decades that followed, the advertising pitch that framed smoking as a matter of equal rights became an advertising standby for the tobacco industry. Cigarette smoking reached its peak at slightly less than 40% of the female population in the 1960s and their smoking rates never surpassed those of men (USHHS 2001).

In 1964, Surgeon General Luther Terry released his report on the connection between smoking and a variety of diseases, including lung cancer (USHHS 1964). Smoking rates began to decline shortly before the release of the report, though primarily among the more educated. In 1966, the federal government mandated warning labels on cigarette packaging. In the 1970s, fewer than 30% of college-educated people smoked, but the smoking rate among those with less than a high school degree did not drop below 50% until the late 1980s (Pampel 2009). Since the 1990s, American smoking rates have dropped below those in most Western European countries. But, in spite of continuing public health efforts, the inequality in smoking with respect to education level has changed very little in recent decades, declining by only four percentage points between 1998 and 2005. In addition, compelling evidence suggests that the small measured decrease in smoking disparity can be explained by the influx of foreign-born Hispanics

with less than high school education who tend not to be smokers, rather than real decline in smoking rates among native-born low SES Americans (Pampel 2009)

*Today's Socioeconomic Smoking Disparities*

Smoking continues to be highly socioeconomically stratified behavior to the present day. Not every American is equally likely to become a smoker, or to smoke long enough to experience its harmful health effects. Smoking disproportionately burdens people with the fewest resources. In 2015, 34% of adults with only a general educational development (GED) diploma smoked, while only 7% of college graduates did. Those with the least disposable income are most likely to smoke; 26% of Americans living below the poverty line smoke, compared to 14% of those at or above the poverty line (CDC 2016a).

The dominant sociological framework for explaining health disparities has been the Fundamental Cause hypothesis (Link and Phelan 1995). This theory argues that socioeconomic health disparities are a manifest consequence of inequalities in flexible resources. Such flexible resources include income or knowledge, both of which are generally more available to those with higher socioeconomic status and can be used to protect or enhance health. As long as resource inequality persists, health disparities will remain. Thus, while the nature of the behavior or condition that mediates the relationship between social inequality and heath disparity is changeable, the connection between the two is durable. The Fundamental Cause hypothesis has informed the conceptual models of sociologists studying the unequal distribution of smoking.

Consistent with the theory, researchers working in this area have attributed the rise in smoking inequality to the ability of more educated Americans to draw on their education (knowledge resources) and to quit smoking when the smoking-related health risks became widely publicized. In several studies, Pampel offered descriptive evidence of tobacco-use inequality and smoking's decline in the second half of the twentieth century. He used cross-sectional National Health Interview Survey (NHIS) data to show that there was less SES inequality in smoking in the 1960s, and documented the expansion of the SES smoking gap over the course of the second half of the twentieth century (2005, 2009). Maralani elaborated on Pampel's work to show that, in the later part of the twentieth century, the progressively expanding the socioeconomic inequality in smoking initiation was the main driver of this trend (2013).

Unlike sociologists, public health scholars typically have not theorized about the rise in the smoking disparity at the population level, but have instead focused on cataloging specific individual or environmental characteristics that might put one at a risk of becoming and remaining a smoker. These characteristics have been usually referred to as smoking risk factors. The focal group in the public health smoking initiation literature has been adolescents; 90% of all adult smokers developed their addiction in their teens (CDC 2014a). The explanation for the enduring smoking inequalities that these researchers implicitly endorse is that low SES children and adolescents are subjected to a greater number of risk factors known to be associated with becoming a smoker, and are thus more likely to succumb to its allure. These influences range from the biological, e.g., nicotine exposure in utero (Buka, Shenassa and Niaura 2003), to the social and

environmental, e.g. peer and parental effects (Bauman and Ennett 1994), and the high concentration of tobacco distributors in low SES residential neighborhoods (Novak et al. 2006).

Public health scholars have also examined the correlations between making an attempt to quit smoking and successful cessation by people in all age groups. They have found that low SES smokers are just as likely to try to quit smoking, or nearly so, as are high SES smokers. But low SES smokers succeed much less often (Hiscock et al. 2012), due to the unequal distribution of barriers to cessation. Unequally distributed cessation barriers include lesser social supports for quitting (Lindström et al. 2000), low internal motivation, present as opposed to future orientation (Williams et al. 2002), strength of addiction (Baker et al. 2007), more stressful life (Tsourtos and O'Dwyer 2008), and targeted tobacco industry marketing (Balbach, Herzberg and Barbeau 2006). An increasingly popular tool for quitting is pharmacological therapy that helps some aspiring quitters to overcome nicotine addiction (Stead et al. 2012). However, acquiring a prescription and buying medication may be prohibitively expensive for smokers with the fewest financial resources (Bonevski, Bryant and Paul 2011). In addition, intervention studies have demonstrated that low SES smokers have a more difficult time adhering to treatment regimens (Shiffman et al. 2008)—a finding that aligns with the broader literature on socioeconomic status and medication adherence (Vermeire et al. 2001).

*Contribution*

My dissertation aims to make both a conceptual contribution to our understanding of health behavior disparities broadly, and to the empirical literature on disparities in smoking specifically. I answer three research questions, each of which weighs in on the individual risk factors and social structure interaction from a different perspective. First, does smoking transmit between parents and adult children, and is the likelihood of transmission modified by their respective social classes? Second, have smoke-free laws contributed to or ameliorated the inequality in smoking? Third, what is the relationship between tobacco policy change, smoke-free laws and increase in cigarette price and smoking cessation and intensity among older adults? Taken together, these chapters provide new evidence of the interactions between mechanisms of social stratification and the efforts to eliminate smoking in the US society. I conclude the dissertation by discussing future research directions.

# CHAPTER II

## Intergenerational Transmission of Social Class and Smoking

### INTRODUCTION

Two main explanations exist for why children inherit the health behaviors of their parents. The first centers on what parents do, the second on who they are. The first explanation views parental health behaviors as potential risk factors that may socialize children into harmful practices and whose models they carry with them into adulthood. The second explanation ascribes the behavioral similarity between parents and children to similarity in their social class, of which health behaviors are but one element. Children of parents who engage in harmful health behaviors thus come to practice the same health behaviors in adulthood because they and their parents more often than not share the same class norms (Pampel, Krueger and Denney 2010).

Although both transmission mechanisms translate to the same individual outcome, that is, family resemblance in health behaviors, they imply different stratification dynamics at the population level and require different intervention strategies. If the first mechanism dominates, all children, regardless of class origin or future social class destination, are at an increased risk of a specific negative health behavior in adulthood if it is modeled to

them in childhood. Disrupting this mechanism requires intervening by helping parents change that behavior or establish strong rules about the health behavior in the presence of children. If the second mechanism dominates, children whose destination class does not condone the heath behavior in question will not be at an increased risk, even if the behavior is modeled to them in their childhood home. On the other hand, children whose destination class behavioral norms match the modeling they are exposed to in the home will experience increased risk. Because in the United States, as in most other wealthy democracies, one's destination class is strongly influenced by one's class of origin, the observed behavioral transmission would be a consequence of class transmission in the second case. Disrupting the mechanism would require broad social reforms equalizing access to educational resources and employment opportunities and generally severing the link between parental and child socioeconomic attainment.

Unfortunately, any attempt to untangle the effects of early life socialization from the more general social class transmission process brings vexing analytic challenges. If the observed outcome is equivalent, how can we isolate the two mechanisms? The majority of research on health behavior transmission does not take into account the child's own social class, primarily because it concerns itself with adolescents, who are yet to establish themselves economically and whose health behaviors are not yet settled. Related work in the Long Arm of Childhood literature has confronted a similar set of issues in estimating the extent to which childhood circumstances influence health outcomes in adulthood by constructing regression models that simultaneously control for adult socioeconomic status (SES), adult health behaviors, and childhood SES,

interpreting the parameters estimated for childhood circumstances as an independent effect on adult health outcomes (Hayward and Gorman 2004). However, in the likely scenario that the two SES variables are highly correlated, entering them into a regression model simultaneously will result in multicollinearity, leading to inaccurate parameter estimates, especially in small samples. A rigorous analytic method, implemented in long-run datasets that prospectively collect information on parents as well as children, is required to tease them apart.

This study investigates the transmission of a negative health behavior within families, specifically smoking, and how it is related to the transmission of social class in the United States. Smoking presents an ideal case for this investigation because it is a highly socially stratified health behavior and past research has shown clear associations between parents' and children's smoking. I improve upon prior work by implementing a novel analytic technique, coarsened exact matching, and contrast smoking outcomes of adults who were children in smoking families to otherwise similar adults who were not; I then examine whether the likelihood of transmission varies by the child's own socioeconomic attainment in relation to the parents'. I consider three research questions: First, Is smoking among parents associated with smoking among adult children between 1968 and 2011? Have smoking parents with low and high economic resources transmitted smoking to their children at similar rates? Finally, does the smoking behavior of upwardly or downwardly mobile children resemble that of their parents or is it more closely aligned with the children's own adult economic position? My results support a modest independent association between smoking in the family and

one's own smoking in adulthood, especially in the older generation studied here. I uncover that smoking has become increasingly tied to downward mobility and that it is not usually transmitted from smoking parents to adult children who are upwardly mobile with respect to their class of origin.

## BACKGROUND

Smoking is the largest preventable cause of death in the United States, killing nearly half a million Americans every year (CDC 2014b). Most of these deaths are caused by smoking-induced cardiovascular disease, and smaller but still significant numbers die due to cancer of the lung and other parts of the body. Smokers lose on average 10 years of life due to smoking and enjoy fewer disability-free years (Jha et al. 2013b). More than 16 million Americans live with a smoking-related disease (USHHS 2014). Despite its risks, smoking is not uncommon. In 2016, 36.5 million adults, or 15.8 percent of them, smoked cigarettes (USHHS 2017). The toll of smoking does not fall on all Americans equally; it is highly stratified by socioeconomic status. Thirty-four percent of adults with only a general educational development (GED) diploma smoke, while 7 percent of college graduates do. Those with the least disposable income are most likely to smoke; 26.1 percent of Americans living below the poverty line smoked in 2015, compared to 13.9 percent of those at or above the poverty line (CDC 2016a).

People who grow up in families that include a smoker are more likely to smoke themselves (USHHS 2012). A comprehensive meta-analysis of 58 studies on smoking transmission within families shows that the odds of a child's smoking initiation is 1.7 times greater in families in which at least one parent smokes and 2.7 times greater if both parents smoke (Leonardi-Bee, Jere and Britton 2011). Part of this association is

thought to be physiological. Children of mothers who smoke during pregnancy may become more susceptible to nicotine and initiate smoking at a younger age (Buka, Shenassa and Niaura 2003, Weden and Miles 2012). After initiation, these children also report a greater degree of nicotine dependency than children of nonsmoking mothers (O'Callaghan et al. 2009). Genetic makeup has also been associated with initiation (Kim 2009). Children who share their parents' smoking-relevant genotype and smoke before the age of 16 are more likely to become lifelong smokers than other experimenters who do not (Schnoll, Johnson and Lerman 2007). On the environmental side, a smoking parent exposes a child to secondhand smoke, which might establish a taste for tobacco and nicotine (Wang, Ho and Lam 2011). A recent study of children born in the United Kingdom, the Millennium Cohort Study, reports that smoking initiation of disadvantaged children can be largely explained by their greater exposure to adult smokers; the study argues that protecting disadvantaged children from adult smoking modeling in the environment reduces inequality in smoking initiation among young children by more than half (Taylor-Robinson et al. 2017).

Parents are children's primary socializers and social learning theory suggests that parents will socialize their offspring into health behaviors whether or not they intend to do so (Bandura 1978). Children as young as four imitate their parents' smoking in play (de Leeuw, Engels and Scholte 2010) and readily recognize cigarette advertising after the age of six (Henke 1995). When cigarette advertising is child-oriented, such as the infamous Camel Joe advertisements, children come to associate it with cigarettes at even younger ages (Fischer et al. 1991). This smoking socialization that is likely to happen within a smoking home has two core components: smoking skill acquisition and

positive smoking attitude development (Henriksen and Jackson 1998). Smoking skill acquisition means that children of smokers have more opportunities to observe the "right way" to smoke, learn to discern when smoking is desirable, such as after meals or with alcohol, and even learn how to light a cigarette. In addition they have more opportunities to practice the skills they are observing in their parents. Because cigarettes are more likely to be readily available in a smoking home, a child faces fewer practical obstacles to experimentation and initiation in households with a smoking adult (Conrad, Flay and Hill 1992).

Today's children are on the receiving end of frequent anti-smoking messages from the media, schools, and the majority from their parents too. Most parents, even if they are smokers themselves, do not encourage their child to smoke and do not willingly impart positive attitudes toward smoking. However, children who live in smoking homes are less likely to be given anti-smoking messaging from their parents than children who do not (Henriksen and Jackson 1998, Otten, Engels and Van Den Eijnden 2008). Even when smoker parents do convey anti-smoking messages and set anti-smoking rules in the home, they may have difficulty enforcing them when their children perceive conflict between their modeling and their authority (Jackson and Henriksen 1997). In short, a complex set of both physiological and socialization mechanisms is thought to contribute to the intergenerational continuity of smoking within families.

Sociologists recognize the importance of socialization, but also believe that practices, attitudes, and property transfer between parents and children in bundles. The transmission of one type of resource is not likely to be independent of the transmission of another. I anticipate the intergenerational transmission of smoking to be correlated

with the transmission unfolding in other domains, most notably social class. In his foundational work *Distinction*, Bourdieu (1984) argues that parents engage in both intentional and unintentional cultivation of their offspring in a way that preserves their class standing across generations. He identifies three forms of capital transmitted in the class transmission process: economic, social, and cultural. Economic capital constitutes the direct financial resources that can be transferred from a parent to a child, such as income or assets. Social capital represents advantageous ties to both individuals and institutions. Cultural capital encompasses cultivated skills and education—namely, the tools that one needs to navigate one's class location. Cultural capital is further divided into three forms: embodied, which refers to ways of thinking, self-presentation, and interacting with the world; objectified, which constitutes high culture objects, such as sculptures or paintings that we own; and institutionalized, that is, our academic degrees or professional qualifications (1973:57-59). A favorable or unfavorable attitude toward smoking and other health behaviors is a component of cultural capital and, via the practice of smoking, the attitude becomes embodied.

Bourdieu's emphasis on structural stability, with limited room for agentic change, has come under some criticism, but the concept of cultural capital, especially of the embodied kind, has been embraced by medical sociologists working on disparities in health behaviors (Frohlich, Corin and Potvin 2001, Williams 2003). Cockerham's neostructural health lifestyle theory (2005) marries Bourdieu's insights on the multifaceted nature of cultural capital with Weber's understanding of life choices and life chances. He defines health lifestyles as "collective patterns of health-related behavior based on choices from options available to people according to their life chances

(2006).” In Weber’s framework life choices are actions taken from our own volition informed by our personal attitudes and beliefs, for example experiments with cigarettes, while life chances, such as class circumstances, are elements of social structure we control to only a limit extent. The two in concert determine whether an experimenter goes on to become an established smoker. Health lifestyles theory leaves room for individual agency with respect to adopting and persisting in health behaviors, but it also stresses that, as Bourdieu shows, individuals seek consistency within the various components of their habitus. One is not likely to have very high levels of economic capital and adopt health behaviors that are associated with low economic standing. Because health behaviors are expressions of cultural capital, they are best understood not in isolation, but in relation to other practices, as consistent lifestyles. Our lifestyles signal as well as construct inequalities between groups. Smoking, for example, is today perceived as an indicator of social disadvantage, while it simultaneously perpetuates and solidifies the very thing it is assumed to indicate. Smoking imparts health penalties on smokers, disadvantaging them in their pursuit of economic capital, and carries stigma, complicating their pursuit of beneficial social connections.

Cockerham identifies class circumstances as the first structural determinant of health behaviors (2005). However, he does not explicitly theorize how we come to acquire them. A reader might deduce that Cockerham, like Bourdieu, presumes the durability of class. In the United States, the expectation of class durability aligns well with empirical evidence. The documented elasticity of fathers’ and sons’ income falls between 0.4 to 0.6 (Corak 2006); a 100 percent difference in income between two fathers is expected

to translate to a 40 percent to 60 percent income difference between their two sons. High income is especially sticky. Twenty-six percent of sons born to fathers in the top 10 percent of the income distribution remain there, while more than 50 percent stay in the top 30 percent (Corak 2016). The same holds for education. Hertz and colleagues (2008) report an average correlation of 0.5 between a child's years of education and his or her parents' mean years of education among cohorts born between 1930 and 1985. The occupational status of children often resembles that of their parents (Blau and Duncan 1967). In recent decades, the correlation between white fathers' and their sons' occupational status has ranged between 0.3 and 0.5, though it is weaker among black men (Hauser et al. 2000).

If class typically transmits between generations, smoking is highly socially stratified, and we tend to adopt practices consistent with our class status, what role is left for an independent effect of parental socialization? The stability of class between generations poses an analytic challenge for the socialization mechanism of intergenerational transmission. Studies in this vein that do not consider the underlying dynamics of class transmission overestimate the effect of parental socialization on the transmission of health behaviors. When a child of less educated parents completes only minimal schooling herself and later becomes an established smoker, what amount of responsibility for her smoking falls on the smoking behavior of her parents? In contrast, when highly educated parents who do not smoke raise a highly educated daughter who does not smoke, how much of the credit can they claim for their positive influence in the realm of health behaviors? Separating the bundle of economic and cultural capital

flowing from parents to children into their individual elements is analytically challenging. In circumstances when parental and child class are as correlated as they are in the United States, merely introducing variables into regression models in an effort to control for the effects of parental and child class will not be sufficient and will yield inaccurate estimates due to collinearity.

Because we cannot control away the correlation between parental and child class, our next best option is to break it. We can do so by focusing on the smoking patterns observed among children who venture farther away from the tree and achieve higher than lower socioeconomic status than their parents. Though class is generally linked across generations, many adults experience upward or downward mobility. When we contrast smoking outcomes of otherwise similar adult children who do and do not experience social mobility with respect to their parents' class, we begin to glean the separate contributions of the child's destination class and their childhood socialization. If, for example, we find that the parental and child smoking association persists regardless of the child's destination class, we have found evidence of an independent contribution of parental socialization into smoking to one's adult smoking outcomes. If, on the other hand, we find that such an association persists only if the child stays or transitions to a destination class where smoking is pervasive, we may begin to question such an independent contribution of parental socialization. Contrasting two cohorts of adult children who came of age during times of dramatically different extent of smoking's socioeconomic stratification, one born in or before 1968 and the other born in or before 1986, this study asks: Is smoking by parents associated with smoking among

their children, net of their demographic characteristics? Do parents across social classes transmit smoking to their children at similar rates? Do socially mobile adult children reproduce smoking at similar rates as adult children who do not experience social mobility?

In alignment with the robust literature on the intergenerational continuity of smoking, I hypothesize a positive association between parental smoking and the adult child's own smoking. As the prevalence of smoking declined over the course of the second half of the 20th century, I anticipate a stronger association between parental and child smoking in the 1968 generation than in the 1986 generation. For my second research question, I hypothesize that rates of transmission vary by parental social class. Smoking parents of low economic status are more likely to transmit smoking to their children. In contrast, the less common economically advantaged smoking parents are less likely to transmit smoking to their offspring. I anticipate the differential rates of transmission because more advantaged children may be buffered from transmission by other anti-smoking influences in their environment. Finally, I hypothesize that adult children who are mobile with respect to their parents' economic status experience different rates of transmission than children whose adult socioeconomic attainment matches that of their parents and that their own smoking status is more likely to resemble their destination than their origin class. For children who are upwardly mobile, I anticipate lower rates of transmission because of the protective effects of their destination class. For children who are downwardly mobile, I anticipate greater rates of transmission, especially among

those who descend from a high economic status childhood family to low economic status adulthood.

## DATA AND METHODS

I use data from the Panel Study of Income Dynamics (PSID), an ongoing longitudinal survey that began tracking the lives of a nationally representative sample of 4,800 American families in 1968, originally annually and starting in 1997 biennially. Over time, the PSID has collected data on topics ranging from employment and wealth to expenditures, philanthropy, and health. The PSID, by design, has attempted to follow all members and descendants of the original sample, even as they separated from the original household whether due to marital dissolution or adult children forming new households. Its unique structure makes the PSID the most frequently used dataset for intergenerational analysis in the United States (Hill 1992, Sharkey 2008). In addition to a broad array of socioeconomic measures for individual respondents and their families, the PSID has recorded smoking and smoking histories at several time points, first in 1968, then in 1986, and then again in 1999, when the survey started asking about smoking regularly. The PSID thus offers an ideal opportunity to examine the connections between the smoking practices of parents and those of children as they grow older.

### *Analytic Sample*

This study uses two analytic samples. I construct the first by identifying all households with children under the age of 18 in the original 1968 sample (N=2,622). I then match

the 1968 households to the 1986 data and locate all children of the 1968 households who have since established their own households and are between the ages 25 and 35 at the time of their 1986 interview (N = 2,570). The age range is restricted to ensure that respondents have aged into their adult smoking status and likely into their educational attainment as well. I exclude all observations that are not in the labor force, and therefore of unclear occupational status (N = 530), and those who are missing other relevant data during either the 1968 or the 1986 interview (N = 113). The size of the first analytic sample is 1,927.

I construct the second analytic sample by identifying all households with children under the age of 18 during the 1986 interview (N= 2,232). I then match the 1986 households to the 2011 data and locate all children of the 1986 households who have since established their own households and are between the ages of 25 and 35 at the time of their 2011 interview (N =1,645). I exclude all observations that are not in the labor force, and thus of unclear occupational status, typically students, homemakers, or people too sick to work (N = 180). All observations that are missing relevant data during either the 1986 or 2011 interview are also excluded from the analysis (N = 81). The size of the second analytic sample is 1,384.

