# FACTORS INFLUENCING SUPPORT FOR POINT-OF-SALE PROVISIONS OF THE TOBACCO CONTROL ACT: RETAILER AND PUBLIC OPINION

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ABSTRACT

Shyanika Wijesinha Rose: Factors Influencing Support for Point-of-Sale Provisions of the Tobacco Control Act: Retailer and Public Opinion
(Under the direction of Kurt M. Ribisl)

**Background:** The Family Smoking Prevention and Tobacco Control Act (FSPTCA) of 2009 provided new opportunities to regulate tobacco products at the point-of-sale (POS). Little is known about retailer, public and smoker support for 10 FSPTCA POS policies in five domains (1) minors' access to tobacco, (2) regulating promotion, (3) product bans (menthol, flavored cigarettes), (4) advertising restrictions, and (5) labeling changes (graphic warnings).

**Study 1:** This study conducted a survey of 257 tobacco retailers in three counties in North Carolina and linked their opinions about tobacco control policies with audit data of their stores' compliance with POS policies. Through structural equation modeling and generalized estimating equations, I found that store noncompliance with tobacco control policies was associated both with more retailer barriers to compliance and less support for POS policies. Awareness and Source of information about tobacco control regulations was not associated with compliance.

**Study 2:** This study surveyed a US nationally representative sample of 17,507 respondents using linear regression to calculate weighted point estimates and identify factors associated with support for POS policies among adult respondents and smokers. For smokers we also examine the interaction of individual characteristics and policy self-interest on support for specific POS policies. Overall, non-smokers had more support than smokers. African-Americans, Hispanics, and those of other races, had more support than Whites. Education level and income were generally unrelated to level of support. Among smokers, those patterns also

held. Policy support varied by provision with the highest support for minor's access restrictions (over 80%) and the lowest for advertising restrictions like black and white text advertising (23%). Among smokers, policy self-interest moderated the relationship between intention to quit and support for graphic warnings. Other self-interest variables had a direct effect on policy support.

**Conclusions:** This dissertation study provides new information on retailer support and compliance and public support for policies that are or could be implemented under the Tobacco Control Act at POS. Tobacco control advocates and the FDA can build on existing levels of public support to promote, enforce, and maintain controversial policy changes in the retail environment.

To John, for strength and love
To Jadyn and Keynan, for light and joy
To all my family, for support and dedication

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| | |
|---|---|
| CFA | Confirmatory Factor Analysis |
| CFI | Comparative Fit Index |
| CI | Confidence Interval |
| COMMIT | Community Intervention Trial for Smoking Cessation |
| CTCP | California Tobacco Control Program |
| CTP | Center for Tobacco Products |
| EPA | U.S. Environmental Protection Agency |
| FDA | U.S. Food and Drug Administration |
| GEE | Generalized Estimating Equations |
| FIML | Full Information Maximum Likelihood |
| ICC | Intraclass Correlation |
| ITC | International Tobacco Control |
| MLR | Robust Maximum Likelihood |
| NAACP | National Association for the Advancement of Colored People |
| NACS | Association of Convenience and Fuel Retailing formerly the National Association of Convenience Stores |
| NAICS | North American Industry Classification System |
| NATO | National Association of Tobacco Outlets |
| NCI | National Cancer Institute |
| OR | Odds Ratio |
| POS | Point of Sale |
| QIC | Quasi-likelihood under the Independence Model Criterion |
| RCRA | Resource Conservation and Recovery Act |
| RMSEA | Root Mean Square Error of Approximation |
| SES | Socioeconomic status |

| | |
|---|---|
| SFA | Smokefree Air |
| TCME | Tobacco Control in a Rapidly Changing Media Environment |
| TLI | Tucker-Lewis Index |
| TPSAC | Tobacco Products Scientific Advisory Committee |
| UIC | University of Illinois at Chicago |
| UNC-CH | University of North Carolina at Chapel Hill |
| WLS | Weighted Least Squares |

# CHAPTER 1 BACKGROUND AND SIGNIFICANCE

## 1.1 Introduction

In 2009, Congress passed and President Obama signed into law the Family Smoking Prevention and Tobacco Control Act ("Tobacco Control Act") (Public Law 111-31),[1] providing unprecedented powers to the U.S. Food and Drug Administration (FDA) to regulate tobacco products in the United States.[2-4] Historically, both in the US and globally, tobacco retailing has been largely unregulated,[5] but the Tobacco Control Act affords a significant opportunity to establish tobacco control regulations at *establishments that sell tobacco products, also called the point-of-sale* (POS). The FDA released 56 research priorities, and these included understanding public perceptions of the Tobacco Control Act and FDA's regulatory authority over tobacco products; knowledge, attitudes, and beliefs about tobacco products; and FDA regulatory authority among vulnerable populations.[6] Understanding how new POS regulations are perceived by consumers as well as by retailers can help to fill these research gaps. Additionally, the opinion of the general public and retailers who are a major interest group in the POS arena can have a significant influence on policy implementation, enforcement, and maintenance.

I conducted two studies for this dissertation research. In Study 1, *Retailer Opinions about and Compliance with Family Smoking Prevention and Tobacco Control Act Point of Sale Provisions*, I examined the opinions of tobacco retailers toward POS provisions of the Tobacco Control Act through conducting a survey of retailers in three counties in North Carolina. The study examined retailer compliance with federal tobacco control policy provisions (measured by store audit), retailer support for tobacco regulations affecting the point of sale, and the barriers to compliance that exist from the retailer perspective. Retailers are important implementers of

tobacco policy at the point of sale. Understanding retailer attitudes toward POS regulations can improve government agencies' and tobacco control advocates' communications with retailers, direct attention toward retailer training needs, and potentially improve compliance. Both research evidence and tobacco industry documents agree that exposure to tobacco industry marketing, advertising, and promotions in the retail environment prompts smoking initiation, encourages tobacco use, and undermines quit attempts.[7,8] Thus, engaging retailers over time as policy implementers can help to improve public health.

Study 2, *Public Support for Family Smoking Prevention and Tobacco Control Act Point of Sale Provisions,* examined the opinions of the general public to these same provisions through adding questions to a web survey of a nationally representative sample of 17,507 individuals throughout the US. Public opinion can help to support policy change and is an important predictor of policy implementation.[9] Public opinion can influence the policy agenda, influence decision maker support, and be used to promote a public health agenda by demonstrating public support.[9,10] It can also affect retailer compliance by shifting social norms in favor of tobacco control at POS. This study provides opportunities to examine opinions toward POS regulations and to understand how such regulations are perceived by both smokers and nonsmokers.[6,11]

In both studies I examine retailer and public support for the same set of POS policies included in the Tobacco Control Act. Table 1.1 shows the implementation status of particular POS provisions included in the Tobacco Control Act.

**Table 1.1 Tobacco Control Act POS Provisions**

| POS Area | POS Provision | Tobacco Control Act Status |
|---|---|---|
| **Minor's Access** | Fining retailers for selling to minors | Federal Enforcement beginning in June 2010. Initial warning letters for violations of youth sales with subsequent fines. All states had prior laws banning sales to minors. |
| | Increasing penalties for repeated sales to minors | Federal enforcement beginning in June 2010. Initial warning letters and subsequent compliance checks of retailers. Civil money penalties can be imposed that increase with repeated sales to minors from $250 to up to $10,000 for a sixth sale to minors. |
| **Promotion** | Banning gifts with purchase of cigarettes | Banned in June 2010. |
| | Banning sales of branded non-tobacco items (e.g., hats, t-shirts) | Banned in June 2010<br>Non-tobacco products and services may not bear any branding that is identical or similar to a brand of cigarette or smokeless tobacco |
| **Product** | Banning cigarette flavorings (except menthol) | All cigarette 'characterizing flavors' (except menthol)were banned in September 2009 |
| | Banning menthol | Menthol cigarettes were specifically exempted from the flavor ban in 2009 but in a 2010 report an FDA scientific advisory panel supported a ban. Docket for public comment received over 170,000 comments in November 2013. FDA has yet to make a ruling on menthol. |
| **Advertising** | Restricting tobacco advertising to black and white text only | Was slated for implementation in June 2010, labeling and advertising for cigarettes and smokeless tobacco may not use color but may only use black text on a white background. Litigation decided against FDA (*Discount Tobacco & Lottery v. United States*). March 29, 2012 Sixth Circuit Court of Appeals denied the restriction on the colors used in tobacco advertisements as unconstitutional. |
| | Restricting cigarette packaging to plain packaging | There is currently no restriction in the Tobacco Control Act promoting the use of 'plain' packs without any logos or designs though this has been proposed in other countries and implemented in Australia in December 2012. |
| **Counter-advertising** | Graphic warning labels on packs | In the Tobacco control Act for implementation in September 2012, cigarette packs were to have 50% of the front and rear face of the pack showing a graphic warning label. *R.J. Reynolds Tobacco Co. v. U.S. Food and Drug Administration*, No. 11-1482 (D.D.C.), No. 11-5332 (D.C. Cir.) upheld the FDA's ability to have graphic warnings on packs but vacated the specific graphic warnings proposed. FDA will likely not appeal this case and will instead propose new warnings that are compliant with court rulings. Implementation timing is uncertain. |
| | Graphic warning labels on ads | In the Tobacco Control Act for implementation September 2012. Cigarette ads needed to have graphic warnings on the top of advertisements that needed to take up 20% of the ad space. Appeals court upheld the FDA's ability to have graphic warnings on packs but vacated the specific graphic warnings proposed. FDA will likely not appeal this case and will instead propose new warnings that are compliant with court rulings. Implementation timing is uncertain. |

## 1.2 Specific Aims

### *1.2.1 Specific Aims for Study 1 Retailer Opinion*

Retail outlets are one of the main avenues for marketing and promotion of tobacco products in the US.[12] In 2011, cigarette companies spent 89% of their marketing budget at POS including retail advertising and price discounting.[13] Tobacco advertising especially at the point of sale has four direct effects on smoking by: (1) encouraging youth smoking, (2) increasing daily smoking consumption by smokers by acting as a cue to action, (3) reducing smoker's motivation to quit, and (4) enticing ex-smokers to start again.[14,15] Tobacco Control Act provisions are designed to mitigate these effects at POS in several ways. This includes potentially reducing youth initiation by banning flavored cigarettes and restricting self-service of tobacco products and reducing impulse purchasing by restricting gifts with purchase. Tobacco control advocates have called for additional attention to be paid to implementation and enforcement of existing regulations by anti-tobacco coalitions and activists.[16] Prior to the implementation of the Tobacco Control Act, the average retailer violation rate of sales to minors in 2008 was 9.9%; the lowest rate recorded since the implementation of the Synar Amendment in 1992 restricting tobacco sales to youth.[17] However, information is still being collected as to how compliant tobacco retailers are with newer Tobacco Control Act POS provisions and little is known about what factors are associated with their compliance.

Tobacco retailers are an important, but often overlooked, audience for tobacco control efforts. Currently, tobacco retailers are often viewed as tobacco industry allies because their economic self-interest is tied to tobacco sales and convenience store associations have served as front groups for the industry to blunt the effects of POS policy.[18,19] Most work with POS compliance has been around minor's access provisions and concludes that legal enforcement is necessary to promote compliance.[16] In fact, intervention studies show that sales to minors decrease with active enforcement programs.[20,21] [22] Theories of public policy implementation suggest that the extent of policy implementation and compliance with new policy rest largely

with ‘street level bureaucrats’ (in this case tobacco retailers) – implementers on the ground that directly influence the extent to which public policies are enacted as planned.[23] Theory also suggests that local flexibility and adaptation are necessary conditions for successful policy implementation.[24] Thus, engaging tobacco retailers as *stakeholders* in tobacco control efforts rather than adversaries requires understanding the factors associated with their compliance: (1) tractability of the problem (i.e., how easy or difficult it is for implementers to enact policy), (2) the policy itself, and (3) non-statutory factors affecting implementation including the attitudes of interest groups.[25] Few studies of tobacco control retailers have systematically assessed these theoretically driven policy implementation factors related to tobacco control policy – particularly newer POS policies enacted under the Tobacco Control Act of 2009.

The main study objectives are to (1) identify retailer opinions about Tobacco Control Act provisions, (2) identify factors that may be associated with these opinions, and (3) link retailer opinions with retailer compliance. To support these objectives, Study 1 had two main aims:

- **Aim 1.** To determine whether retailer compliance with Tobacco Control Act POS provisions is reciprocally related to awareness of regulations, source of information about regulations, and barriers to regulatory changes (tractability factors) controlling for county, retailer neighborhood, store, and individual respondent factors.
- **Aim 2.** To examine whether retailer Tobacco Control Act compliance is independently and reciprocally associated with retailer policy support.

Data for this study were collected through interviews of retailers and linked with store audit data assessing compliance with a variety of POS regulations (*Grant: Healthy Stores, Healthy Communities, CoI: Kelly Evenson, Kurt Ribisl)*. Analyses of *Healthy Stores* data I conducted found that among a sample of 349 retailers 15.7% were noncompliant with at least one POS provision.[26] Unlike prior studies, these analyses indicate there is not increased tobacco retail advertising[27-29] or differences in compliance with existing regulations[30,31] in racial/ethnic and socioeconomically disadvantaged neighborhoods. However, differences do

appear by store type with higher violation rates in pharmacies vs. grocery store/supermarkets and significant differences across counties in compliance.[26] Prior studies of retailers have found that industry influence affects product promotion and advertising volume.[32-34] Given new and more stringent tobacco retailer restrictions, it is unclear what type of response may be generated by the tobacco industry and, in turn, how that response may affect retailers. Gaining additional information from retailers directly can help to understand what factors drive compliance, which types of Tobacco Control Act regulations have support, the impact of formal sources of information on policy implementation, and how retailers can be reached to promote compliance.

### *1.2.2 Specific Aims for Study 2 Public Opinion*

From a policy advocacy perspective it is important to assess levels of public support for tobacco use policies among both majority and sub-populations. Tobacco control advocates recognize that one key factor affecting the strength of policy implementation and enforcement is level of public support.[35] Compliance with regulations is also driven in part by social acceptance, and prior regulatory efforts have met with failure in part due to lack of public support.[36] However, little is currently known about public attitudes toward new POS regulations and how these attitudes differ by subgroup. Understanding public support for new regulations can provide public health advocates with information on mitigating negative responses to regulatory changes, and also identify areas for education and communication with smokers and disparately affected communities about potential impact of such regulations.

A social norms paradigm suggests that smoking norms change in response to policy, and that increases in public support for policy are necessary in order to bring about these normative changes.[35] However, little is known about what individual characteristics contribute to developing supportive policy attitudes *in the retail environment* where tobacco is ubiquitous and highly normative.[5] Prior studies have found smokers have less support for tobacco control

regulations than non-smokers,[37-39] African Americans have more support than Whites,[38,40] and individuals of high-SES have more support than those of low-SES.[40,41]

Preserving smoker's rights or choice has often been used as an argument against new tobacco control regulations.[42] Thus , particularly among smokers, controlling for behavioral and demographic factors found in other studies,[37,43-45] *policy self-interest*[46,47] may be an important moderator of the relationship between individual characteristics and level of support for POS regulations (i.e., the relationship between individual characteristics and policy support may vary for those individuals who are more affected by the policy versus those who are less affected). Policy self-interest can be measured for major POS components of the Tobacco Control Act. Specifically, level of exposure to POS *advertising*, use of *promotions*, or use of potentially banned *products* such as menthol cigarettes, may moderate the relationship between individual characteristics and the level of support for POS regulations *among smokers*. The purpose of this study is to (1) examine the overall level of support for POS policies among the general public and among smokers, (2) identify which policies have support, (3) identify individual and state level characteristics associated with support, and (4) examine policy self-interest as a moderator of the relationship between individual characteristics and level of support among smokers. Specific aims of study 2 are to:

- **Aim 3:** To determine whether individual race, socioeconomic status, and smoking status are associated with level of support for Tobacco Control Act regulations among a national sample of smokers and non-smokers.
- **Aim 4.** To determine whether policy self-interest (exposure to POS advertising, use of price promotions, and use of menthol cigarettes) among a national sample of smokers moderates the relationship between specific demographic characteristics and level of support for specific Tobacco Control Act policies.

### 1.3 Significance

Much of the success of the tobacco control movement over the last 25 years has come through policy changes in multiple arenas including tobacco taxation, clean indoor air, advertising and promotion, minor's access to tobacco, and product regulation.[18] With the passage of the Tobacco Control Act, *tobacco retail establishments* are important new avenues for tobacco control regulation. The Tobacco Control Act lifted federal preemption of many "lower level" state and local laws governing the marketing and promotion of tobacco products. Tobacco control advocates at the state and local levels are now also considering new point of sale (POS) regulations that may be stronger or go beyond the scope of federal law. As these regulations are enacted at all levels, there is an urgent need to study the extent of support available for POS regulation among both smokers and nonsmokers and among retailers. No study to date has examined public and retailer support for a broad set of POS regulations and what factors are associated with level of support. In a contested policy environment with multiple messages coming from both pro- and anti-tobacco interests, it is also important to better understand the mechanisms through which individuals form supportive or unsupportive opinions toward POS regulations and what personal factors drive generation of these opinions. Through this study, understanding how support for regulations may differ by individual race, SES, and smoking status characteristics among a large, diverse national sample of smokers and nonsmokers and among a sample of retailers can help to determine how well Tobacco Control Act POS regulations can be maintained and promoted over time. This understanding can help to better implement new POS policies, mitigate potential negative response to policy change, as well as to identify topics that government and nonprofit organizations should cover when communicating with the general public, smokers, and retailers about the potential impact of such regulations.

## CHAPTER 2 LITERATURE REVIEW

The next 'frontier' in tobacco control policy is POS. Traditional tobacco control strategies used by tobacco control advocates include tobacco taxation, clean indoor air laws, media campaigns, and smoking cessation services.[48] Approaches affecting point of sale include minor's access restrictions, advertising and promotional restrictions, price restrictions, labeling and packaging, and placement of tobacco retailers including density and licensing of outlets. These POS policies may be effective environmental strategies that reduce the impact of tobacco in communities.[49] For instance,

- **Minor's Access.** National studies finding that there is a significant increase in the odds that youth will discontinue regular smoking for every one unit increase in the strength of youth access laws in their state.[50]
- **Advertising restrictions.** Modeling studies estimate that comprehensive advertising bans can lead to 7.4% decrease in cigarette use.[51]
- **Graphic warnings.** Large graphic warning labels can lead to a 2% decrease in smoking prevalence and increase in smoking cessation at the population level.[48]
- **Product bans.** A hypothetical ban on menthol cigarettes may lead to as much as a 9.7% decrease in population level smoking prevalence by 2050.[52]

However, understanding the mechanisms that link 'upstream' policies to 'downstream' health impacts is complex and multifaceted.[53] Assessing attitudes and beliefs about tobacco and tobacco control policy is an important intermediate mechanism toward understanding the potential impact of policy change on population health. This chapter reviews the literature on the tobacco retailing as a tobacco control priority area (Section 2.1), prior work done to assess tobacco retailer opinions and compliance with policy (Section 2.2), the role of public opinion

toward various tobacco control policy options including smoke-free air laws, tobacco taxation, minor's access provisions, and advertising restrictions (Section 2.3), and the evidence linking such opinions to tobacco use behaviors (Section 2.4).

**2.1 Why Tobacco Retailing Matters for Public Health**

POS advertising and tobacco outlet density remain some of the largest sources of visible cues to smoking in neighborhoods.[15,54,55] POS advertising has been associated with initiating smoking among youth, undermining quit attempts and promoting consumption among adults.[56] Botvin and colleagues found that along with peer smoking, exposure to advertising was found to be an important correlate of current smoking and intention to smoke in the future; youth who were highly exposed to advertising were 1.93 times more likely to be current smokers than those less exposed.[57] Longitudinal studies have found that owning tobacco promotional items and receptivity to tobacco advertising in adolescence was predictive of transition to established smoking in later adolescence[58] or young adulthood.[59] Additionally, in a longitudinal study, increased exposure to POS advertising among youth was associated with increased odds of smoking initiation at follow-up.[60] Among youth, POS advertising and promotion exposure has also been associated with increased positive brand imagery,[61] choice of usual brand,[62] and progression from experimentation to regular smoking.[63] Among adult smokers, POS displays influence unplanned purchases[64] and stimulate cravings among former smokers.[65] Sensitivity to POS displays was associated with less likelihood of quitting.[66]

Tobacco retailing is also associated with neighborhood level characteristics. Tobacco retail outlets may contribute to tobacco use disparities by both increasing availability of tobacco products and by serving as an environmental cue to smoke.[12] Tobacco outlet density is associated with neighborhood smoking prevalence.[67] Higher levels of tobacco outlet density are found in minority, low education, and low income neighborhoods.[68-71]

Tobacco retailers are also an increasingly important source of tobacco marketing in communities. With the restriction of other forms of tobacco advertising, in 2011 cigarette

manufacturers spent approximately 89% of their marketing budget – roughly $7.4 billion – on tobacco advertising and promotion at POS primarily through price discounting, POS advertisement, and retail promotional allowances.[13] Living in areas with more retail tobacco advertisements is linked with increased youth smoking and more positive attitudes toward smoking.[72] Sales and marketing of tobacco products are also geographically patterned. There are more tobacco advertisements in minority and low income neighborhoods.[27,28,73] There is also increased POS promotion of menthol cigarettes in African-American neighborhoods,[29,74] and lower cigarette prices in minority communities.[75] A meta-analysis of volume of tobacco advertising in African American communities found that there are 2.6 times as many tobacco billboards and large display advertisements at tobacco retailers per person in African American neighborhoods as compared with White neighborhoods.[28] A study of seventh graders found that African American and Latino youth were significantly more likely to report exposure to tobacco advertising than youth of other ethnic backgrounds.[76] Henriksen and colleagues also found that schools with the most economically disadvantaged students were more likely to be surrounded by higher tobacco outlet density and similarly be exposed to higher levels of tobacco advertising within those outlets [54]

## 2.2 Tobacco Retailer Compliance with and Opinions toward Regulations

### *2.2.1 Retailer Compliance*

Tobacco retailers affect public health through lack of compliance with tobacco control regulations. For example, odds of daily smoking for youth decrease 2% for every 1% increase in average merchant compliance with youth access laws.[77] Several studies have also documented lower rates of compliance with minor's access regulations in racial/ethnic and socioeconomically disadvantaged neighborhoods.[30,31]

Newer sales and marketing provisions of the Tobacco Control Act include restrictions on products sold, labeling, placement of tobacco products in stores, promotions, and advertising. These 12 provisions focus on:

1. restrictions on the sale of flavored cigarettes (excluding menthol);
2. bans on sales of single or loose cigarettes in less than a standard pack
3. bans on sales of smokeless tobacco in less than a standard unit pack;
4. banning labeling on cigarette packs with terms like “light,” “low tar” and “mild” known as “modified risk” products;
5. requiring sales of tobacco products through face-to-face transactions rather than allowing self-service;
6. banning tobacco vending machines in stores frequented by youth;
7. restricting free gifts with purchase,
8. banning sales of branded non-tobacco products such as hats or t-shirts,
9. restricting the use of catalogs offering gifts with proof of purchase;
10. banning certain types of video adverting with color or sound effects
11. banning certain types of audio advertising with sound effects;
12. and restricting advertising of tobacco brand name event sponsorship.