**Measurement**

*Smoking*

I construct two sets of smoking measures: one at the household level, used as a treatment in the analysis, and the second at an individual level, used as an outcome

variable. The PSID questions asking about smoking among respondents have evolved over time. In 1968, smoking was measured at the family level with the question: “Do any of you smoke?” Fifty-five percent of the sample answered in the affirmative. In 1986, smoking was measured at the individual level. The respondent was asked separately about his and his partner’s smoking. For his own smoking, the question was phrased as: “Do you smoke cigarettes?” Thirty-five percent said they did. For the partner, the question was posed as: “Does she smoke cigarettes?” Of those who had a partner, 25 percent said she smoked. Because the responding adult could have been either a spouse of the 1968 household child or the 1968 household child himself or herself, I use these two variables in combination with the 1968 lineage indicator to designate the descendant as a smoker or nonsmoker. For cohabiting couples, I then combine the information from both partners (one descendant and one new sample member) to designate the entire household as smoking, with at least one smoker, or nonsmoking, with neither adult smoking.

In 2011, respondents were asked about their and their partners’ smoking analogously and I designate the 1986 household child descendent as a smoker or nonsmoker in the same manner. Twenty-two percent of the respondents reported smoking, and 14 percent had a partner who did.

*Social Class Position*

I measure social position with respect to three indicators: household income, education, and occupational group. In all years, family income is calculated by summing total

taxable family income with any additional transfers other than food stamps. Each family is then assigned to an income tertile based on how its income compared to the US family income distribution for that specific year.

I construct two variables for educational attainment; one for individuals and one for the highest educational attainment within each household. In each year, the survey asked: How many grades of school did you finish?" and a similar question was asked for the partner. I use the number of years reported to assign each person into the less than high school, high school graduate, or college graduate category. I then compare educational attainments within the household and assign the household the highest educational category between the two household members.

All labor force-active respondents were asked about their occupation, and the PSID survey team coded their open-ended responses into three-digit 1970 and 2000 US Census codes. I use the Census codes to determine whether a respondent has an unskilled job, skilled job, or is in a managerial or professional position. Similar to education variables, I construct occupational indicator variables separately for both parents, when both are resident, and then determine the highest occupational level within each household. When only one member of the household is active in the labor force, his or her occupation is designated as the highest by default.

*Other Variables*

I use additional survey questions to construct variables that may explain the association between socioeconomic position and smoking. These include: gender (male or not), continuous age, marital status (married or not), and race (white or not). Individual variables are measured at 1986 and 2011 only; household level variables are measured at all three time points.

**Methods**

Two analytic strategies are used in this study: coarsened exact matching (CEM) and regression modeling. Matching is a popular non-parametric strategy useful for controlling the confounding effects of pre-treatment differences in the treated and non-treated group. The overall goal is to identify only those observations in the two groups that are alike on observable characteristics, thereby lessening the threat of selection bias, and then estimate the treatment effect based only on these observations. Once the matched samples are identified, there is no need to introduce additional controls in the regression model. The simple difference between the groups is assumed to be due to the treatment's effect. Although an increasingly popular strategy, matching has been criticized for increasing bias and model dependence because, in observationally collected datasets, matching one variable frequently means we cannot adequately match on another; thus, the two samples may be biased in the resulting solution with respect to other characteristics (King and Nielsen 2016)

To avoid difficulties in balancing covariates, Iacus and colleagues (2012) propose a new class of matching method, monotonic imbalance bounding, that gives the analyst

greater control over the matching process and leaves the acceptable degree of imbalance up to her discretion. CEM allows the analyst to determine just how imprecise (or coarse) each variable can be with respect to the value reported by the prospective match, that is, what values of continuous measures are close enough to fall in the same matching bin. In this sense, CEM requires the analyst to draw on her substantive knowledge of the hypothesized associations when making coarsening decisions.

The CEM analysis begins the matching process by determining which continuous variables are suitable for being coarsened, and which will be left in their original form. In this case, the only coarsened variable is age. After coarsening age into two categories (i.e., 25–30, 31–35), I apply the CEM algorithm to identify the matched units. I define the treated group comprises children who had at least one parent reporting smoking and the untreated are the children of the same age without a smoking parent in the household. To each matched unit, the matching algorithm assigns a weight; unmatched units are weighted as zero. After processing data by CEM, I estimate the treatment effect of parents' smoking on an adult child's own smoking using a logistic regression model that predicts child smoking by parental smoking with a control for non-coarsened age. All analyses are performed in Stata 14, and CEM is implemented using the Stata user-written package -cem- (Iacus, King and Porro 2009).

## RESULTS

Table 1 shows the sociodemographic characteristics of the original parent sample, measured in 1968, the first adult child cohort, measured in 1986, and the second adult

child cohort, measured in 2011. In 1968, the characteristics are stratified by family smoking status. In 1986 and 2011, they are stratified by the adult child's smoking status.

[Table 1 about here]

Sixty-five percent of the original parent sample includes a smoker in 1968. Those that did had a lower average educational attainment and lower likelihood of having at least one of the parents holding a managerial or professional occupation. There are no apparent differences in household income or race of smoking and nonsmoking families in the original parent sample.

In first adult child cohort, in 1986, 31 percent smoke and the socioeconomic differences between smokers and nonsmokers are greater than in 1968. Non-smokers are under-represented in all bottom socioeconomic attainment categories. Thirty-three percent of smokers are in the first income tertile, in comparison to 21 percent of nonsmokers, 24 percent have less than a high school education, in comparison to 6 percent of nonsmokers, and 19 percent work in manual/unskilled professions, in comparison to 14 percent nonsmokers. Smokers are more likely to be men, 57 percent. Importantly, 74 percent of the 1986 smokers come from a family with a 1968 smoker, while only 60 percent of the nonsmokers do.

The observed economic gradient in smoking further crystallizes over time. In 2011, 21 percent of the second adult child cohort smoke. Of the smokers, nearly half, 47 percent, are in the bottom tertile of the income distribution, 22 percent have less than a high school degree, and 31 percent work as manual/unskilled laborers. Their socioeconomic

status strongly contrasts to that of nonsmokers. Only 3 percent of nonsmokers have less than a high school diploma, 27 are in the bottom group of the income distribution, and 18 percent work in unskilled occupations. Smokers continue to be predominantly men. Fifty-four percent of 2011 smokers come from a 1986 household with a smoker, while only 39 percent of nonsmokers do.

Figure 1 shows the intergenerational smoking transmission path starting with the households that include a smoker in 1968. In 1986, 36 percent of the children raised in the 1968 smoking households are smokers. In 2011, 30 percent of the children who were in the 1986 smoking households smoked themselves. This pattern sharply contrasts with smoking adoption in the group that grew up in a nonsmoking household, in which, in 2011, only 18 percent smoked.

[Figure 1 about here]

Table 2 shows results from logistic regression models that predict smoking in the original 1968 parent sample, the first adult child cohort, and the second adult child cohort family and individual sociodemographic characteristics. The goal of this set of models is to identify any differences in associations between sociodemographic characteristics and smoking in the different cohorts. All coefficients have been transformed into odds ratios. For 1968, the model predicts smoking in the household, whereas in subsequent years, the models predict the adult child's own smoking.

In 1968, families in which at least one of the parents is a college graduate are less likely to include a smoker than families in which neither parent graduated from high school

(OR: 0.4). In contrast to subsequent years, higher household income is marginally statistically significantly associated with a smoker in the household.

[Table 2 about here]

For both adult child cohorts, I present results from two models; the first predicts smoking by the adult child's sociodemographic characteristics only and the second adds an indicator for whether or not an individual comes from a smoking family. In both sets, the same sociodemographic characteristics predict smoking regardless of the inclusion of the indicator for smoking in the family of origin.

In the first adult child cohort, respondents with less than a high school degree are significantly more likely to smoke than those who graduated from high school or college. Respondents in both the middle and top income tertiles are less likely to smoke than those in the bottom. Net of these sociodemographic characteristics, smoking in one's 1968 family is associated with about 1.7 times greater odds of smoking than those originally from nonsmoking families.

In the second adult child cohort, household income as well as education and occupational status all show an association with smoking. Respondents in the second tertile of the income distribution have about 0.6 times the odds of smoking than respondents with income in the bottom tertile of the income distribution, while those in the top tertile have odds only 0.4 times as high. College graduates are estimated to have between 70 and 60 percent lower odds of smoking than those without a high school degree. However, after adjusting for smoking family origin, high school graduates are no longer statistically significantly less likely to smoke than people

without a high school degree. In both models, respondents in managerial or professional occupations have about half the odds of smoking compared to people in unskilled occupations.

Net of the child's own sociodemographic characteristics, smoking in the 1986 parental household is a significant predictor of smoking even after accounting for other sociodemographic characteristics in the second adult child cohort. In 2011, adult children of smoking parents have 1.5 times greater odds of smoking than those from non-smoking families.

Figure 2 contrasts the percentage of smokers found in the first and second adult child cohort by whether or not they come from a smoking household, unmatched and unadjusted in the first set of columns, then matched on age, gender, and race in the second set of columns, and finally matched on age, gender, race, income, education, and occupational category in the third set of columns. The top panel shows results for adult children of the 1968 households, the bottom for the adult children of the 1986 households.

[Figure 2 about here]

The unmatched results show that, on the whole, in the first adult child cohort, the adult children of smoking parents have a 10 percentage point greater probability of smoking than those of nonsmoking parents. In 2011, in the second adult child cohort, they have a 10 percentage point greater probability of smoking as well. These differences from children of nonsmokers are statistically significant. The effect of parental smoking treatment becomes slightly attenuated once we adjust for demographic characteristics

in the second adult child cohort, now associated with a 9 percentage point increase in smoking, but remains unchanged for the first adult child cohort. Both differences remain statistically significant. Finally, after adjusting for the child's own socioeconomic attainment, the treatment effect of parental smoking drops to a 7 percentage point difference in smoking in the first adult child cohort. The reduction in parental effect is more apparent for the second adult child cohort. After adjusting for the adult child's own socioeconomic characteristics, I find a reduced treatment effect of parental smoking of 5 percentage points, a difference that is no longer statistically significant. This result suggests that the association between parental and child smoking can be partially, but not fully, explained by the adult child's own socioeconomic characteristics.

Table 3 considers whether parental socioeconomic position influences the rate of smoking transmission to the next generation. The table is divided into two parts. The first part shows results for first adult child cohort, while the second shows a parallel set of results for the second adult child cohort. Each period then contains two estimates of average treatment effect (ATE). In the first ATE column, the adult children are matched on their sociodemographic characteristics only. In the second, they are matched on demographic as well as socioeconomic characteristics.

[Table 3 about here]

In the first adult child cohort, parental smoking in the top and bottom tertiles of the income distribution is associated with own smoking, while in the middle income group, parental smoking has no statistically significant effect. After adjusting for the adult child's socioeconomic characteristics, the statistically significant association persists.

I find a positive effect of parents' smoking on smoking among adult children across educational attainment groups. The estimated effect ranges from 7 to 11 percentage points. After adjusting for the adult child's own socioeconomic characteristics, the positive associations between parental and adult child smoking persist for high school and college graduate parents, at 11 percentage points and 13 percentage points, respectively, but parental influence is no longer statically significant for people with less than a high school degree.

I discover evidence of a treatment effect of parental smoking on the child's own smoking among people who originate in families in which at least one parent is a skilled worker or a manager/professional, 15 percentage points and 11 percentage points, respectively. After adjusting for the child's own socioeconomic attainment, the treatment in the manager/professional group is no longer statistically significant, but its size increases among skilled workers to 19 percentage points.

In the second adult child cohort, measured in 2011, most statistically significant associations do not persist after adjustment for the adult child's own socioeconomic status. I find a positive treatment effect of parental smoking on the child's own smoking across income groups of between 7 and 13 percentage points; however, once matched on the child's own socioeconomic attainment, only the association in the lowest income group remains, marginally statistically significant at 10 percentage points. There is a positive treatment effect of parents' smoking on smoking in the high school graduate parent group, 7 percentage points, but similarly to income, this association is only marginally statistically significant after matching children by their socioeconomic attainment, 6 percentage points. Finally, though I observe a positive treatment effect of

parental smoking on the child's own smoking among manual/unskilled workers and managers/professionals, 18 and 10 percentage points, respectively, in both groups the observed effect is only marginally statistically significant after matching children on their own socioeconomic attainment, 13 and 10 percentage points.

To better understand how class mobility might influence the likelihood of transmission, Table 4 present the treatment effects of parental smoking estimated in samples of adult children matched on demographic and economic characteristics and stratified based on their economic mobility pattern. In the first adult child cohort, parental smoking is associated with smoking in adult children who are downwardly mobile with respect to income and occupation. The estimated effect is 17 percentage points for income and 20 percentage points for occupation. In the case of education, parental smoking is associated with smoking among adult children who maintain their parents' level of education. The estimated treatment effect is 14 percentage points. The same association is found in second adult child cohort as well, where I estimated it to be 11 percentage points. In addition, adult children who were downwardly mobile with respect to education experience an estimated treatment effect of 16 percentage points. I observe a marginally statistically significant treatment effect of parental smoking on smoking among children who are not mobile with respect to occupation or who are downwardly mobile, both at 8 percentage points.

[Table 4 about here]

Table 5 presents parental smoking treatment effects further stratified by class of origin to examine whether mobility from different rungs of social class matters for smoking differently. Results are again presented in the 1986 and 2011 columns.

In the first adult child cohort, downwardly mobile adult children of smoking parents who descended from the second to the bottom income tertile show a large treatment effect of parents' smoking, 21 percentage points. Smoking in a 1968 college-educated family is positively associated with smoking in the adult children who did not graduate from college themselves. The treatment effect also appears among adult children who, like their parents, graduate from high school but not from college, 14 percentage points. The downward mobility effect also appears with respect to occupation. Children of skilled laborers and managers/professionals who have a lower occupational attainment than their parents experience a 15 and 25 percentage point, respectively, treatment effect of parental smoking. Adults who are skilled laborers just like their parents experience an 18 percentage points increased probability of smoking themselves.

[Table 5 about here]

For the second adult child cohort, I find no statistically significant associations across mobility patterns, potentially due to the small numbers of adult children in most cells after stratification.

## DISCUSSION

Disparities in health have emerged as the defining challenge of population health in the United States. While, on average, Americans are becoming healthier and living longer, large groups of people have been left behind and not benefited from comparable gains

in disease-free living or life expectancy. Those left behind share one main characteristic: they are less wealthy than the rest. Their worse health outcomes are symptomatic of their groups' general social disadvantage (Phelan, Link and Tehranifar 2010).

A greater prevalence of smoking is among the chief reasons we have seen lesser improvements in health among disadvantaged Americans. Linked to shorter life expectancy and a multitude of debilitating conditions, smoking is infrequently practiced by the wealthy and highly educated today, but it has remained common among the less educated and the poor (CDC 2016a). Past research has identified parental socialization as an important risk factor that contributes to the current disparities (Green et al. 2014, Henriksen and Jackson 1998). This literature shows a large positive association between parental smoking and a child's own smoking (Leonardi-Bee, Jere and Britton 2011). Because less advantaged children are more likely to have parents who smoke, the socialization mechanism is thought to compound their risk of smoking initiation. Recent work has argued that up to 60 percent of disparities in early smoking initiation among children in the United Kingdom can be explained by their exposure to smoking adults (Taylor-Robinson et al. 2017). It follows that, if we could only limit children's exposure to smoking adults, we would make a mammoth leap toward closing health disparities.

This paper argues that the current scholarship on the family continuity of smoking does not consider the broader social dynamics of intergenerational transmission. Smoking is

one among many practices that are passed from parents to children in the envelope of social class, albeit more deadly than most others. Building on health lifestyles theory (Cockerham 2005), I argue that a complete understanding of the process of smoking's transmission requires close attention to the broader social mechanisms through which children come to resemble their parents. The importance of such an examination reaches beyond scientific curiosity; it can help us understand the extent to which interventions aimed at changing parental smoking behavior can mitigate offspring's smoking initiation; it can also help in understanding the degree to which favorable or unfavorable intervention outcomes depend on the broader class context, which cannot be effectively modified without more extensive social policy changes.

The results confirm the previously documented association between parental and child smoking in two generations of adult children, the first born in or before 1968 and surveyed in 1986 and the second born in or before 1986 and surveyed in 2011. The unadjusted treatment effects are large; in both cohorts, children of smokers are 10 percentage points more likely to smoke. However, the contribution of parental behavior to adult children's smoking is reduced after accounting for the second generation's own socioeconomic position. In the second adult child cohort, the observed reduction is larger and explains about half of the measured parental smoking treatment effect. The estimated 5 percentage point difference between smoking among adult children of smokers and nonsmokers is no longer statistically significant. This finding suggests that while smoking among parents has continued to predict smoking among children into the early 21st century, a large share of the association can be explained by the child's own

socioeconomic attainment. When we only compare children of smokers to children of nonsmokers with the same socioeconomic attainment, the importance of the parental smoking influence is substantially diminished.

Upon close inspection of how smoking's transmission varies by parental socioeconomic attainment, I again find variation between the two cohorts. While there is a clear pattern of parental transmission between 1968 and 1986, which, in most cases, holds even after adjustment for the adult child's own socioeconomic attainment, the patterns observed in the second adult child cohort are less unequivocal. The parental treatment effect is not statistically significant at conventional levels in any instance. This finding points to the importance of the adult child's own socioeconomic attainment over the influence of parental socialization in childhood. In the context of smoking becoming increasingly a health behavior of marginalized people over the 1986 to 2011 period, the larger influence of one's own economic status over parental behavior witnessed 25 years prior is not entirely surprising.

A scrutiny of rates of transmission under different economic mobility patterns provides further evidence to this effect. In both cohorts, I find that parents' smoking has a positive association with their children's smoking if the children are either downwardly mobile or maintain their parents' socioeconomic position, with downward mobility showing the largest effect. This finding speaks to the compression of smoking into the least economically advantaged group—that is, parents in whose generation smoking is perceived as a middle class practice only transmit smoking to children who do not

achieve middle class status themselves because smoking has become a stigmatized practice in the following generation. An alternate explanation for the downward mobility and smoking transmission can be found in the downward drift hypothesis, which argues that downward mobility is linked to stress and depression (Perry 1996), both of which have been associated with smoking (Kassel, Stroud and Paronis 2003, Kinnunen et al. 2006). The causal arrow between mental distress and downward mobility may be pointing in the opposite direction as well. Young adults with externalizing conduct disorders and attention deficit disorders achieve lower than expected levels of education (Miech et al. 1999), and people with serious mental health conditions are at a greater risk of material hardship (Hudson 2005). The mentally ill are smokers much more often than the general population, 37 percent of them smoked in 2013 (CDC 2017). If the observed downward mobility can be explained by mental illness, the observed link between downward mobility and smoking could be explained by the higher prevalence of mental illness in this group.

The results of this study suggest that while parental smoking is an important risk factor for smoking, children who become more educated than their parents, achieve greater relative income, and work in skilled occupations tend to be buffered from its effects. Thus, the risk factor of parental smoking is doubly socially stratified. First, it is children growing up in less advantaged homes who are more likely to be exposed; but, no clear evidence suggests that they reproduce smoking at greater rates than would be expected based on their own adult economic status in the recent generation. Second, children who grow up with smoking parents but are otherwise relatively advantaged, but

then go on to experience downward mobility, also experience a strong influence of parental smoking on their own behavior. This pattern is consistent with the theoretical perspective that anticipates the primary role of destination class as opposed to the class of origin in shaping our health behavior practices. However, it is important to point out that, in the later cohort, none of the mobility patterns shows a statistically significant treatment effect of parental smoking on the adult child's own smoking. This could be because the effects of parent smoking on child smoking have changed and mobility is no longer an important factor in 2011, but it may also be the case that the absence of statistically significant associations can be explained by the relatively small size in each of the stratified cells.

**LIMITATIONS**

This study has several limitations that need to be considered while interpreting its results. Because the PSID is partially a household and partially an individual interview, it is not always the case that respondents are reporting on their own smoking. The head of the household, most often an adult male respondent, reported smoking for both him and his partner. Though it is unlikely, one adult in the households may not have accurate information on whether the other is a smoker or may choose to report inaccurately even while knowing. The measurement of smoking does not allow us to determine whether the reported smoking is daily or intermittent or whether one is an established or experimenting smoker. When asked about whether one or one's partner is a smoker, without clearly specifying the definition of smoker, respondents necessarily rely on their own conceptualization of a smoker. This has likely introduced some bias

into the measurement. I estimate that the percentage of families with children that include a smoker in 1968 is 65 percent. I cannot accurately quantify the degree of imprecision introduced by the question. Researchers who have used the National Health Interview Survey to measure cohort-specific smoking rates have shown that between 60 percent and 70 percent of white men born between 1920 and 1930 smoked in 1965 and between 40 percent and 50 percent of white women born in the same period did so. As nearly all PSID households include a woman and 85 percent includes a man and a woman, the 65 percent smoking estimate appears somewhat higher than we would anticipate based on past measurement.

This study is unable to account for the likely contribution of shared genetic makeup for the similarity in smoking between parents and children. Such contribution would manifest itself the same way as a socialization mechanism; children of smokers will have a higher probability of smoking regardless of their own socioeconomic status. The fact that the association between parental and child smoking is not statistically significant after accounting for adult child's socioeconomic status in the second cohort points to either a relatively weak effect of genetic background or to the interactions between genes and socioeconomic environment, similar to the interaction that has been for example documented for cognitive ability (Harden, Turkheimer and Loehlin 2007). A promising strategy for investigating the influence of genes on smoking under different adult SES conditions might be comparing twins, who share genetic material but differ in adult socioeconomic attainment.

The constructed measures of socioeconomic position categorized respondents into broader socioeconomic categories than is typical in studies of stratification. The broadening was necessitated by the relatively small sample. The economic well-being of an individual whose household income is close to the top of the second tertile is quite different from someone whose income is close to the bottom. In 2016, the Current Population Survey recorded approximately $26,000 to be the 34th percentile income, while a household in the 66th percentile had an income of about $52,000. Future work, with larger intergenerational datasets, would benefit from finer economic stratification. However, no such datasets are currently available.