Prior studies looking at a subset of these provisions identified violations of self-service of cigarettes or smokeless tobacco products (from 3-8%).[78,79] One study, examining four POS provisions found no difference in compliance between retailers in higher versus lower income neighborhoods.[78] A store audit of stores in Canada after implementation of similar sales provisions found that 21% of tobacco retailers were noncompliant with either minor’s access restrictions or with POS provisions; but that there was no correlation between the two types of violations.[80] Our prior study is the only one to date to examine all 12 sales and marketing provisions.[26] In contrast, in 2011 (the year of the retailer study), the FDA conducted compliance checks in over 20 states (not yet including North Carolina) and issued warning letters or civil penalty letters for repeat violations to only 5% of the retailers visited.[81] However, law enforcement actions are not conducted for research purposes. They tend to focus on stores or areas that have had violations in the past or are based on complaints. Also compliance

inspections are often not conducted based on random samples of retailers to obtain population level estimates of compliance. Additionally, enforcement action is not enough to assess compliance as some provisions are not being enforced (e.g., sales of modified risk labeled cigarettes),[82] assessment of civil monetary penalties is subject to contextual conditions (e.g., number and frequency of violations, severity of violations, existence of training program, among others),[83] and enforcement inspections may fail to identify areas of compliance disparities. Independent assessments of compliance are necessary complements to enforcement action; few have been conducted in relation to Tobacco Control Act POS provisions. This study helps fill this gap in the literature and determines retailer level factors that are associated with compliance.

### *2.2.2 Retailer Opinions*

Some work has been done to assess retailer opinions toward POS regulations. Prior qualitative work with alcohol retailers identified three factors associated with compliance with minors' access to alcohol: (1) understanding and awareness of the rules, (2) ability to comply with the rules, and (3) willingness and motivation to comply.[84] Relative to minor's access to tobacco, negative sanctions may be necessary to ensure compliance. Researchers have found that such provisions are rarely self-enforcing and need continued enforcement through compliance checks, multicomponent educational interventions, or both, to ensure that rates stay low and retailers follow the law.[16,21] Similarly, a study of store managers found that one potential correlate of reduced odds of selling tobacco to minors was a belief that minors were sent to stores to conduct compliance checks.[85] Intervention studies also point to several factors that may influence changes in youth sales. A study of California retailers found that knowledge of minor's access regulations was related to a small but statistically significant change in checking ID.[86]

Tobacco retailers opinions toward regulation and their ability to make changes in the tobacco retail environment exist in a larger socio-normative environment. Prior studies of tobacco retailers find a significant influence of the tobacco industry in the retail environment. Studies of tobacco retailers find that the tobacco industry provides substantial incentives to retailers to promote tobacco products in the retail environment.[32,33] These types of 'slotting fees' and promotional allowances have been speculated to reduce tobacco prices, promote youth sales by allowing self-service and pilferage, promote a pro-tobacco environment encouraging youth pro-smoking attitudes, and enhance political support by retailers for tobacco industry advocacy.[87] Qualitative interviews with retailers have found that about two-thirds of retailers are offered and participate in tobacco industry sponsored incentive programs to promote prime placement of tobacco products and advertisements at POS.[33] Additionally some retailers feel that they have little control over the advertisement or promotion of tobacco products in their store once they have signed contracts with the tobacco companies that provide incentives; even those who felt that they had too much tobacco signage were reluctant to make changes to avoid jeopardizing these contracts.[71]

In addition to the role of industry, studies of retailers find that the sales and marketing decisions about tobacco products are complex.[88,89] In one study, 65% of tobacco retailers noted that they sold tobacco as a way to drive customer traffic, rather than primarily for profit. [89] Two-thirds noted that they received monetary incentives for displaying tobacco ads.[89] Over one-half noted that they would be willing to display anti-tobacco messages in their store.[89] A survey of Indiana pharmacists found that 81% thought that pharmacies should not be selling tobacco products at all; but in follow-up interviews acknowledged that the decision to sell or not did not rest with them.[88] In New Zealand, a qualitative study of retailers found that contrary to industry claims, retailers who had voluntarily removed displays of tobacco products did not experience increased barriers to sales, increased crime, or economic hardship. It was also appreciated by community members and parents and generated good will for the retailers.[90] Case studies of

California retailers who voluntarily stopped sales of tobacco products found that independent pharmacies did so to stop selling a deadly product and independent grocers saw it as consistent with their focus on selling healthy foods.[91] Thus, while minor's access provisions may require active enforcement and negative sanctions for retailers to implement, there may be potential for more positive factors to influence compliance with other POS marketing and advertising provisions.

However, few studies explicitly asked retailers about their support for tobacco control regulations; particularly concerning newer sales and marketing provisions. A study of large US retailers found that 66% supported minor's access laws, agreeing that retailers should be penalized for selling tobacco to minors. But, of those, 51% thought that minor's should also be penalized for buying.[92] An Australian study found that 50% of retailers agreed that retailers should be prosecuted for sales to minors.[93] Another New Zealand study found that some retailers had support for display bans.[94] A qualitative study found retailer opposition to graphic warning signs in stores.[95] No other studies document retailer support for sales and marketing provisions; a gap this study fills.

**2.3 Public Support for Regulations**

Several studies have looked at the effects of smoking status, race, and education level on policy support. Prior studies have consistently found that smokers have lower support for tobacco control policies than do non-smokers. [37-39,96] However, studies have also found that smokers do have some support for certain regulations including advertising and promotion, [37,97] smoke-free restrictions, [96,98] and minor's access restrictions. [37,99] For example, a Canadian study found that support for smoke-free fast food restaurants was 71% among nonsmokers and 47% among smokers. It also found support for a tobacco advertising ban from 68% for nonsmokers to 47% for smokers.[37] In four US states, between 73 to 85% of current smokers and over 86% of former or never smokers indicated that they would support stronger laws to prevent tobacco sales to minors.[99]

Studies also find that policy support may increase with the implementation of regulations.[98,100-102] For instance, a longitudinal study of bar and restaurant employees in Norway (which implemented a clean indoor air law in 2004) found that from pre-indoor smoking ban to 4 months and 11 months post-ban there was a significant linear trend toward workers agreeing that they felt positively toward the ban, that a ban was an acceptable way to reduce passive smoking, and that their work conditions had improved.[103] Bar and restaurant workers in Scotland also significantly increased support for a smoking ban in public places implemented in 2006 from 69% pre-ban to 79% three months post-ban. Their concern that a ban would negatively affect business fell from 42% to 18%.[104] This result has also been found in the general public where support for a total smoking ban in pubs/bars in Ireland increased from 13% to 46% pre- to post-implementation.[98] Related to POS, a study on several college campuses found over 55% of students supported retail display bans on tobacco products in campus stores; with the highest level of support found for students on campuses with an existing ban.[101] A longitudinal study of POS advertising and display bans as they were implemented across Canadian provinces found that support for the bans was higher at final follow-up among smokers who had been exposed to the bans at baseline versus those who were exposed during or after the data collection period.[105]

Fewer studies to date have examined support for POS tobacco regulations by subgroup, a strength of the current study. Studies have found relatively higher support for tobacco regulations among African Americans compared with Whites.[38,40,106] For instance, in the Community Intervention Trial for Smoking Cessation (COMMIT), researchers found differences in support for minors access restrictions (specifically vending machine bans) among African American smokers and nonsmokers relative to whites (80.9% of African American nonsmokers vs. 68.3% of White nonsmokers, 65.2% of African American smokers vs. 56.1% of White smokers). [38] Additionally, in looking at support for a variety of tobacco control measures using the *Smoking Policy Inventory*, Doucet et al found that African Americans had more support for

public education measures such as publicizing the dangers of secondhand smoke compared with Whites.[40] Studies also find that those with higher education are more supportive of tobacco taxes and smokefree regulations than those with less education.[40,41]

Related to specific POS provisions in this study, prior studies have found:

*Minor's Access.* Support is high in the general public for policies that restrict minor's access to tobacco. Among smokers and former smokers, 64% endorsed policies that penalized merchants or youth for violations of youth access laws.[97] Additionally, enforcement of minor's access provisions along with public education about the dangers of smoking have the highest levels of support among both blacks and whites compared with smokefree air policies, tobacco taxation, and advertising and promotion restrictions.[40]

*Promotion.* Studies have found that a third to a half of smokers may use price promotions when purchasing cigarettes.[107,108] In a survey of New Yorkers, smokers (41%) were less likely than non-smokers (57%) to support banning price promotions such as coupons and two-for-one deals on cigarette packs.[109] Support for bans on free gifts with purchase and on the distribution of branded non-tobacco items (e.g., hats, t-shirts) as now implemented under the Tobacco Control Act (along with other promotional restrictions) have been assessed in various studies utilizing the Smoking Policy Inventory.[40,110,111] In a six country study, support for such restrictions was highest in Australia which had comprehensive bans on such provisions and lowest in the US which only had partial or no restrictions on various forms of tobacco advertising and promotions.[110] Support for such restrictions has also demonstrated a trend toward higher average support with increasing levels of education.[40]

*Product.* Prior findings indicate that support is higher for a ban on flavored cigarettes (other than menthol) than for a ban on menthol cigarettes. A national telephone survey found that 70% of adults (including 75% of blacks) supported a ban on flavored cigarettes.[106] Overall support for a menthol ban was 56%, however, findings indicate that smokers (28.4%) have less support for a menthol ban than do never smokers (67.3%).[106] Compared with menthol smokers,

non-menthol smokers were 2.73 times (OR 95% CI 1.43, 5.21) more likely to support a ban on menthol cigarettes.[106] Another study found support for a menthol ban in a national web survey to be 20%.[112]

*Advertising and labeling.* Smokers exhibit high levels of exposure to tobacco advertising with 90% of a US sample indicating that they noticed tobacco advertising at POS.[113] Among Massachusetts adults in 2000, 55% supported restricting tobacco advertising to black and white text; and this level of support remained fairly constant from 1995.[114] In a national sample of US smokers, only 24% agreed that cigarettes should be sold in plain packaging.[115] Graphic warning labels and advertisements similar to those proposed in the Tobacco Control Act have been implemented in Canada. They have been found to have positive impacts on cessation with 19% of smokers reporting smoking less in response to the warnings.[116] Thirty percent of a sample of German smokers supported educational efforts including requiring graphic warning labels on 50% of a cigarette pack.[97] A survey of California voters, found that 82% would support requiring graphic warnings to be posted in retail stores.[117]

No studies to date examine public support among smokers and non-smokers with a comprehensive array of POS tobacco control regulations, few examine differences in support for these POS provisions by subgroup, and few use national data to examine the potential for geographic differences in public support for these provisions. This study can help to fill these gaps.

**2.4 Support for Regulations and Tobacco Use Behavior**

Level of support for regulations has been associated with various smoking cessation measures. The conceptual model of the International Tobacco Control (ITC) Policy Evaluation Project posits that policy-specific variables (those closest to the policy itself such as perceived cost or label salience) precede psychosocial mediators including quit intentions and policy relevant outcomes including quit attempts and successful quitting.[118] Several studies have found that support for smoke-free environments[43-45] and advertising restrictions[44,45] are associated with

intention to quit. Some of these studies are cross sectional and thus the causal direction of the relationship is unclear, i.e., whether intention to quit or quit attempts promotes support for policy or the converse.[44,45,97]

However, several newer studies have used comparative or longitudinal methods and structural equation modeling analyses to test the effects of policy on smoking behaviors using the ITC framework.[43,119,120] A study in Scotland found that support for a smokefree ban at baseline (pre-ban) was related to intention to quit at follow-up (post-ban) and that this relationship may have worked through increased social unacceptability of smoking as a normative construct.[43] A study comparing Texas towns with and without comprehensive smokefree legislation found that extent of agreement with restricting smoking in public places was associated with attitudes toward quitting and perceived normative pressure to quit and in turn with intention to quit among smokers.[120] Another study in the Netherlands found that the pathway from exposure to a smokefree policy to smoking cessation was mediated via support for the policy, attitudes toward quitting, and intention to quit.[119] This model accounted for 27.7% of the variance in quit attempts in a population based sample.[119] These studies suggests that, in part, the effect of tobacco policy changes on tobacco use behavior may depend on the extent of community support,[119] and stronger effects may be possible through increasing support among smokers.[120] Understanding smoker's and the general public's attitudes toward new POS regulations can help promote acceptance of the policies and lessen negative attitudes toward beneficial policy changes.[40,121]

## CHAPTER 3 CONCEPTUAL/THEORETICAL FOUNDATIONS

Policy implementation is an area that has received calls for more attention both from a public health as well as from a public policy perspective. In the public health arena, tobacco control advocates have been advised to put more effort toward policy implementation and enforcement, rather than simply the promotion of new policies.[16] Studies of retailers find that tobacco control policy at POS (primarily minor's access restrictions) are not self-enforcing and need ongoing compliance checks to monitor implementation and promote enforcement.[16,20,122] Likewise, public policy scholars have called for increased emphasis on theories of policy implementation, and not just policy formation.[123,124] Work in the 1970-80s emphasized policy implementation research in addition to the then common approaches of analysis of policy content and formulation, evaluative studies of policy 'effectiveness,' and organizational studies focusing on improving performance of political and administrative organization.[124]

Two different, but complementary, approaches – so called 'top-down' versus 'bottom-up' – have been identified in this literature.[123] Top down approaches focus on the role of the central government in promoting a policy and focus on whether policies were able to achieve their own goals.[125] Bottom-up approaches take the view that implementation can be viewed from the perspective of local level implementers, known as 'street-level bureaucrats,' and focus more on the problem that the policy was trying to solve rather than the goals of the policy itself.[23] Critiques of both approaches seek more dynamic models by incorporating both top down and bottom up perspectives,[125] or by detailing circumstances where one approach may be more useful than another.[126] One perspective in particular, Mazmanian and Sabatier's Framework of Analysis for Policy Implementation, seems well suited for the current study to examine the factors that are associated with tobacco retailer compliance with policy changes in the retail

environment and to situate the role of public support for such policies within the broader policy implementation process.[9,25]

This framework is generally taken to be an example of a 'top down' approach but efforts by the authors have been made to reconcile the framework with bottom up critiques.[125] Additionally, Matland proposes the Ambiguity-Conflict Matrix that finds that Mazmanian and Sabatier's model is particularly useful in situations of low ambiguity (the policy is clear on what changes are expected) but high conflict (where different actors or stakeholder groups within the policy arena may have deeply held and contradictory views on the policy itself).[126]

This scenario fits the retail implementation of the Tobacco Control Act well. In this situation, termed *political implementation*, power is held centrally to promote implementation, but implementation is actually conducted by a diverse set of stakeholders, i.e., tobacco retailers, who may or may not be supportive of implementing the policy. For policy to be implemented under these conditions, the central authority needs to use its power both through coercive means (e.g., fines, penalties) and through bargaining for agreement (e.g., education and communication to gain agreement with policy objectives). Additionally, to promote implementation, central authorities like FDA need to both support policy proponents (tobacco control advocates), but also thwart opponents (tobacco industry) who are both actively seeking to influence local implementers (tobacco retailers).

In the Policy Implementation Analysis Framework[9] shown in Figure 1.1, three main type of variables (1) tractability of the problem designed to be addressed by the policy, (2) ability of the statute (policy) to structure implementation, and (3) non-statutory variables affecting implementation each influence five stages of the policy implementation process. Each of these stages can be treated as individual dependent variables of policy implementation. In the basic conceptualization, policies are more likely to be implemented (at various stages) when (1) the problem being addressed is tractable, (2) the statute is well designed to promote implementation, and (3) when non-statutory factors favor implementation.

**Table 3.1 Based on Sabatier and Mazmanian (1980) Framework for Analysis of Policy Implementation**

| | |
|---|---|
| Tractability of the problem | 1. Availability of valid technical theory and technology<br>2. Diversity of target group behavior<br>3. Target group as a percentage of the population<br>4. Extent of behavioral change required |
| Ability of statute to structure implementation | 1. Availability of valid technical theory and incorporation of adequate causal theory<br>2. Unambiguous policy directives<br>3. Financial resources<br>4. Hierarchical integration within and among implementing institutions<br>5. Decision-rules of implementation agencies<br>6. Recruitment of implementing officials<br>7. Formal access by outsiders |
| Non-statutory variables affecting implementation | 1. Socio-economic conditions and technology<br>2. Media attention to the problem<br>3. Attitudes and resources of constituency groups<br>4. Support from sovereigns<br>5. Commitment and leadership skill of implementing officials |
| Each leading to stages (Dependent Variables) in the implementation process | • Policy outputs of implementing agencies<br>• Compliance with policy outputs by target groups<br>• Actual impacts of policy outputs<br>• Perceived impacts of policy outputs<br>• Major revision in statute |

*Tractability of the Problem.* Clearly, some problems to be addressed by policy are more difficult than others. In this framework, problems have greater tractability when there is a valid theory connecting policy solutions to the problem, there is little variation in the behaviors that cause the problem, the target group is easily identifiable and defined relative to the population, and the amount of behavioral change required by the policy is modest. For instance, an application of this model to the control of hazardous wastes by the US Environmental Protection Agency (EPA) hypothesized that implementation of the Resource Conservation and Recovery Act (RCRA) was more likely in states that: (1) have less uncertainty associated with hazardous waste control technology, (2) have less uncertainty in relating toxic exposure to health effects (3) have a smaller scope of those affected, and (4) encounter less difficulty in measuring the seriousness of the hazardous waste problem.[127]

Tractability of the problem measures the extent to which a policy can resolve the underlying problem it seeks to address. For the purposes of complying with Tobacco Control Act provisions at POS, I conceptualize tractability as mainly related to extent of behavioral change

required. I operationalize it as (1) the extent to which retailers experience barriers to compliance with regulations, (2) awareness of regulations, and (3) source of information about regulations. These are necessary conditions for implementing regulations and affect the amount of change that retailers must make. First, retailers may find it difficult to comply with regulations because of structural or logistic barriers. Second, they may be unable to comply if they are unaware of regulations. Finally, their source of information about regulations may influence the extent to which they receive timely and accurate information about compliance requirements.

Additionally, prior studies of retailers support these factors as important for compliance with other tobacco control regulations. Retailers identified barriers to complying with minor's access provisions such as staff turnover which affected their ability to comply.[92] Based on simulation models, awareness of new regulations is associated with merchant compliance with minor's access provisions by affecting merchant concern for compliance.[128] Finally, a study of worksites (including retailer) compliance with smoke-free legislation found that compliance was lower for those citing informal sources such as family and friends as primary sources of information about the new legislation vs. those citing formal sources.[129] Translating to this study, formal sources may include government, tobacco industry, corporate, and trade associations vs. informal sources including media, family and friends, and other retailers. Links between theoretical and study constructs are shown in Table 3.1.

*Ability of Statute to Structure Implementation.* For the current study, I describe, but do not examine statutory variables. The policy has already been enacted and these factors did not vary during the study period. Based on the framework, policies are more likely to be implemented when policy objectives are clear; the 'causal theory' behind the policy is valid; there is adequate allocation of financial resources, there is a high degree of integration within and among implementing agencies; rules are clear for how implementation will occur; officials are committed to implementation; and there is access to participation in the implementation process by outsiders.

In the case of the Tobacco Control Act, the ability of the statute to structure implementation has been fairly well specified. Under the Act, the FDA was given regulatory authority to implement the Act. Act statutes were clearly specified with clear penalties for noncompliance.[83] The specific research behind many portions of the Act is cited in the legislation and rests on clear scientific studies and epidemiologic evidence. In cases where the evidence is more ambiguous, the FDA can call for further review of the evidence and synthesis prior to proposing new rule-making. The FDA developed a new congressionally mandated Center for Tobacco Products (CTP) with financial resources for implementation. These financial resources are substantial and $482 million was requested in fiscal year 2013, paid for through user fees imposed on tobacco companies.[130] It also issued funding to states to implement compliance checks of tobacco retailers. State inspectors are centrally trained and provided with an FDA inspector badge so that decision rules are clear. Finally, external review is a formal part of the process. A federally mandated scientific advisory panel was created under the legislation to advise FDA on policy implementation. Additionally, all new regulations and enforcement actions are subject to public comment through the Federal Register before Final Rules are promulgated.

*Non-Statutory Variables.* Under the framework there are two main dynamic processes that occur that affect the implementation of policy. These include (1) the need for periodic 'infusions' of political support to maintain progress in implementation, and (2) the effect of changes in socioeconomic and technological conditions that influence policy support from the general public, interest groups, and decision-makers. The most distal factors affecting policy implementation are socioeconomic and technological factors (e.g., if there are difficult economic times, it can be difficult to maintain resources for policy implementation in the face of competing priorities). Intermediate variables include media attention which can help to raise awareness of the policy and the problem as well as frame the issue for the public, affected groups, and decision makers. Public support in the policy implementation process is also useful in

maintaining and implementing policy, but can be cyclical. Proximal variables include changing attitudes and resources of constituency groups and of decision makers ('sovereigns' and 'implementing officials'), which can also help to maintain or defeat the implementation of policy.