Prior research on intergenerational transmission of economic status has stressed the importance of comparing parental and adult child earnings at the same point in the life course. Most parents included in the sample are between the age 25 and 35 (i.e., the age at which their own children's smoking is measured), but 20 percent falls out of this age range. Sensitivity analysis with age of parents limited to between 25 and 35 does not reveal major differences in estimated treatment effects, likely because the focus is on relative income rank and not absolute income differences. To preserve the larger sample size, observations from parents who were outside of the 25 to 35 age range in 1968 or 1986 are kept in the analysis.

The PSID has suffered a significant amount of attrition since its conception in 1968. Past work investigating the impact of attrition on intergenerational linkages has concluded that its influence on the validity of estimates is not large, although such work has also shown that those who leave the survey have different sociodemographic characteristics than those who stay (Fitzgerald, Gottschalk and Moffitt 1998). Most

importantly for this study, those who leave the survey are more likely to have low socioeconomic status and to be racial minorities. Even if attrition does not influence the patterns observed at large, attrition concentrated among low SES respondents may significantly affect the stratified estimates presented. For example, if children of low SES parents who remain in the study are unusually close to their parents, they may also be more likely to adopt their health behaviors than we would expect in the population at large. In contrast, if the retained second-generation adult children tend to exhibit unusual patterns of economic mobility—that is, they are less often or more often upwardly or downwardly mobile than we would observe in the population at large—the results of this study will overestimate the importance of considering mobility in models of intergenerational health behavior transmission.

This study assumes that children are exposed to the smoking of their parents. Families differ in how they regulate smoking in their private spaces, such as homes and cars. Hence, even if I identify a family as a smoking family, I cannot determine the extent to which the child is exposed to smoking. This limitation would be especially problematic if past research had identified a clear dose-response relationship between the likelihood of second-generation smoking and intensity of exposure. However, no such evidence exists in the current literature.

The smoking outcomes of the adult children included in this study were measured at an early part of their adulthood, between the ages of 25 and 35; the analysis thus cannot address the other likely mechanism of population stratification: differential cessation. Smoking disparities are constructed at both ends of the life course; less educated young people are more likely to initiate into smoking and, later in the life course, less educated

adults are less likely to quit, though disparities in initiation play a more prominent role (Maralani 2013). While I cannot test differences in cessation by social mobility and destination classes, one may hypothesize that an adult child in high SES destination class, who smokes between the ages of 25 and 35, will be more likely to quit later in life than a person in less advantaged destination classes, thereby enlarging the pre-existing disparity even further.

Finally, this analysis would be improved if the data were stratified by gender. Prior studies have shown that boys are more susceptible to parental smoking influence than girls (Gilman et al. 2009). Unfortunately, the small sample size precludes the investigation of gender-specific analyses of transmission.

## CONCLUSION

Health behaviors, like other behaviors, arise from the confluence of individual proclivities, opportunities, and constraints. While parental socialization into negative health behaviors is an important risk factor, its influence diminishes if a child grows up to take on a more advantageous social position. The key role of destination class in shaping our health behaviors highlighted by this study bids us to look beyond the present distribution of economic resources in our quest to understand their durability. It suggests that inequality in the distribution of negative health behaviors is tied not only to the present inequality in the distribution of economic resources, but also to the permeability of social classes – the opportunities for people to reach a greater degree of economic comfort than their parents or to lose ground. It follows that health behavior disparities in a society with a low degree of class permeability, such as the United States, where the economic fate of children is firmly linked to the economic fate of their

parents, may be more difficult to counter than in other societies as negative health behaviors become more concentrated in the least advantaged groups of society over time. Policies that promote social mobility by encouraging equal opportunities in education and employment too are tobacco control policies.

## CHAPTER III

## Adoption of Smoke-Free Laws and Their Implications for Smoking Inequality in the United States

### INTRODUCTION

Smoke-free laws and regulations were implemented to protect nonsmokers against the harmful effects of secondhand smoke (SHS) (Jacobson, Wasserman and Raube 1993). In the words of former Surgeon General Jesse L. Steinfeld, the goal of these laws was to "interpret the Bill of Rights for the nonsmoker as well as the smoker" (Steinfeld 1983). As he would have hoped, researchers have demonstrated that nonsmokers living in areas with smoke-free laws experience lower exposure to toxic SHS (Farrelly et al. 2005), and the lower exposure to SHS has translated to better health outcomes. The laws are associated with a lower incidence of cardiac, cerebrovascular, and respiratory diseases in the short term (Tan and Glantz 2012).

In addition to protecting nonsmokers, smoke-free laws have had an added beneficial secondary effect. Their implementation has been linked to a decline in smoking intensity among those who continue to smoke and, in some studies, lower smoking initiation rates among youth and lower smoking prevalence among adults (Brownson, Hopkins and Wakefield 2002, Carton et al. 2016, Klein et al. 2009, Song et al. 2015). Scholars have hypothesized that this secondary positive effect could be explained by altered

social norms regarding the acceptability of smoking (Hamilton, Biener and Brennan 2008). The positive effects of smoke-free laws might also be the result of helping current smokers quit by decreasing opportunities to replenish their blood nicotine levels (Moskowitz, Lin and Hudes 2000). As of July 1, 2016, about 82 percent of all U.S. residents lived in areas with smoke-free laws for nonhospitality workplaces, restaurants, or bars, or some combination of the three (American Nonsmokers' Rights Foundation 2016).

Although smoke-free laws are considered a successful health policy that protects nonsmokers and helps reduce cigarette smoking, this paper argues they may have a previously unconsidered role in shaping smoking disparities as well. There are two main mechanisms through which smoke-free laws can exacerbate or ameliorate disparities in smoking. The first mechanism was foreshadowed by the extant literature on smoke-free laws and smoking behaviors. Since state-level smoke-free laws reduce smoking, uneven adoption of smoke-free laws across states will translate to spatial polarization of smokers and nonsmokers. If the states that do and do not adopt smoke-free laws differ systematically with respect to population composition, the groups that are overrepresented in states without smoke-free protection will experience a smaller decrease in smoking at the population level.

The second mechanism that can exacerbate or ameliorate disparities might unfold within states that enact smoke-free laws. If these laws have heterogeneous effects—that is, if they help to decrease smoking in one group but not in another—they will

contribute to either exacerbating or ameliorating health disparities, depending on which group is most sensitive to these policies. For example, if smoke-free laws decrease smoking among the remaining highly educated American smokers more than among less-educated smokers, they will exacerbate smoking disparities despite their overall positive effect on population health.

This study examines the relationship between 100 percent smoke-free workplace and hospitality laws and socioeconomic status (SES) disparities in smoking in the United States during the period 1990 to 2014. I use several survey and administrative datasets to answer the following questions, testing the two possible mechanisms described above: First, are there systematic differences in sociodemographic profiles between the states that adopt smoke-free workplace and hospitality laws and those that do not? Second, in the states that have implemented statewide smoke-free workplace and hospitality laws, does the observed effect on smoking vary by individual residents' SES, operationalized as educational attainment? I discuss the findings in the context of the existing literature on smoking disparities and in relation to theoretical frameworks in social stratification and medical sociology.

## BACKGROUND

Smoke-free laws are a relatively recent policy innovation. While partially restrictive smoking laws and ordinances were adopted in many U.S. municipalities and counties during the second half of the twentieth century, it was only as recently as 1990 that San Luis Obispo, California became the first municipality to declare local restaurants, bars,

and public buildings 100 percent smoke-free. The measure proved popular among nonsmokers and smokers alike (King, Dube and Tynan 2013, Tang et al. 2003), and, despite the tobacco industry's vehement claims to the contrary, limiting smoking in restaurants and bars did not have any negative effects on these businesses' profits (Loomis, Shafer and van Hasselt 2013). Following their debut in San Luis Obispo, smoke-free regulations spread among California's municipalities and in some parts of Arizona, North Carolina, and Massachusetts. In 1995, the smoke-free effort graduated to the state level, when Utah implemented a 100 percent smoke-free law for restaurants. Three years later, the State of California mandated both smoke-free restaurants and smoke-free bars, so that all of the state's residents gained smoke-free protection in those hospitality industry businesses. Many other states would follow Utah's and California's examples during the first decade of the twenty-first century. In 2002, Delaware became the first US states to enact a comprehensive smoke-free law that included private workplaces, restaurants, and bars. The proliferation of smoke-free regulations has been viewed as a major success for public health and citizen activism against the tobacco industry (Hyland, Barnoya and Corral 2012).

[Figure 3 about here]

Comprehensive smoke-free laws have become vastly popular. Today, 4,577 U.S. political units, states, commonwealths, municipalities, and territories ban smoking in some public locations, usually in nonhospitality workplaces, restaurants, or bars, or some combination of the three (American Nonsmokers' Rights Foundation 2016).

Despite the large number of existing laws, protection from SHS remains incomplete in many parts of the United States. While 82 percent of all U.S. residents live in an area with some type of smoke-free law, only 58 percent reside in a state or local area that requires comprehensive protection from smoking in all three types of venues. The reasons for the absence of adequate smoke-free protection in some states can be traced to differences in state-level politics.

In some states, incomplete protection has been ensured by an express or implied preemptive state law that only allows weak smoke-free measures. Such preemptive laws eliminate or curtail the power of lower-level governance units to enact their own smoke-free laws that would conflict with the state law demanding weak tobacco control. In Oklahoma, for example, no spaces other than schools are required to be 100 percent smoke-free at all times. The state mandates smoke-free indoor workplaces, but only for workplaces that conduct business with the public, it makes allowances for smoking rooms, and it permits smoking in owner-occupied workplaces. Oklahoma's restaurants are required to designate a separate ventilated nonsmoking section. Bars have no smoke-free requirements at all (American Nosmokers' Rights Foundation 2017a). Oklahoma's current law prohibits local areas from passing smoke-free laws that would be any stricter.

In other states, weak or absent smoke-free protection is not the result of preemption by a state law, but instead stems from a lack of agreement among state legislators. Texas, for example, has no statewide smoke-free law, and although state representatives have

discussed proposals for such a law during the last several legislative sessions, so far they have failed to reach an agreement (American Nosmokers' Rights Foundation 2017b, Luthra 2013). Local communities in Texas have sought to mitigate the current situation through their own actions, and consequently approximately half of Texas's population is protected by a patchwork of local laws. However, because 23 percent of the state's population lives in unincorporated cities or rural areas that do not have the power to enact their own smoke-free regulations, a significant portion of the population will remain unprotected until the state legislature agrees to pass smoke-free laws (Batheja 2014, Luthra 2013).

*Current State of Smoking Inequality*

Nearly half a million Americans die from smoking-related causes each year, making smoking the largest preventable cause of death in the United States (CDC 2014b) Many smoking victims succumb to lung cancer, but more die of smoking-induced heart disease, stroke, and other cancers combined. A smoker's lifespan is, on average, 10 years shorter than that of a nonsmoker and is more often punctuated by emphysema, bronchitis, asthma, and periodontal disease (Jha et al. 2013a). Despite smoking's well-established negative health consequences, 15.8 percent of all U.S. adults smoked in 2016 (USHHS 2017).

Not all Americans are equally likely to become smokers or to smoke for long enough to experience its deleterious health effects (Warner 2011). Smoking is disproportionally practiced by people with lower SES. In 2014, 43 percent of all American adults with only

a General Educational Development (GED) diploma reported smoking, while only 8 percent of those who were college graduates did. Additionally, individuals with the least disposable income are also more likely to smoke: 26 percent of Americans living below the poverty line smoke compared to 15 percent of those at or above the poverty line (CDC 2015). Men smoke more often than women; 18 percent of men smoked in 2016 compared to 14 percent of women (USHHS 2017), but the current gender disparity in smoking is only a shadow of the past, when male smoking prevalence exceeded 50 percent in midcentury, but women's never surpassed 40 percent. Among today's American men, 44 percent either currently smoke or were smokers in the earlier part of their lives, while only 33 percent of women do or did (USHHS 2017).

Several hypotheses have been proposed to explain the greater prevalence of negative health behaviors such as smoking among people with lower SESs (Pampel, Krueger and Denney 2010). They posit that low-SES individuals use negative health behaviors to cope with the greater levels of stress and deprivation in their lives (e.g., Lutfey and Freese 2005, Pearlin 1989), perceive fewer benefits of maintaining a healthy lifestyle and extending longevity (e.g., Becker and Murphy 1988, Glied and Lleras-Muney 2008), and have less appreciation of the dangers associated with smoking, are more vulnerable to tobacco advertising, or possess latent traits that make them more vulnerable to unhealthy practices (Gottfredson 2004). Because smoking is a negative health behavior that is typically learned from parents, peers, social and community influence are considered one of the most important mechanisms for the transmission of smoking (e.g., Christakis and Fowler 2008). Particularly for teenagers, smoking friends

are highly predictive of an individual's initiation into smoking, and young people who are exposed to more smokers are more likely to become smokers themselves (Jacobson et al. 2001). From a health disparity perspective, the social influence hypothesis suggests a self-reinforcing process: As long as smoking rates are high and tobacco smoke permeates the social settings of low-SES Americans, initiation into smoking will be widespread and quitting difficult. When smoking rates decline, so will smoking opportunities and the desire for initiating smoking, along with the odds of relapse for quitters.

Tobacco control policies might help disrupt the mechanisms that connect SES to smoking, but the extent to which they can do this has not been established (Hill et al. 2013). The most robust evidence of the relationship between tobacco control policies and SES disparities has been provided by the cigarette taxation literature. Increased tobacco prices due to increased tobacco taxation reduce disparities in smoking because socioeconomically disadvantaged smokers, and most of all young socioeconomically disadvantaged smokers, are more sensitive to price (National Cancer Institute 2016). The taxation policy thus takes advantage of the preexisting inequality in income and transforms it into a lever for health equality. Although effective, the policy is controversial. Low-SES smokers who cannot or simply choose not to quit or decrease their consumption in response to price changes will suffer greater economic hardship as a result of tax hikes (Colman and Remler 2008). Research that has focused on how other types of tobacco control policies might disrupt the links between smoking and SES shows more mixed results. For example, both media campaigns and smoking cessation

services appear to primarily benefit high-SES smokers (Hill et al. 2013, Niederdeppe et al. 2008). The reasons underlying this pattern have not been established, although it might result from lower penetration of these programs into low-SES communities, greater marketing appeal to more advantaged smokers, or access to additional support resources that enhance individuals' chances of successfully quitting.

In this paper, I consider the question whether smokefree laws, a measure typically associated with protecting nonsmokers and less often viewed as a tool for reducing smoking, may too have influenced smoking disparities in the United States. Several prior studies, generally with cross-sectional or local data, have suggested that smoke-free laws may be neutral with respect to SES (Dinno and Glantz 2009, Fowkes et al. 2008, Hackshaw et al. 2010, Schaap et al. 2008), and that they are associated with decrease in smoking across educational and income levels. In contrast, a recent paper by Carton and colleagues using repeated cross-sectional data finds the effect of smokefree laws varies by subpopulations, with largest smoking decreases measured among the young, women, and low-income people (2016). I advance this literature by evaluating two potential pathways through which smokefree laws may avert or contribute to disparities formation: policy selection and heterogeneous treatment.

*Smoke-free Laws and Smoking Inequality Mechanisms*

The question of whether and how smoke-free laws affect countrywide disparities in smoking in the United States is directly tied to which states adopt these laws, and when. If smoke-free laws are primarily implemented in more socioeconomically advantaged

states, which are likely the states with fewer smokers in the first place, their implementation could exacerbate disparities in smoking between states. But if smoke-free laws are no more likely to be implemented in states with wealthier populations than in states whose residents are less well-off, their overall effect is likely to depend on whether they affect all SES groups equally within states. The degree of economic well-being that is typically found in areas that implement smoke-free laws is an open question, but there is some evidence that, within states that have no statewide laws, municipalities or counties that adopt protective laws may be more advantaged than nonadopting municipalities or counties (Ferketich et al. 2010, Skeer et al. 2004). Accordingly, I hypothesize that states with higher average educational attainments, higher median incomes, and lower unemployment rates were more likely to adopt smoke-free workplace and hospitality laws (*Hypothesis 1*).

Medical sociologists have argued that the fundamental cause of health disparities is inequality in socioeconomic resources (Link and Phelan 1995), but they have also acknowledged that, in the absence of complete socioeconomic equality, social and health policies can partially mitigate health disparities by removing some of the more proximal causes of health disadvantage (Phelan, Link and Tehranifar 2010). A tobacco control policy can decrease disparities in smoking if it succeeds in disrupting the link between SES and smoking. Its capacity to succeed depends on the characteristics of the policy in question as well as its implementation. Disparities will decrease if the policy provides resources to the disadvantaged that remedy unequal access to health care, education, or healthful environments and goods. Disparities may also decrease when

the disadvantaged are “priced out” of negative health behaviors by increasing the cost of consumption via taxes. Least desirably, disparities will decrease if the policy compromises the health and well-being of the more advantaged but not of the disadvantaged. I hypothesize that smoke-free laws will operate under the premise of the first scenario. When implemented, they equitably protect both the socioeconomically advantaged and the socioeconomically disadvantaged, but, at the aggregate level, they are likely to be more beneficial to the disadvantaged, who have higher smoking rates and are more frequently exposed to smoking peers. Smoke-free laws thus show promise for disrupting the community influence mechanism that promotes disparity in smoking by prohibiting smoking in all indoor public spaces and not merely in the public spaces occupied by high-SES people. These laws are therefore likely to decrease the relative disparity in smoking between high- and low-SES Americans. I hypothesize that adoption of a smoke-free law is associated with a larger percentage points reduction in smoking among low-SES Americans and, consequently, a decrease in relative disparities in smoking within adopting states (*Hypothesis 2*).

*This Study*

The goal of this study is to examine the relationship between a successful public health policy—smoke-free laws—and a health disparity, namely, smoking. I hypothesize that smoke-free laws had an equalizing effect within the states that enact such laws. However, the diffusion of smoke-free laws has not been equal across states, and states with higher average educational attainments, higher average incomes, and lower unemployment rates were more likely to be early adopters of the laws. I argue that the

mechanism of uneven policy diffusion could further exacerbate between-state inequalities in smoking in the United States. To test my hypotheses, I use data from several administrative and survey databases. The findings in this paper provide evidence that state policymaking is an underappreciated social determinant of population health disparities in the United States.

## DATA AND METHODS

For the first part of the study, where I examine the predictors of smoke-free law adoption, I constructed a dataset comprised of state-level variables that I gathered from secondary literature or calculated from other datasets for the years 1990 to 2014. For the second part of the study, where I examine changes in individuals' probability of smoking following the implementation of smoke-free restaurant and bar laws, I relied on the Behavioral Risk Factor Surveillance System (BRFSS) data collected by the Centers for Disease Control and Prevention (CDC) for the years 1995 to 2010 (CDC 2016b).[2] I used the smoke-free law database collected by the Americans for Nonsmokers' Rights Foundation (ANRF) to construct smoke-free policy variables (American Nonsmokers' Rights Foundation 2015).

### *Law Adoption Measures*

I created several measures of law adoption: an indicator of whether or not each type of law was adopted in a state and combined indicators measuring how many and what type of laws were in place. (A separate category for a smoke-free bar law only states was not needed because no state had a bar law without also having a restaurant law in

place.) To control for the possible influence of local laws on individual smoking, I calculated the percentage of each state's population that was protected by a local workplace, restaurant, or bar law. In states where a state law was eventually implemented, the percentage of the population that was protected became 100 percent in the year when law went into effect. This measure was calculated using the ANRF-provided population counts for states and local areas (American Nonsmokers' Rights Foundation 2015).

*Private Smoke-free Workplace Policies*

Because the effect of smoke-free laws on smoking in the population may be tempered by pre-existing private restrictions, I use data collected by the Current Population Survey – Tobacco Use Supplement (CPS-TUS) to measure the percentage of the population in each state that reported smoking is prohibited by the employer at their workplace. Private workplace coverage data was not available in 1997, 2000, 2004, 2005, 2008, 2008, and 2012 in the CPS-TUS. I used linear interpolation to impute the likely level of private coverage in a state for the years during which data were absent.

*State characteristics and sociodemographic composition*

The political leadership of states in which a high percentage of the residents smoke may be more reluctant to restrict public smoking than the leadership of states where smoking rates are low. I calculated the percentage of smokers in each state from the BRFSS dataset for the years 1990 to 2010. For a small number of cases in the early 1990s, when some states did not administer the BRFSS regularly, I used linear interpolation

and extrapolation to estimate the smoking prevalence based on the measured values that immediately preceded and followed the gap in the state series.

Additional state sociodemographic characteristics, including the percentages of urban residents, Hispanics, and African Americans, and the percentage of the population with a bachelor's degree or higher were gathered from the 1990, 2000, and 2010 U.S. Censuses and 1995, 2005, and 2015 intercensal estimates. I used linear interpolation to fill in missing values for years when neither census nor intercensal data were available. The unemployment rate in each state for every year of the study period was obtained from the Bureau of Labor Statistics (2016). I calculated the median household income in each state for every year of the study period using the Current Population Survey Annual Social and Economic Supplement (U.S. Census 2016) and transformed the state median income into constant dollars for the year 2000 using the Bureau of Labor Statistics Consumer Price Index for All Urban Consumers.

There is compelling research evidence that tobacco-producing states are more hostile to smoke-free restrictions than other states, as they see their economic well-being intimately tied to the well-being of the tobacco industry (Fallin and Glantz 2015). Prior literature has demonstrated that tobacco taxation is an important policy tool for decreasing smoking (National Cancer Institute 2016). All individual-level models include a state-level control variable accounting for the tax per pack of cigarettes, which varies annually, measured by the Federation of Tax Administrators (2016). Finally, the Democratic and Republican Parties have historically differed in their support of the

tobacco industry, and any model predicting the likelihood of adoption of smoke-free laws therefore needs to consider the dominant political party in each state. Using a political and economic summary of all U.S. states, *The Book of the States*, from 1990 to 2014, I constructed an indicator of whether a state was majority-Democratic during each year (Council of State Governments 2014). The majority was defined as both the governor and the dominant party in the legislature being in the same party. In Nebraska, a sole US state that is both unicameral and nonpartisan, the legislature is coded as not majority-Democratic.

Each state's region (Midwest, Northeast, West, or South) was designated based on the standard U.S. Census geographic classification (U.S. Census 2017). I used data reported by the United States Census of Agriculture to construct a measure of whether a state produced tobacco in a given year and divided southern states into major tobacco producers and non-producers. A major tobacco producer was defined as a state that produced at least 20 thousand pounds of tobacco per year in most years. These included North Carolina, Kentucky, Georgia, Virginia, Tennessee, and South Carolina (United States Department of Agriculture 2017).

*Individual-level Characteristics*

For the second part of the study, where I estimate changes in individuals' probability of smoking after the implementation of a smoke-free law, I use the BRFSS, a nationally representative survey dataset. The BRFSS began collecting data on Americans' health behaviors in 1984. At first, the BRFSS gathered data in only 15 states, but it expanded

to all 50 U.S. states by the middle of the 1990s. The BRFSS is uniquely suited to the analysis of smoking changes at the state level due to its large sample size (438,624 in 2010) and also because the sampling design allows for comparisons of smoking between states and even smaller geographic units. For the purposes of this study, I pool the BRFSS dataset from 1995 to 2010.

*Smoking measure*

All BRFSS respondents were asked whether they had smoked at least 100 cigarettes, and among those who said they had, whether they now smoke every day, some days, or no days at all. Approximately 20 percent of the analytic sample smoked at the time of their interview, a result of combining multiple waves of data with gradually declining smoking rates.

*SES*

I measure SES by educational attainment because this is a stable individual characteristic established in early adulthood that does not fluctuate from year to year—in contrast, for example, to income. All respondents were asked for the highest educational credential they had obtained, and were categorized as having less than a high school degree, a GED or high school degree,[3] some college, or a bachelor's degree or higher.

*Other sociodemographic characteristics*

Additional variables were constructed to evaluate the effects of other individual-level characteristics on smoking. I measure gender and age by single-question items. Questions that ask about the respondent's race and ethnicity have changed over the course of the survey. To maintain consistency across waves, I construct a categorical variable indicating whether a respondent was a non-Hispanic white, a non-Hispanic black, from another non-Hispanic race or multiracial, or Hispanic.

*Analytic samples*

The state-level analysis conducted for the first part of the study uses the dataset resulting from the analytic sample restrictions that has no missing values for the period between 1990 and 2014. I include observations for all 50 U.S. states.

In the individual-level analysis, I include only observations for those who were 25 and older. This is to ensure that the respondents most likely reached the final stage of their education and were no longer in the experimental smoking stage. After deleting observations with missing data for any of the variables used in the analysis ($N$ = 317,927), the final analytic sample comprises 3,678,029 observations.

*Analytic Strategy*

The first part of the study, focusing on the correlates of law adoption, relies on discrete event history analysis (also known as survival analysis), a regression technique that captures the relationship between time-invariant and time-variant characteristics of

year-state observations and the time to adopting an event. I specify the event history model as logistic and model time as a linear parameter. All models were evaluated for multicollinearity, and no significant levels were detected.

In the second part of the study, where I examine individual-level effects of policy modifications, I use two-way fixed effects linear probability models. The two error components introduced in the models are year and state. This type of model is especially suitable for estimating the effects of a policy change in repeated cross-sectional datasets because it is possible, even likely, that unobserved state-level heterogeneity (e.g., attitudes toward smoking) correlates with the implementation of smoke-free laws in a state and also independently influences individual smoking behavior. By estimating separate parameters for year and state, I account for unobserved state-level heterogeneity, as well as time trends common to all groups that vary by year. The linear probability model has the following form:

$$Y_{ijt} = \alpha + \gamma S_{jt} + \delta Z_{jt} + \zeta L_{jt} + \beta X_{ijt} + \sigma_j + \tau_t + \varepsilon_{ijt},$$

where the subscript *i* indicates the individual, *j* the state of residence, and *t* the year of the interview. The outcome *Y* is individual current smoking. *S* denotes a vector of dummy variables indicating the type of smoke-free laws that were in place in a state and *Z* the state cigarette taxes. *L* is a vector of variables that capture the average local-level protection in a state and protection by private workplace rules, and *X* is a vector of individual-level covariates. The state and year fixed effects are denoted by $\sigma$ and $\tau$, respectively, and the random error term is represented by $\varepsilon$.

The analysis is stratified by gender. While the majority of prior work has not examined how the relationship between smokefree laws and smoking may vary by gender, recent research has shown greater decreases in smoking among women upon the laws' implementation (Carton et al. 2016). The individual-level models used survey weights to adjust for sampling and nonresponses. Stata 14 was used for all analysis (StataCorp 2015).

## RESULTS

Figure 4 shows the spatial diffusion of smoke-free workplace, restaurant, and bar laws throughout the United States between 1990 and 2014. All three types of laws were first implemented in smaller communities, but the initial wave of local laws was soon complemented by statewide laws. In 1995, Utah was the first state to implement a law requiring 100 percent smoke-free restaurants. Three years later, California began to require both restaurants and bars to be smoke-free, but not all nonhospitality workplaces.[4] The laws continued to gain popularity, primarily on the East and West coasts. The laws implemented in the late 1990s and early 2000s were typically not comprehensive and usually required only smoke-free workplaces or restaurants. The latter part of the first decade of the twenty-first century brought heightened attention to statewide smoke-free bar laws. In 2002, Delaware became the first state to enact a law requiring 100 percent smoke-free environment in all three domains. The passage of smoke-free laws has stagnated since 2012, when North Dakota became the last state to date to implement a comprehensive smoke-free law (Holmes, King and Babb 2016).[5] Smoke-free protection remains most incomplete in the South, where most state

legislatures continue to oppose smoke-free laws and are especially reluctant to enact laws requiring smoke-free bars. The only major tobacco-producing state with statewide smoke-free restaurants and bars is North Carolina.

[Figure 4 about here]

Table 6 presents the sociodemographic characteristics of U.S. states in 2014, stratified by whether they had a 100 percent smoke-free nonhospitality workplace, restaurant, or bar law in place. States with at least one type of smoke-free law had lower smoking rates than those with none.

States with no smoke-free workplace laws were less urban than those that had such laws, a lower percentage of their population had a bachelor's degree or higher, a higher percentage of these states produced tobacco, a lower percentage of their neighbors had smoke-free workplace laws, and they were significantly less likely to be led by the Democratic Party. These states were predominantly located in the southern region of the United States. No major tobacco producing state had a smoke-free nonhospitality workplace law.

[Table 6 about here]

States without smoke-free restaurant laws had a lower percentage of urban residents and a higher percentage of African Americans, and a lower percentage of their population had a bachelor's degree or higher. They also had a lower median income, a

higher percentage of tobacco producers, and fewer neighbors with smoke-free restaurant laws, and only 7 percent of these states were led by the Democratic Party. Nearly three quarters of these states were in the South. Only one major tobacco producer, North Carolina, implemented a smoke-free restaurant law, effective in January 2010.

Finally, states without smoke-free bar laws had a lower percentage of urban residents and a higher percentage of African Americans, a lower percentage of their population had a bachelor's degree or higher, a higher percentage of their population was unemployed, and they had a lower median income. They were significantly more likely to produce tobacco, had a lower percentage of neighbors with smoke-free bar laws, and were less likely to be led by the Democratic Party. Three southern states implemented a smoke-free bar law, with only one of them, North Carolina, a major tobacco producer.

I estimated event history models to systematically examine the state characteristics associated with adoption of each type of 100 percent smoke-free law. The adoption of a 100 percent smoke-free bar law implies the adoption of both smoke-free restaurant and bar laws, because no state adopted a smoke-free bar law without also adopting a smoke-free restaurant law. The odds ratios from the logistic regression models are displayed in Table 7. For all types of smoke-free laws, I found that states that had a higher lagged percentage of smokers were less likely to enact such laws. The unemployment rate in a state was negatively correlated with the implementation of

smoke-free nonhospitality workplace laws, and states with a greater share of neighbors with smoke-free workplace laws were more likely to enact one themselves.

Aside from a lower percentage of smokers in the state, the only statistically significant predictor of adoption of a smoke-free restaurant law was a Democratic Party majority. The implementation of a smoke-free bar law was also associated with a Democratic Party majority. In addition, states in which a higher percentage of the population held a bachelor's degree or higher were more likely to enact smoke-free bar laws. Major tobacco producers in the South were least likely to enact smoke-free laws of any type, even after accounting for their other sociodemographic characteristics.

[Table 7 about here]

The second part of my analysis addresses the hypothesis that less-educated U.S. residents disproportionally benefit from smoke-free laws when they are implemented. Table 8 shows the sociodemographic characteristics of the analytic BRFSS sample that contains observations collected between 1995 and 2010 from respondents 25 and older. In addition to the BRFSS respondents' individual characteristics, the table includes other relevant variables measured at the state level.

[Table 8 about here]

Table 9 displays the results of two-way linear regression models predicting the influence of statewide smoke-free laws on the BRFSS respondents' smoking status, stratified by gender. All models include state and year fixed effects. Columns 1 and 4 show the predicted probabilities of smoking for men and women by state smoke-free-law status without any adjustment. The predicted probabilities shown in columns 2 and 5 adjust for

individuals' race, age, and educational attainment. The predicted probabilities shown in columns 3 and 6 also adjust for state tax per pack of cigarettes and the percentage of the population that is protected by each type of law at the local level.

[Table 9 about here]

Among men, I found no statistically significant difference between the predicted probability of smoking in states with any constellation of smoke-free laws and in states without statewide smoke-free laws. Regardless of the law typology found in a state, the predicted probability of smoking with and without adjustment was between 0.22 and 0.23.

Turning to women, across all models, those living in states with either or both types of smoke-free hospitality laws had a lower predicted probability of smoking compared to women living in states with no smoke-free laws. Implementation of only a nonhospitality workplace law was not associated with a statistically significant difference in the predicted probability of smoking. The estimated difference in the probability of smoking for women living in states with smoke-free hospitality laws and for women living in states without them was about 0.02.

The next set of models examines whether the associations between the passage of a state smoke-free law and the likelihood of smoking differ by SES. The models are fully adjusted as in columns 3 and 6 in Table 10, and were estimated separately for each educational and gender group. For men, across educational groups, I found no statistically significant difference in the estimated probability of smoking regardless of

the combination of laws implemented in their state. For women, I found that decreases in the probability of smoking are concentrated in the high-school-only group. I observed probabilities of smoking that were 0.02 and 0.01 percent lower in states with smoke-free restaurant and bar laws and those with all three types of smoke-free laws, respectively. In addition, for college-educated women, living in a state that implemented a smoke-free restaurant law or all three types of smoke-free laws was associated with a 0.01 percentage-point lower probability of smoking.

[Table 10 about here]

## DISCUSSION

In 1932, Supreme Court Justice Louis Brandeis remarked that the U.S. federal system enabled individual states to be “laboratories” for policy experiments. According to Brandeis, the structured federal governance system protects the nation from risk because a failed experiment will not be to the detriment to all, while successfully tested policy innovations will bubble up to other states (New State Ice Co. v. Liebmann, 1932). However, not all successful policy innovations do. Time has shown that some states’ policy laboratories are more effective than others with respect to ensuring their citizens’ health and well-being, or less interested in taking steps that would curtail some of their citizens’ freedoms. Due to the variations in state policymaking processes and preferences, two otherwise similar Americans from different states may find themselves living under dramatically different rules and regulations that affect their well-being. For example, while Californians have enjoyed clean air in their restaurants and bars since 1998, 19 years later Texans still do not have the benefit of either, unless they live in one

of the smaller areas that have implemented their own smoking ordinances. Not only are Californians better protected from the negative effects of SHS on their health, but the smoke-free laws may have also made it easier for California smokers to quit. In the long run, their state's proactive policy against public smoking may translate to Californians' longer life expectancies and fewer smoking-related chronic conditions for decades to come.

The results presented in this paper provide partial support for the study's first hypothesis that states with more advantaged populations are more likely to enact smoke-free laws. I found a clear pattern of socioeconomic advantage among the states that had any of the types of smoke-free laws when I examined them descriptively in the year 2014, although most of the associations did not retain their statistical significance in event history models adjusting for all characteristics simultaneously. There were two exceptions. The models predicting the adoption of a nonhospitality workplace law showed that a one-percentage-point increase in a state's unemployment rate was associated with 32 percent lower odds of adopting such a law, possibly indicating that during economically anxious times law makers and their constituents are less oriented toward public health policies. In the models predicting the adoption of a smoke-free bar law, a one-point increase in the percentage of the population with a bachelor's degree or higher was associated with 37 percent greater odds of enacting a smoke-free bar law.

The most consistent predictor of the adoption of smoke-free laws was a lower percentage of smokers in a state's population. Across the types of smoke-free laws, the

odds of adoption decreased by between 19 and 31 percent as the percentage of the smoking population in a state rose by one percentage points. This is an important finding because it highlights the self-reinforcing nature of the relationship between the absence of public health regulations and negative health behaviors: the states that would most benefit from having smoke-free laws were less likely to successfully place one on the books. Southern states were least likely of all to have statewide smoke-free laws. This spatial pattern was not explained by the other characteristics of the Southern states. Southern states' recalcitrance regarding smoke-free laws could lie in shared but unmeasured political characteristics, other than the absence of a Democratic Party majority, that were not captured by this study's variables. For example, Southern states may have a stronger preference for local public health policymaking over statewide laws and choose to keep their populations protected through local laws. But this hypothesis is inconsistent with the fact that the only two states that altogether lack any statewide or local smoke-free restaurant laws—Tennessee and Oklahoma—are both found in the South.

In states that implemented smoke-free laws, the effects of these laws on smoking were apparent only among women, for whom the probability of smoking was lowered by about one percentage points on average. After allowing for the possibility of variation by educational groups, I discovered the laws' mixed effects across SES categories. The largest benefit, a two percentage-point decrease in the probability of smoking, was realized by women with high school degrees in states that implemented both restaurant and bar smoke-free laws. The group that had the second largest decrease in the

probability of smoking, by one percentage points, comprised college-educated women. The results partially confirm this study's second hypothesis, which posits that the benefits of smoke-free laws are concentrated among low-SES individuals, but only for women.

The majority of prior studies on smoke-free laws and smoking have tended to consider population effects for men and women together rather than stratify their analysis by gender and have thus failed to identify the underlying gender disparities in the laws' effects that are highlighted in this study. The reported gender differences are consistent with the most recent prior work (Carton et al. 2016) and with research on the relationship between smoke-free laws and cardiovascular outcomes that has found greater reductions in acute myocardial infarctions for women than for men (Hahn et al. 2011). There are several reasons why women might be more strongly affected by these laws. In the United States, women generally display more favorable health behaviors than men due to gendered expectations of risk-taking and authority defiance associated with masculinity (Verbrugge 1985), and this disparity in favorable health behaviors extends to nonsmoking as well as smoking cessation. Women might be more likely to change their health behavior in a prosocial direction than men following the implementation of a new law, such as when smokefree laws are implemented.

The gender disparity in response to smoke-free laws merits further investigation, and surveys along with qualitative inquiries that ask deeper questions about changes in smoking behavior and smoking attitudes in the aftermath of a smoking ban and examine

how these might differ by gender are likely to yield especially useful insights. It may be that non-smoking laws enable women to quit but do not provide a large enough impetus to men, who are less likely to quit in the first place. Another possible reason is physiological. It has been proposed that men and women may also differ with respect to their reactions to nicotine withdrawal, although studies exploring the associations between nicotine withdrawal and gender have found mixed results (Leventhal et al. 2007). If it is the case that women have a less difficult time overcoming their dependency and quitting smoking when smoking spaces become less available, that too could produce the observed gender differences. Finally, the fact that the results are not consistent across educational classes and differ for men and women raises the possibility that the findings reflect inconsistencies in the model or data. However, the estimated coefficients were robust to alternate model and variable definition. This work would benefit from replication in other large national datasets.

Overall, this study identifies two mechanisms through which incomplete diffusion of a successful policy such as smoke-free laws can shape health disparities. First, the selective adoption of smoke-free laws by some states—the states that were already characterized by lower average smoking rates before the adoption of the laws—has likely contributed to the increase in between-state disparities in smoking because the implementation of a state's smoke-free law is associated with a significant decrease in smoking among women. Second, the benefits of statewide laws have not been evenly distributed in the states where they have been implemented. They are associated with the largest decreases in smoking among women who have high school degrees and

with smaller, but still statistically significant, decreases in smoking among women with a college degree or higher. This suggests these laws may contribute to the decrease in smoking disparities among women, but their effect is likely to be small in this regard. Since they appear to be most effective among women, they may also contribute to the smoking disparity between men and women. The findings suggest that a federal law requiring 100 percent smoke-free workplaces, restaurants, and bars in all parts of the country would not only favorably influence population health, by limiting SHS exposure and lowering smoking rates, but could also have some, if limited, potential to decrease SES health disparities among women.

**LIMITATIONS**

The results presented here need to be considered in the context of the study design's limitations. The data that were used are cross-sectional. While I implemented two-way fixed effects models, which enabled me to observe changes in smoking probabilities over time (Wallace and Hussain 1969), future work could strengthen the findings by observing the smoking behavior of the same individuals over time, both before and after implementation of the nonsmoking laws. Unfortunately, the only individual longitudinal datasets that are currently available have been collected on a much smaller scale than would be required for between-state policy effect comparisons (but see e.g. Song et al. 2015, Vuolo, Kelly and Kadowaki 2015 for longitudinal studies smoke-free laws and youth smoking). To be able to compare results across a variety of laws, this study focuses only on the effects of 100 percent smoke-free laws in nonhospitality workplaces, restaurants, and bars. Many states that do not have such laws

nevertheless require separate smoking rooms or permit smoking only in areas that are not accessible to children. The estimated effects that contrast the states with 100 percent smoke-free laws to those that do not have 100 percent smoke-free laws understate the policy heterogeneity that exists among states that are not classified as 100 percent smoke-free.

The study would have also been strengthened if both local and state laws were accounted in the analysis, but the dataset used does not include sufficiently detailed spatial markers to enable such an analysis. Although the regression models control for the percentage of the population protected by a private smoke-free rule at workplaces in each state and year, I am unable to determine whether any such policy is implemented at the individual respondents' workplaces. Additionally, bias may have been introduced into the results because of the use of self-reported smoking statuses. Previous research has shown that approximately 90 percent of all smokers will accurately self-report their smoking behavior (Patrick et al. 1994), but it may be the case that the accuracy of smoking reports is lower in environments with more restrictive smoking laws, where smokers would experience greater stigma. The possible presence and implications of an increased reporting bias therefore need to be investigated in the future. A fruitful avenue for future research would be separating daily and non-daily smokers, for it would be useful for tobacco control experts to know whether the decline is concentrated among less dependent smokers, smokers who may for example only smoke socially in restaurants and bars, or whether the decrease cuts across both groups.

## CONCLUSION

The massive decline in smoking during the second half of the twentieth century was a joint product of the growing awareness of the dangerous nature of smoking and the policies that have made smoking progressively more inconvenient and expensive and have also made it less socially acceptable to be a smoker. More educated Americans abandoned smoking more quickly than the less educated, and tobacco became primarily a behavior of marginalized populations, further exacerbating pre-existing health disparities. Sociologists studying smoking disparities have generally focused either on documenting the historical processes that led to smoking's unequal distribution or, on the individual-level, risk factors that perpetuate it (Maralani 2013, Pampel 2005). The findings of this study suggest that there are important macrosocial and institutional determinants of smoking—such as whether an individual lives in a state that has taken a proactive stand against smoking in public places—that need to be taken into account and investigated by scholars examining inequality in smoking across US regions, and these may also play some, though less prominent, role in the persistence of smoking disparities. This study highlights that the absence of state-level public-health legislation can itself be a social determinant of population health.

## NOTES

[1] July 1, 2016.

[2] Although data for the years 2011 to 2015 are available, they cannot be included in this analysis. The BRFSS data sampling design and weighting procedure were substantially revised in 2011, and the data from 2011 onwards are thus not directly comparable to data collected in 2010 and prior years.

[3] Note that grouping GED recipients and high school graduates inflates the estimated smoking rate in this population. GED recipients have been documented as displaying health behaviors that are more similar to the population without a high school degree. In the U.S. population, GED recipients have the highest smoking rate of all educational groups, including those without a high school degree or a GED, about 34percent (CDC 2017). The BRFSS does not distinguish between GED recipients and high school graduates in survey questionnaire and thus the two could not be separated in this analysis.

[4] California was the first state to enact a law in 1994, but it made exceptions for bars and restaurants with bar areas until January, 1998 (ANRF 2016).

[5] In 2016, California closed a remaining gap in its nonhospitality workplace law, which had previously allowed smoking in businesses with five or fewer employees, employee break rooms, warehouses, hotel lobbies, and owner-operated businesses (ANRF 2016).

[6] There are important exceptions to this general pattern. For example, basic protections pertaining to products sold in interstate commerce are covered under the Commerce clause in the Constitution. Pharmaceuticals, manufactured food products, cosmetics,

and medical technology all fall under the jurisdiction of the Federal Drug Administration, as do the manufacturing, distribution, and marketing of tobacco products.