In summary, Mazmanian and Sabatier suggest that for policy to be implemented ideally it would have clear and consistent policy directives, a valid causal theory and jurisdiction provided, a supportive implementing structure, commitment and skill in top implementing officials, continued support from constituencies and sovereigns, and supportive socioeconomic conditions.[25] However, implementation can still occur if not all of these conditions are met or are not met in an optimal way. Mazmanian and Sabatier suggest several patterns or scenarios of implementation corresponding to different patterns of inputs and changes in those factors over time:

- Effective Implementation – a pattern of rapidly increasing compliance with sustained high levels of implementation over time.
- Gradual Erosion – increasing compliance to a moderate level followed by start-up problems and then a gradual erosion of support with subsequent policy implementation failure over time.
- Cumulative Incrementalism – modest initial effort with gradual improvements in compliance and support over time.
- Rejuvenation Scenario – Initial pattern similar to the gradual erosion scenario followed by a change in socioeconomic conditions that precipitate greater support and improved compliance over time.

For the purposes of this study, I focus primarily on public support, and attitudes and resources of constituency groups (in this case tobacco retailers) as these non-statutory areas seem the most amenable to intervention by public health advocates.

## 3.1 Theoretical Foundations for Study 1

### *3.1.1 Theory supporting Compliance as a Dependent Variable*

This study focuses on Mazmanian and Sabatier's Policy Implementation Analysis Framework to focus on policy implementation from the perspective of tobacco retailers. Retailers are both a 'target group' who must implement the policy at the local level but also a 'constituency group' with a stake in policy implementation. In this framework, constituency groups are important because they (versus the general public) are more likely to have sustained interest in a policy domain, are more likely to have resources to bring to bear on an issue, and have expertise that allows them to intervene to either oppose or promote policy implementation.

Based on the framework, constituency group attitudes and resources invested in a policy issue may differ based on the amount of behavioral change required and the level of public support for a policy. They may have direct influence by actively participating including by sponsoring lawsuits, testifying before legislative bodies, lobbying, and engaging in public comment. They may indirectly influence the process through engaging in public advocacy campaigns or through media advocacy for or against the policy agency. In the POS policy arena, retail trade associations (e.g., the National Association of Tobacco Outlets (NATO), the Association of Convenience and Fuel Retailing (NACS)) have been active as tobacco industry allies in opposing tobacco policy at point of sale.[19,131] However, at the individual retailer-level it is not fully clear how tobacco control policy attitudes are associated with compliance with policy. It is also unclear how strong the 'attitude-behavior' link is for tobacco retailers.

Fazio suggests that there is stronger attitude-behavioral correlation when attitudes and behaviors are measured at the same level of specificity, when attitudes tend to be automatically processed, and when attitudes do not conflict with societal norms.[132] 'Strong' attitudes are more likely to be automatically activated, which means that they are easier to retrieve from memory and more likely to result in consistent behavior. Weak attitudes are not automatically activated;

thus, where attitudes are weak, behavior may not be consistent with attitude but rather based on situational variables or on what seems to be the most salient aspects of the object.[132]

Incorporating aspects of the policy implementation framework into these ideas suggest that the extent of behavior change needed by retailers, subjective norms, and how diverse and difficult the required behaviors are to implement are related to retailers opinions about which POS policies are salient to them (i.e., they may not see all provisions as equally important in affecting their business). POS policies such as minor's access restrictions have been implemented for a long period of time and have strong normative influences, and thus may result in stronger levels of support. Promotional restrictions (banning free gifts with purchase and non-tobacco branded items) require few changes on the part of retailers and may not result in strong opinions. Table 3.1 shows how the theoretical constructs are mapped onto study concepts.

**Table 3.2 Mapping Theoretical Constructs onto Study Constructs**

| Theoretical Constructs | Study Constructs |
|---|---|
| Tractability of the problem | |
| • Extent of behavioral change required | Barriers<br>Awareness of regulations<br>Source of information about tobacco control regulations |
| Non-statutory variables affecting implementation | |
| • Socio-economic conditions | County-level:<br>• Retailer county<br>Retailer Neighborhood Level:<br>• % Black residents<br>• % Hispanic residents<br>• % Households under family poverty<br>• % Residents with bachelor's degree or more<br>Store Level:<br>• Store type<br>• Amount of advertising<br>• Proximity to schools<br>Individual Level:<br>• Smoking status<br>• Respondent type (owner, manager, clerk) |
| • Attitudes and Resources of Constituency Groups | Retailer Level of Support for POS regulations |
| Stages in the Implementation Process | |
| • Compliance with policy outputs by target groups | Compliance with TCA POS provisions |

### *3.1.2 Theory supporting Compliance as an Independent Variable*

Based on the Policy Implementation Framework, it is important to examine the relationship between awareness, source of information, barriers to compliance, and policy support on retailer compliance with POS policy. While this relationship makes sense, it is equally plausible that retailer compliance may be associated with awareness, source, barriers, and support for policy as an independent variable. Kelman, for instance, suggests that attitudes and behaviors are reciprocally related and that particularly in the case of policy change, policy implementation can lead to behavioral compliance (by imposing situational constraints that make compliance beneficial) that then subsequently leads to attitude change.[133] Some argue that this is due to *cognitive dissonance* processes whereby when individual behavior is inconsistent with attitude it creates dissonance.[134] This dissonance encourages individuals to change their attitudes to be in line with their behavior.[134,135] Others argue that this is due to *self-*

*perception* whereby an individual in part posits his/her own attitudes toward an object based on 'observation' of his/her own overt behavior.[136] This may be particularly the case when internal cues are relative weak, ambiguous or uninterpretable (i.e., individuals do not have strong pre-existing opinions about policy).[136]

However, a social norms framework implies a feedback process by which policy changes norms, which change behaviors and attitudes, which in turn influence additional behavior change in the population.[137] Kelman, in fact, believes that while self-perception or cognitive dissonance processes may be at work, in cases where behavior change appears to influence attitude change that such processes are not necessary.[133] Instead, typical processes of attitude formation are still in play including role expectations, social supports, and direct experiences.[133]

The observational data of retailer compliance in this study was collected first and the items focused on retailer opinions of the Tobacco Control Act were collected subsequently (See Chapter 5 for more details). As a result, the study design suggests that the analysis should examine both directions and assess compliance both as a independent variable associated with opinions and as a dependent variable. Rationale for the reciprocal relationship of compliance as an independent variable of retailer opinions includes the following relationships:

*Support for policy.* Retailers may comply, even with policies they disagree with (have negative attitudes towards), due to ideas about the value of the rule of law or fears of negative consequences for noncompliance.[138] As policies are implemented and retailers comply with policy due to these external constraints, they may accordingly change their attitudes about the policy itself.[133]

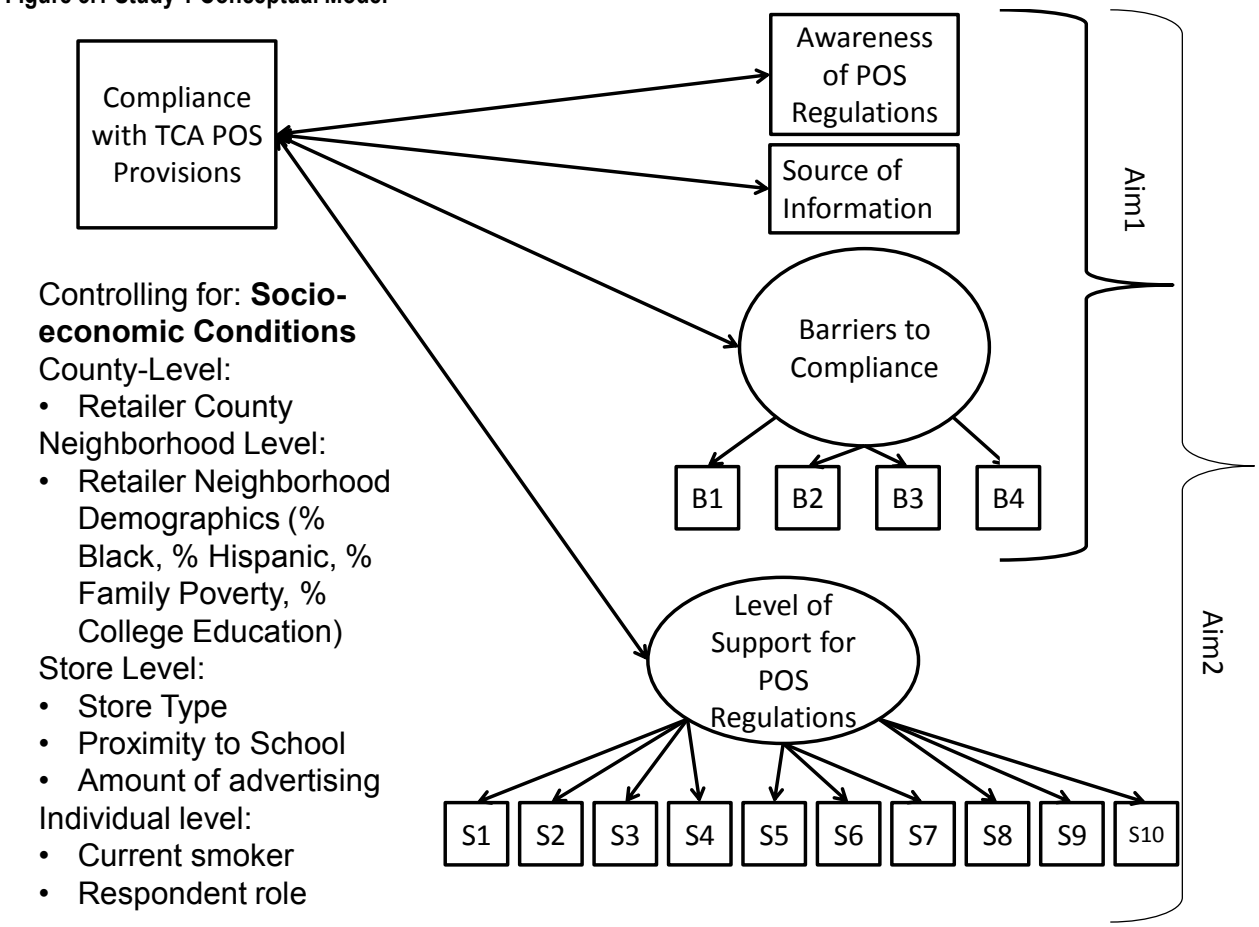
*Barriers.* Additionally, as they gain direct experience, if actual barriers are few or have been overcome, it may decrease the extent to which they endorse barriers over time. For example, a longitudinal study of bar workers found that post-smoking ban, perceptions that the ban would hurt business fell from 49% to 20%.[104]

*Awareness.* Awareness of legislation may support initial compliance.[128] However, awareness can decrease over time with a peak when legislation is passed, without corresponding decreases in compliance once changes are implemented. For example, a study of workplaces after the introduction of smoke-free workplace legislation in Massachusetts found that compliance at 24 months post ban was associated with awareness of the law (OR 2.2 CI: 1.34, 3.61), but that awareness of the law decreased from 3 months post ban to 24 months post ban (92% to 73% p <.00001) while presence of workplace smoking restrictions stayed constant (83% to 80%, ns).[139]

*Source of information.* Additionally, compliance may be associated with source of information about regulations. It is possible that those who have informal sources may receive little information and thus be less likely to comply. However, theory suggests that it is also possible that once individuals have chosen whether or not to comply they may select a source similar to themselves to 'bolster' their existing opinions and justify their decision.[140]

Figure 3.2 shows the conceptual model for Study 1 utilizing relevant aspects of Mazmanian and Sabatier's Framework.[9,25]

**Figure 3.1 Study 1 Conceptual Model**




### 3.2 Theoretical Foundations for Study 2

Geoffrey Rose (1985) advocates population-based intervention approaches versus interventions targeting those at "high risk" in order to improve population health and "shift the whole distribution of exposure in a favourable direction."[141, p. 37] Rose notes that population based interventions are 'behaviorally appropriate' because they shift social norms such that maintenance of the new normative behavior no longer requires individual effort. Social norms changes can be useful to reduce smoking prevalence at the population level because everyone as a whole becomes less likely to initiate smoking, more likely to quit, and less likely to relapse.[142] For example, some estimate that if the US as a whole shared Californians' level of social unacceptability of smoking it would decrease cigarette consumption by 15%.[143]

It is important to note that these levels of social norms are not intrinsic in the population. They are modifiable and population attitudes can be changed over time.[144] The California Tobacco Control Program (CTCP), a model state program, explicitly uses a social norms paradigm to promote reductions in tobacco use throughout the state.[35,145] A logic model of the program shows that increasing support and creating positive attitudes towards tobacco control measures are seen as important outcomes that are necessary to obtain policy enactment and enforcement.[137] In this framework, supportive opinions of policies are also necessary over time to promote social norms changes around tobacco use that act to decrease initiation and consumption, promote cessation, decrease tobacco use prevalence and ultimately morbidity and mortality.[137] Positive public opinion toward regulation is also important to maintain policy, enhance compliance, and ensure that it is not weakened over time.

Implicit in this model are longstanding debates in the public policy tradition as to the role of public opinion in shaping public policy. Political scientists debate the extent to which public policy is directly shaped by public opinion ('majoritorian democracy'), by interest groups who represent constituencies ('interest group politics'), or by knowledgeable elites who promote policies based on scientific evidence or on the basis of social good ('entrepreneurial politics').[146] Promoting public opinion supportive of regulation is seen as part of a strategy by tobacco control advocates, using entrepreneurial politics, to influence public opinion as a counter to interest group politics practiced by the tobacco industry.[146] These types of debates also tap into deeper philosophical questions about the relative role of self-interest or societal interest in promoting policy and shaping opinions toward policy.[147]

While a number of studies and public opinion polls look at public opinions related to tobacco regulations,[148] none have comprehensively examined attitudes toward POS restrictions that have been or may be implemented as part of the recent Tobacco Control Act. Public opinion is important to gauge about these new regulations as prior efforts have met with failure in part due to the lack of public support.[36] Documenting where there is public support for

tobacco control regulations can also help to support policy change.[149] Interest group politics often pits ideas of social responsibility against ideas of individual self-interest in the contested battle for public opinion about tobacco regulation.[150] These types of messages are most evident in communications about the potential for a highly controversial ban on menthol cigarettes. The FDA's Tobacco Products Scientific Advisory Committee (TPSAC) in 2011 issued a Congressionally mandated report concluding that "Removal of menthol cigarettes would benefit public health in the United States."[151]

Tobacco control advocates have been highly active in promoting such a ban,[152-154] and the Congressional Black Caucus[155] and some civil rights organizations, including the National Association for the Advancement of Colored People (NAACP), have argued that menthol has been unfairly marketed to African Americans by the tobacco industry and thus keeping it on the market is harmful to African Americans.[156] Industry analysts have been dismissive of the need for a ban[157] – specifically on the basis of preserving smokers' choice.[158] Other African-American leadership organizations that have been linked with the tobacco industry have spoken out against a ban arguing that it would increase a contraband market for menthol cigarettes and hurt African-American businesses that sell menthol cigarettes.[159] Industry-sponsored analyses presented to the TPSAC concluded that a menthol ban would reduce menthol smoking prevalence by less than 30% due to the possible emergence of a contraband market for menthol cigarettes; and it could reduce population smoking prevalence by 3.5%.[151] Other researchers estimate that if 30% of menthol smokers quit after a ban it could decrease population smoking prevalence by 9.4% and avert over 600,000 deaths by 2050.[52] In a national sample almost 40% of menthol smokers think that they would quit smoking entirely if menthol were banned.[112] Thus, understanding the extent to which policy self-interest is associated with support for tobacco regulations can help to determine for which policies and for whom tobacco control advocates using a social norms paradigm need to frame messages in terms of social

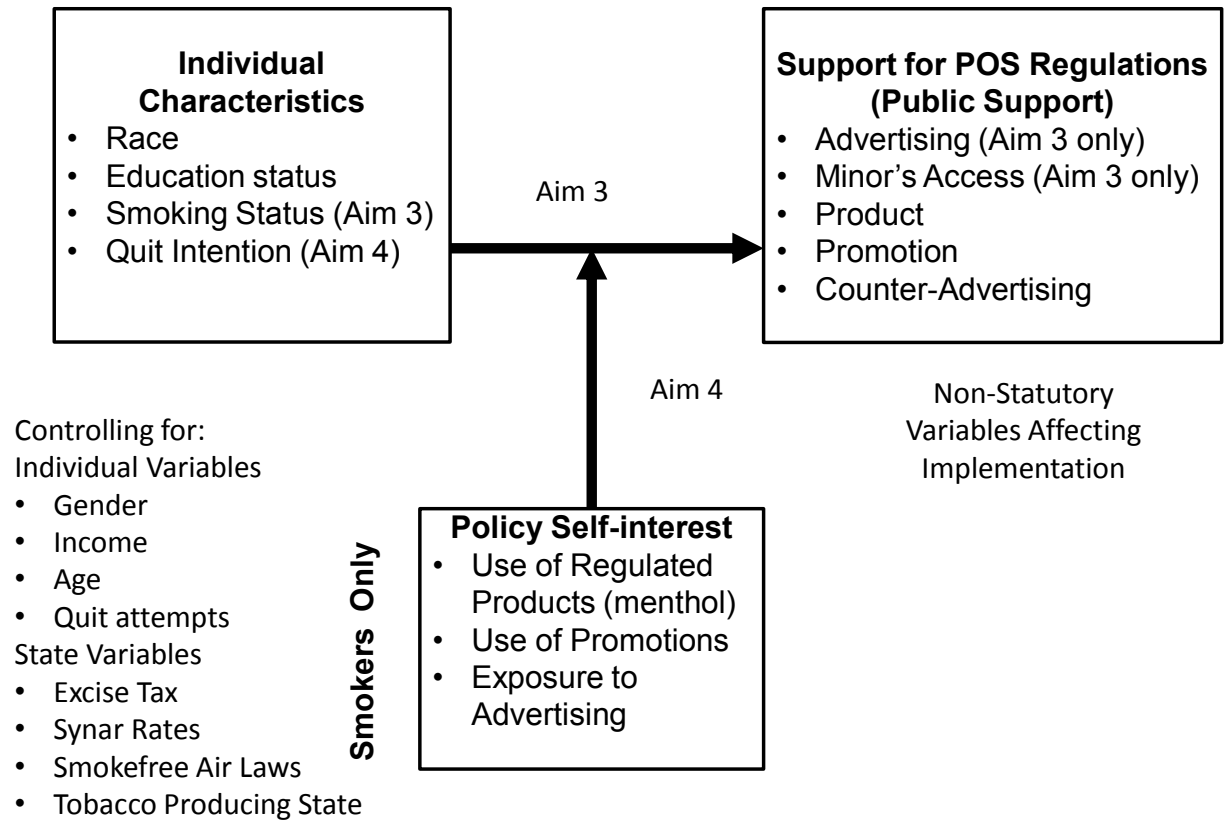
responsibility (e.g., menthol harms the community) or in terms of self-interest (e.g., a menthol ban can help you quit) when promoting and implementing POS regulations.

Mazmanian and Sabatier[9,25] note public support as an important non-statutory variable affecting policy implementation but provide little guidance on how this occurs. As shown in Figure 3.3, I focus my study on determining which factors are associated with public support for POS regulations. This type of analysis is important to understand the extent to which social norms paradigms and entrepreneurial political approaches by public health advocates are (or could) promote the normative changes needed to support new regulations among different populations (Aim 3). Additionally, using interest group politics, the tobacco industry and industry-funded groups have often tried to promote opposition to tobacco control regulations through asserting 'smokers' rights.'[42,160] However, smokers are not a monolithic group. Many regret starting to smoke,[161] and up to 68% of adult smokers would like to quit.[162] Understanding how policy self-interest may moderate the relationship of policy self-interest and level of support for POS regulations among smokers may help promote support for POS policies among those most affected by such regulations (Aim 4).

A review article on policy interventions found that across public health topics (e.g., tobacco, alcohol, obesity), policy support was stronger for those who were least affected by the results of the policy in question (i.e., were less self-interested), compared with those who were self-interested.[163] Prior studies in the tobacco policy arena have found that policy self-interest, usually measured as simply smoker compared with nonsmoker, is predictive of level of policy support as a direct effect.[46,47] However, other studies of self-interest in other non-health policy areas have not demonstrated the same direct effect.[164] Newer analyses demonstrate that self-interest should best be conceptualized as a moderator of the relationship between generic political attitudes and policy endorsement (support).[165] This is due to the fact that policy self-interest does not have a uniform effect but rather functions differentially based on prior experience and attitudes. For example, Lehman and Crano[165] found that though in an earlier

study,[164] white parents whose children were to be bussed were no more likely to oppose (or support) bussing than those whose children were not being bussed (direct effect), there was a significant effect when self-interest was used as a moderator of the relationship between general racial attitudes and policy support. Thus, those with negative racial attitudes were less likely to endorse bussing if their child was to be bussed while those with positive racial attitudes and were more self-interested were more likely to endorse the policy.[165] Direct effects of self-interest are most likely in situations where there is a substantial and clear stake in the issue (such as the impact of tobacco taxes on smokers).[164] I used more nuanced view of policy self-interest by assessing components of policy self-interest that are directly aligned with POS policy components of product, promotion, and advertising; these more subtle effects may be better conceptualized as moderators. The specific self-interest moderators I examine are (1) menthol smoking status, (2) use of promotions, and (3) exposure to retail tobacco advertising.

**Figure 3.2 Study 2 Conceptual Model**




Rationale for each of the proposed self-interest moderators is below:

*The relationship of race on support for a ban on menthol cigarettes moderated by menthol smoking status.* Studies have found relatively higher support for tobacco regulations among African Americans vs. Whites.[38,40,106] However, reasons for this pattern are unclear. Findings indicate that smokers (28.4%) have less support for a menthol ban than do never smokers (67.3%).[106] Compared with Whites, Blacks were 1.85 times more likely to support a menthol ban (54.8% vs. 68.0%).[106] Compared with menthol smokers, non-menthol smokers were 2.73 times (OR 95% CI 1.43, 5.21) more likely to support a ban on menthol cigarettes.[106]

However, prior studies have not looked at the interaction of race and menthol smoking status on support for a menthol smoking ban. Such an interaction is possible as African-Americans predominantly smoke menthol cigarettes with 84% of African-Americans vs. 24% of

whites citing that they smoke a mentholated brand.[166] As a result of this difference, messages about the benefits or harms of such a ban have been targeted to African Americans, but not specifically to Whites. Several African-American leadership organizations including the Congressional Black Caucus[155] and some civil rights organizations, including the NAACP, have argued that menthol has been unfairly marketed to African Americans by the tobacco industry and thus keeping it on the market is harmful to African Americans.[156] Other African-American leadership organizations that have been linked with the tobacco industry have spoken out against a ban arguing that it would increase a contraband market for menthol cigarettes and hurt black businesses that sell menthol cigarettes.[159] Thus, while blacks typically have higher support for tobacco control policies than whites and while self-interest would suggest that menthol smokers (vs. non-menthol smokers) would be less likely to support a menthol ban (direct effect), this relationship is likely interactive with menthol smoking status affecting African-American smokers' support for a ban more strongly than white smokers. Thus the relationship between race and menthol smoking status would be stronger for menthol smokers than non-menthol smokers.

*The relationship of education status on support for bans on promotions moderated by use of promotions.* Studies find that those with high education levels are more supportive of tobacco control regulations than those with less education.[40,41,167,168] Specifically, support for promotion restrictions has demonstrated a trend toward higher average support with increasing levels of education.[40] In a survey of New Yorkers, smokers (41%) were less likely than non-smokers (57%) to support banning price promotions such as coupons and two-for-one deals on cigarette packs.[109]

Additionally, studies have found that a third to a half of smokers may use price promotions when purchasing cigarettes.[107,108] While smokers of all income brackets make use of promotions, they may be most salient for those of lower SES status who are more price sensitive. For example, those classified as of the lowest SES level were 25% more likely to

have used one or more price minimizing techniques at last cigarette purchase compared with those of high SES.[169] Compared with those of the highest income level, those of moderate income were more likely to use coupons and promotions; there was also a linear but non-significant trend related to educational attainment.[108] This would suggest that low SES smokers' support for a ban on promotions may be more negatively affected by use of promotions than high SES smokers since a ban on promotions would not be as salient for these smokers whether or not they currently used promotions. As education level (as a proxy for SES) is interrelated with use of promotions, examining the interactive effect will provide a better view of how they jointly affect support for bans on POS promotions. Thus, the relationship between education and support for a ban on promotions would be stronger for those who use promotions than for those who do not use promotions.

*The relationship of quit intentions on support for graphic warning labels moderated by exposure to advertising.* In the longitudinal literature looking at policy support, studies use quit intentions at follow-up as an outcome measure and do not report baseline intentions.[43] However, it seems feasible that smokers with intentions to quit may have more support for tobacco control policies as potentially beneficial to support their quitting. There is some evidence that baseline quit intentions may indeed have a *direct effect* on policy support among smokers. Cohen et al. found that support for a variety of tobacco control policies including bans on smoking in workplaces, restaurants, and bars and support for plain packaging and banning tobacco advertising increased in a significant linear trend among smokers along the stages of change from precontemplation, contemplation, to preparation.[45] These stages were defined respectively by using measures of quit intention as either no intention to quit within the next 6 months, intention to quit within the next 6 months, or intention to quit within the next month.[45] Similarly, others have found that smokers strength of intention to quit was associated with support for a tobacco tax increase in New Zealand (AOR 1.30 CI 1.06-1.60) with the greatest odds found among those with the intention to quit in the next month (AOR 4.89 CI 2.78-8.65)

compared with those with no intention to quit.[170] Relative to graphic warning labels, a study of Dutch smokers found a dose-response relationship with strength of quit intention and impact of graphic warning labels on acceptance of labels, purchase decisions, motivation to quit, and smoking behavior (consumption) with stronger effects for those who wanted to quit in the nearer term.[171] An evaluation of the graphic warning labels on Australian cigarette packs found that those with intention to quit in the next 6 months or 1 month held more positive attitudes toward the health warnings than those without intention to quit including agreeing that health warnings on cigarette packs should be stronger and that the warnings make them think about quitting.[172]

Although no study to date specifically looks at these factors together, I believe that it is possible that exposure to protobacco advertising may moderate the relationship between quit intention and support for graphic warnings on packs and ads as a self-interest variable. For smokers, tobacco advertising may play a role in influencing smoking maintenance (and perhaps anti-tobacco control attitudes). Much of the impact of tobacco advertisements is theorized to occur at a subconscious level. The Elaboration Likelihood Model suggests that advertising messages can affect attitudes and behaviors in one of two ways. They can take a central route where messages require thoughtful appraisal and high elaboration and a peripheral route where messages require little or no appraisal and low elaboration.[173] Tobacco advertising specifically uses peripheral routes of persuasion often linking cigarettes to images of “independence, glamour, and fun.”[174] Additionally, agreement with low elaboration messages depends on the quantity of the messages in the message environment while agreement with high elaboration messages depends more on the quality of the argument.[14]

Exposure to tobacco advertising has also been found directly associated with reduced support for tobacco policy and more positive attitudes toward the tobacco industry. One study found that exposure to tobacco adverting in magazines (but not in newspapers) was associated with less support for tobacco control policies about smoking in movies.[148] Another study found that anti-tobacco industry beliefs were associated both with exposure to anti-tobacco messages

(including through health warnings) and less exposure to protobacco advertisements.[175] One mechanism that may be particularly salient in understanding the role of tobacco advertising relation to health warnings was proposed by Poiesz.[176] He suggest that tobacco advertising can create positive affective change based on information (i.e., repeated exposure to positive information about tobacco may change the decisional balance and help to "buffer" smokers against anti-smoking messages).[176] Thus, when smokers make a conscious decision to quit smoking and thus perhaps see the value of graphic warning labels in supporting that decision, this relationship may be in part be mitigated by their unconscious reaction to tobacco advertising. Thus, the relationship between intention to quit and support for graphic warnings will be weaker for those who are exposed to advertising than for those who are not exposed to advertising.

### 3.3 Research Aims and Hypotheses

#### *3.3.1 Study 1 Research Aims and Hypotheses*

I note that my initial hypotheses were based on retailer compliance, but for analyses I focused on retailer noncompliance. Other retailer studies also focus on noncompliance (rather than compliance) as noncompliant stores may require additional resources, communication, or enforcement to meet regulatory standards.[26,85,177] Identifying factors associated with noncompliance helps to identify leverage points for public health intervention. I have listed hypotheses here to correspond with that focus.

**Aim 1.** To determine whether retailer compliance with Tobacco Control Act POS provisions is reciprocally related to awareness of regulations, source of information, and barriers to regulatory changes (tractability factors) controlling for county, retailer neighborhood, store, and individual respondent factors.

- **Hy 1.1** Retailers who are noncompliant with POS regulations are less likely to be aware of FDA regulation of tobacco products than retailers who are compliant with POS regulations. Reciprocally, retailers who are aware of FDA regulation of tobacco products

will be less likely to be noncompliant with POS regulations than retailers who are not aware.

- **Hy 1.2** Retailers who are noncompliant with POS regulations will be less likely to have formal sources (i.e., government, tobacco industry, trade associations, and corporate sources) of information about regulations than those who are compliant with POS regulations. Reciprocally, retailers with formal sources of information about tobacco control regulations will be less likely to be noncompliant with regulations than those without formal sources.
- **Hy1.3** Retailers who are noncompliant with POS regulations will have more barriers to compliance than retailers who are compliant with POS regulations. Reciprocally, there will be a positive association between retailer barriers and likelihood of noncompliance.

**Aim 2.** To examine whether retailer Tobacco Control Act compliance is independently and reciprocally associated with retailer policy support.

- **Hy 2.1** Retailers who are noncompliant with POS regulations will have lower levels of support for Tobacco Control Act provisions than those who are compliant. Reciprocally, there will be a negative association between levels of support for Tobacco Control Act provisions and likelihood of noncompliance.
- **Hy 2.2** Based on length of implementation, retailers will have more support for minor's access and promotion bans than they will have for product bans, counter advertising, and advertising restrictions.

### *3.3.2 Study 2 Research Aims and Hypotheses*

**Aim 3.** To determine whether individual race, socioeconomic status, and smoking status are associated with level of support for Tobacco Control Act regulations among a national sample of smokers and non-smokers.

- **Hy 3.1.** Non-smokers, African Americans, and those of high education level will have greater overall support for regulations than will smokers, Whites, and those of low education level, respectively
- **Hy 3.2.** Based on self-interest, smokers will have more support for minors' access and advertising, than they will for product, counter-advertising, and promotion restrictions.

**Aim 4.** To determine whether policy self-interest (exposure to POS advertising, use of price promotion, and use of menthol cigarettes) among a national sample of smokers moderates the relationship between demographics characteristics and level of support for Tobacco Control Act regulations.

- **Hy 4.1** Blacks will have higher support for a menthol ban than whites, but this relationship will vary by menthol smoking status, such that the relationship will be stronger for menthol smokers vs. non-menthol smokers.
- **Hy 4.2.** Those of high education level will have more support for promotional restrictions than will those of low education level, but this relationship will vary by use of price promotions, such that the relationship will be stronger for those who use promotions than for those who do not use promotions.
- **Hy 4.3.** Those with intention to quit will have more support for graphic warning labels than will those without intention to quit, but this relationship will vary by exposure to POS advertising, such that the relationship will be weaker for those exposed to advertising than those not exposed to advertising.

# CHAPTER 4 METHODS

The manuscripts provided in Chapter 5 and 6 provide methods for Study 1 and 2 related to study sample, measures, and data collection procedures. I provide this chapter to provide additional detail on analysis procedures. This chapter provides detailed analytic methods for the completion of Study 1 Retailer Opinions (Section 4.1) and Study 2 Public Opinions (Section 4.2). Each section provides details on measure development, analytic strategies related to each aim, and statistical power.

## 4.1 Analysis of Study 1 Retailer Opinions

Study 1 designs, conducts, and analyzes a survey of tobacco retailers in three counties in North Carolina to determine their opinions of Federal tobacco control policy options and understand what factors are associated with their stores' compliance with Tobacco Control Act POS marketing and sales provisions. The survey questions were added to an evaluation of the *Red Flag* campaign, a social marketing campaign to promote the use by tobacco retailers of North Carolina color coded driver's licenses to reduce tobacco sales to minors. Data collection instruments are provided in Appendix A. This study linked interview data from retailers to data collected in store audits in the *Healthy Stores, Healthy Communities (Co-PIs Kelly Evenson and Kurt Ribisl)* study, on store compliance with Tobacco Control Act provisions. I followed several steps when analyzing these data: (1) measure development for scales, (2) analytic procedures related to using compliance as an independent variable, (3) analysis using compliance as a dependent variable, and (4) statistical power considerations.

### *4.1.1 Measure Development*

The first step in conducting the analyses related to this study was to determine whether the barriers items and level of support for policy items comprise unidimensional scales using limited scale development procedures.[178] A primary consideration in this decision was whether there was sufficient variability in the answer categories utilized so that the ordinal data represented by Likert scale responses can be treated as interval data that approximates a normal distribution. Examining the distribution of answers to each barriers item and assessing distributional assumptions graphically was the first step including histograms and Q-Q-plots to assess normality and a residual plot to look for homoscedasticity of residuals. Barriers items did represent a continuous distribution but residuals were not normally distributed and instead exhibited positive skew and negative kurtosis. However, using analytic strategies that were robust to assumptions (i.e., a robust maximum likelihood estimator), allowed me to move forward with confirmatory factor analysis with adjusted standard errors.[179] Level of support for POS policy and residuals were normally distributed and residuals were also homoscedastic.

I then conducted a CFA using Mplus 7 to check for a unidimensional factor structure of each of these two constructs. Goodness of fit of the model was assessed by looking at various fit indices specifically the chi-square ($X^2$), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and Tucker-Lewis Index (TLI) which taken together can determine whether the fit was adequate for a one-factor solution.[180,181]

**Barriers.** I developed a measure of barriers to compliance with tobacco control regulations based on four indicators (i.e., hurts my business, too costly, takes too much time, too hard to redo displays/shelves). Only owners and managers (n=165) were asked these items; clerks were not asked these items. Cronbach's alpha of these four items was .83 representing a reliable scale by established cutoff criteria of .8.[182,183] I conducted a CFA using a robust maximum likelihood (MLR) estimator of the four items. The MLR estimator has been shown to appropriately adjust standard errors and thus model fit statistics to account for data

that does not fully meet assumptions for multivariate normality.[179] The scaling factor introduced in this analysis was 1.4 only slightly above 1 indicating a normal distribution correcting for only a slightly leptokurtic distribution.[179] Table 4.1 shows fit statistics for the CFA indicating that a one factor solution was appropriate. With a non-significant chi-square test of model fit, CFI and TLI values over .95, SRMR of less than .08, and RMSEA of less than .06 with a 90% confidence interval (CI) including zero these data indicate excellent model fit based on established cutoff criteria.[181]

**Table 4.1 One-factor Solution for Barriers with Compliance**

| Goodness of Fit Statistics | Parameters |
|---|---|
| Chi-Square Test of Model Fit | $\chi^2$ (2) = .92 (p =.63) |
| CFI | 1.00 |
| TLI | 1.03 |
| RMSEA | .000 (90% CI: .00 to .12) |

As shown in Table 4.2, each of the parameter estimates for the barriers scale is highly significant at the .0000 level, indicating that they are all contributing significantly to the scale. $R^2$ values are also high indicating that each of the items, particularly those related to cost and time were addressing high levels of variance in the model. I conclude that the Barriers measure is reliable and has good model fit and can be used in analyses as a scale.

**Table 4.2 Item Loadings for CFA of Barriers to Compliance**

| Latent Variable Construct | Items | Model 1: One Factor Solution | | |
|---|---|---|---|---|
| | | γ | p | $R^2$ |
| **Barriers** | Hurts Business | .69 | .0000 | .38 |
| | Cost | .87 | .0000 | .70 |
| | Time | .90 | .0000 | .76 |
| | Space | .71 | .0000 | .43 |

**Support for POS Regulations.** I also conducted analyses to examine the reliability of the Support of POS Regulations measure. Using all ten items, Cronbach's alpha is .79, which is below the preferred threshold of .8.[182] Examination of deleted items analysis indicated that dropping the two minor's access items would improve scale reliability as they both had little variance; over 90% of respondents agreed with those items.[184] Dropping the two items improved scale reliability to .84.

A confirmatory factor analysis using a maximum likelihood estimator also demonstrated that a one factor solution had good model fit as shown in Table 4.3. By design, each of five types of POS provisions (e.g., minor's access, promotion, advertising, counter-advertising, and product) had two items. These items were expected to have correlated residuals and the fit statistics with these modifications are shown in the table. Factors loadings for items shown in the proposed scale are shown in Table 4.4. The two minor's access items were non-significant indicating that they were not contributing to model fit. All other items were significant at the p<.05 level. Dropping these two items did not significantly improve model fit based on the scaled chi-square difference test $\chi^2$ (14)=12.80 (p=.54). However, as is common practice, in the case of a non-significant result, these two items were not retained in multivariate analyses to increase the parsimony of the model.[185]

**Table 4.3 One-factor Solution for Level of Support for POS Policies – Study 1**

| Goodness of Fit Statistics | Parameters 10 Factor with Modifications | Parameters 8 Factor With Modifications |
|---|---|---|
| Chi-Square Test of Model Fit | $\chi^2$ (30) = 21.22 (p =.88) | $\chi^2$ (16) = 10.97 (p =.81) |
| CFI | 1.00 | 1.00 |
| TLI | 1.03 | 1.02 |
| RMSEA | .00 (90% CI: .00 to .02) | 0.00 (.00 to .04) |
| SRMR | .026 | .020 |

The final model for Level of Support had the structure shown in Figure 4.1.

**Figure 4.1 Final Model for Level of Support for POS Regulations**

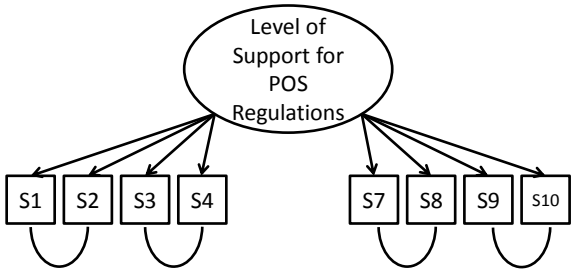


**Table 4.4 Item Loadings for CFA of Level of Support for POS Policies – Study 1**

| Latent Variable Construct | Items | Model 1 (10 factor) | | | Model 2 (8 factor) | | |
|---|---|---|---|---|---|---|---|
| | | γ | p | $R^2$ | γ | p | $R^2$ |
| **Support for POS Policy** | Black and White | .70 | .000 | .34 | .70 | .000 | .34 |
| | Plain Packs | .68 | .000 | .40 | .68 | .000 | .40 |
| | Graphic Warnings – Packs | .62 | .000 | .25 | .62 | .000 | .25 |
| | Graphic Warnings – Ads | .64 | .000 | .27 | .64 | .000 | .27 |
| | Minor's Access | .07 | .22 | .01 | -- | -- | -- |
| | Increasing Fines | .08 | .19 | .01 | -- | -- | -- |
| | Flavor Ban | .65 | .000 | .31 | .65 | .000 | .31 |
| | Menthol Ban | .71 | .000 | .49 | .71 | .000 | .49 |
| | Free gift | .78 | .000 | .42 | .78 | .000 | .42 |
| | Branded non-tobacco items | .96 | .000 | .63 | .96 | .000 | .63 |

### *4.1.2 Analyses for Aim 1 and 2 using Compliance as an Independent Variable*

I conducted simultaneous regression models using both Aim 1 and Aim 2 dependent variables in one set of analyses using structural equation modeling to account for multiple dependent variables (the four retailer interview measures). In this approach I directly utilized the CFA results to maintain Barriers and Level of Support for POS regulations as latent factors rather than converting them to scale scores. Due to the fact that *Awareness of POS regulations* and *Formal source of information* are binary variables I utilized Weighted Least Squares (WLS) as the estimation technique for the SEM. This approach assumes that the categorical outcomes represent a case of an underlying latent variable and approximates a probit regression approach using the probit function.[186] I used MPlus7 to conduct this analysis. All structural equation models accounted for sampling weights by county and clustering by census tract. By default, missing data with respect to predictors was also accounted for by a Full Information Maximum Likelihood (FIML) approach.[187] I viewed fit statistics of the CFI and Tucker-Lewis index (TLI) of .95 or above and root mean square of approximation (RMSEA) values lower than .06 as indicative of good model fit based on established cutoff criteria.[181]

Using WLSMV to model binary outcomes as representing an underlying normal distribution I found that the model without covariates for Aim 2 showed good, but not excellent, model fit (Table 4.5) based on established cut-offs. [181] The chi-square test was non-significance,

and the RMSEA is less than the preferred value of .06, but CFI and TLI were over threshold value of .95.

**Table 4.5 Model Fit of Aim 2 without Covariates**

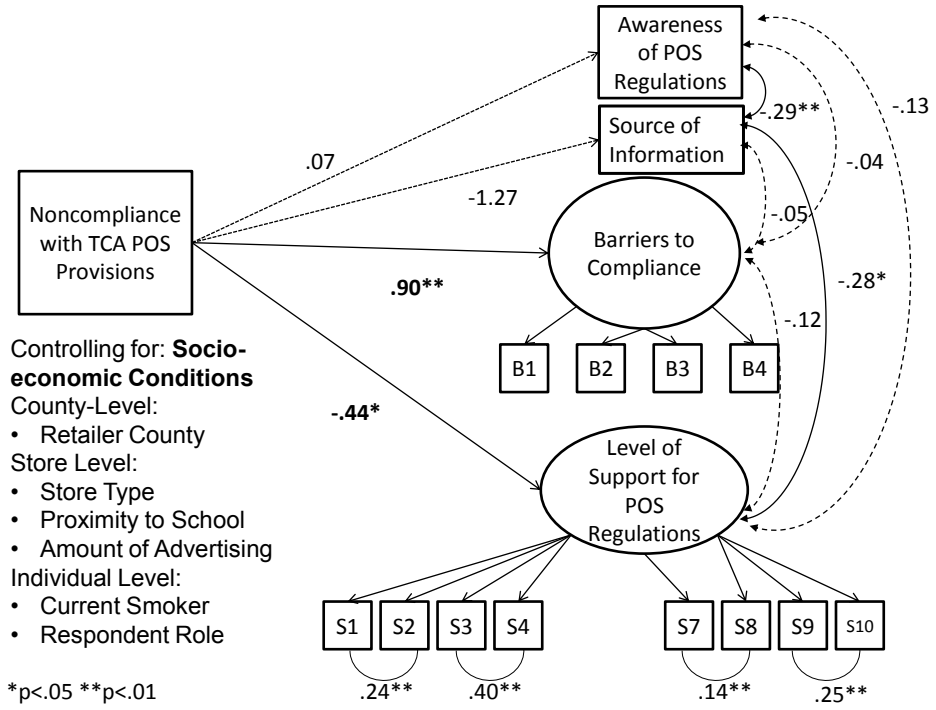
| | |
|---|---|
| Chi-Square Test of Model Fit | $\chi^2$ (79) = 99.966 (p =.06) |
| CFI | .927 |
| TLI | .902 |
| RMSEA | .033 (90% CI: .000 to .051) |

These results suggested that adding covariates may be necessary to improve model fit. I used a model building strategy that added individual respondent, store level, store neighborhood, and county covariates as hierarchical sets. Hierarchical sets are appropriate when covariates are grouped in substantive sets, and we want to examine the contribution of the set of variables to variance in the outcome rather than individual covariates by themselves.[188] Adding covariates to the model improved model fit indices, shown in Table 4.6. The best fitting model included individual, store level, and county covariates but did not include neighborhood covariates. In models that included neighborhood covariates they were non-significantly related to all dependent variables. All fit indices indicate good to excellent model fit. I used chi-square difference testing appropriate to the WLSMV estimator to assess the nested model that constrained neighborhood covariates to zero. This test indicated a non-significant result ($\chi^2$ = 12.15 df 16 p=.73), indicating that the more parsimonious model with more restrictions is preferred. This model accounts for 18% of the variance in the Barriers latent factor, 83% of the variance in Source of information, 7% of the variance in Awareness of POS Regulations, and 28% of the variance in the Support for POS latent factor. The full model is shown in Figure 4.2.