# CHAPTER IV

## Tobacco Control Policy and Smoking Cessation and Intensity in a Longitudinal Sample of U.S. Older Adults (1992 – 2014)

### INTRODUCTION

Between 2005 and 2015, smoking decreased by 28 percent in the United States (CDC 2016a). Active tobacco control, most importantly increased cigarette taxation and comprehensive smoke-free laws, have been lauded as the key drivers of the success. Past research has shown that for every ten percent increase in the cost of a pack of cigarettes, we observe a three to five percent reduction in smoking (USHHS 2014). Comprehensive smoking bans have been associated with two to three percent reduction (Carton et al. 2016). Yet, encouraging patterns of smoking decline have not been found in all groups of Americans; older adults stand out for fewer favorable changes. For women 65 and older, smoking dropped only by twelve percent, and men in the same age group showed an alarming 9 percent increase in smoking (CDC 2016a). A compelling explanation for the less favorable changes in older adult smoking could be their lesser responsiveness to tobacco control measures. However, the current limited research on the effect of tobacco control on smoking among older adults has not been able to adequately address this question due to data and analytic limitations. This

study uses a nationally representative longitudinal sample of older Americans collected over 22 years and examines the lesser responsiveness hypothesis.

Older adults have lower smoking rates than adults in other age groups; only about eight percent of people 65 and older smoke, compared to the approximately 16 percent smoking rate found in the general adult population overall (CDC 2016a). Lower smoking rates later in life arise from the combination of cessation that has accumulated over the life course and smokers' more frequent premature mortality. Those who persist in smoking to advanced age make fewer quit attempts on average, and subsequently quit at lower rates than younger smokers (CDC 2011, Messer et al. 2008). This has not always been so. Studies of age-stratified cessation patterns that were conducted in the 1980s and 1990s demonstrated that older adults had greater success quitting than adults of other ages attempting to quit during that time (Gilpin and Pierce 2002, Messer et al. 2007), in spite of their lower likelihood of receiving pharmacological cessation interventions (Steinberg et al. 2006). There is evidence that older adults are less often encouraged to quit by their health care providers than adults of other ages (Doolan and Froelicher 2008). As a population with overall low smoking rate but also a low average number of quit attempts and quit rates, today's older adult smokers could meet the definition of a "hardened" group, that is, a group of smokers that may have become resistant to tobacco control efforts because it no longer contains people who find it easy to quit (Hughes 2011).

Past research has found mixed evidence in support of both older adults' lesser responsiveness to tobacco control efforts and the hardening hypothesis more generally (Warner and Burns 2003). While many scholars have argued that smokers become less sensitive to cigarette prices as they age (CDC 1998, Lewit and Coate 1982), work by Tauras (2006) and later by DeCicca and McLeod (2008) has shown small, but appreciable, effects of cigarette prices on current smoking prevalence among older adults. Results from the 1997 to 2013 Cancer Prevention Study cohort focusing specifically on older adult cessation found that a one dollar increase in the price of a pack of cigarettes was associated with a nine percent increased odds risk of cessation among smokers 65 years of age and older, and the effect was the largest, 13 percent, among smokers without any major diagnosed diseases (Stevens et al. 2017). We know less about the effect of smoke-free laws on older adult smoking. The extant research that has considered the effects of law implementation in small local areas has found older adults less likely to quit following laws' implementation than the general population (Prochaska et al. 2009), but more likely than any other age group to believe that smoking should not be allowed in indoor workplaces, 87 percent, or outdoor workplaces, 30 percent (King, Dube and Tynan 2013).

The US Census projects that by 2030, one in five Americans will be 65 years of age or older (Colby and Ortman 2015). Unless we witness a drastic decrease in smoking among today's prime age adults, the anticipated increase in the mean age of a US resident will translate to an increase in the number of older adult smokers. If older adult smokers are less likely to be influenced by our current main tobacco control strategies, their increased share in the smoking population will result in an overall decrease in the

effectiveness of tobacco control. This study remedies the current knowledge gap by using a nationally representative longitudinal sample of adults 51 years of age and older, the Health and Retirement Study (HRS), combined with geographic markers of respondents' residence and tobacco control policies applicable to them between 1992 and 2014. The study addresses two questions: were changes in average cigarette prices and smoke-free laws associated with an increased likelihood of cessation and/or decreased smoking intensity among older adults? Did the effects of tobacco control policies on the likelihood of cessation and/or decreased smoking intensity vary by education and/or race? The findings support the hypothesis that older adults may not be as responsive to the implementation of smoke-free laws, especially in restaurants and bars, as previously shown among adults of other ages and only some of them change their smoking intensity in response to higher cigarette prices.

## DATA AND METHODS

### Data

I used the Health and Retirement Study (HRS), a longitudinal survey first administered in 1992 to a nationally representative sample of older adults born between 1931 and 1941. In its first wave, the HRS interviewed 12,652 people. The HRS merged with a separate longitudinal study of adults born before 1923, Asset and Health Dynamics among the Oldest Old (AHEAD), and sampled two additional cohorts, the first born between 1924 and 1930, and the second between 1942 and 1947. After these sample expansions, the HRS became nationally representative of Americans 51 years of age

and older. The HRS has continued to interview its respondents every two years. The sample is periodically replenished to maintain a steady state representative sample of Americans 51 years of age and older. The survey interview covers a variety of topics, including health and health behaviors, labor force participation, family changes, social support, financial well-being, end of life planning, and others.

*Analytic Sample*

I merged the 1992 – 2014 HRS sample to geomarker data so that I could match respondents' home addresses to their local smoke-free laws and cigarette prices, resulting in an initial sample of 37,316 HRS respondents. I then identified all respondents who reported smoking in the first wave they were interviewed, and who were thus candidates for cessation (N = 7,998). Finally, I exclude the respondents who did not provide valid responses to all questions that were used to construct any covariates used in the analysis (N = 302) and those who were younger than 51 years at the time of their interview (N = 756). The total sample includes 6,940 HRS smokers contributing 25,881 person-years.

## Measures

*Current cigarette smoking*

In all waves, respondents were asked whether they had ever smoked cigarettes, with the additional clarification that ever having smoked cigarettes means smoking more than 100 cigarettes in their lifetime. Respondents who responded affirmatively were

asked a follow up question inquiring whether they smoke “now.” I coded those who said they smoke “now” as current smokers.

*Smoking cessation*

If a respondent reported smoking in a survey wave, but said they did not smoke “now” in the wave that immediately followed, they were coded as a quitter.

*Smoking intensity*

All current smokers were asked about the number of individual cigarettes or packs of cigarettes they “usually smoke in a day.” Responses given in packs were converted to number of cigarettes.

*Smoke-free Laws*

I used data from the Americans for Nonsmokers’ Rights Foundation (ANRF) to identify smoke-free laws in each respondent’s locality in a given year. In some cases respondents lived in areas where their local municipality, county, or state implemented new smoke-free laws, and in other cases they moved from an area without smoke-free laws to an area with them. This study focuses on three types of 100 percent smoke-free laws: non-hospitality workplace (defined as all workplaces excluding restaurants and bars), restaurant, and bar laws. I constructed a categorical variable that designated whether a respondent lived in an area with none of these smoke-free laws, non-hospitality workplace smoking bans only, restaurant smoking bans only, non-hospitality

workplace and restaurant smoking bans, smoking bans in both restaurants and bars, or laws against smoking in all three domains.

*Cigarette Prices*

The price of a pack of cigarettes was measured at the state level. I used The Tax Burden of Tobacco data compiled by Orzechowski and Walker (2014) and assigned each respondent the average price for a pack of cigarettes that applied to the year and state in which they lived at the time of their interview. The price of cigarettes was adjusted to the 2000 Bureau of Labor Statistics Consumer Price Index for All Urban Consumers.

*Private Smoke-free Workplace Policies*

Because the effect of smoke-free laws on smoking in the population may be tempered by pre-existing private restrictions, I use data collected by the Current Population Survey – Tobacco Use Supplement (CPS-TUS) to measure the percentage of the population in each state that reported smoking is prohibited by the employer at their workplace. Private workplace coverage data were not available for the years when CPS-TUS was not administered, in 1994, 1997, 2000, 2004, 2005, 2008, and 2012. I used linear interpolation to impute the likely level of private coverage in a state for the years during which data were absent.

*Other variables*

Several additional variables were constructed to control for changes in other relevant respondent characteristics that may influence their likelihood of smoking cessation or smoking intensity. These included age, marital status, health status, household income, labor force participation, smoking intensity, education, and race. Age was calculated based on respondent birth date and the day of the interview. Respondents were classified as partnered or single based on a sequence of questions in the marital history portion of their interview. Both legally married and cohabiting unmarried couples were considered partnered. Health status was measured by a commonly used single item that asked: “Would you say your health is excellent, very good, good, fair, or poor?” I divided respondents into two groups, one in excellent, very good, or good health, and one in fair or poor health. Total household income was calculated by combining the money resident household members reported from all sources before taxes. These were, for example, earnings, social security, pensions, and financial assistance from other family members. Respondents were asked a number of questions in each interview to ascertain whether they were working full-time, working part-time, unemployed, partly retired, retired, disabled, or not in the labor force for other reasons. I categorized respondents as labor force active and inactive. Those who were working full-time, working part-time, unemployed or only partly retired were labeled as labor force active.

For analyses that considered the effects of time invariant variables, I constructed an indicator of respondent’s educational attainment based on a question asking about “highest grade of school or year of college” they completed and classified them as

having less than a high school education, a high school diploma, or a college degree. In addition, I used a survey question asking “what race do you consider yourself to be” to determine whether the respondent was white or a member of another racial or ethnic group.

**Analytic Strategy**

I constructed logistic and ordinary least squares regression models with individual fixed effects to model the likelihood of cessation after the implementation of each law or change in average cigarette prices in a state. Fixed effects models rely on within-person variation to estimate the effect of a change in observed independent variables on the change in an observed dependent variable, and remove the bias that arises from correlated unmeasured characteristics.

The main model estimating the probability of cessation or smoking intensity for an individual *i* at a time *t* is estimated as

$$Y_{it} = SMOKEFREEx_{it} + PRICEx_{it} + PRIVATEx_{it} + \beta x_{it} + \alpha_i + \varepsilon_{it}$$

, where $x_{it}$ is a vector of variables that vary both across time and individual, $\beta$ represents other individual characteristics that vary over time entered into the model, $\alpha_i$ are unmeasured differences that do not vary over time, and $\varepsilon_{it}$ represents idiosyncratic errors that vary both over time and individuals.

A notable disadvantage of the fixed effects framework is that it does not allow for estimating effects of time invariant individual characteristics, such as gender, race, or

education. Their contribution to the likelihood of cessation or smoking intensity can, however, be ascertained by using two strategies: stratification and interaction. To examine how the effect of smoke-free laws and cigarette prices might differ for men and women, I stratify all models by gender. Additional stratification by education or race is not feasible because it would result in very small sample sizes for some models. I therefore opt for interactions and allow first education and then race to modify the effects of smoke-free laws and tobacco prices on the likelihood of cessation.

The interaction model estimating the probability of cessation or smoking intensity for an individual *i* at a time *t* and how it varies by education is estimated as

$$Y_{it} = SMOKEFREEx_{it} * \gamma z_i + PRICEx_{it} * \gamma z_i + PRIVATEx_{it} + \beta x_{it} + \alpha_i + \varepsilon_{it}$$

, where $\gamma z_i$ is a characteristic that varies between individuals, but not across time (first education and then race in separate models).

After preliminary analysis I determined there were only 26 respondents whose circumstances changed from no laws restricting smoking to laws banning smoking in all three domains between two survey waves, and thus respondents who transitioned into this most comprehensive category were excluded for the analysis.

All analyses were conducted using Stata 14.2 (StataCorp 2015).

## RESULTS

Table 11 shows the descriptive characteristics of the analytic sample in person-years, first overall and then stratified by whether or not they quit smoking. Between 1992 and 2014, 11 percent of the smoking sample quit. The mean number of cigarettes smoked daily by the sample is 16. The majority of the respondents were interviewed during periods and in areas with low tobacco control activity, but most experienced a relatively high level of private workplace smoke-free coverage, 81 percent. Seventy-six percent of the observations were collected when no smoke-free law was present and the average price of cigarette pack at a time of the interview was only $3.70. Sixty percent of the sample was comprised of high school graduates. When I stratified the descriptive characteristics by cessation, I found that respondents who quit were older, more often married, sicker, and had a higher mean household income. They also had a significantly greater educational attainment. Twelve percent of quitters graduated from college, as opposed to ten percent of non-quitters.

[Table 11 about here]

Table 12 shows results from fixed effects logistic regression models predicting smoking cessation by change in smoke-free laws, average cigarette prices, and sociodemographic characteristics. The models are stratified by sex. For men, I found that a transition from living in a locality and a state with no smoke-free law to one with a smoke-free non-hospitality law is associated with 4.5 times greater odds of smoking cessation, a sizeable effect. The implementation of smoke-free non-hospitality

workplaces appears to increase the odds of cessation for women also, but this association is not statistically significant. I found no relationship between increased cigarette prices and smoking cessation. Other important predictors of cessation include age (OR 1.2 for men and 1.3 for women) and transition to poor or fair health (OR 1.7 for men and 1.9 for women). In contrast, for both men and women, respondents still in the labor force were less likely to quit smoking (OR 0.7 for both). The remaining tables do not display odds ratios from sociodemographic coefficients because they stayed substantively unchanged across model specifications.

[Table 12 about here]

Table 13 shows results from ordinary least squares regression models predicting number of cigarettes smoked by smokers. I find no associations between smoking intensity and either policy. For both men and women, increase in age was associated with a decrease in the average number of cigarettes smoked daily, by 0.5 and 0.4 cigarettes per year respectively. Among women, a transition into poor or fair health was also a statistically significant predictor of a decrease in smoking intensity, by about 0.6 daily cigarettes.

[Table 13 about here]

In the tables that follow, the category “workplace only law” was dropped for insufficient number of observations, as there were only 28 sample members who transitioned into this category. These sample members were excluded from the analysis. Table 14 displays the results from models where both tobacco control policies were included and

the interaction with respondent educational attainment was examined to ascertain whether their effect varied across educational groups. For both men and women, I found that the effect of smoke-free policies or cigarette prices on cessation among older adult smokers does not vary by education.

[Table 14 about here]

In Table 15, I estimate change in smoking intensity analogously to Table 4. For both men and women, I find a statistically significant interaction between price of cigarettes and being a high school graduate. Although the main effect of the interaction is not significant, the statistically significant coefficients of the interaction terms show that high school graduates were more price responsive than older adults with less than a high school degree. Older men and women high school graduates reduced their smoking intensity by about 0.4 cigarettes more than older adults with less than a high school diploma.

[Table 15 about here]

Table 16 shows results for a parallel set of models, but this time I examined whether race of the respondent modified the association between tobacco control policies and smoking cessation. The results show that non-white women were less impacted by smoke-free restaurant laws than white women (OR 0.2); however, the main effect of the policy is not statistically significant. This means that while the effect on black and white women differs, the effect overall is not significant. Across models, despite the absence

of statistically significant associations, I find consistently larger coefficients for men as opposed to women, suggesting stronger impacts of the policies on smoking cessation for men.

[Table 16 about here]

Finally, Table 17 shows results from smoking intensity models analogous to those in Table 16. I find that one dollar increase in price is associated with a 0.6 decrease in the number of cigarettes smoked by white men. For women, in contrast, I find that nonwhites reduced their smoking consumption statistically significantly more than whites, by nearly one cigarette per dollar, a reduction 0.7 of a cigarette greater than found among white women.

[Table 17 about here]

**DISCUSSION**

Quitting smoking, even relatively late in life, confers health and life expectancy benefits. Cessation at the age of 50 leads to a six year increase in life expectancy; at 60 the expected increase is three years (Doll et al. 2004). In addition to their enhanced life expectancy, older adults who quit smoking lower their odds of adverse cardiovascular events, stroke, and smoking-related pulmonary conditions (Gellert et al. 2013, Higgins et al. 1993). Unfortunately, in the last ten years, declines in smoking have stalled among older Americans, and the share of smokers has even increased among older men (CDC 2016a). A potential explanation for the lower gains in smoking reduction in this population could be lesser effectiveness of the core tobacco control strategies among the older adult population. This study investigated whether smoke-free laws and

tobacco taxes are associated with older American smokers quitting or decreasing the intensity of cigarette smoking. The results show some healthful effects of smoke-free laws and increased cigarette prices, but these are inconsistent and generally limited to only some subpopulations. I found a positive effect of workplace laws on the odds of smoking cessation among men, and evidence of decreased smoking intensity with the rise of cigarette prices among high-school graduates, white men, and non-white women. Overall, similarly to adults of other ages (National Cancer Institute 2016), increased price appeared the more effective smoking-reduction strategy.

Smoke-free laws may be less effective among older adults for several reasons. In their early days, the implementation of smoke-free laws mainly centered on workplaces. Unless they were in the labor force, as only 51 percent of this sample was, or frequently visiting the workplaces of others, older adults were not directly affected. Older Americans may also be influenced less by the laws that regulate smoking in restaurants and bars; descriptive data on consumer spending collected by the US Census Bureau show older adults to be less likely to spend money on food outside of the home (The Food Institute 2015). However, even if older adults are not likely to change their smoking practices in response to the newly implemented restaurant and bar laws, older adult nonsmokers will benefit from a decreased exposure to second-hand smoke when they do frequent them, which will lead to a decrease in their risk of heart attacks (Institute of Medicine 2010).

Older adult Americans also appear to be less affected by increases in price than what has been typically measured in younger groups (Chaloupka, Yurekli and Fong 2012). Their lesser responsiveness to price increases was not explained by other factors, such as the magnitude of their addiction, proxied by lagged smoking intensity. The lesser price sensitivity could suggest that some older adults may view smoking as an integral part of their lives, for which they are more willing to make the required financial sacrifice more so than younger people. Taking into account that many older adults live on a fixed income, such financial sacrifice may not be negligible.

Across models, and in alignment with past literature focused on new diagnoses and smoking cessation (Falba 2005), I found an association between a negative change in individual health and quitting or decreasing smoking intensity. I confirmed that older adults who newly consider their health poor or fair are more likely to also be recent quitters, and to have recently lowered their smoking intensity. This finding is significant for two reasons. First, it shows that older adults may be most motivated to make positive health changes when faced with individual, rather than contextual or structural, obstacles to smoking, such as a clear indication of failing health (Falba 2005, Margolis 2013). Coupled with the results of past studies demonstrating that only a minority of seriously ill older adults is counselled to quit smoking (Houston et al. 2005), this finding underscores a missed opportunity for smoking interventions for older adults that could take place during their interactions with their healthcare providers.

## LIMITATIONS

Although this paper provides novel longitudinal evidence of older adults' lower responsiveness to tobacco control measures than what has been measured in younger populations, it would benefit from a larger sample size of older adult smokers. Because the within-person estimator retains only observations from smokers who changed their smoking status over the course of the study, and cessation is a rare occurrence among older adult smokers, the estimated coefficients may be imprecise. This limitation is compounded in models that include an interaction with educational attainment because only a few college graduates continued to smoke into old age. Furthermore, the small number of older Hispanic, Asian, and Native American sample member smokers prevented their separate consideration, and they were thus included in the "non-white" racial/ethnic category. Due to their divergent smoking patterns in comparison to African Americans, who predominate in this group, the results may not well reflect their response to changes in tobacco control.

Smokers are usually not successful when they attempt to quit smoking. This study cannot differentiate between an attempt to quit and a successful cessation. However, in sensitivity analyses that only considered smokers as having quit when they had two consecutive reports of not being smokers (i.e., four years without smoking); estimated coefficients were not changed substantively.

This study would have been strengthened if it used local level price data to complement local level smoke-free laws data. Localities can levy their own tobacco taxes and thus the average tobacco price may vary widely within state (Chaloupka et al. 2015).

Tobacco companies and retailers can adjust the cigarette price or product mix based on local cigarette market conditions, and that too can lead to in state variation. The average cost of a cigarette pack in a state may thus not always correspond with the typical cost paid by a given respondent. While some local tobacco price data are available to researchers, none of them meet the time period and spatial coverage criteria of this study, and thus could not be used.

Changes in tobacco control may not only lead to changes in individual smoking behavior, but may also result in self-reported smoking behavior bias. It is possible that rather than changing their smoking intensity or quitting smoking, smokers become less likely to report smoking or to under-report their smoking intensity instead. Research that compares changes in self-reported data with changes in biomarker data is best suited to quantify the extent of such bias, and past work along these lines has shown reductions in both smoking and cotinine, a metabolite of nicotine, levels following increases in tobacco control efforts (Nesson 2017). However, other work in this tradition has shown that smokers sometimes adjust the amount of nicotine they extract from a cigarette upon price increases. Their level of addiction thus stays the same, even if their self-reported smoking intensity decreases (Adda and Cornaglia 2006). But importantly, no existing studies have addressed whether these patterns are consistent across the life course and whether older adults are similarly likely to compensate.

## CONCLUSION

Smoking cessation by older smokers leads to substantial health gains and overall improvement in health. Examining whether and to what extent our core population-level tobacco control strategies effectively aid in achieving this goal is essential in helping us lower smoking in this population. This study concludes that smoke-free laws and increased tobacco taxation are less effective among older adults than they have been among smokers of younger ages.

# CHAPTER V

## Conclusion

Health disparities are a symptom of social inequality. How long we live, and whether or not we are limited by disease and disability while we do, is closely tied to our socioeconomic resources. A society with highly unequally distributed socioeconomic resources will experience correspondingly highly unequally distributed health outcomes.

A major share of health disparities can be explained by health behaviors, which are thought to be responsible for about a quarter of life expectancy disparities among Americans (Pampel, Krueger and Denney 2010). Health behaviors are not only a major, but also a most vexing cause of disparities. They cannot be fully addressed by expanding health insurance coverage, medical care, or even by providing access to behavioral alternatives. A positive behavioral change requires a substantial effort on the part of the individual. Such effort may be stimulated by educational campaigns that diffuse information about the links between health behaviors and health. Viewed through the paradigm of individual responsibility, persisting in negative health behaviors after becoming well informed about their destructiveness is akin to deliberate self-harm. Yet many continue regardless, because they choose not to quit, or are unable to

change. In the United States, people with low socioeconomic resources are overrepresented in this group. Why do Americans with limited resources more often practice health behaviors they know to be harmful; behaviors that frequently make substantial claims on their money? That is the animating problem of this dissertation.

I focused my research on smoking; the largest preventable cause of death in the United States today. Using a variety of data sources and analytic techniques, I contributed to the literature on the cause of health behavior inequality by answering three broad questions. First, does smoking transmit between parents and adult children, and is the likelihood of transmission modified by their respective social classes? Second, have smoke-free laws contributed to or ameliorated the inequality in smoking? Third, what is the relationship between tobacco policy change, smoke-free laws and increase in cigarette price and smoking cessation and intensity among older adults? Taken together, these chapters provide new evidence of the interactions between mechanisms of social stratification and the efforts to eliminate smoking in the US society.

The results of my first empirical chapter show that, between 1968 and 2011, adult children who grew up with parents who smoked were more likely to be smokers themselves. This finding is well aligned with past literature. The chapter goes beyond current knowledge by hypothesizing and demonstrating that the intergenerational transmission of smoking is closely tied to the intergenerational transmission of social class. I show that, between 1968 and 1986, adult children who maintained their parents' socioeconomic status or were downwardly mobile had larger probabilities of smoking

than the adult children who were upwardly mobile. Among the upwardly mobile, I measured no association between parental smoking and their own smoking. Between 1986 and 2011, only downwardly mobile individuals experienced treatment effects of parents' smoking on their own smoking. After accounting for both parental and adult child's socioeconomic characteristics, the effect of parental smoking on adult child's own smoking was not statistically significant. This chapter argues that conceptual models of smoking initiation that discount broader social transmission mechanisms through which social class and its attributes pass from parents to children have limited explanatory capacity.

The second empirical chapter addresses the role of policy, specifically smoke-free nonhospitality and hospitality workplace laws, in the construction and maintenance of smoking disparities. I propose two mechanisms through which smoke-free laws may have exacerbated smoking inequalities in the US: selective enactment and heterogeneous treatment effects. I view these mechanisms as potentially influencing the smoking inequality in opposite directions. If selective enactment applies, states with higher average socioeconomic status would be more likely to enact the laws, which would translate to the growth of between-state smoking inequalities. If heterogeneous treatment effects apply, I expect groups with low socioeconomic status to be more influenced by the laws than those with high economic status because of their lower prior exposure to nonsmoking spaces and higher smoking rates. I find support for the first mechanism and partial support for the second mechanism. States with greater average educational attainment and lower unemployment rates were more likely to put smoke-

free laws in place. I only observe heterogeneous treatment effects among women, however. Among men I do not measure a significant reduction in smoking following the laws' implementation. Women with a high school degree reduced their smoking by two percentage points, while women with a college degree reduced their smoking by one percentage point. I argue that the results suggest the greatest beneficiaries of smoke-free laws were women of low socioeconomic status living in wealthy US states.

My final empirical chapter analyzes the effect of smoke-free laws and cigarette price change on smoking cessation and intensity among older Americans, the only age group in the United States that has not seen a notable reduction in smoking rates in the past 10 years. I use a longitudinal dataset collected between 1992 and 2014, which enables me to rigorously examine the policy effects and how they may have differed for different groups of older adults. I discover that the implementation of smoke-free laws was associated with an increased likelihood of cessation among men, but not among women. This finding contrasts with the results presented in Chapter 2. Importantly, though older adults appeared less sensitive to changes in policy than previously reported for younger groups of Americans, their responsiveness varied by sociodemographic characteristics. High school graduates decreased their smoking intensity more than other groups upon increased average cigarette prices. Overall, this chapter shows that the best established tobacco control strategies have lesser promise among people who have likely been smoking for several decades.

Taken together, the results presented in the three chapters have implications for both sociological and public health scholarship. Stepping out from the well-covered territory of individual level risk factors for smoking, I show that risk factors are structured by the properties of the broader macrosocial contexts. In the first case, the examined property is socioeconomic permeability, the ease with which children can attain socioeconomic status different from their parents. While children of smokers are more likely to become smokers themselves, their smoking initiation is conditional on socioeconomic attainment. In a macrosocial context with limited opportunities for upward mobility, the rigidity of socioeconomic hierarchy becomes implicated in the maintenance of disparities. One may speculate that in a society where a greater share of young people succeeds in moving upward from their parental social class, smoking disparities might be less entrenched. This chapter thus bids sociologists to consider the determinants of social class while examining the associations between socioeconomic status and health outcomes.

In the second empirical chapter I argue that in quantitative sociology concerned with estimating the effects of policies on health disparities and other outcomes, the political and social causes of policy implementation are frequently talked about, but rarely investigated. This subfield has become somewhat disconnected from research in other fields, including other fields of sociology that theorize and document the origins of policies. My work shows that studies aspiring to illuminate the link between policies and health disparities would be improved by moving beyond measuring their simple effects on individual outcomes and simultaneously scrutinizing the macrosocial dynamics of

their origin. A policy can only have an effect on a population where it is implemented, a deceptively simple proposition, one that implies the existence of a political selection process. An examination of policy treatment effects is incomplete without an understanding to what geopolitical units are likely to have it on the first place. The diversity of US state public health policy is a strength and a liability to population health, and, among sociologists, an underappreciated driver of health disparities. It is an open question whether or not the implementation of comprehensive smoke-free laws in the remaining 24 recalcitrant states would result in declines in smoking comparable to those found in this study.

There are several promising future research directions to further both the conceptual and empirical contributions presented here. The work can be strengthened and clarified by testing gender-specific mechanisms and evaluating whether or not it is plausible that smoke-free laws are less effective among men than women, as some results in this study suggest. A promising strategy for investigating such differences might be evaluating whether men and women differ in their degree of support for smoke-free laws. Qualitative research could be especially helpful in investigating whether or not smoke-free laws hold different meaning for men and women. This dissertation also did not address questions of racial and ethnic differences in smoking. The omission was deliberate. An adequate treatment of racial and ethnic disparities in smoking along with socioeconomic disparities was outside of the scope of this project. A fruitful extension to this work would be re-examining the posited associations in non-White populations and evaluating how and if race and ethnicity might modify the observed relationships.

The overall macrosocial orientation of the work lends itself to cross-national comparisons. It may be especially instructive to compare the intergenerational transmission of smoking in societies with different degrees of socioeconomic permeability. Such comparison could help us understand whether greater opportunities for socioeconomic advancement might translate to lesser disparities in health behaviors in the United States. With respect to measurement, I returned several times to questions of smoking self-reporting, and how it may change under different tobacco policy regimes. Severally nationally representative datasets, including two of the datasets used in this dissertation – HRS, and PSID, have begun collecting salivary markers that enable us to distinguish between nonsmokers and smokers who are not comfortable with reporting their smoking. As the stigma associated with smoking increases, future research would benefit from triangulating all smoking self-reports with biomarker smoking data.

Health disparities remain a large social problem in the United States, and one that is not likely to be solved without the work of researchers from multiple disciplines and fields. Scholars' attention has been already captured; the present moment is one of feverish research activity. Our next challenge is synthesis and earnest cross-disciplinary engagement that will encourage the debate of empirical findings as well as conceptual models from a variety of academic fields. This dissertation, rooted in scholarship produced by sociology, social epidemiology, and health policy, makes a step toward such a model of scholarship.

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## TABLES AND FIGURES

Table 1 (Start). Descriptive PSID analytic sample characteristics.

| | 1968 | | | | 1986 | | | |
|---|---|---|---|---|---|---|---|---|
| | **Total Sample** | **Non-smoking Family** | **Smoking Family** | **p for diff** | **Total Sample** | **Non-smoking Descendant** | **Currently Smoking Descendant** | **p for diff** |
| **Total** | 100% | 35% | 65% | | 100% | 69% | 31% | |
| **Household Income** | | | | | | | | |
| First tertile | 33% | 33% | 33% | | 25% | 21% | 33% | |
| Second tertile | 33% | 33% | 33% | | 36% | 37% | 34% | |
| Third tertile | 34% | 34% | 35% | | 39% | 42% | 32% | |
| **Highest Education*** | | | | | | | | |
| Less than HS | 30% | 26% | 32% | | 11% | 6% | 24% | |
| HS Grad | 55% | 52% | 56% | | 62% | 61% | 65% | |
| College+ | 15% | 22% | 11% | | 27% | 34% | 11% | |
| **Occupational Group*** | | | | | | | | |
| Manual/unskilled worker | 32% | 30% | 34% | | 15% | 14% | 19% | |
| Skilled worker | 36% | 33% | 37% | | 46% | 42% | 57% | |
| Professional or Manager | 32% | 38% | 29% | | 38% | 45% | 24% | |
| **Male** | --- | --- | --- | --- | 52% | 50% | 57% | 0.055 |
| **Age** | --- | --- | --- | --- | 30.14 | 30.18 | 30.06 | 0.542 |
| SD | --- | --- | --- | | (3.04) | (2.96) | (3.20) | |
| **White** | 84% | 85% | 84% | 0.358 | 87% | 87% | 86% | 0.608 |
| **Smoking Family in Prior Generation** | --- | --- | --- | --- | 64% | 60% | 74% | <0.001 |
| N | 2,622 | 940 | 1,682 | | 1,927 | 1,280 | 647 | |

Table 1 (Continued). Descriptive PSID analytic sample characteristics.

| | 2011 | | |
|---|---|---|---|
| | **Non-smoking Descendant** | **Currently Smoking Descendant** | **p for diff** |
| | 79% | 21% | |
| **Total** | | | |
| **Household Income** | 27% | 47% | |
| First tertile | 36% | 35% | |
| Second tertile | 37% | 18% | |
| Third tertile | | | |
| **Highest Education*** | 3% | 22% | |
| Less than HS | 45% | 59% | |
| HS Grad | 52% | 19% | |
| College+ | | | |
| **Occupational Group*** | 18% | 31% | |
| Manual/unskilled worker | 35% | 45% | |
| Skilled worker | 47% | 23% | |
| Professional or Manager | | | |
| | 48% | 57% | 0.038 |
| **Male** | 29.68 | 29.55 | 0.551 |
| **Age** | (2.96) | (3.09) | |
| SD | 83% | 80% | 0.297 |
| **White** | 38% | 54% | <0.001 |
| **Smoking Family in Prior Generation** | | | |
| N | 1,063 | 321 | |

Figure 1. Intergenerational transmission of smoking in the PSID analytic sample from 1968 to 2011.

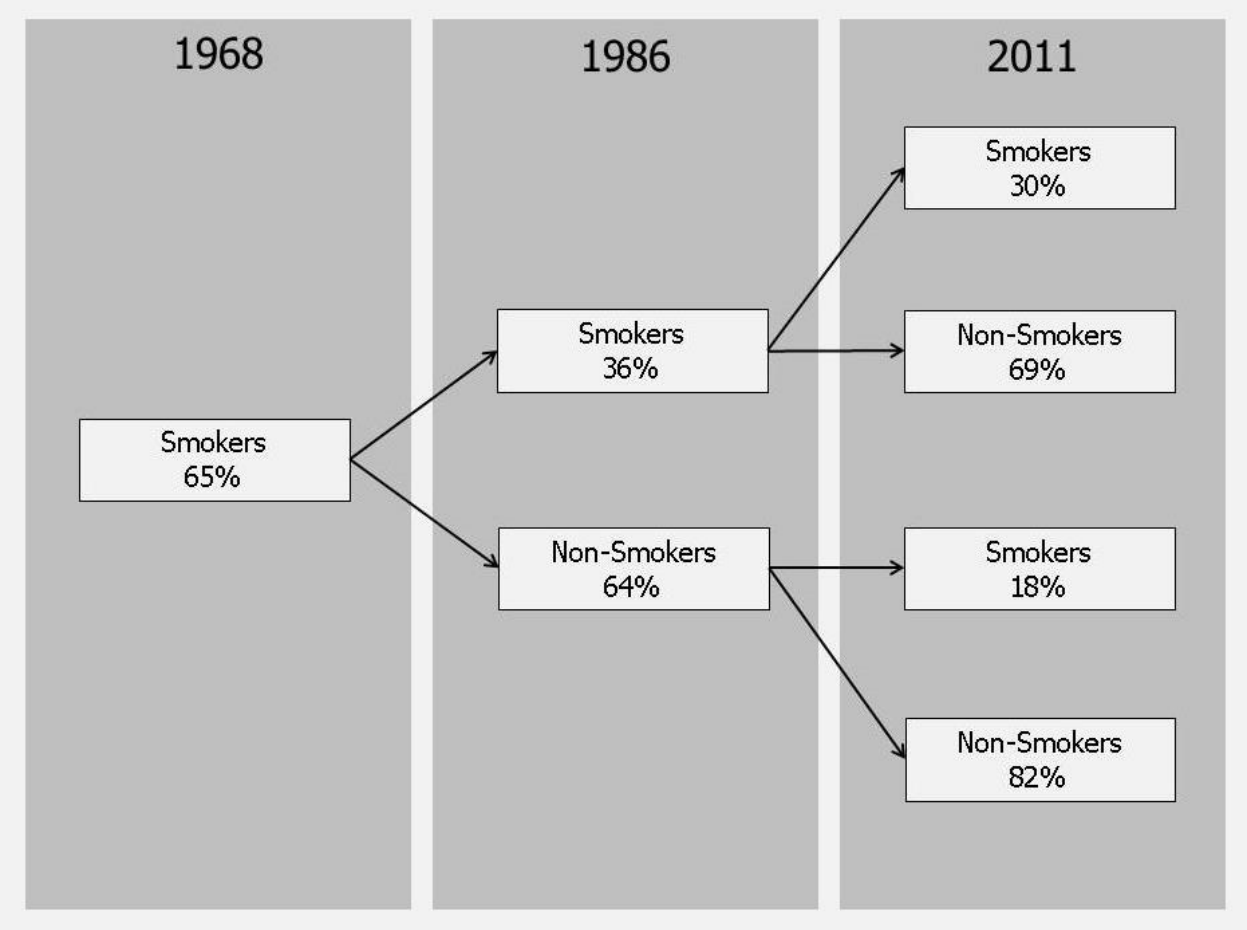
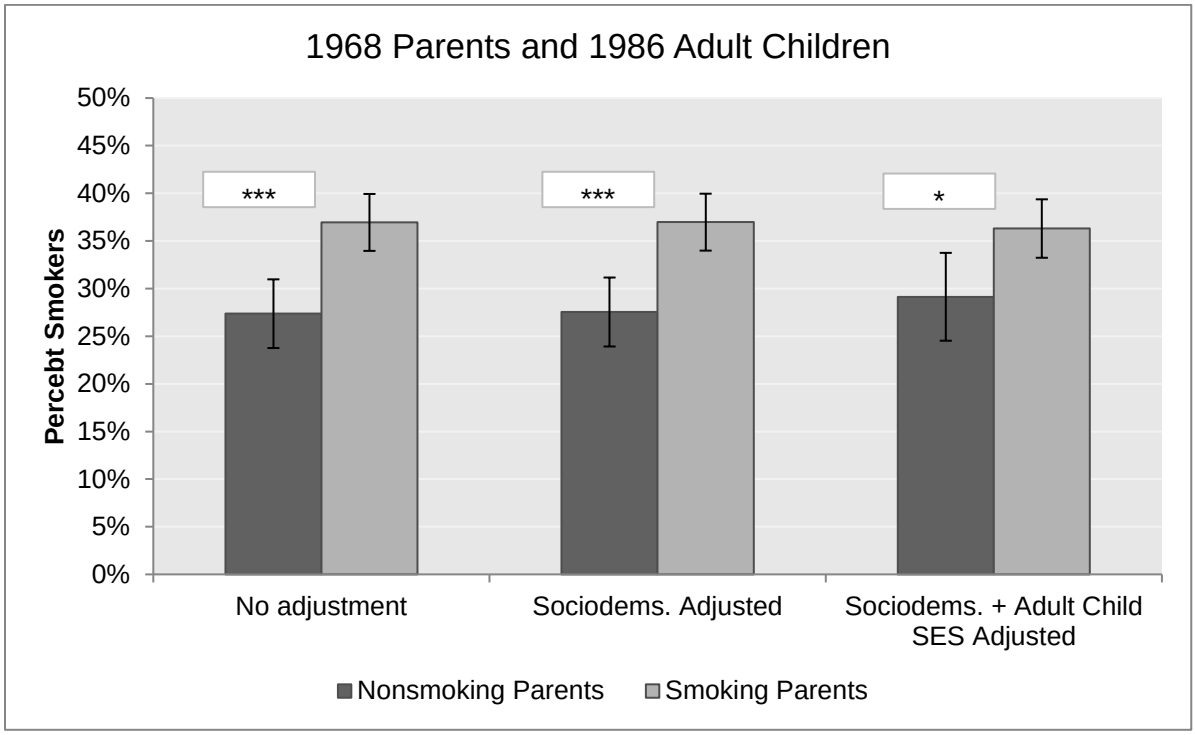


Table 2. Logistic regression models in 1968, 1986, 2011 predicting current smoking. Coefficients transformed into odds ratios. Standard errors in parentheses.

| | 1968 | | 1986 | | | | 2011 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Smoking Family | | Smoking Descendant | | Smoking Descendant | | Smoking Descendant | | Smoking Descendant | |
| Smoking family in prior generation | -- | | -- | | 1.65 | ** | -- | | 1.50 | * |
| | -- | | -- | | (0.26) | | -- | | (0.28) | |
| Household Income (First Quartile Reference) | | | | | | | | | | |
| Second Tertile | 1.02 | | 0.63 | * | 0.63 | * | 0.59 | * | 0.57 | * |
| | (0.14) | | (0.11) | | (0.11) | | (0.14) | | (0.15) | |
| Third Tertile | 1.32 | † | 0.70 | * | 0.69 | * | 0.36 | *** | 0.35 | *** |
| | (0.21) | | (0.12) | | (0.12) | | (0.09) | | (0.09) | |
| Education (Less than High School Reference) | | | | | | | | | | |
| High School Graduate | 0.78 | † | 0.28 | *** | 0.29 | *** | 0.62 | † | 0.71 | |
| | (0.10) | | (0.05) | | (0.05) | | (0.17) | | (0.20) | |
| College + | 0.35 | *** | 0.10 | *** | 0.10 | *** | 0.32 | *** | 0.39 | ** |
| | (0.07) | | (0.03) | | (0.03) | | (0.09) | | (0.12) | |
| Occupational Group (Manual/unskilled Worker Ref.) | | | | | | | | | | |
| Skilled Worker | 1.08 | | 1.09 | | 1.07 | | 0.86 | | 0.89 | |
| | (0.15) | | (0.22) | | (0.21) | | (0.25) | | (0.26) | |
| Manager/Professional | 0.99 | | 0.78 | | 0.77 | | 0.49 | * | 0.50 | * |
| | (0.17) | | (0.16) | | (0.16) | | (0.13) | | (0.14) | |
| White | 0.86 | | 1.15 | | 1.18 | | 1.24 | | 1.25 | |
| | (0.12) | | (0.23) | | (0.24) | | (0.30) | | (0.30) | |
| Age | --- | | 1.00 | | 1.00 | | 1.01 | | 1.01 | |
| | | | (0.02) | | (0.02) | | (0.02) | | (0.02) | |
| Male | --- | | 1.36 | † | 1.37 | † | 1.43 | | 1.42 | |
| | | | (0.21) | | (0.22) | | (0.34) | | (0.34) | |
| N | 2,622 | | 1,927 | | 1,927 | | 1,384 | | 1,384 | |

Figure 2. Results from coarsened matching of 1986 and 2011 adult samples predicting current (1986 and 2011) smoking by having had a smoking parent in prior generation. Adult child sample matched on age, gender, race, income, education, and occupational category. Standard errors clustered at the family level.