**Table 4.6 Model Fit of Final Model for Compliance as an Independent Variable with Individual, Store, and County-level Covariates**

| | |
|---|---|
| Chi-Square Test of Model Fit | $\chi^2$ (245) = 256.97 (p =.29) |
| CFI | .96 |
| TLI | .95 |
| RMSEA | .01 (90% CI: .00 to .03) |
| WRMR | .74 |

**Figure 4.2 Final Structural Equation Model with Compliance as an Independent Variable**




### *4.1.3 Analyses for Aim 1 using Compliance as a Dependent Variable*

General analyses for Aims 1 and 2 with compliance as a dependent variable were conducted using generalized estimating equations, appropriate for use with a binary outcome.[1] Because the survey sample of stores was stratified by county, analyses accounted for the sample weights in order to obtain accurate assessments of standard errors and associated confidence intervals. Though the sample weights were not largely different across counties, failing to account for the difference in the weighted versus unweighted sample may lead to inaccurate standard errors.[189] This possibility was accounted for through use of weighting to incorporate the sample design[190] using PROC GENMOD in SAS version 9.3. All analyses also accounted for clustering of stores at the census tract level because stores within census tracts were not independent of each other on the compliance dependent variable. The intraclass

[1]I conducted additional analyses of compliance as a dependent variable using structural equation modeling. Results of these analyses are provided in Appendix B. These models did not exhibit good model fit.

correlation (ICC) of the null model incorporating clustering by census tract was .11 indicating that 11% of the variance in compliance was accounted for neighborhood. Little missing data was evident (n=3) so that procedures for handling missing data were not needed.

For Aim 1 which focused on the relationship of tractability factors to compliance, I conducted Generalized Estimation Equations (GEE) models using logistic regression adding in awareness, source, and barriers as independent variables, assessing the relationships, and then conducting additional analyses adding in control variables. Prior analyses simply looking at the impact of store and neighborhood characteristics on POS compliance found that store type (pharmacy) and county (Buncombe) were the most salient independent variables associated with POS compliance.[26] However, understanding additional policy implementation factors that may be associated with POS compliance complements those analyses. All analyses accounted for weighting of stores by county as part of the sampling design and clustering of stores by census tract. I used GEE with an exchangeable covariance structure to allow for appropriate calculation of standard errors to avoid type I error due to non-independence of observations.[191] I included covariates in hierarchical sets at the individual, store, neighborhood, and county level. As noted in the measures section in Chapter 5, all covariates selected have been associated with either compliance or support for tobacco control policies in prior studies. I used the lowest quasi-likelihood under the independence model criterion (QIC) to select the best fitting model.[192] Analyses for Aim 2 using compliance as a dependent variable.

For Aim 2, the Policy Implementation Framework suggests statutory variables and non-statutory variables directly influence compliance beyond the influence of tractability factors examined in Aim 1. Since the Tobacco Control Act has already been passed, I chose not to focus on the statutory variables as they are fixed and did not vary for the purposes of influencing implementation. Thus, my interest in Aim 2 was to examine the extent to which attitudes of interest groups operationalized in this study as retailer level of support for POS provisions is independently associated with compliance with POS policy. I used similar steps as for Aim 1,

using GEE with the logit link to examine the relationship between Level of Support and retailer compliance and then adding in covariates in hierarchical sets. The analysis generated odds ratios of the odds of a store being noncompliant. Other studies of compliance with tobacco control regulations also focus on noncompliance (rather than compliance) as noncompliant stores may require additional resources, communication, or enforcement to meet regulatory standards.[26,78,129] Confidence intervals (95%) that do not cross 1 are significant at the p=.05 level.

### *4.1.4 Power Analyses*

I used compliance as a dependent variable as the main outcome variable to calculate power. As compliance is a dichotomous variable, this approach is conservative, compared with calculating power based on continuous scale variables of barriers or support. I calculated power for the bivariate relationship between barriers and compliance. I also accounted for clustering by neighborhood. I calculated the design effect based on the ICC (.11) and the average cluster size of stores within census tracts of 2.17. Based on the actual sample size of 252 stores I divided by the design effect to get the effective sample size of 222.

I used the effective sample size and the actual proportion of stores that were noncompliant with tobacco control POS regulations of .163 and the distribution of the barriers items to calculate power based on different effect sizes. I selected the barriers item rather than support for POS since I hypothesized that barriers would have a positive relationship with noncompliance in order to utilize odds ratios over 1. No prior study examines retailer barriers with compliance with tobacco control regulations as examined in this study to obtain empirical estimates of estimated effect sizes. Thus, I calculated power based on guidance on threshold values for odds ratio effect sizes where 1.5 is a ‘small’ effect, 2.5 is a ‘medium’ effect, and 4 is a ‘large’ effect as shown in Table 4.7.[193] All power calculations used the logistic function of PROC

POWER in SAS 9.3. Given these analyses I can detect a 'medium' effect size of 1.9 with over 80% power, but would be unable to detect a 'small' effect.

**Table 4.7 Power Calculations for Study 1**

| Odds ratio | Effect Size | Power based on effective sample size of 222 |
|---|---|---|
| 1.5 | Small | .45 |
| 2.5 | Medium | .99 |
| 4 | Large | >.99 |

## 4.2 Analysis of Study 2 Public Opinions

Study 2 is a secondary data analysis of questions added to a web survey of the general public regarding their opinions of Federal tobacco control policy options to understand what demographic and self-interest variables may be associated with their opinions. The survey questions were added to wave 1 of *The Tobacco Control in a Rapidly Changing Media Environment Survey (TCME),* which was funded by the National Cancer Institute (NCI) (Sherry Emery, PI; Kurt Ribisl, CoI: U01CA154254) from 2011 to 2016. Data collection instruments are provided in Appendix A. Details about study sample, measures, and data collection procedures is contained in Chapter 6. This section provides additional detail on analytic strategies used to conduct Study 2 including (1) measure development, (2) analytic procedures, and (3) statistical power.

### *4.2.1 Measure Development*

I followed comparable steps to Study 1 to assess whether Support for POS regulations could be used as a unidimensional scale. First using all ten items, I found that average responses over the ten items were continuous, residuals for support for POS policy were normally distributed, and the Q-Q plots were on the diagonal. Residual by predicted plots were homoscedastic but had a distinct pattern due to the restricted range of the Likert scale from 1-5. However, survey procedures used are robust to violations of assumptions. Additionally, I also found that Cronbach's alpha=.91 demonstrating high reliability of the scale items.

I further conducted a CFA using a robust maximum likelihood (MLR) estimator to identify whether a one-factor solution had good model fit. By design, each of five types of POS provisions (e.g., minor's access, promotion, advertising, counter-advertising, and product) had two items. These items were expected to have correlated residuals and the fit statistics with these modifications are shown in Table 4.8. With the exception of the a significant chi-square test which was not unexpected given the high sample size, all fit indices show excellent good fit with the data.

**Table 4.8 One-factor Solution for Support for POS Policies – Study 2**

| Goodness of fit statistics | Parameters with 10 items |
|---|---|
| Chi-Square Test of Model Fit | $\chi^2$ (30) = 532.37 (p =.000) |
| CFI | .983 |
| TLI | .975 |
| RMSEA | .031 (90% CI: .029 to .033) |

As shown in Table 4.9, all 10 items loaded highly significantly onto the support factor at the .000 level. Additionally, $R^2$ was high, particularly for minor's access and advertising variables, and significant for each item. This indicates that all items were contributing to variance explained by the latent factor. This pattern differed from the CFA for retailers where minor's access provisions were not significantly contributing. I concluded that Support for POS policy was unidimensional and could be used as a scale score with all 10 items.

**Table 4.9 Item Loadings for CFA of Level of Support for POS Policies – Study 2**

| Latent Variable Construct | Items | Model 1 (10 factor) | | |
|---|---|---|---|---|
| | | γ | p | $R^2$ |
| **Support for POS Policy** | Black and White | .66 | .000 | .57 |
| | Plain Packs | .70 | .000 | .51 |
| | Graphic Warnings – Packs | .78 | .000 | .39 |
| | Graphic Warnings – Ads | .76 | .000 | .42 |
| | Minor's Access | .40 | .000 | .84 |
| | Increasing Fines | .40 | .000 | .84 |
| | Flavor Ban | .81 | .000 | .34 |
| | Menthol Ban | .84 | .000 | .30 |
| | Free gift | .86 | .000 | .26 |
| | Branded non-tobacco items | .87 | .000 | .24 |

### *4.2.2 Analyses for Aim 3*

I conducted weighted and unweighted analyses using SAS 9.3 to generate sample characteristics and point estimates of support for POS provisions. I conducted separate

analyses for the total sample and for current smokers. All analyses used design-based population weights and accounted for stratification in the sampling design to generate estimates for the total sample and smoker population that corresponded to the national US population. GfK, the survey vendor, generated the weights for the complex sampling design accounting for oversampling of smokers.

I then examined support for POS regulations as a scale score using the average of the 10 items for both the total sample as well as for smokers only. I conducted linear regression using PROC SURVEYREG to account for the complex sampling design and post-stratification weights. I first conducted bivariate (unadjusted) analyses of each covariate and then conducted multivariate analyses. I included all demographic characteristics in multivariate analyses regardless of significance in bivariate analyses. Other control variables at the state level were only included if they were significant at the $p<.25$ level in bivariate analyses.[194]

To maintain the focus on support for policy as the dependent variable for this study, I did not include items regarding respondent's likelihood of visiting stores with graphic warning labels on cigarette packs and ads or smoker's likelihood of buying cigarettes in such stores in analyses presented in Chapter 6. Instead, I plan to develop a future manuscript examining support for graphic warning labels on packs and ads and respondent intentions as assessed by these items. Descriptive statistics for these items are presented in Appendix B.

### *4.2.3 Analyses for Aim 4*

I conducted Aim 4 by looking at specific components of POS support as the dependent measure (e.g., menthol ban, promotion bans, and tobacco advertising restrictions), rather than the entire policy support scale. These components were aligned with the specific components of self-interest (e.g., use of menthol cigarettes, use of promotions, and exposure to advertising) to have a better fit with level of specificity of the attitudinal variables as recommended by Lehman and Crano.[165] I restricted the sample to smokers only.

For each self-interest variable I conducted a separate moderation analysis that controlled for race, intention to quit, education, gender, age, income, and quit attempts. I did not include state policy variables as they were non-significant in all analyses with or without interactions. To test the interaction, I included the interaction term along with main effects and covariates. Where the interaction term was significant, then I probed the interaction, graphed the results based on least square means, and tested the significance of the simple slopes and intercepts. I also conducted analyses of the main effects as conducted in prior studies. [106,107] Additional details about each analysis are below. All analyses used SAS survey procedures and accounted for sampling weights and survey design stratification by media market.

**Support for a menthol ban.** In conducting this analysis I examined the interaction of race restricted to only black and white respondents and those indicating smoking either menthol or non-menthol cigarettes (n=5,688) on support for a menthol ban.

**Support for graphic warnings.** For this analysis, I examined the interaction of intention to quit on exposure to retail advertising. I restricted analyses to smokers who answered those two questions (n=6,528). Support for graphic warning labels was the average of responses regarding the two items of support for graphic warning labels on packs and ads.

**Support for promotion bans.** This analysis examined support for promotions as the average of two items on support for bans on free gifts with purchase and branded non-tobacco items. I looked at the interaction of education which was dichotomized into high school or less or more than high school education and use of promotions at last purchase. I restricted analyses to smokers who answered these items (n= 6,503).

### *4.2.4 Power analyses*

Questions were administered to 17,507 respondents in the 50 US states and District of Columbia. The smallest comparison was between African Americans (n=1,317) and whites (n= 13,920). Given the post-stratification weights and complex sampling design, the design effect for

African-Americans was 3.04 and for whites was 2.84 as provided by SAS survey procedures. Accounting for this design effect yields an effective sample size of 433 African-Americans and 4,901 whites. As a new dependent variable, I first calculated power using the *most conservative* assumptions. Table 4.10 shows power to detect various effect sizes differences based on the using *a dichotomous outcome*. I based Calculation 1 on detecting a 7% difference in agreement with individual policy support measures starting from the most conservative value of 50%; such an effect could be detected with greater than 80% power. Relative to percent agreement with a ban on menthol cigarettes (e.g., product), Winickoff and colleagues found a 14% differences in support between African Americans and Whites.[106] A similar effect size for this study shown in Calculation 2 could be detected with a power of greater than 99.9%. The actual difference in proportion found in this study in support for a ban on menthol cigarettes was 30.7 for whites vs. 41.6 for African-Americans which could be detected with power of 99.4%. However, since the new measure of policy support can be considered a scale with a continuous dependent measure, then given the effective sample size, this study could detect a difference in mean scores between African-Americans and Whites as small as .0014 with 80% power (SD .01). All power calculations were conducted using SAS 9.3.

**Table 4.10 Power Calculations for Study 2**

| **Parameters** | **Calculation #1 (Conservative estimate: 7% difference)** | **Calculation #2 (Winickoff et al. 2011: 14.6% difference)** | **Calculation #3 (Actual difference: 10.8%)** |
|---|---|---|---|
| Alpha | .05 | .05 | .05 |
| African American proportion policy support | 50% | 68% | 41.6 |
| White proportion policy support | 43% | 53.4% | 30.7 |
| Sample size per group (African American, White) | 1,317, 13,920 | 1,317, 13,920 | 1,317, 13,920 |
| Effective sample size per group accounting design effect | 433, 4901 | 433, 4901 | 433, 4901 |
| Power | 80.2% | >99.9% | 99.4% |

# CHAPTER 5 STUDY 1
# RETAILER OPINIONS ABOUT AND COMPLIANCE WITH FAMILY SMOKING PREVENTION AND TOBACCO CONTROL ACT POINT OF SALE PROVISIONS

## 5.1 Introduction

Retail outlets are one of the main avenues for marketing and promotion of tobacco products in the US,[12] however, tobacco retailers are an often overlooked audience for tobacco control efforts.[92] In 2011, cigarette companies spent 89% of their marketing budget at the point-of-sale (POS) predominantly on retail advertising and price discounting. [13] Tobacco advertising especially at POS is thought to have four direct effects on smoking: (1) encouraging youth smoking, (2) increasing daily smoking consumption among smokers by acting as a cue to action, (3) reducing smokers' motivation to quit, and (4) enticing ex-smokers to start again.[15,63,66] To address such effects, in 2009 the Family Smoking Prevention and Tobacco Control Act ("Tobacco Control Act") (Public Law 111-31) instituted new sales and marketing provisions at POS. Provisions aimed at reducing youth initiation, for example, include banning flavored cigarettes and restricting self-service of tobacco products. Other provisions such as banning free gifts with cigarette purchase can be expected to reduce impulse purchasing.[1]

Now that some provisions of the Tobacco Control Act are enacted nationwide, research is needed to understand how the Act is being implemented at POS and what factors may be associated with this implementation. Prior to the enactment of the Tobacco Control Act, the average retailer violation rate of sales to minors in 2008 was 9.9%. This was the lowest rate recorded since the implementation of the 1992 Synar Amendment which restricted tobacco sales to youth.[17] More recently, several studies have been conducted about how compliant tobacco retailers are with newer Tobacco Control Act POS sales and marketing provisions.[26,78,79] Two studies in Ohio examined the compliance of retailers with four Tobacco

Control Act POS provisions, finding violation rates under 10%.[78,79] In 2012, the FDA conducted compliance checks in 37 states and the District of Colombia and issued warning letters or civil penalty letters to retailers in 6% of the checks.[81] Our prior study in North Carolina identified a violation rate of any of 12 provisions of the Tobacco Control Act of 15.7%.[26]

However, few studies examine what factors may enhance Tobacco Control Act implementation at POS. To further improve compliance, some authors have called for anti-tobacco coalitions and advocates to pay greater attention to implementation and enforcement of existing regulations, rather than simply promoting new policies.[16] Policy implementation is an area where public health can also learn from theories in the public policy arena.[123,124] Mazmanian and Sabatier's Framework of Analysis for Policy Implementation is particularly well suited for studying the implementation of the Tobacco Control Act in retail stores.[9,25] This framework suggests that implementation of policies at POS may rely on several factors:

1. The extent of change required by retailers to implement the policy (termed a 'tractability' factor),
2. Socioeconomic conditions that may be related to tobacco retailers' compliance with policy changes in the retail environment, and
3. Retailer support for such policies.[25]

The Policy Implementation Framework may be particularly appropriate in policy situations of low ambiguity (the policy is clear on what changes are expected), but high conflict (where different actors or stakeholder groups within the policy arena may have deeply held and contradictory views on the policy itself).[126] This situation applies to implementing the Tobacco Control Act, where clear guidance exists for inspections and enforcement of sales and marketing provisions at POS, but some of these provisions, such as black and white advertisements, are highly contentious and have not been implemented due to litigation by the tobacco industry.[195,196]

Policy implementation theory suggests that the extent of policy implementation and compliance with new policy rest largely with 'street level bureaucrats' – implementers on the ground (in this case, tobacco retailers).[23] Theory also suggests that local flexibility and adaptation are necessary conditions for successful policy implementation.[24] Currently, tobacco retailers are often viewed as tobacco industry allies because their economic self-interest is tied to tobacco sales.[19] Convenience store associations have also served as front groups for the industry to block or blunt the effects of POS policy.[18,19] Thus, engaging tobacco retailers as *stakeholders* in tobacco control efforts, rather than adversaries, requires understanding the factors associated with their compliance.[25] However, little is currently known about what retailer opinions are associated with compliance with tobacco control POS provisions. For this study, I conceptualize four opinion constructs related to Mazmanian and Sabatier's theory: (1) retailer barriers to complying with regulations, (2) awareness of policy, and (3) source of information about policies related to their ideas about *extent of behavioral change* required; and (4) retailer support for policies. I also examine sociodemographic factors that may be associated with compliance as control variables.

However, while retailer opinions are likely to influence compliance, it is equally important to understand a converse hypothesis: that retailer compliance may influence retailers' awareness, source of information, barriers, and support for policy. A social norms framework implies a feedback process by which enactment of policy affects supportive attitudes toward policy, which leads to additional policy implementation and enforcement.[137] Additionally, theory suggests that attitudes and behaviors are reciprocally related.[133] In the case of policy change, policy implementation can lead to behavioral compliance by imposing situational constraints that make compliance beneficial. Compliance, in turn, can subsequently lead to attitude change[133,138] which may relate to all of the retailer opinions examined in this study: support for policy, barriers, source of information about regulations, and awareness of regulations. Those who comply with policies can subsequently change their support for those policies. For example,

once a smoking ban was successfully implemented Scotland,[197] bar and restaurant workers' support for the policy improved.[104] Additionally, as they gain direct experience with the policy, retailers' perceptions of barriers may change. In the same study, perceptions that a bar and restaurant smoking ban would hurt business fell from 49% to 20%.[104] Awareness of policies can also decline after initial implementation without subsequent compliance declines.[139] Additionally, compliance may affect selection of source of information about regulations; once individuals comply with a policy they may select a similar source to 'bolster' their existing opinions and justify their decision.[140]

To understand how retailer opinions may be associated with compliance we interviewed 252 retailers whose stores had previously been audited for compliance with Tobacco Control Act POS provisions.[26] The main study objectives were to (1) identify retailer opinions about Tobacco Control Act provisions, (2) identify factors that may be associated with these opinions, and (3) link retailer opinions with retailer compliance. I hypothesized that levels of compliance would be lower among retailers who reported higher levels of barriers to compliance, were unaware of the Tobacco Control Act, did not have formal sources of information about regulations, and had lower levels of support for tobacco control POS provisions. In addition, to address the potential for reciprocal relationships, I modeled compliance both as a dependent and independent variable associated with retailer barriers, source of information, awareness, and support. I also expected that support for provisions in the Tobacco Control Act that had been enacted the longest (i.e., minor's access provisions enacted under Synar regulations in the 1990s and promotion restrictions which were prohibited under the Master's Settlement Agreement in 1999) would be stronger than newer or proposed product, graphic warnings, and advertising restrictions.