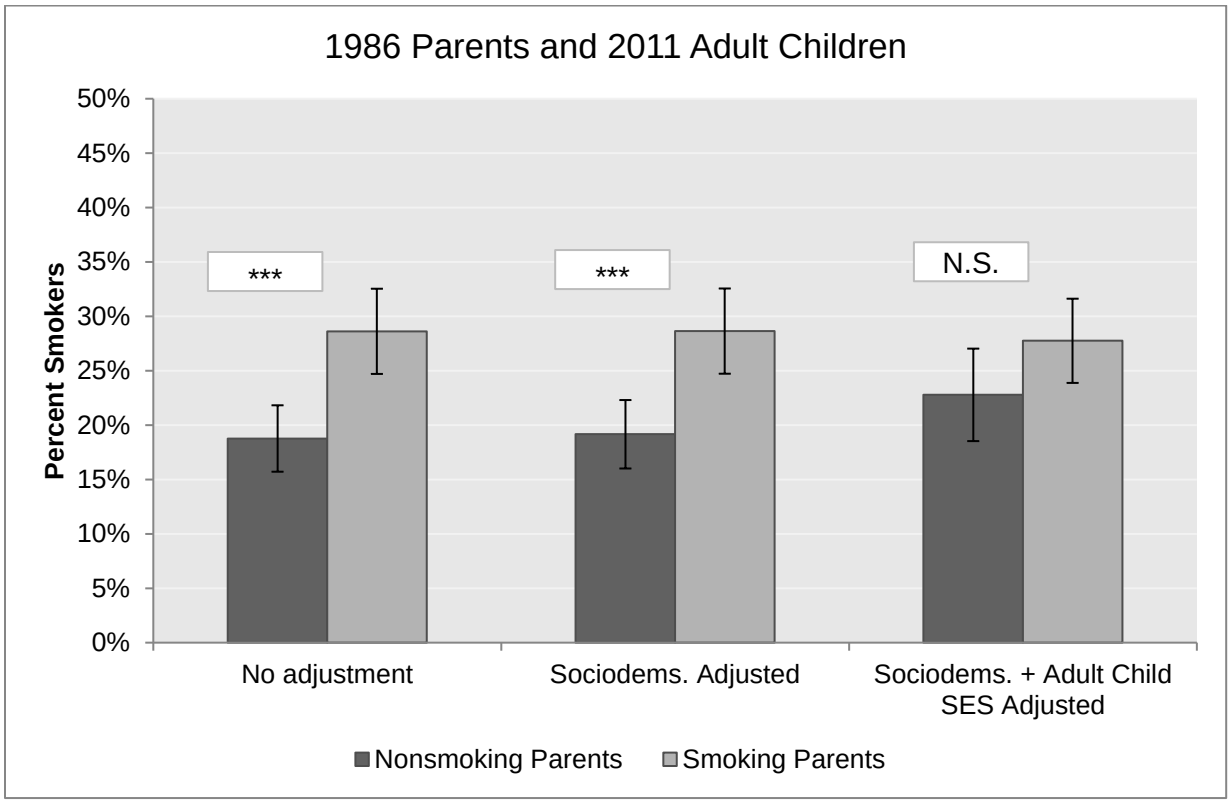



Table 3. Coarsened matching of 1986 and 2011 adult samples predicting current (1986 and 2011) smoking by having had a smoking parent in prior generation. Stratified by parental SES. Adult child sample matched on first on age, gender, race, marital status, and then on own income, education, and occupational category. Standard errors clustered by family.

| Stratification | 1968 - 1986 | | | | | | | | 1986 - 2011 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ATE sociodem match | CI | | N | ATE sociodem + SES match | CI | | N | ATE sociodem match | CI | | N | ATE sociodem + SES match | CI | | N |
| **Parental Income Tertile** | | | | | | | | | | | | | | | | |
| First | 0.09* | 0.02 | 0.17 | 827 | 0.07* | 0.02 | 0.16 | 686 | 0.13** | 0.05 | 0.20 | 539 | 0.10† | 0.00 | 0.19 | 449 |
| Second | 0.05 | -0.05 | 0.15 | 513 | 0.06 | -0.06 | 0.18 | 349 | 0.08† | 0.00 | 0.16 | 468 | 0.02 | -0.08 | 0.12 | 362 |
| Third | 0.15** | 0.07 | 0.23 | 589 | 0.16** | 0.07 | 0.26 | 490 | 0.07† | 0.00 | 0.14 | 439 | 0.01 | -0.08 | 0.10 | 346 |
| **Parental Education** | | | | | | | | | | | | | | | | |
| Less than HS | 0.07† | -0.01 | 0.15 | 796 | 0.07 | -0.03 | 0.16 | 636 | 0.08 | -0.09 | 0.24 | 169 | -0.07 | -0.32 | 0.19 | 105 |
| HS Grad | 0.11** | 0.04 | 0.18 | 880 | 0.11** | 0.03 | 0.19 | 736 | 0.07* | 0.01 | 0.14 | 916 | 0.06† | -0.01 | 0.13 | 818 |
| College + | 0.11† | -0.01 | 0.22 | 233 | 0.13† | -0.01 | 0.27 | 162 | 0.02 | -0.06 | 0.10 | 346 | 0.00 | -0.08 | 0.08 | 247 |
| **Parental Occupational Category** | | | | | | | | | | | | | | | | |
| Manual/unskilled Worker | 0.02 | -0.05 | 0.10 | 803 | 0.04 | 0.05 | 0.13 | 644 | 0.18** | 0.07 | 0.30 | 205 | 0.13† | -0.01 | 0.26 | 135 |
| Skilled Worker | 0.15** | 0.04 | 0.25 | 539 | 0.19** | 0.08 | 0.30 | 399 | 0.07 | -0.01 | 0.15 | 513 | 0.03 | -0.07 | 0.12 | 425 |
| Manager/Professional | 0.11* | 0.01 | 0.20 | 424 | 0.06 | -0.06 | 0.18 | 335 | 0.10* | 0.01 | 0.19 | 313 | 0.10† | -0.01 | 0.21 | 201 |

Table 4. Coarsened matching of 1986 and 2011 adult samples predicting current (1986 and 2011) smoking by having had a smoking parent in prior generation. Stratified by SES mobility. Sample matched on age, gender, race, income, education, and occupation.

| | 1968 - 1986 | | | | 1986 - 2011 | | | |
|---|---|---|---|---|---|---|---|---|
| **Intergenerational Mobility** | ATE | CI | | N | ATE | CI | | N |
| **Parental Income Tertile** | | | | | | | | |
| No Mobility | 0.03 | -0.05 | 0.12 | 841 | 0.06 | -0.02 | 0.13 | 666 |
| Upward | 0.04 | -0.05 | 0.13 | 589 | 0.05 | -0.02 | 0.17 | 365 |
| Downward | 0.17* | 0.04 | 0.31 | 428 | 0.05 | -0.06 | 0.17 | 326 |
| **Parental Education** | | | | | | | | |
| No Mobility | 0.14** | 0.07 | 0.22 | 937 | 0.11** | 0.04 | 0.17 | 865 |
| Upward | 0.06 | -0.02 | 0.13 | 753 | 0.02 | -0.06 | 0.10 | 326 |
| Downward | 0.13 | -0.06 | 0.31 | 153 | 0.16† | -0.01 | 0.32 | 154 |
| **Parental Occupation** | | | | | | | | |
| No Mobility | 0.09† | 0.01 | 0.18 | 655 | 0.08† | -0.01 | 0.17 | 393 |
| Upward | 0.02 | -0.06 | 0.10 | 758 | 0.05 | -0.03 | 0.14 | 310 |
| Downward | 0.20*** | 0.10 | 0.30 | 408 | 0.08† | 0.00 | 0.15 | 658 |

Table 5. Coarsened matching of 1986 and 2011 adult samples predicting current (1986 and 2011) smoking by having had a smoking parent in prior generation. Stratified by SES mobility and class of origin. Sample matched on age, gender, race, education, and SES variables, as appropriate.

| | | 1968 - 1986 | | | | 1986 - 2011 | | | |
|---|---|---|---|---|---|---|---|---|---|
| SES Origin | SES Mobility | ATE | CI | | N | ATE | CI | | N |
| **HH Income Tertile** | | | | | | | | | |
| | Match | 0.07 | -0.06 | 0.20 | 345 | 0.10 | -0.03 | 0.23 | 261 |
| | Upward | 0.05 | -0.06 | 0.15 | 422 | 0.09 | -0.03 | 0.21 | 222 |
| | Downward | -- | -- | -- | -- | -- | -- | -- | -- |
| | Match | -0.10 | -0.32 | 0.12 | 156 | 0.01 | -0.15 | 0.16 | 149 |
| | Upward | 0.09 | -0.07 | 0.25 | 133 | -0.04 | -0.25 | 0.16 | 113 |
| | Downward | 0.21* | 0.03 | 0.39 | 98 | 0.09 | -0.08 | 0.26 | 100 |
| | Match | 0.05 | -0.08 | 0.17 | 257 | 0.01 | -0.10 | 0.12 | 184 |
| | Upward | -- | -- | -- | -- | -- | -- | -- | -- |
| | Downward | 0.12 | -0.10 | 0.34 | 282 | 0.03 | -0.13 | 0.19 | 191 |
| **Educational Category** | | | | | | | | | |
| | Match | 0.14 | -0.03 | 0.31 | 139 | -0.14 | -0.67 | 0.38 | 36 |
| | Upward | 0.03 | -0.06 | 0.12 | 566 | -0.02 | -0.24 | 0.19 | 75 |
| | Downward | -- | -- | -- | -- | -- | -- | -- | -- |
| | Match | 0.14** | 0.05 | 0.23 | 581 | 0.07 | -0.02 | 0.15 | 550 |
| | Upward | 0.07 | 0.08 | 0.23 | 161 | 0.01 | -0.06 | 0.08 | 200 |
| | Downward | -0.10 | 0.41 | 0.22 | 51 | 0.15 | 0.08 | 0.39 | 68 |
| | Match | 0.07 | -0.08 | 0.21 | 112 | 0.03 | -0.05 | 0.12 | 208 |
| | Upward | -- | -- | -- | -- | -- | -- | -- | -- |
| | Downward | 0.21† | -0.03 | 0.45 | 56 | -0.15 | -0.38 | 0.08 | 45 |
| **Occupational Category** | | | | | | | | | |
| | Match | -0.07 | 0.27 | 0.13 | 171 | 0.26 | -0.25 | 0.78 | 14 |
| | Upward | 0.07 | -0.02 | 0.16 | 624 | 0.07 | -0.13 | 0.27 | 96 |
| | Downward | -- | -- | -- | -- | -- | -- | -- | -- |
| | Match | 0.18* | 0.03 | 0.33 | 260 | 0.05 | -0.08 | 0.18 | 245 |
| | Upward | 0.06 | -0.10 | 0.21 | 169 | 0.01 | -0.08 | 0.11 | 165 |
| | Downward | 0.25* | 0.00 | 0.50 | 69 | 0.10 | -0.08 | 0.28 | 135 |
| | Match | 0.03 | -0.10 | 0.16 | 216 | 0.06 | -0.04 | 0.16 | 222 |
| | Upward | -- | -- | -- | -- | -- | -- | -- | -- |

Figure 3. Percentage of US population protected by state or local smoke-free laws (1990 – 2014)

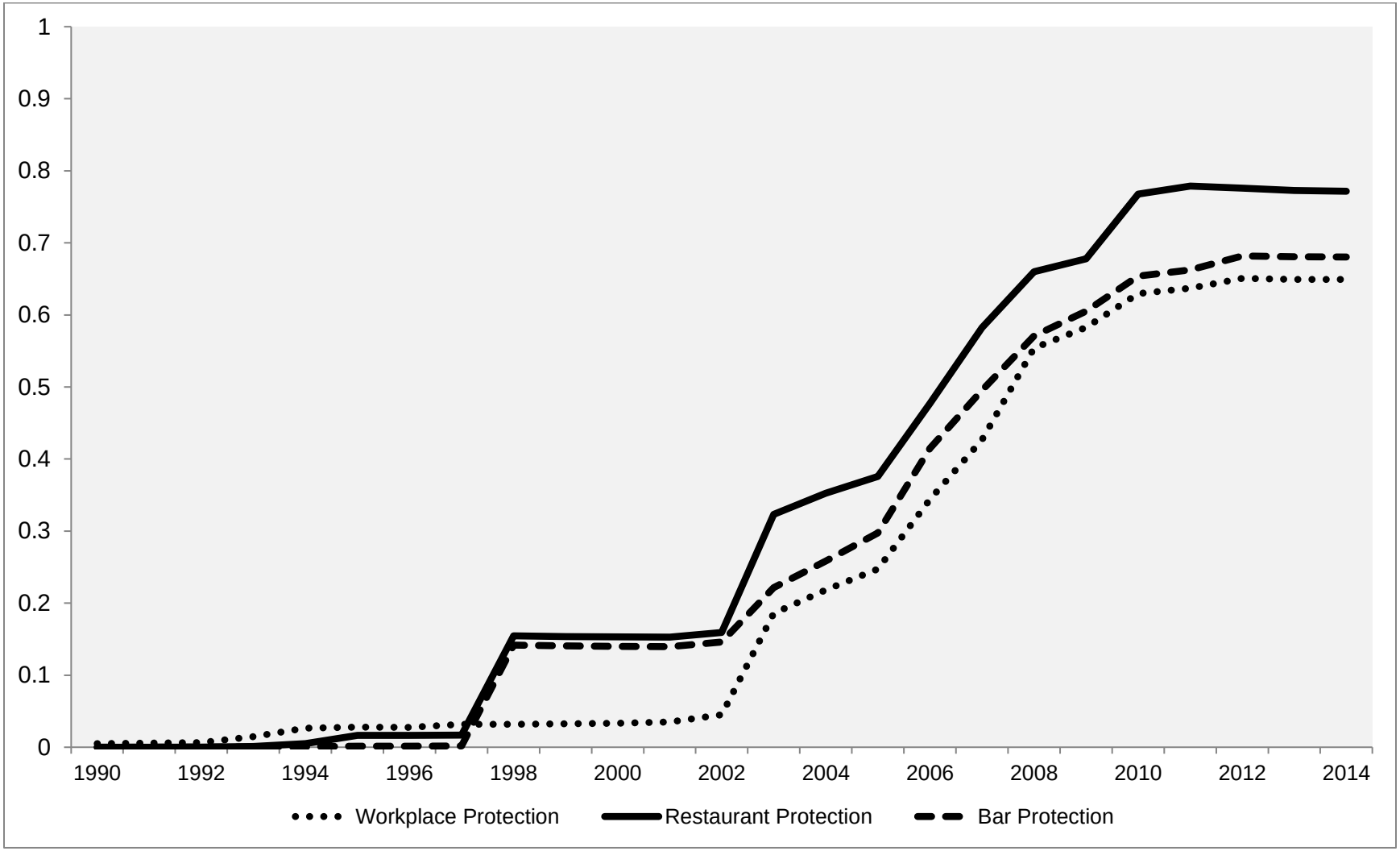
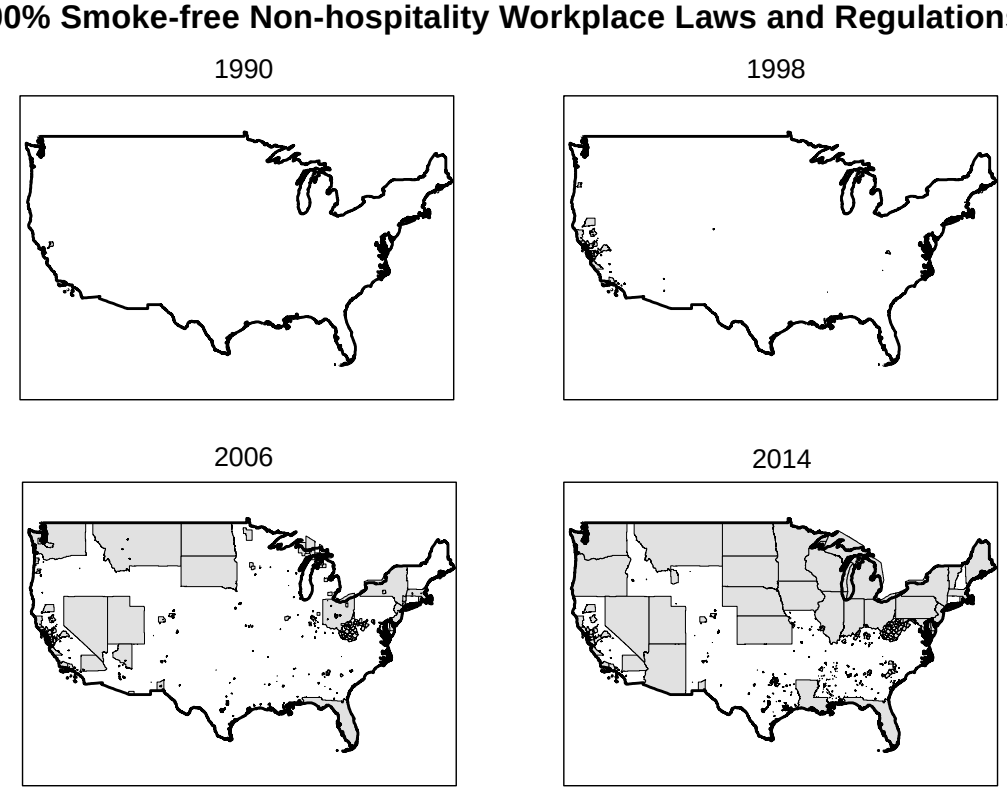
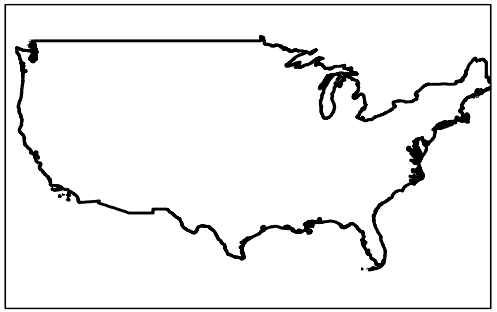


Figure 4. Spatial diffusion of smoke-fee laws in the United States betweeen 1990 - 2014. Data from Americans for Nonsmokers' Rights.

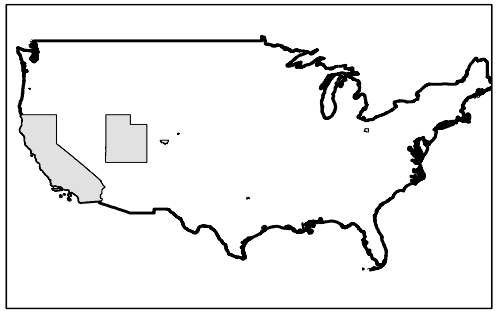


**100% Smoke-free Restaurant Laws and Regulations**

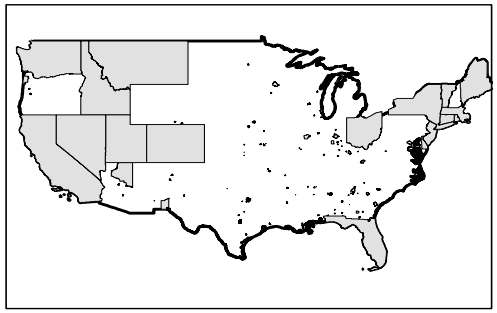
1990



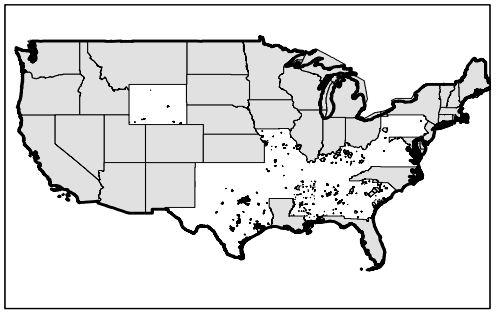
1998



2006



2014



## 100% Smoke-free Bars Laws and Regulations

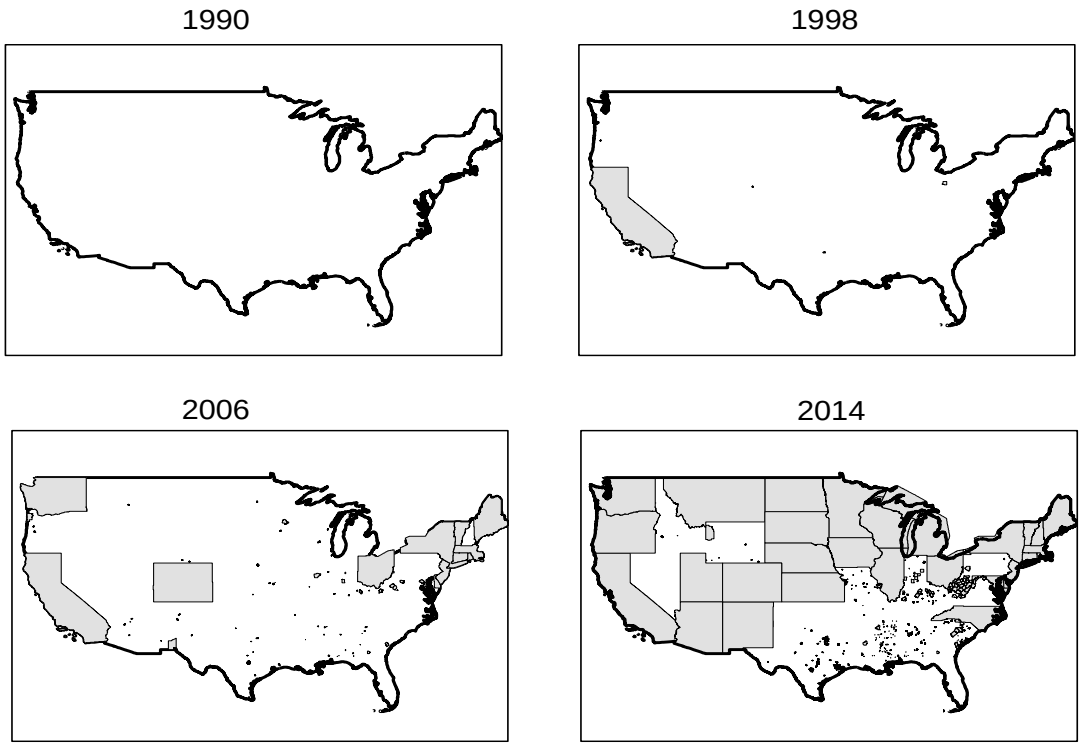


Table 6. Descriptive characteristics of US States in 2014 stratified by the adoption of each state smoke-free law.

| | | Non-hospitality Workplaces | | | Restaurants | | | Bars | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Overall Mean or Percentage | No | Yes | Stat. Sig. | No | Yes | Stat. Sig. | No | Yes | Stat. Sig. |
| % Smokers in state | 19 | 21 | 18 | * | 22 | 18 | *** | 22 | 18 | *** |
| % Urban residents in state | 74 | 69 | 77 | † | 66 | 77 | ** | 69 | 76 | † |
| % African Americans in state | 10 | 13 | 9 | N.S. | 15 | 8 | * | 15 | 7 | ** |
| % Population with BA+ in state | 29 | 28 | 30 | † | 26 | 31 | *** | 26 | 32 | *** |
| % Unemployed in state | 6 | 6 | 5 | N.S. | 6 | 6 | N.S. | 6 | 5 | * |
| Median household Income in state (constant $ 2000; mean) | 54,963 | 52,492 | 56,752 | N.S. | 49,707 | 57,215 | ** | 49,276 | 58,753 | *** |
| Confidence Interval | (52,374 - 57,551) | (47,811 - 57,172) | (53,961 - 59,542) | | (44,867 - 54,547) | (54,447 - 59,982) | | (45, 564 - 52,989) | (55,951, 61,555) | *** |
| % Any tobacco production in state | 16 | 29 | 7 | * | 40 | 6 | ** | 30 | 7 | * |
| % Protected by a local law | --[a] | 18 | --[a] | - | 25 | --[a] | - | 15 | --[a] | - |
| % Neighboring states with a state law | 60 wp., 60 rest., 50 bar.* | 50 | 67 | † | 41 | 68 | ** | 31 | 63 | *** |
| % Democratic party majority | 38 | 24 | 48 | † | 7 | 51 | ** | 10 | 57 | ** |
| State region | | | | | | | | | | |
| %Northeast | 18 | 10 | 24 | | 7 | 23 | | 5 | 27 | |
| %Midwest | 24 | 5 | 38 | | 7 | 31 | | 10 | 33 | |
| %South (No major tobacco producers) | 10 | 6 | 4 | | 6 | 4 | | 8 | 2 | |
| %South (Major tobacco producers) | 6 | 6 | 0 | | 5 | 1 | | 5 | 1 | |
| %West | 26 | 29 | 24 | | 13 | 31 | | 20 | 30 | |
| States | 50 | 21 | 29 | | 15 | 35 | | 20 | 30 | |

Note: Differences in means were tested by Wald tests; differences in the distribution of categorical variables were tested by $\chi^2$ tests.
[a]Only calculated for states without each state law.
*** p<0.001, ** p<0.01, * p<0.05, † p <0.10.