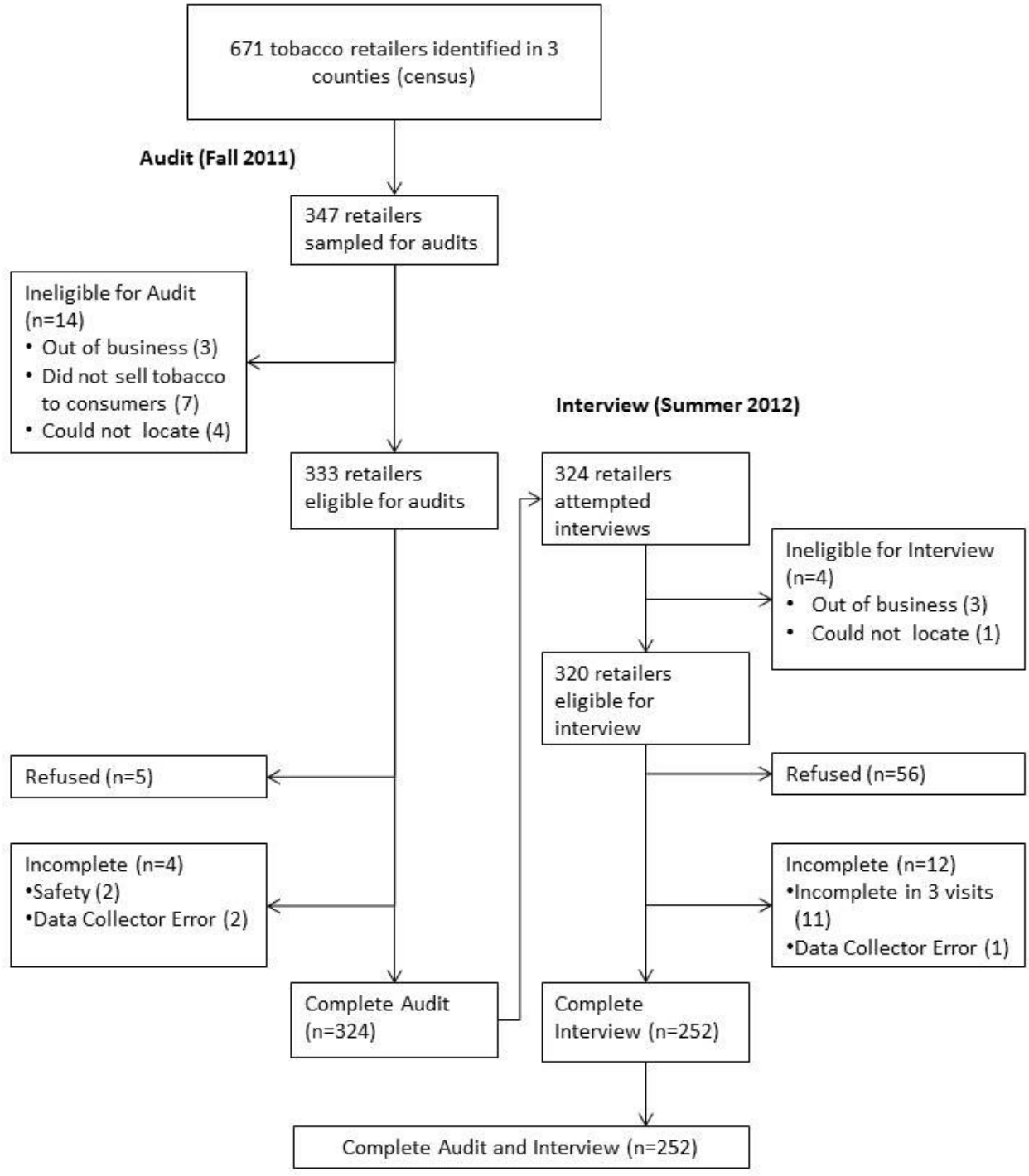
## 5.2 Methods

### *5.2.1 Data Source and Study Population*

This study linked interview data from retailers to data on store compliance with Tobacco Control Act provisions as measured by store audits *(Healthy Stores, Healthy Communities, Co-PIs Kelly Evenson and Kurt Ribisl)*. I added interview questions to an evaluation of the *Red Flag* campaign, a social marketing campaign for tobacco retailers to promote the use of North Carolina color coded driver's licenses to reduce tobacco sales to minors. The Red Flag team interviewed tobacco retailers in three counties in North Carolina about their opinions of Federal tobacco control policy options and to understand what factors may relate to their stores' compliance with Tobacco Control Act point of sale marketing and sales provisions. We selected the three counties, Buncombe, Durham, and New Hanover, to represent distinct geographic regions of the state (mountain, central, and coastal); all have a high cancer burden. We identified all tobacco retailers within these three counties (n=671) in Summer/Fall 2011 through driving all primary and secondary roads. In Fall 2011, we conducted in-person store audits of 347 retailers selected through stratified random sampling proportionate to the number of retailers in each county. Of these, we completed 324 audits; we did not complete audits in 14 stores that were ineligible; 5 stores that refused; and 4 stores for safety or other reasons.

We then conducted retailer interviews at these audited stores in Summer 2012. We conducted an in-person interview with the store owner, manager, or clerk. The study sample consists of stores that completed both a store audit and retailer interview. Figure 5.1 shows the response for each data collection activity for this study. Of the 324 stores with audit data, 4 stores were ineligible (out of business or could not be located) and 56 retailers refused to complete the interview. Data collectors could not complete the interview in 12 stores – 1 store due to data collector error and 11 stores where the interview could not be completed in 3 attempts. Thus, for the interview, we achieved a response rate of 78% of stores. The final sample of stores with both interview and audit data was 252.

**Figure 5.1 Study Sample Response Diagram**




### *5.2.2 Respondent Eligibility Criteria*

Respondents in the store were eligible if they were either the owner, on-site manager (including assistant manager), or store clerk of a tobacco retail establishment previously audited

in the three counties. If multiple potential respondents were in the store at the time of the interview visit we requested permission to interview the "highest" ranking participant first. Eligible respondents needed to be able to respond to the interview in English. Only one respondent, who also refused the interview, did not speak English. Respondents were offered a $20 gift card to a major chain store as an incentive for participation. We interviewed only one respondent per store.

### *5.2.3 Data Collection and Measures*

Data for the audit were collected in Fall 2011[26] and for the interview in Summer 2012. For the audit, we trained 10 master's degree–level data collectors through a day-long didactic and hands-on session conducted in retailer locations (a grocery store, a pharmacy, and a tobacco store) in a county not selected for the study. As part of a larger study on food, tobacco, and physical activity environments, 2 data collectors visited each retailer, but only one conducted the tobacco audit. We conducted all retailer audits electronically using data collection forms programmed in Pendragon (Pendragon Software Corporation, Buffalo Grove, Illinois) on an iPod touch (Apple Inc, Cupertino, California). We regularly reviewed data, which were uploaded to a secure central database. The University of North Carolina at Chapel Hill (UNC–CH) Public Health–Nursing institutional review board determined that the audit did not constitute human subjects research and thus did not require approval.

For the interview, we piloted the questionnaire at 6 retailers in a county not selected for the study. Data collectors were trained in a half-day session on study procedures and were certified in using the interview instrument which was programmed in Qualtrics (Qualtrics Labs Inc, Provo, Utah) for use on an iPad (Apple Inc, Cupertino, California). The interview was approved by the University of North Carolina at Chapel Hill (UNC–CH) Public Health–Nursing institutional review board (Study Number #12-0548).

**Compliance measure.** The primary measure of compliance was from the store audit data. I assessed compliance with 12 POS provisions of the Tobacco Control Act implemented at the time of the store audit (September – November 2011). A store was seen as compliant if there were:

- no sales of flavored tobacco products,
- no sales of "light" or "low tar" labeled cigarettes,
- no self-service kiosks for cigarettes or smokeless tobacco,
- no tobacco vending machines,
- no sales of loose cigarettes,
- no sales of loose smokeless tobacco,
- no audio advertisements with sound effects,
- no video advertisements with sound effects, music, or color,
- no gifts given with purchase,
- no availability of gift catalogs,
- no branded non-tobacco products, or
- no retailer promotion of tobacco brand name event sponsorship.

Stores with any of these items were seen as noncompliant. Thus, I assessed noncompliance as a store level characteristic and measured it as a binary variable. Other retailer studies also focus on noncompliance (rather than compliance), as noncompliant stores may require additional resources, communication, or enforcement to meet regulatory standards.[26,85,177]

**Retailer Opinions.** I used three measures to assess the extent of change required to implement the policy: (1) Awareness, (2) Source of information, and (3) Barriers to Compliance. *Awareness* was measured as a dichotomous measure of whether retailers were aware of the Tobacco Control Act. This item was derived from the 2009 ITC US survey *"In 2009, the*

*President signed a law that gave the US Food and Drug Administration (FDA) power to regulate tobacco products. Have you heard of this law before?* [115]

*Source of information* was measured through a series of yes/no/does not apply questions asking about usual source of information about tobacco control regulations. I assessed nine different sources including both formal sources (government, tobacco industry, corporate, boss/manager, and trade associations) and informal sources (media, family and friends, customers, and other retailers). Respondents could indicate multiple 'usual sources.' From these variables, I created a dichotomous variable that indicated whether or not a retailer cited any formal source of information. Additional analyses looked at one specific source – government agencies (See Appendix B).

Extent to which *barriers to compliance* are perceived by retailers was assessed through 4 items measured on a five-point Likert scale with options ranging from strongly disagree to strongly agree. Items were coded so that higher values indicate stronger agreement with barriers to compliance. Barriers items (i.e, hurts my business, too costly, takes too much time, too hard to redo displays/shelves) were only asked of owners and managers (n=165), and not of clerks.

I assessed *level of support* for POS regulations by retailers through 10 items measured on a 5 point Likert scale from strongly disagree to strongly agree. These items were drawn from or adapted from the Smoking Policy Inventory,[40,97,111] the Massachusetts Adult Tobacco Survey 2000,[114] California Tobacco Retail Policy Survey,[117] COMMIT trial,[96] Social Climate Survey of Tobacco Control,[106] and the International Tobacco Control Survey 2009.[115] Items were scored so that higher scores represent more support for tobacco control POS regulations. I assessed support for a variety of measures included in the Tobacco Control Act including actions that had been enacted such as a ban on flavored cigarettes, and those delayed by litigation including graphic warning labels and black and white tobacco advertisements. This scale had two items

addressing each of five different aspects of the provisions – product, counter-advertising, advertising, promotion, and minor's access provisions. Specifically, these included support for:

- bans on flavored and menthol cigarettes (product),
- graphic warning labels on packs and ads (counter advertising),
- black and white text ads and packaging (advertising),
- bans on gifts with tobacco sale and branded non-tobacco items (promotion),
- fines for retailers that sold tobacco to minors (minor's access).

**Controls.** I used several control variables at the county, store neighborhood, store, and individual retailer levels to represent socioeconomic conditions that have been associated with either compliance or other tobacco marketing disparities or with support for policy in prior studies.

*County.* Our prior study found that odds of compliance varied significantly by county.[26]

*Neighborhood.* I used census tracts as the measure for neighborhood. This has been found to be comparable to block group in other studies[198] and is also commonly used as a measure of neighborhood in store audit studies.[78] Using the latitude and longitude of the store taken at the front entrance, I linked store location to the following neighborhood characteristics: the percentage of black and Hispanic residents, derived from 2010 US census data;[199] and the percentage of families living below federal poverty guidelines, based on the 2006–2010 American Community Survey 5-year estimates.[200] All of these neighborhood characteristics have been linked to retail tobacco marketing[71,201] with more marketing in racial/ethnic minority and low-income neighborhoods. Racial/ethnic retailer neighborhood composition has also been associated with noncompliance with minor's access regulations with more sales in white, Asian, and Hispanic neighborhoods compared with African-American neighborhoods.[202] Low income neighborhoods have been associated with self-service violations[78] and sales to minors.[30]

*Store.* I controlled for *store proximity to school* measured as a dichotomous variable of whether the store is within 1000 feet of a public school through mapping data of school parcels based on county educational data and store locations. Prior studies find that stores within 1000 feet of schools are more likely have tobacco advertisements and have more tobacco advertisements per retailer than stores further away.[203] Studies have not documented store proximity to schools with compliance with tobacco control policies, but in an older study employees in 50% of stores near schools said that they would sell tobacco to minors.[204] I categorized *store type* (e.g., pharmacy, supermarket, convenience store) using definitions from the North American Industry Classification System (NAICS) definitions, coded with supermarkets as the reference category.[205] Prior studies have found differential compliance by store type with minor's access provisions, with more sales to minor's in gas/convenience, pharmacies, supermarkets, and general merchandise stores than in convenience stores.[177] Our prior study also found higher likelihood of noncompliance in pharmacies compared with grocery stores of sales and marketing provisions.[26] Total amount of tobacco marketing material was derived from the store audit data and included counts of tobacco ads on the store interior and exterior, branded functional items (e.g. change mats), and tobacco moveable displays. Prior research has found small but significant correlations between amount of retail tobacco advertising and illegal sales.[206]

Individual level variables included respondent *current smoking status* (everyday/some days vs. not at all) and *respondent role* (owner, manager, or clerk). Smokers have significantly lower support for tobacco control policies than do non-smokers.[46,97] More managers than owners endorse minors' access policies.[207]

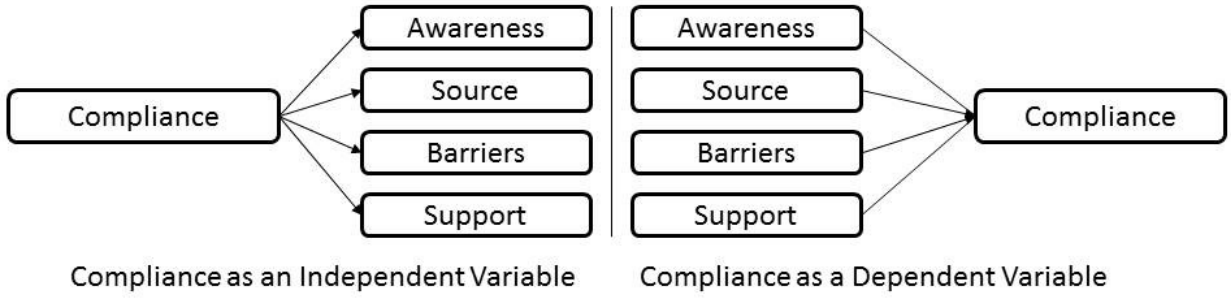
### *5.2.4 Data Analysis*

I calculated descriptive statistics to characterize the study sample and patterns of barriers, source of information about regulations, awareness of the Tobacco Control Act,

support for POS policy, and compliance with POS policy. Confirmatory Factor Analysis (CFA) of the Barriers items indicated that the 4 items formed a unidimensional scale with excellent fit based on established cutoff criteria ($\chi^2$=.92 df=2 p=.63; RMSEA .00 90%CI 0.00, .12 CFI=1.00; TLI=1.03; SRMR=.014).[181] All four items loaded significantly onto the latent factor. For the Level of Support measure, CFA found that the items formed a unidimensional scale with excellent model fit ($\chi^2$=10.97 df=16 p=.81; RMSEA 0.0 90%CI 0.0, 0.037; SRMR =.02; CFI=1.000; TLI = 1.01). Residuals for each of the pairs of items that had to do with a single POS domain (e.g., advertising, promotion) were correlated. All items loaded significantly onto a single support for POS factor with the exception of the two minor's access items which had over 90% support and thus little variance and were dropped from the scale for multivariate analyses.

I conducted bivariate analyses (not shown) using Fisher's exact test and logistic regression for binary variables and ANOVA and Pearson correlations for continuous variables. Covariates that were significant at p<.05 for any dependent variable were included in multivariate analyses. In multivariate analyses, since given the design of the study I could not establish whether retailer opinions influences compliance or the converse, I conducted the analysis using compliance both as an independent and dependent variable, shown in Figure 5.2.

**Figure 5.2 Brief Conceptual Model Diagram**




*Compliance as an Independent Variable*

To account for multiple dependent variables (the four retailer interview measures), I used structural equation modeling to conduct the analysis. In this approach, I directly utilize the CFA

results to maintain Barriers and Level of Support for POS regulations as latent factors rather than converting them to scale scores. Due to the fact that *awareness of POS regulations* and *source of information* are binary variables I used Weighted Least Squares (WLS) as the estimation technique for the SEM. This approach assumes that the categorical outcomes represent a case of an underlying latent variable and approximates a probit regression approach using the probit function.[186] I used MPlus7 to conduct this analysis. All structural equation models accounted for sampling weights by county and clustering by census tract. By default, missing data with respect to predictors was also accounted for by a Full Information Maximum Likelihood (FIML) approach.[187] I report unstandardized coefficients for multivariate adjusted models. I viewed fit statistics of the Comparative Fit Index (CFI) and Tucker-Lewis index (TLI) of .95 or above and root mean square of approximation (RMSEA) values lower than .06 as showing good model fit.[181]

*Compliance as a dependent variable*

I conducted additional analyses looking at the relationships of Barriers, Source of information, Awareness, and Support for POS policies with likelihood of noncompliance using General Estimating Equations (GEE) using PROC GENMOD in SAS 9.3. I used GEE because the ICC of the null model using census tract as the clustering variable showed that 11% of the variance in noncompliance was due to neighborhood (census tract). Because of this clustering, independence of stores cannot be assumed and GEE allows for calculating robust standard errors using an exchangeable covariance structure to ensure appropriate confidence intervals and avoid Type I error. Additionally, I adjusted for sample weights at the county level as the sampling design was a stratified random sample proportionate to the number of retailers in each county.

For these analyses I separately modeled the factors associated with extent of change required (operationalized as barriers, source of information, and awareness) and retailer support for policies. These separate analyses were conducted to understand the individual impact of

these as separate theoretical constructs. Empirically, barriers items were only asked of managers and owners but not of clerks, also supporting separate analyses.

### *5.2.5 Model Building Strategy*

For both compliance as an independent and a dependent variable, I used a model building strategy that added covariates in hierarchical sets. Hierarchical sets are appropriate when covariates are grouped in substantive sets, and when one wants to examine the contribution of the set of variables to variance in the outcome rather than individual covariates by themselves.[188] First, I entered the factors derived from theory (i.e., either compliance or barriers, source of information, awareness, and support). I saw retailer compliance or opinions 'nested' in sets of socioeconomic conditions. Individual demographics were expected to directly influence compliance or opinions. Store factors influence individual respondents, neighborhood factors influence stores, and counties influence neighborhood demographics factors. Hence, I entered the control variables in order from the most 'proximal' to the most 'distal' influences: theory driven, individual, store-level, neighborhood, and then county-level factors. In models of compliance as a dependent variable using structural equation modelling, I directly tested goodness of fit of these nested models against one another using chi-square difference tests. However, if all covariates were non-significant for a set of variables, I assessed model fit without that hierarchical set. For compliance as an independent variable using Generalized Estimating Equations, I compared the quasi-likelihood under the independence model criterion (QIC) to select the best fitting model.[192]

## 5.3 Results

### *5.3.1 Sample Description*

Among the 252 stores in the study, 16% were noncompliant with Tobacco Control Act provisions. Interview respondents, shown in Table 5.1, were predominantly store managers or assistant managers (54%), followed by clerks (35%) and owners (12%). Smoking prevalence

among respondents (some day or everyday) was 40%, higher than the 21.8% smoking rate in North Carolina in 2011.[208] The predominant store type was gas station or gas station with convenience stores (53%), followed by grocery store/supermarket including warehouse and supercenters (16%), convenience store (13%), drug store/pharmacy (10%), tobacco stores (4%), and other store types consisting of beer, wine, and liquor stores and discount department stores (3%). On average, stores had 34 tobacco marketing materials and 16% were within 1000 feet of a K-12 public school. Stores in the sample were in 116 neighborhoods (tracts) across the 3 counties. On average, retailer neighborhoods were similar to the state as a whole with 21.8% Black residents (vs. 21.5% for the state) and 9.6% (vs. 8.4%) Hispanic residents, but had higher percentages of residents with a college degree (31.1% vs. 26.1%), and fewer residents under family poverty thresholds (12.5% vs. 15.5%) than the state.

I conducted analyses for non-response bias by examining bivariate relationships between respondents (n=252) and non-respondents (n=72) using chi-square tests for categorical variables and t-tests for continuous variables. These analyses showed no significant differences by any store, neighborhood or county characteristic among stores that completed the interview and those that did not participate (analyses not shown). Stores also did not differ on noncompliance between responders (16.3%) and non-responders (16.8%) ($\chi^2(1)$=.0064 p=.94).

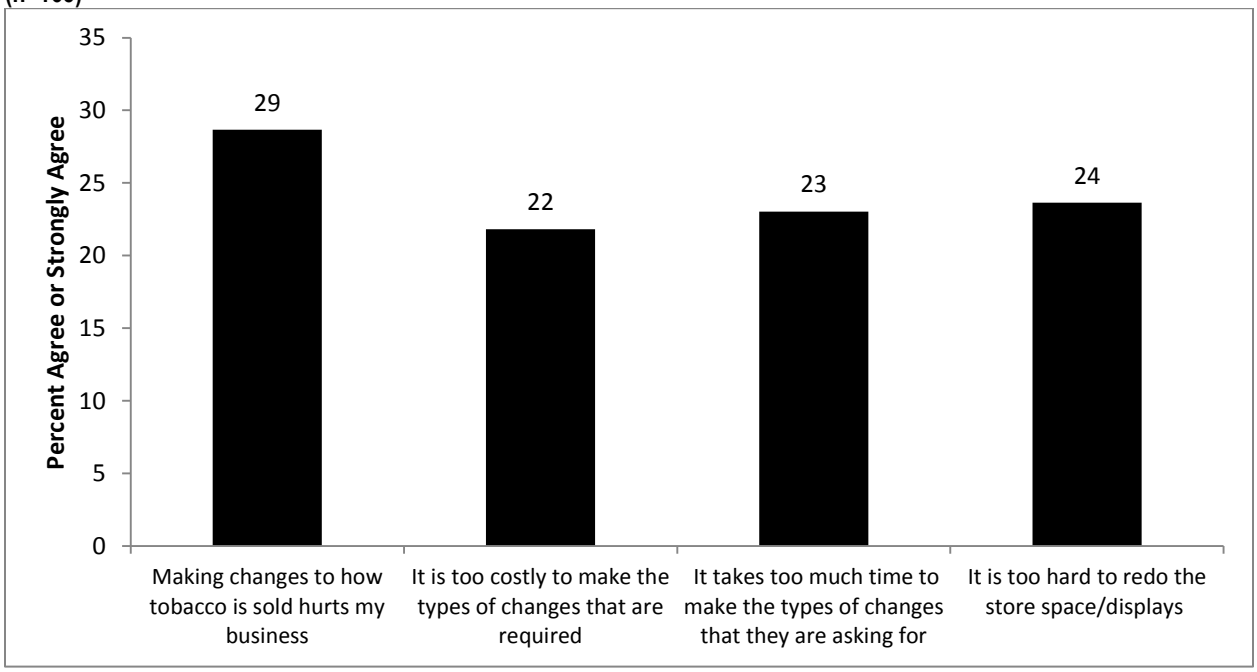
**Table 5.1 Descriptive Characteristics of Interview Respondents**

| | Mean (SD) or n(%) (n=252) |
|---|---|
| **Barriers (n=162) (Mean)** | 2.52 (.9) |
| **Support for POS Regulations (n=249) (Mean)** | 3.15 (.7) |
| **Formal Sources (n=248) (%)** | 241 (97.2) |
| **Awareness of FDA Regulations (n=248) (%)** | 106 (42.7) |
| **Noncompliant (n=252) (%)** | 41 (16.3) |
| | |
| **Individual Characteristics** | |
| **Smoking Status (n=249)** | |
| Never Smokes (%) | 149 (59.8) |
| Smokes Every or Some days (%) | 100 (40.2) |
| **Respondent Type** | |
| Store Owner (%) | 29 (11.5) |
| Store Manager (%) | 135 (53.6) |
| Store Clerk (%) | 88 (34.9) |
| | |
| **Store Characteristics** | |
| **Store Type** | |
| Grocery Store/Supermarket (%) | 40 (15.9) |
| Gas Station/Gas Convenience (%) | 134 (53.2) |
| Convenience (%) | 33 (13.1) |
| Drug Store/Pharmacy (%) | 26 (10.3) |
| Tobacco Store (%) | 11 (4.4) |
| Other Store (%) | 8 (3.2) |
| **Number of Tobacco Marketing Materials (Mean)** | 34.13 (SD 19.60) |
| **Proximity to School** | |
| Greater than 1000 ft. (%) | 211 (83.7) |
| Within 1000 ft. (%) | 41 (16.3) |
| | |
| **Retailer Neighborhood Characteristics(Mean)** | |
| % Black Residents | 21.8 (SD 22.3) |
| % Hispanic Residents | 9.6 (SD 8.7) |
| % Bachelors or More (%) | 31.9 (SD 16.3) |
| % Family Poverty | 12.5 (SD 12.1) |
| | |
| **County** | |
| Durham (%) | 79 (31.4) |
| Buncombe (%) | 91 (36.1) |
| New Hanover (%) | 82 (36.1) |

### *5.3.2 Descriptive Statistics*

***Barriers.*** Overall, 41% of respondents noted at least one barrier to complying with regulations, with the most common that making changes to how tobacco is sold hurts their business (29%). Differences in percent agreement by barriers item are shown in Figure 5.3.