Table 7. Discrete time hazard logistic regression models predicting the adoption of state-wide 100% smoke-free laws in US states between 1990 and 2014. Clustered standard errors. Transformed to odds ratios.

| | (1) Non-hospitality Workplaces | | (2) Restaurants | | (3) Bars | |
|---|---|---|---|---|---|---|
| Lagged percentage of smokers in state | 0.80 | * | 0.67 | * | 0.73 | ** |
| | (0.08) | | (0.11) | | (0.08) | |
| Percentage of urban residents in state | 1.03 | | 1.01 | | 0.97 | |
| | (0.03) | | (0.02) | | (0.02) | |
| Percentage of African Americans in state | 1.05 | | 0.99 | | 0.99 | |
| | (0.04) | | (0.04) | | (0.05) | |
| Percentage of population with BA+ in state | 1.02 | | 1.06 | | 1.37 | ** |
| | (0.10) | | (0.09) | | (0.13) | |
| Percentage unemployed in state | 0.69 | * | 0.97 | | 1.03 | |
| | (0.13) | | (0.04) | | (0.12) | |
| Median household income in state (in $1,000) | 0.92 | | 0.94 | | 0.93 | |
| | (0.05) | | (0.09) | | (0.04) | |
| Percentage of population protected by local law | 0.85 | | 0.97 | | 0.98 | |
| | (0.26) | | (0.02) | | (0.02) | |
| Percentage neighboring states with a state law | 1.02 | | 1.00 | | 1.01 | |
| | (0.01) | | (0.01) | | (0.01) | |
| Democratic party majority | 1.27 | | 3.29 | ** | 7.24 | ** |
| | (0.64) | | (1.50) | | (4.27) | |
| Region (Midwest reference group) | | | | | | |
| Northeast | 0.23 | * | 0.79 | | 0.28 | |
| | (0.17) | | (0.54) | | (0.20) | |
| South (No major tobacco producers) | 0.11 | * | 0.25 | | 0.09 | |
| | (0.11) | | (0.29) | | (0.14) | |

| | | | | | | |
|---|---|---|---|---|---|---|
| South (Major tobacco producers) | ---[a] | | 0.05 | * | 0.04 | * |
| | | | (0.07) | | (0.06) | |
| West | 0.11 | ** | 1.23 | | 0.38 | |
| | (0.09) | | (0.69) | | (0.23) | |
| Wald $\chi^2$ | 62.1 | | 111.46 | | 87.22 | |
| Degrees of Freedom | 13 | | 14 | | 14 | |
| Probability > $\chi^2$ | <0.001 | | <0.001 | | <0.001 | |
| Pseudo $R^2$ | 0.22 | | 0.34 | | 0.41 | |
| N (state-years) | 835 | | 927 | | 984 | |

a. No major tobacco producers have smoke-free nonhospitality workplace laws.

Table 8. Weighted descriptive characteristics of BRFSS analytic sample 1995 - 2010.

| | Mean or Percentage | Min | Max |
|---|---|---|---|
| *Individual characteristics* | | | |
| %Smoker | 20 | 0 | 1 |
| %Male | 48 | 0 | 1 |
| Education | | 0 | 3 |
| %Less than HS | 12 | -- | -- |
| %HS or GED | 29 | -- | -- |
| %Some College | 26 | -- | -- |
| %BA+ | 33 | -- | -- |
| Age (in years) | 49.37 | 25 | 99 |
| Standard deviation | 15.96 | | |
| Race | | 1 | 4 |
| %NH White | 77 | | |
| %NH Black | 6 | | |
| %Other NH Race | 5 | | |
| %Hispanic | 12 | | |
| *State Characteristics* | | | |
| % In state with a workplace law | 20 | 0 | 1 |
| % In state with a restaurant law | 31 | 0 | 1 |
| % In state with a bar law | 25 | 0 | 1 |
| % In State Population Covered by Local Smokefree Non-hospitality Workplace Laws or Regulations* | 56 | 0 | 80 |
| % In State Population Covered by Local Smokefree Restaurant Laws or Regulations* | 29 | 0 | 87 |
| % In State Population Covered by Local Smokefree Bar Laws or Regulations* | 21 | 0 | 33 |
| State cigarette tax per pack (in $) | 0.80 | 0.03 | 3.46 |
| Standard deviation | 0.60 | | |
| % In State Protected by Private Workplace Rules | 83 | 0 | 96 |
| Year | 2003.45 | 1995 | 2010 |
| Standard deviation | 4.27 | | |
| N | 3,737,436 | | |

*If state-wide law enacted, only pre-enactment coverage included in the measure.

Table 9. Individual predicted probability of smoking estimated by linear probability models with two-way fixed effects in BRFSS 1995 - 2010 with population survey weights.

| | Men | | | Women | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Current Smoker | Current Smoker | Current Smoker | Current Smoker | Current Smoker | Current Smoker |
| No smoke-free laws | 0.22 | 0.22 | 0.22 | 0.19 | 0.19 | 0.19 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Non-hospitality workplace laws only | 0.23 | 0.23 | 0.23 | 0.19 | 0.19 | 0.19 |
| | (0.004) | (0.004) | (0.004) | (0.003) | (0.003) | (0.003) |
| Restaurant laws only | 0.22 | 0.23 | 0.23 | 0.18** | 0.18* | 0.18* |
| | (0.004) | (0.004) | (0.004) | (0.003) | (0.003) | (0.003) |
| Restaurant and bar laws | 0.22 | 0.22 | 0.22 | 0.17*** | 0.17*** | 0.17** |
| | (0.005) | (0.005) | (0.005) | (0.003) | (0.003) | (0.003) |
| Non-hospitality workplace, restaurant, and bar laws | 0.22 | 0.22 | 0.22 | 0.18*** | 0.18*** | 0.18** |
| | (0.003) | (0.003) | (0.003) | (0.002) | (0.002) | (0.002) |
| Observations | 1,445,146 | 1,445,146 | 1,445,146 | 2,292,290 | 2,292,290 | 2,292,290 |
| R-squared | 0.007 | 0.073 | 0.076 | 0.009 | 0.066 | 0.066 |

Standard errors in parentheses. Models 1 and 4: State and year fixed effects. Models 2 and 5: Individual race, age, educational attainment, state and year fixed effects. Models 3 and 6: Individual race, age, educational attainment , tax per cigarette pack, share of state's population protected by local non-hospitality workplace, restaurant, bar laws, percentage of population protected by private laws, state and year fixed effects.
Statistical significance tests refer to the difference between a law change and no law change. *** p<0.001, ** p<0.01, * p<0.05.

Table 10 (Start). Predicted probability of smoking for 40 year old white men and women by education with and without laws' enactment; based on Models 3 and 6 in Table 4.

| | Men | | | | | | |
|---|---|---|---|---|---|---|---|
| | No Laws | Non-hosp. Law only | Non-hosp. Law only - No Law | Stat. sig. of Δ | Rest. Law Only | Rest. Law Only - No Law | Stat. sig. of Δ |
| Less than HS | 0.53 (0.01) | 0.52 (0.02) | 0.02 | N.S. | 0.55 (0.02) | 0.02 | N.S. |
| HS Grad | 0.37 (0.002) | 0.37 (0.01) | 0.00 | N.S. | 0.37 (0.01) | 0.00 | N.S. |
| Some College | 0.28 (0.002) | 0.28 (0.01) | 0.00 | N.S. | 0.29 (0.01) | 0.01 | N.S. |
| College + | 0.13 (0.02) | 0.14 (0.01) | 0.01 | N.S. | 0.13 (0.01) | 0.00 | N.S. |
| | Women | | | | | | |
| | No Laws | Non-hosp. law only | Non-hosp. law only - No Law | Stat. sig. of Δ | Rest. Law Only | Rest. Law Only - No Law | Stat. sig. of Δ |
| Less than HS | 0.49 (0.004) | 0.49 (0.01) | 0.00 | N.S. | 0.49 (0.01) | 0.00 | N.S. |
| HS Grad | 0.35 (0.002) | 0.35 (0.01) | 0.00 | N.S. | 0.34 (0.01) | 0.00 | N.S. |
| Some College | 0.26 (0.002) | 0.26 (0.01) | 0.00 | N.S. | 0.25 (0.01) | -0.01 | N.S. |
| College + | 0.11 (0.001) | 0.11 (0.004) | 0.00 | N.S. | 0.10 (0.004) | -0.01 | ** |

Table 10 (Continued). Predicted probability of smoking for 40 year old white men and women by education with and without laws' enactment; based on Models 3 and 6 in Table 4.

| | Men | | | | | |
|---|---|---|---|---|---|---|
| | Rest. and Bar Laws | Rest. and Bar Laws - No Laws | Stat. sig. of Δ | All Laws | All Laws - No Laws | Stat. sig. of Δ |
| Less than HS | 0.53 (0.02) | 0.00 | N.S. | 0.53 (0.01) | 0.00 | N.S. |
| HS Grad | 0.37 (0.01) | 0.00 | N.S. | 0.36 (0.01) | 0.01 | N.S. |
| Some College | 0.29 (0.01) | 0.01 | N.S. | 0.28 (0.01) | 0.00 | N.S. |
| College + | 0.13 (0.01) | 0.00 | N.S. | 0.12 (0.003) | 0.00 | N.S. |
| | Women | | | | | |
| | Rest. and Bar Laws | Rest. and Bar Laws - No Laws | Stat. sig. of Δ | All Laws | All Laws - No Laws | Stat. sig. of Δ |
| Less than HS | 0.48 (0.01) | -0.01 | N.S. | 0.48 (0.01) | -0.01 | N.S. |
| HS Grad | 0.33 (0.01) | -0.02 | * | 0.34 (0.004) | -0.01 | * |
| Some College | 0.25 (0.01) | -0.01 | N.S. | 0.25 (0.004) | -0.01 | N.S. |
| College + | 0.10 (0.004) | -0.01 | N.S. | 0.10 (0.003) | -0.01 | * |

Linear probability models with two-way fixed effects in BRFSS 1995 - 2010 with population survey weights.
Statistical significance tests refer to the difference between a law change and no law change. *** p<0.001, ** p<0.01, * p<0.05.

Table 11. Descriptive characteristics of the HRS analytic sample (1992-2014).

| | Mean/% | CI | Did Not Quit | Quit | p for diff |
|---|---|---|---|---|---|
| ***Time Variant*** | | | | | |
| Quit | 11% | -- | | | |
| Number of Cigarettes Daily | 16.18 | [16.03-16.38] | 16.25 | 16.13 | 0.562 |
| Age | 62.69 | [62.59-62.79] | 62.56 | 64.08 | <0.001 |
| Married | 60% | -- | 59% | 62% | 0.003 |
| Poor/fair Health | 37% | -- | 36% | 42% | <0.001 |
| HH Income | 44,112 | [43,298-44,926] | 43,744 | 47,236 | 0.031 |
| LBF Active | 51% | -- | 52% | 45% | <0.001 |
| Smoke-free Law Coverage | | | | | |
| No Coverage | 76% | -- | 76% | 76% | |
| Non-hospitality Workplaces | 2% | -- | 2% | 2% | |
| Restaurants | 6% | -- | 6% | 5% | |
| Non-hospitality Workplaces + Restaurants | 7% | -- | 7% | 8% | |
| Restaurants + Bars | | -- | 9% | 9% | |
| Price of a Cigarette Pack | 3.66 | [3.64-3.68] | 3.66 | 3.66 | 0.972 |
| Covered by Private Workplace Policy | 81% | [81.24-81.43] | 81.28 | 81.83 | <0.001 |
| ***Time Invariant*** | | | | | |
| Male | 46% | -- | 46% | 47% | 0.227 |
| White | 75% | -- | 25% | 25% | 0.715 |
| Education | | | | | |
| Less than HS | 29% | -- | 29% | 27% | |
| HS Grad | 60% | -- | 60% | 61% | |
| College Grad | 11% | -- | 10% | 12% | |
| **N (person-years)** | 25,881 | | 22,840 | 3,041 | |

Table 12. Fixed effects logistic regression models predicting smoking cessation in the HRS analytic sample (1992-2014) stratified by gender.

| | Odds Ratios of Smoking Cessation | |
|---|---|---|
| | **Men** | **Women** |
| **Smoke-free Law Coverage** | | |
| Non-hospitality Workplaces Only | 4.52* | 2.90 |
| | (3.11) | (1.73) |
| Restaurants Only | 1.27 | 0.88 |
| | (0.57) | (0.32) |
| Non-hospital Workplaces and Restaurants | 0.86 | 0.85 |
| | (0.36) | (0.30) |
| Restaurants and Bars | 1.16 | 0.84 |
| | (0.45) | (0.27) |
| **Price of Cigarette Pack** | 0.90 | 0.95 |
| | (0.11) | (0.10) |
| Age | 1.24*** | 1.29*** |
| | (0.07) | (0.07) |
| Married | 1.93** | 1.65* |
| | (0.49) | (0.35) |
| Poor/fair Health | 1.73*** | 1.88*** |
| | (0.24) | (0.24) |
| LN HH Income | 1.00 | 1.00 |
| | (0.03) | (0.03) |
| LBF Active | 0.72* | 0.72* |
| | (0.11) | (0.10) |
| Smoking Intensity in Prior Wave | 1.00 | 0.99 |
| | (0.00) | (0.01) |
| Percent Covered by a Private Workplace Policy | 1.00 | 0.99 |
| | (0.02) | (0.02) |
| **N** | 3,158 | 3,782 |

In addition to variables listed, models control for time period.
*** p<0.001,* p<0.05

Table 13. Fixed effects ordinary least squares regression models predicting smoking intensity in the HRS analytic sample (1992-2014) stratified by gender.

| | Number of Cigarettes daily | |
|---|---|---|
| | **Men** | **Women** |
| **Smoke-free Law Coverage** | | |
| Non-hospitality Workplaces Only | 1.29 | 0.47 |
| | (1.29) | (0.93) |
| Restaurants Only | 0.76 | -0.04 |
| | (0.94) | (0.73) |
| Non-hospital Workplaces and Restaurants | 0.27 | -0.74 |
| | (0.93) | (0.71) |
| Restaurants and Bars | 0.74 | -0.34 |
| | (0.79) | (0.61) |
| **Price of Cigarette Pack** | -0.49 | -0.19 |
| | (0.25) | (0.19) |
| Age | -0.40*** | -0.29*** |
| | (0.12) | (0.09) |
| Married | -0.75 | 0.23 |
| | (0.53) | (0.39) |
| Poor/fair Health | -0.63 | -0.57* |
| | (0.34) | (0.27) |
| LN HH Income | -0.07 | 0.03 |
| | (0.06) | (0.05) |
| LBF Active | 0.45 | 0.23 |
| | (0.36) | (0.27) |
| Percent Covered by a Private Workplace Policy | -0.05 | -0.03 |
| | (0.04) | (0.03) |
| **N** | 10,534 | 12,191 |

In addition to variables listed, models control for time period.

*** p<0.001,* p<0.05

Table 14. Fixed effects logistic regression models predicting smoking cessation in the HRS analytic sample (1992-2014) stratified by gender with education interaction.

| | Odds Ratios of Smoking Cessation | |
|---|---|---|
| | **Men** | **Women** |
| **Smoke-free Law Coverage** | | |
| Restaurants Only | 2.33 | 0.40 |
| | (2.20) | (0.27) |
| Non-hospitality Workplaces and Restaurants | 1.18 | 0.39 |
| | (0.98) | (0.26) |
| Restaurants and Bars | 2.54 | 0.64 |
| | (2.24) | (0.35) |
| **Smoke-free Law Coverage*Education Interaction** | | |
| Restaurants Only*HS Grad | 0.49 | 2.55 |
| | (0.54) | (2.05) |
| Restaurants Only*College Grad | 0.40 | 4.44 |
| | (0.58) | (8.37) |
| Non-hospitality Workplaces and Restaurants*HS Grad | 0.67 | 3.07 |
| | (0.65) | (2.37) |
| Non-hospitality Workplaces and Restaurants*College Grad | 0.63 | 0.89 |
| | (0.86) | (1.84) |
| Restaurants and Bars*HS Grad | 0.29 | 1.26 |
| | (0.29) | (0.87) |
| Restaurants and Bars*College Grad | 0.80 | 3.79 |
| | (1.03) | (5.33) |
| **Price of Cigarette Pack** | 0.89 | 0.91 |
| | (0.14) | (0.12) |
| **Price of Cigarette Pack*Education Interaction** | | |
| Price of Cigarette Pack*HS Grad | 1.01 | 1.04 |
| | (0.11) | (0.10) |
| Price of Cigarette Pack*College Grad | 1.05 | 1.01 |
| | (0.16) | (0.19) |
| **N** | 3,072 | 3,707 |

Table 15. Fixed effects ordinary least squares regression models predicting smoking intensity in the HRS analytic sample (1992-2014) stratified by gender with education interaction.

| | Number of Cigarettes daily | |
|---|---|---|
| | **Men** | **Women** |
| **Smoke-free Law Coverage** | | |
| Restaurants Only | -1.21 | 0.94 |
| | (1.76) | (1.32) |
| Non-hospitality Workplaces and Restaurants | -2.09 | -0.09 |
| | (1.72) | (1.28) |
| Restaurants and Bars | 1.82 | -2.02 |
| | (1.36) | (1.11) |
| **Smoke-free Law Coverage*Education Interaction** | | |
| Restaurants Only*HS Grad | 2.08 | -1.35 |
| | (2.14) | (1.61) |
| Restaurants Only*College Grad | 2.40 | -4.97 |
| | (1.90) | (3.23) |
| Non-hospitality Workplaces and Restaurants*HS Grad | 2.02 | -1.05 |
| | (2.07) | (1.53) |
| Non-hospitality Workplaces and Restaurants*College Grad | 0.92 | -3.64 |
| | (0.82) | (3.39) |
| Restaurants and Bars*HS Grad | -2.42 | 2.56 |
| | (1.75) | (1.35) |
| Restaurants and Bars*College Grad | -0.10 | 0.91 |
| | (2.39) | (2.22) |
| **Price of Cigarette Pack** | -0.18 | 0.03 |
| | (0.29) | (0.22) |
| **Price of Cigarette Pack*Education Interaction** | | |
| Price of Cigarette Pack*HS Grad | -0.44* | -0.37* |
| | (0.21) | (0.15) |
| Price of Cigarette Pack*College Grad | -0.47 | -0.01 |

| | | |
|---|---|---|
| | (0.32) | (0.28) |
| **N** | 10,534 | 12,191 |

Table 16. Fixed effects logistic regression models predicting smoking cessation in the HRS analytic sample (1992-2014) stratified by gender with race interaction.

| | Odds Ratios of Smoking Cessation | |
|---|---|---|
| | **Men** | **Women** |
| **Smoke-free Law Coverage** | | |
| Restaurants Only | 1.51 | 0.88 |
| | (0.74) | (0.35) |
| Non-hospitality Workplaces and Restaurants | 0.90 | 0.73 |
| | (0.42) | (0.28) |
| Restaurants and Bars | 1.24 | 1.27 |
| | (0.51) | (0.50) |
| **Smoke-free Law Coverage*Race** | | |
| Restaurants Only*Non-white | 0.35 | 0.68 |
| | (0.41) | (0.70) |
| Non-hospitality Workplaces and Restaurants*Non-white | 1.01 | 3.89 |
| | (1.07) | (4.80) |
| Restaurants and Bars*Non-white | 0.51 | 0.21* |
| | (0.60) | (0.15) |
| **Price of Cigarette Pack** | 0.93 | 0.97 |
| | (0.12) | (0.11) |
| **Price of Cigarette Pack*Race** | | |
| Price of Cigarette Pack*Race | 0.91 | 0.85 |
| | (0.10) | (0.08) |
| **N** | 3,072 | 3,707 |

Table 17. Fixed effects ordinary least squares models predicting smoking intensity in the HRS analytic sample (1992-2014) stratified by gender with race interaction.

| | Number of Cigarettes daily | |
|---|---|---|
| | **Men** | **Women** |
| **Smoke-free Law Coverage** | | |
| Restaurants Only | 1.15 | -0.18 |
| | (1.03) | (0.76) |
| Non-hospitality Workplaces and Restaurants | 0.83 | -0.78 |
| | (1.02) | (0.73) |
| Restaurants and Bars | 0.63 | -0.41 |
| | (0.90) | (0.69) |
| **Smoke-free Law Coverage*Race** | | |
| Restaurants Only*Non-white | -3.71 | -0.57 |
| | (2.53) | (2.63) |
| Non-hospitality Workplaces and Restaurants*Non-white | -4.58 | 0.40 |
| | (2.43) | (2.62) |
| Restaurants and Bars*Non-white | -0.04 | -0.01 |
| | (1.87) | (1.41) |
| **Price of Cigarette Pack** | -0.57* | -0.30 |
| | (0.26) | (0.19) |
| **Price of Cigarette Pack*Race** | | |
| Price of Cigarette Pack*Non-white | 0.35 | -0.66*** |
| | (0.23) | (0.18) |
| **N** | 10,534 | 12,191 |

In addition to variables listed, models control for age, marital status, poor or fair health, natural log of household income, labor force status, smoking intensity, private workplace coverage, and time period.

* $p<0.05$