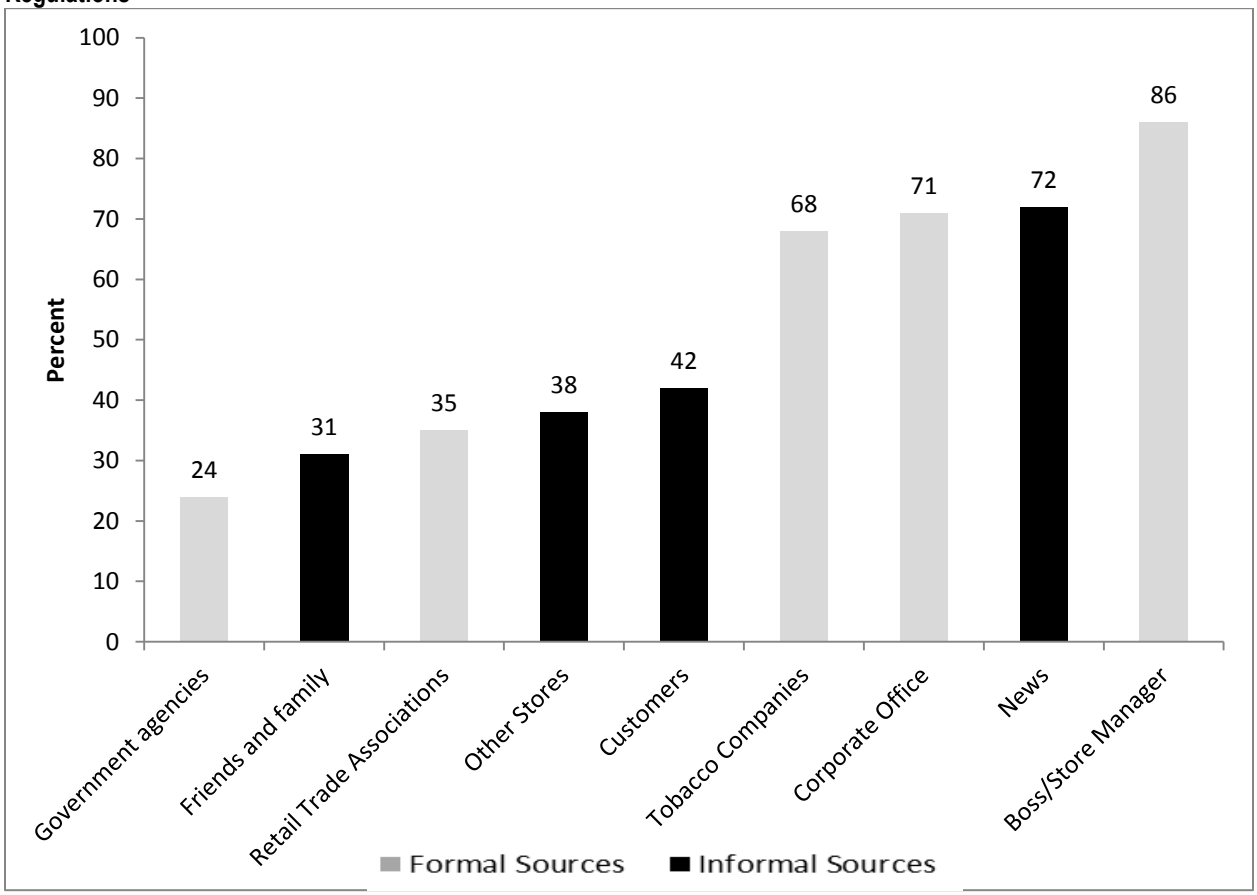
**Figure 5.3 Percent of Respondents who Agreed or Strongly Agreed with Barriers to Compliance with Regulations (n=165)**




***Awareness of the Tobacco Control Act.*** Fewer than half of respondents (43%) were aware of the Tobacco Control Act three years after its implementation.

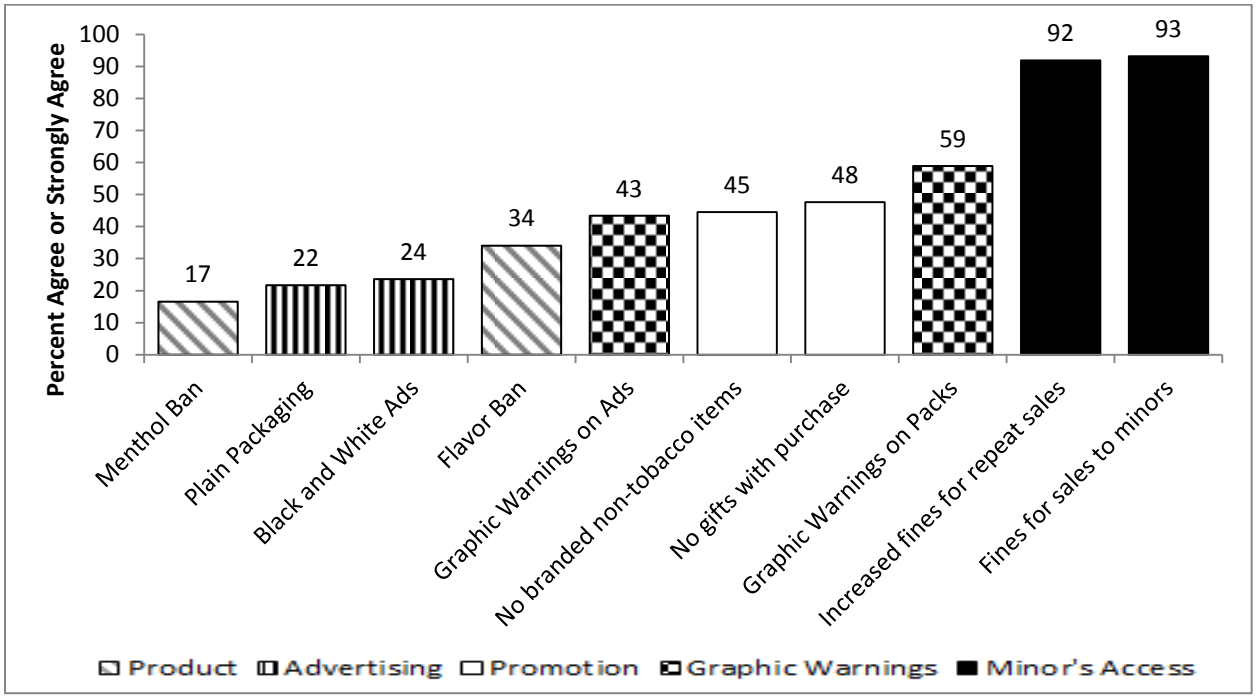
***Source of information about Tobacco Control Regulations.*** Percent of respondents listing each source of information is shown in Figure 5.4. Almost all respondents (97%) had at least one formal source of information. The least common usual source of information about tobacco control regulations was government agencies (24%). In contrast, boss/store managers were cited by 86% of respondents. Almost 70% of respondents cited tobacco companies as a usual source of information about regulations.

**Figure 5.4 Percent of Respondents Citing Category as a 'Usual Source' of Information about Tobacco Control Regulations**




***Support for POS regulations.*** As shown in Figure 5.5, respondents varied in the percent who agreed or strongly agreed with each particular POS provision. At least 90% of respondents supported minor's access provisions while the lowest level of support was found for a menthol ban, at 17%.

**Figure 5.5 Percent Agree or Strongly Agree with Each POS Provision (n=252)**




### *5.3.3 Results for Compliance as an Independent Variable*

I conducted multivariate analyses using structural equation modeling. I sequentially added hierarchical sets of covariates to the model. The full model with all sets of covariates had acceptable but not great model fit (RMSEA .02, CFI .93, TLI .90) and I also found no significant relationships between retailer opinions and any neighborhood variable. Thus, to improve model fit, I assessed the full model against a nested model that constrained to zero the set of neighborhood variables. I found a non-significant result between the full and nested model using chi-square difference testing ($\chi^2$ = 12.15 df 16 p=.73), indicating that the more parsimonious model (the model with more restrictions) is preferred. The final model, as shown in Table 5.2 had good fit ($\chi^2$=256.97 df=245 p=.29; RMSEA 0.01 90%CI 0.0, 0.03; CFI=.96; TLI = .95).

*Retailer Compliance and Retailer Opinions*

In multivariate analyses, shown in Table 5.2, respondents in noncompliant stores perceived higher levels of barriers to complying with tobacco control regulations (3.0 vs. 2.4 mean barriers score; B=.90 p=.001) and had less support for POS policies (2.6 vs. 2.9 mean

support score; B=-.44 p=.03) than respondents in compliant stores. Store compliance was unrelated to retailer awareness of the Tobacco Control Act or source of information.

*Covariates related to Retailer Opinions*

Owners expressed more barriers than managers (2.9 vs 2.4 mean barriers score; B=.43 p=.04). Those in tobacco stores expressed significantly more barriers than grocery stores and supermarkets, (3.3 vs 2.3 mean barriers; B=1.24 p=0.01).

Owners had less support for POS policies than managers/clerks (2.9 vs. 3.2 mean support score; B=-.55 p=.03). Respondents who smoked some days or every day expressed significantly less support for POS policy than those who did not smoke on any days (2.7 vs 3.0 mean support; B=-.47 p=.004). Those in gas/gas convenience stores (2.8; B=-.77 p=.002), drug store/pharmacies (2.7; B=-.61 p=.03), and tobacco stores (2.3; B=-1.15 p=.02) expressed significantly less support for POS policies than those in grocery store/supermarkets (3.5). Respondents in New Hanover versus those in Durham expressed significantly less support for POS policies (2.6 vs 3.1 mean support; B=-.91 p=.001).

There were no significant covariates associated with awareness of the Tobacco Control Act. However, store owners had the highest level of awareness, followed by managers, and clerks (51% vs. 44% vs. 37% respectively), though this was not significant.

In multivariate analyses, there were no significant covariates associated with having a formal source of information about tobacco control regulations. However, in bivariate analyses, owners were significantly less likely to report that they had a usual formal source for hearing about tobacco control regulations than were managers or clerks (82.8% vs. 97.8 vs. 96.3 respectively p=.007) and for every one unit increase in amount of tobacco marketing materials, retailers were 6% more likely to have a formal source of support (p=.02).

Additional analyses (presented in Appendix B) found that pharmacy/drug stores compared with grocery/supermarkets were less likely to cite a government agency as a usual source of information about regulations (B=-1.15, p<.05). Conversely, stores in neighborhoods

with more Hispanic residents (B=.04, p=.01) and in New Hanover versus Durham were more likely to cite a government source of information (B=.90 p=.003). However, the model looking at government source of information had poorer fit indices compared with the model using formal source of information. CFI and TLI were under established cutoff criteria of .95 (RMSEA =.02, CFI .90, TLI .93) suggesting that this model is not preferred.

**Table 5.2 Multivariate Structural Equation Model of Barriers, Awareness, Source of Information, and Support for POS Policies**

| **IVs (n=249 except as noted)** | **Barriers (n=162)** | | **Awareness** | | **Source of information** | | **Support for POS** | |
|---|---|---|---|---|---|---|---|---|
| | B (SE) | p-value | B (SE) | p-value | B (SE) | p-value | B (SE) | p-value |
| **Compliance** | | | | | | | | |
| Noncompliant | .90 (.28) | .001 | .07 (.20) | .72 | -1.27 (1.64) | .44 | -.44 (.20) | .03 |
| Compliant | ref | | | | | | | |
| **Individual Factors** | | | | | | | | |
| **Smoking Status** | | | | | | | | |
| Smoke every or some days | .16 (.22) | .45 | .29 (.22) | .18 | 1.50 (4.47) | .74 | -.47 (.16) | .004 |
| Smokes no days | ref | | | | | | | |
| **Respondent Type** | | | | | | | | |
| Owner | .43 (.21) | .04 | .49 (.33) | .14 | -.81 (1.02) | .43 | -.55 (.25) | .03 |
| Manager/Clerk | ref | | | | | | | |
| **Store Factors** | | | | | | | | |
| **Store Type** | | | | | | | | |
| Grocery Store/Supermarket | ref | | | | | | | |
| Gas Station/ Gas Convenience | .13 (.30 | .66 | -.02 (.28) | .94 | .61 (1.66) | .71 | -.77 (.25) | .002 |
| Convenience | .38 (.36) | .28 | -.18 (.30) | .56 | .38 (1.03) | .71 | -.41 (.33) | .21 |
| Drug Store/Pharmacy | -.11 (.38) | .77 | .04 (.32) | .91 | 4.10 (2006) | 1.00 | -.61 (.28) | .03 |
| Tobacco Store | 1.24 (.48) | .01 | .43 (.52) | .41 | 2.53 (2575) | 1.00 | -1.15 (.51) | .02 |
| Other Store | .54 (.46) | .24 | -.56 (.59) | .35 | -.95 (1.86) | .61 | -.66 (.50) | .19 |
| **Amt. Tobacco Marketing** | -.003 (.006) | .56 | -.01 (.01) | .24 | .03 (.03) | .30 | .009 (.005) | .06 |
| **Proximity to School** | | | | | | | | |
| Within 1000 ft | -.009 (.27) | .97 | .14 (.25) | .59 | .27 (2.46) | .91 | .26 (.20) | .19 |
| Greater than 1000 ft | ref | | | | | | | |
| **County** | | | | | | | | |
| Buncombe | -.05 (.43) | .90 | .19 (.39) | .63 | -1.51 (5.55) | .79 | -.62 (.36) | .083 |
| New Hanover | .05 (.33) | .88 | .10 (.32) | .75 | 2.12 (257) | .99 | -.91 (.27) | .001 |
| Durham | Ref | | | | | | | |

### *5.3.4 Results for Compliance as a Dependent Variable*

In looking at correlates of compliance, I ran GEE models for theoretical factors related to extent of change required -- Barriers, Awareness, and Source of information (Table 5.3) and a separate model using Support for POS policies (Table 5.4). Looking first at results for Table 5.3, we first ran a model for theoretical variables and then added in covariates at the individual respondent, store, neighborhood, and county levels. In all models, stores with higher levels of barriers had significantly higher odds of noncompliance. In the final model, accounting for individual, store, retailer neighborhood and county characteristics, stores with higher levels of barriers had 5.6 times the odds of non-compliance (AOR=5.56, 95% CI 2.24, 12.26). This final model, Model 5, had the lowest quasi-likelihood under the independence model criterion (QIC) indicating the best model fit.[192] Stores without formal sources of information about regulations were more likely to be non-compliant in models 2 and 3, including individual and store covariates. When adding neighborhood and county characteristics to the model, this result was no longer statistically significant. Awareness of regulations was significantly related to non-compliance only in model 3 when controlling for individual respondent and store covariates.

In the final two models, noncompliance was inversely related to percent black population. In the final model, as percent of black residents in a store neighborhood increased, likelihood of non-compliance decreased 8% (AOR=.92, 95% CI .87, .97). Additionally, non-compliance was positively associated with households in poverty. In the final model, for every 1% increase in the neighborhood family poverty rate, store odds of noncompliance increased by 11% (AOR=1.11 95% CI 1.05, 1.18). In the final model, no other individual, store, or county covariate was significantly related to non-compliance.

Additional analyses examined whether stores had a government source of information are shown in Appendix B. Stores with a government source of information had significantly higher odds of noncompliance only in Model 4 with retailer opinions, individual, store, and neighborhood covariates (AOR 4.19 95%CI 1.01, 17.31). When adding county as a covariate in

Model 5, this result was no longer statistically significant. Other results were substantively unchanged except that in the final model tobacco stores were less likely to be noncompliant though this was a marginally significant result (p=.05).

**Table 5.3 Barriers, Awareness, and Source associated with Noncompliance with POS Provisions**

| Constructs [AOR (95% CI)] (n=161) | Model 1 Barriers Awareness and Source | Model 2 Individual Covariates | Model 3 Individual and Store Covariates | Model 4 Individual, Store and Neighborhood Covariates | Model 5 Individual, Store, Neighborhood and County Covariates |
|---|---|---|---|---|---|
| **Barriers** | **2.13 (1.31, 3.46)** | **2.42 (1.38, 4.25)** | **2.64 (1.49, 4.68)** | **4.62 (2.47, 8.64)** | **5.56 (2.24, 12.26)** |
| **Source of information** | .19 (.03, 1.15) | **.11 (.01, .88)** | **.06 (.01, .81)** | .03 (.00, 1.32) | .03 (.00, 1.45) |
| **Awareness of Regulations** | 1.99 (.84, 4.75) | 2.03 (.83, 4.97) | **2.61 (1.14, 5.95)** | 2.74 (.95, 7.78) | 2.07 (.65, 6.58) |
| **Individual** | | | | | |
| **Respondent Type** | | | | | |
| Store Owner | | .66 (.24, 1.79) | .43 (.08, 2.41) | .47 (.04, 6.17) | .61 (.13, 2.78) |
| Store Manager | | 1.00 (ref) | 1.00 (ref) | 1.00 (ref) | 1.00 (ref) |
| **Smoking Status** | | | | | |
| Never Smoker | | 1.00 (ref) | 1.00 (ref) | 1.00 (ref) | 1.00 (ref) |
| Current Smoker | | .66 (.24, 1.79) | .66 (.24, 1.84) | .45 (.11, 1.80) | .38 (.07, 2.00) |
| **Store** | | | | | |
| **Store Type** | | | | | |
| Grocery Store/ Supermarket | | | 1.00 (ref) | 1.00 (ref) | 1.00 (ref) |
| Gas/ Gas Convenience | | | .96 (.21, 4.30) | .51 (.11, 2.36) | .61 (.13, 2.78) |
| Convenience | | | 2.14 (.32, 14.37) | .75 (.05, 11.99) | .74 (.01, 43.22) |
| Drug Store/ Pharmacy | | | 3.91 (.70, 21.85) | 3.86 (.49, 30.16) | 6.74 (.81, 56.09) |
| Tobacco Store | | | .43 (.02, 7.65) | .11 (.01, 1.64) | .06 (.00, 1.00) |
| Other Store | | | .89 (.08, 10.56) | .21 (.01, 8.16) | .12 (.00, 3.77) |
| **Tobacco Marketing** | | | 1.02 (.99, 1.05) | 1.04 (99, 1.09) | 1.03 (.97, 1.10) |
| **Proximity to School** | | | | | |
| > 1000 ft. | | | 1.00 (ref) | 1.00 (ref) | 1.00 (ref) |
| Within 1000 ft. | | | .53 (.11, 2.58) | .91 (.15, 5.31) | .78 (.18, 3.35) |
| **Neighborhood** | | | | | |
| %Black | | | | **.88 (.84, .91)** | **.92 (.87, .97)** |
| %Hispanic | | | | 1.00 (.91, 1.10) | 1.02 (.91, 1.15) |
| % Bachelors + | | | | .97 (.93, 1.01) | .99 (.95, 1.03) |
| % Family Poverty | | | | **1.13 (1.05, 1.22)** | **1.11 (1.05, 1.18)** |
| **County** | | | | | |
| Durham | | | | | 1.00 (ref) |
| Buncombe | | | | | 19.90 (.52, 760.01) |
| New Hanover | | | | | 1.89 (.12, 29.19) |

Table 5.4 shows the results for using Support for POS policies as a correlate of noncompliance. In each model, greater support for POS provisions was associated with decreased odds of noncompliance. In the final model, for every one-unit increase in level of support for POS provisions, store likelihood of noncompliance decreased by 41% (AOR=.59, 95% CI: .36, .97). In model 4, noncompliance was less likely in stores in neighborhoods with more black residents and with fewer residents with at least a bachelor's degree or higher. However this effect was not significant when accounting for county. In the final model, which had the lowest QIC indicating the best model fit, noncompliance was more likely in drug stores/pharmacies compared with supermarkets. No other covariates were significant.

**Table 5.4 Support for POS Policies associated with Noncompliance with POS Provisions**

| Construct [AOR (95% CI)] (n=249) | Model 1 Barriers Awareness and Source | Model 2 Individual Covariates | Model 3 Individual and Store Covariates | Model 4 Individual, Store and Neighborhood Covariates | Model 5 Individual, Store, Neighborhood and County Covariates |
|---|---|---|---|---|---|
| **POS Support** | **.61 (.37, 1.00)** | **.56 (.34, .90)** | **.57 (.33, .99)** | **.59 (.35, .99)** | **.59 (.36, .97)** |
| **Individual** | | | | | |
| **Smoking Status** | | | | | |
| Never Smokes | | 1.00 (ref) | 1.00 (ref) | 1.00 (ref) | 1.00 (ref) |
| Current Smoker | | .67 (.31, 1.45) | .66 (.30, 1.48) | .54 (.22, 1.31) | .53 (.20, 1.39) |
| **Respondent Type** | | | | | |
| Store Owner | | .53 (.15, 1.86) | .57 (.16, 2.01) | .70 (.19, 2.60) | .53 (.21, 1.39) |
| Store Manager | | .76 (.36, 1.58) | .75 (.34, 1.64) | .86 (.38, 1.95) | 1.05 (.44, 2.53) |
| Store Clerk | | 1.00 (ref) | 1.00 (ref) | 1.00 (ref) | 1.00 (ref) |
| **Store** | | | | | |
| **Store Type** | | | | | |
| Grocery/Supermarket | | | 1.00 (ref) | 1.00 (ref) | 1.00 (ref) |
| Gas Station/Gas Convenience | | | .98 (.29, 3.28) | .98 (.22, 4.48) | 1.18 (.35, 4.00) |
| Convenience | | | .97 (.20, 4.73) | .98 (.22, 4.48) | 1.01 (.17, 5.97) |
| Drug Store/ Pharmacy | | | 2.37 (.74, 7.61) | 3.05 (.97, 9.56) | **3.43 (1.05, 11.20)** |
| Tobacco Store | | | 1.96 (.33, 11.76) | .61 (2.15, 8.62) | 2.35 (.32, 17.46) |
| Other Store | | | .90 (.07, 11.12) | .61 (.04, 8.62) | .67 (.06, 8.13) |
| **Total Tobacco Marketing** | | | 1.01 (.99, 1.03) | 1.01 (.98, 1.03) | 1.00 (.98, 1.03) |
| **Proximity to School** | | | | | |
| > 1000 feet | | | 1.00 (ref) | 1.00 (ref) | 1.00 (ref) |
| Within 1000 feet | | | 1.10 (.43, 2.84) | 1.63 (.60, 4.42) | 1.29 (.51, 3.29) |
| **Neighborhoods** | | | | | |
| %Black | | | | **.94 (.89, .98)** | .96 (.93, 1.00) |
| %Hispanic | | | | 1.00 (.94, 1.06) | .99 (.92, 1.06) |
| % Bachelors or More | | | | **.98 (.95, 1.00)** | .98 (.95, 1.01) |
| % Family Poverty | | | | 1.05 (1.00, 1.12) | 1.03 (.97, 1.10) |
| **County** | | | | | |
| Durham | | | | | 1.00 (ref) |
| Buncombe | | | | | 2.43 (.58, 10.22) |
| New Hanover | | | | | .45 (.12, 1.68) |

### 5.4 Discussion

Consistent with hypotheses, this study suggests that store noncompliance with FDA POS provisions is significantly related to both barriers and lack of support for POS provisions among retailers. However, compliance was unrelated to awareness of the Tobacco Control Act or having formal sources of information about tobacco control regulations. These findings were consistent whether I treated compliance as an independent or dependent variable.

Higher levels of barriers were positively associated with store noncompliance, though this study could not assess the causal direction of this relationship. Findings about barriers are in line with prior studies of tobacco retailers indicating that barriers such as use of false ID made it difficult to comply with restricting sales to minors[92] and that lack of space is a barrier to displaying anti-tobacco messages.[89]

Support for policies was also significantly related to retailer compliance. An older national survey found that 66% of retailers thought it should be illegal for retailers to sell tobacco to minors.[92] However, no prior study examined the relationship between retailer support for policy and their compliance. I did find backing for my expectation of higher support for provisions in the Tobacco Control Act that had been enacted the longest. Over 90% of retailers supported minor's access provisions enacted under the Synar Act, and over 40% supported promotion restrictions implemented under the MSA. For newer policies, less than a quarter to a third of respondents agreed with tobacco advertising restrictions or bans on flavored or menthol cigarettes. The exception was relatively high levels of support among retailers for graphic warning labels on cigarette packs (59%) and graphic warnings on advertisements in stores (43%).These types of provisions were proposed in the Tobacco Control Act but have not been implemented due to litigation. However, text based warning labels have been in effect since 1966 and the FDA proposed new graphic warnings in 2011.[209] The latest court rulings determined that graphic warning labels were constitutional,[210] but vacated the specific proposed graphic warning labels.[211] FDA will need to propose new labels in the future that can withstand

legal challenge.[212] However, knowing that retailers may in fact be supportive of such provisions can provide a valuable counter to industry and retailer claims that such warning labels hurt retailers.[211,213]

Other authors have found that compliance with smokefree air[139] or minor's access regulations[86] is related to awareness of regulations. In this study, awareness of the Tobacco Control Act among retailers was relatively low (43%), but did not correspond with violations of POS sales and marketing provisions. However, the study was conducted in a period prior to FDA inspections of compliance with the Tobacco Control Act in North Carolina, which may increase both compliance and awareness over time.

Our study also did not find that having formal sources of information was related to compliance. In contrast, a prior study found that compliance of worksites with smokefree air legislation was related to citing formal sources of information about tobacco control regulations such as business sources or government agencies, rather than informal sources like friends or family.[129] Our finding may be related to the fact that most stores (91%) had formal sources of information about tobacco control regulations (vs relying only on the media, friends, family and other retailers). However, in this study, the formal source least cited was government agencies, which are tasked with enforcement of these regulations. In contrast, almost 70% of stores received information about regulations from tobacco companies, who have used prior retailer programs to build ties with retailers in order to undermine tobacco control efforts.[214] Boss/stores managers were the most cited source of information and may be a valuable conduit for relating information about tobacco control regulations. Government agencies should do more to communicate with retailers and ensure that they have accurate and timely information about POS provisions.

I also identified several important factors associated with retailer support for POS policies: smoking status, respondent role, store type, and locality. As with prior studies of the general public,[37-39] smokers in this study have less support for tobacco control regulations than

non-smokers. However, the rate of current smoking among tobacco retailers found in this study (41%) was almost twice the North Carolina state rate of 21.8% in 2011,[208] perhaps indicating a priority population for smoking cessation efforts. Retailers who quit smoking may improve support for policies and perhaps improved implementation.

Owners expressed more barriers to compliance and less support for POS policy than did managers. Review of the store lists suggested that the owners interviewed predominantly represented non-chain stores. These store types may lack corporate support to implement tobacco-related policies,[89] making it more difficult to comply. Compared with grocery store/supermarkets, respondents in tobacco stores, which generate almost all of their revenue from tobacco sales,[215] expressed more barriers to compliance and less support for tobacco control policies. Gas/convenience stores which had 42% of sales from tobacco products in 2011[216] also had less support for policies. Therefore, stores with independent owners, tobacco stores and gas/convenience stores may be important targets for government retailer education efforts. Finally, county differences in opinions toward tobacco control policies should be addressed when assessing compliance and enforcement of tobacco control POS provisions.

Overall, the findings from this study best support Mazmanian and Sabatier's "Effective Implementation" scenario of policy implementation which calls for a time of rapidly rising compliance after policy implementation followed by high levels of compliance maintained over time.[25] For the POS provisions that have already been implemented, compliance was relatively high even prior to enforcement. It is also likely to improve further once active inspections, warnings, and fines for noncompliance begin. Additionally, as noted, support for enacted provisions was relatively high among retailers, suggesting few barriers to implementation success over time. However, to see "effective implementation" with more controversial provisions that have not yet been implemented, will need more effort. Public health advocates would do well to work with retailers to improve support for these provisions and enhance the climate for implementation over time.

### *5.4.1 Limitations and Strengths*

I note several limitations and strengths of the research. First, the temporal sequence of data collection in which we conducted the audits first, and then the retailer interview 6 months later, limits my ability to make causal inferences. Because empirical and theoretical considerations also were not conclusive as to whether retailer opinions affect compliance, or compliance affects opinions, I conducted the analysis both ways. Both analyses demonstrated a strong association between barriers and support for POS policies and compliance with POS policies over and above the influence of individual, store, retailer neighborhood, and county characteristics. Future longitudinal studies are needed to separate out these effects.

Additionally, the study was conducted in only three counties in North Carolina, which limits generalizability. However, counties were selected to include diverse geographic areas of the state (a mountain, coastal, and central county of the state) and stores were randomly selected from a comprehensive list of stores within each county. North Carolina is one of only a dozen states that does not have licensing of tobacco retailers and, at the time of the study, compliance with Tobacco Control Act provisions was not yet enforced. In this sense, the opinions expressed by retailers may be a type of baseline compared with other states. Retailer opinions may improve with active enforcement and changes in norms towards these policies as they are implemented over time.

Measuring awareness of the Tobacco Control Act with only one item may have also been a limitation. However, measuring awareness or knowledge of specific provisions as conducted in prior studies may have better correlated with compliance.[86] Additionally, there was little variance in the dichotomous measure of whether retailers had a formal source of information about tobacco control regulations. Additional research about retailers' trust in different sources about tobacco control regulations may be more salient in improving compliance, as has been found in other areas.[217] Finally, the possibility exists for social desirability of responses. However, this appears unlikely in this study as personal information

about respondents was limited and they were not asked about their own or their store's compliance with regulations. Respondents also expressed varying support for POS provisions indicating that this was not a substantial concern.

The study also has several strengths. It is one of the only studies that includes tobacco retailer opinion about policies and links it to observations of retailer compliance[85,86] and the only one, thus far, which does so in relation to compliance with newer sales and marketing provisions of the Tobacco Control Act. It also has a relatively large sample size and high response rate for retailer interviews.

**5.5 Conclusions**

Understanding the relationship between retailer opinions and retailer compliance with POS provisions is important to helping them implement Tobacco Control Act provisions. In particular, helping retailers to address and overcome barriers such as concerns about time and cost of implementing regulations may enable them to become more compliant with these provisions. In most analyses, retailer awareness of the Tobacco Control Act and FDA authority over tobacco products was not necessary for them to comply with regulations. Instead guidance on specific provisions and how to successfully implement them as well as how to train staff to achieve compliance may be more valuable to retailers in overcoming barriers. This research also shows that few tobacco retailers were getting information about tobacco control regulations from government agencies. As such provisions are enforced, government agencies tasked with enforcement can do a better job communicating with and educating retailers about regulatory changes. Working through bosses and store managers and with small stores without corporate support can be a valuable approach to gaining support for tobacco control measures among retail staff who are ultimately responsible for implementing these policies.

This research also documents retailer support for specific POS measures. It is encouraging that some retailers are supportive of many POS policies. Over 90% of retailers support minors' access provisions and a large minority (over 40%) support graphic warnings

and promotion bans. For proposed provisions with little support, advocates need to work with retailers to mitigate opposition to controversial provisions such as banning menthol cigarettes. While in some instances retail trade associations and some retailers have been opponents of tobacco control regulations and allies of the tobacco industry,[19,87] this research demonstrates that individual retailers have more varied opinions toward tobacco control regulations and can be engaged as stakeholders in tobacco control efforts at the point of sale.

## CHAPTER 6 STUDY 2
## PUBLIC SUPPORT FOR FAMILY SMOKING PREVENTION AND TOBACCO CONTROL ACT POINT OF SALE PROVISIONS

### 6.1 Introduction

In 2009, the Family Smoking and Tobacco Control Act ("Tobacco Control Act"),[1] provided unprecedented powers to the U.S. Food and Drug Administration (FDA) to regulate tobacco products in the United States.[2-4] Many of these provisions affect how tobacco is sold and marketed in retail stores at the point-of-sale (POS). Major POS components of The Tobacco Control Act focus on: (1) *minors' access* to tobacco, (2) regulating *promotion* (restricting the use of gifts with purchase, prohibiting free samples), (3) *product* bans (banning cigarette additives such as candy flavor and a possible menthol ban), (4) *advertising* restrictions, and (5) *labeling* changes (new graphic warning labels on packs and ads). However, some aspects of these new regulations are controversial, such as a possible ban on menthol cigarettes.[218] Tobacco industry litigation has delayed implementation of other aspects like black and white text advertising and graphic warning labels.[196]

Several authors believe that POS advertising and tobacco outlet density remain some of the most visible cues to smoking in neighborhoods.[15,49,55] A systematic review concluded that POS advertising promotes smoking initiation among youth, undermines quit attempts, and stimulates consumption among adults.[56] Tobacco Control Act provisions aim to mitigate these effects at POS in several ways. For example, banning flavored cigarettes may reduce youth initiation; restricting free gifts with purchase can decrease impulse purchasing.

Public policy scholars provide insight into the value of public opinion about these types of regulations. First, prior tobacco control efforts have met with failure, in part, due to lack of public support.[36] Conversely, documenting public support for tobacco control regulations has

helped to enact controversial measures such as enacting a tobacco tax increase in Massachusetts,[219] or initial attempts to assert FDA jurisdiction over tobacco products.[149] Public opinion can also influence the policy agenda and influence decision maker support.[9,10] Public opinion also matters once policies are passed. Mazmanian and Sabatier posit public support as an important predictor of policy implementation that improves compliance with new policies.[9,25]

Some studies have examined public opinions about various aspects of these provisions, notably in relation to a ban on menthol cigarettes.[106,112,220] Additionally, a recent study examines support among New York City adults about emerging retail strategies such as a ban on the display of tobacco products or limiting the number of tobacco retailer licenses.[221] But none, to date, examine national public support with a wide range of POS policy provision proposed or enacted under the Tobacco Control Act. Consequently, little is known about what individual characteristics contribute to developing supportive (or non-supportive) policy attitudes *at POS* where tobacco is ubiquitous and highly normative.[5] Prior studies have found that smokers have less support for traditional tobacco control regulations (e.g., tobacco taxes, smokefree air laws) than non-smokers,[37-39] African Americans have more support than Whites,[38,40] and individuals of high-SES have more support than those of low-SES.[40,41] Studies also find that policy support may increase over time following implementation.[98,100-102] This finding suggests that policies implemented for a longer period of time may have the greatest support while newer or proposed policies may have the least support. In conjunction with this, policies implemented first (and therefore for the longest time), may be the ones with the most existing support (e.g., 'low hanging fruit').

In addition to the general public, I also identified factors associated with support for tobacco control measures among smokers. Preserving smoker's rights or choice has often been used as an argument against new tobacco control regulations.[42,160] However, smokers are not a monolithic group. Studies find that smokers do have some support for regulations including advertising and promotion,[37,97] smoke-free restrictions,[96,98] and minor's access restrictions.[37,99]

In prior studies, intention to quit has been associated with support for smoke-free environments[43-45] and advertising restrictions.[44,45] However, few studies examine factors beyond individual characteristics that may influence smoker support for policy. Policy self-interest (or the extent to which an individual is directly affected by the policy)[46,47] may be an important moderator of the relationship of individual characteristics and level of support for POS regulations. Specifically, level of exposure to POS advertising, use of promotions, or use of potentially banned products such as menthol cigarettes, may moderate the relationship between individual characteristics and level of support for POS regulations among smokers. For instance, I hypothesize that the effect of race on support for a ban on menthol cigarettes, with higher support among African-Americans than whites, will be stronger for menthol cigarette smokers than non-menthol smokers. This relationship may be due to increased advocacy in favor of a ban by some African American leadership organizations.[156]

Over and above individual factors, support for tobacco control regulations may also vary geographically. Studies suggest that those who live under stronger tobacco control policies (e.g., higher tobacco taxes and extensive smokefree air restrictions) may have stronger anti-smoking norms[222,223] and have more support for tobacco control measures.[223] Additionally, geographic region may play a countervailing force; those living in tobacco producing states may have less support for tobacco control policies.[223,224] As a result, statistical models should include state-level associations when examining public opinion nationally.

The purpose of this study is to (1) examine the overall level of support for POS policies among the general public and among smokers, (2) identify which individual policies have support, (3) identify individual and state level characteristics associated with support, and (4) examine policy self-interest as a moderator of individual characteristics and level of support among smokers.

## 6.2 Methods

### *6.2.1 Sample*

The research team conducted an online survey in January-February 2013 of a nationally representative sample of US adult tobacco users and non-tobacco users. We sampled respondents from a commercial internet panel (Knowledge Panel™, GfK) covering the entire US population. The Knowledge Panel consists of a large (approximately 55,000) randomly selected sample of adults over 18 in the US, who agree to be contacted to conduct web surveys. The panel is designed to be representative of the US population. The Knowledge Panel uses address-based sampling to cover cell-phone only households. It also provides netbooks and Internet access to households that would otherwise lack computer or high speed Internet access. We supplemented panel respondents in small geographic areas by convenience samples of off-panel respondents generated from commercial lists. Convenience samples were needed in areas where there were insufficient numbers of tobacco users on the panel.

We randomly sampled respondents in a stratified design from 38 consolidated media markets. We oversampled tobacco users. All respondents completed a demographic profile which was used for statistical weighting. For participating in the survey, panel respondents received incentives points which could be redeemed for cash or other goods. We contacted 34,097 respondents of whom 20,907 completed a screening questionnaire (61.3%). Of these, we identified 13,531 eligible respondents; 13,144 completed the survey (97.1%). We included an additional 4,363 off-panel respondents for a total sample size of 17,507. For this analysis, we limited respondents to those in the 50 US states and the District of Columbia.

### *6.2.2 Measures*

**Support for POS provisions.** I measured support for POS provisions as a ten item scale derived from existing surveys. I drew or adapted these items from a variety of sources including the Smoking Policy Inventory,[40,97,111] the Massachusetts Adult Tobacco Survey

2000,[114] California Tobacco Retail Policy Survey,[117] COMMIT trial,[96] Social Climate Survey of Tobacco Control,[106] and the International Tobacco Control Survey 2009.[115] I examined five types of POS provisions: minor's access, tobacco advertising, graphic warning labels, promotions, and product restrictions. Each type of provision had two items associated with it as shown in Table 6.1. I assessed agreement with each item on a five point scale ranging from strongly disagree to strongly agree. Responses to each item ranged from 1-5. I coded items such that higher numbers represented stronger support for the policy. I conducted a Confirmatory Factor Analysis (CFA) (RMSEA .031 90%CI .029, .033; CFI .98; TLI .98) to confirm that these items formed a unidimensional scale. I viewed fit statistics of the Comparative Fit Index (CFI) and Tucker-Lewis index (TLI) of .95 or above and root mean square of approximation (RMSEA) values lower than .06 based on established cut-off values as showing good model fit.[181] I allowed the two items within each domain to covary. For this analysis, I averaged across the 10 provisions (α=.91).

**Table 6.1 Specific POS Provision by Domain**

| Domain | Types of POS provisions |
|---|---|
| Minor's access | Fines for merchants who sell to minors |
| | Increased fines for repeat sales |
| Advertising | Black and white advertising |
| | Plain packs |
| Graphic warnings | Graphic warnings on ads |
| | Graphic warnings on packs |
| Promotion | Ban on branded non-tobacco products (hats, t-shirts) |
| | Ban on gifts with purchase |
| Product | Flavored cigarette ban |
| | Menthol ban |

**Demographic characteristics.** I included three main demographic characteristics as independent variables in the study: smoking status, race/ethnicity, and education status. We incorporated smoking status as a dichotomous variable. Following established conventions, current smokers smoked at least 100 cigarettes in their lifetime and currently smoked every day or some days. I categorized all others as non-smokers, the reference category. I characterized respondents by race/ethnicity: non-Hispanic white (reference), non-Hispanic Black, Hispanic, non-Hispanic other race, and non-Hispanic two or more races. Respondents' education level

comprised four levels based on highest grade completed: less than high school (reference), high school or high school equivalent, some college, and bachelor's degree or higher.

**Individual covariates.** I controlled for additional covariates that have been found associated with support for tobacco control policies in earlier studies: age,[40] gender,[40] and household income.[225] Older ages have been associated with higher support.[40] I measured age in years scaled in 10 year increments. Males, who have lower support for regulations,[40] were the reference category for gender. I divided household income in four categories: $0-24,999 (reference); $25,000-49,999; $50,000-74,999, and $75,000 and above; with higher income associated with higher levels of support.[225] In analyses of smokers only, I additionally controlled for intention to quit[45,170] and quit attempts[225] which have been associated with increased policy support in prior studies. Smokers reported whether they had an intention to quit smoking in the next week, 1 month, 6 month, 1 year, more than 1 year, or not at all, which was dichotomized as having an intention to quit in the next six months or not having an intention to quit in the next six months (reference). Smokers also reported if they had made a quit attempt in the past year, or had not made a quit attempt in the last year (reference).[2]

**State Policy Covariates.** I further controlled for four state-level factors: (1) state compliance with minor's access sales restrictions, (2) state cigarette tax in cents, (3) strength of state smokefree air policy in four venues (bars, restaurants, public workplaces, and private workplaces), and (4) tobacco-producing state or not. Prior studies have found that those from tobacco producing states may have less support for policy compared with those from non-tobacco producing states,[226] and that youth and adults that live in towns with strong antitobacco regulations had significantly stronger antismoking norms.[222] I used minor's access rates from Synar compliance checks, 2012.[227] I linked strength of smokefree air (SFA) policies in each

[2]I conducted additional analyses looking at respondents' intention to visit stores or smokers' intention to buy cigarettes from stores with graphic warning labels and black and white text advertising. Analyses of these variables will be conducted in a separate manuscript separate from the dissertation.

venue from Americans for Nonsmokers' Rights Foundation ordinance data coded on a scale from 0 (no smoking restriction) to 3 (ban at all time with no exceptions).[228] I summed items across venues to create an SFA index. I mean centered all state-level tobacco control variables. I created a dichotomous variable of the 6 top tobacco producing states by acreage (NC, KY, VA, TN, SC, GA).[229] These six states account for 94% of tobacco production acreage in the US.[230]

**Self-interest variables.** I included three self-interest variables for smokers as moderators in this study: (1) the use of menthol cigarettes, (2) exposure to POS advertising, and (3) use of coupon or price promotion at last cigarette purchase. I assessed menthol cigarette use by coding a question on usual brand of cigarette smoked. We coded menthol smokers as those using Newport, Kool, and Salem, which are predominantly menthol brands. I also coded write-in responses from those mentioning those three brands or indicating a "menthol" or "green" version of another brand. All others were coded as non-menthol smokers. I assessed exposure to advertising using a dichotomous one-item measure from the *Global Adult Tobacco Survey: "In the last 30 days, have you noticed any advertisements or signs promoting cigarettes in stores where cigarettes are sold?"*[231] I measured use of promotions as a dichotomous measure from the *California Adult Tobacco Survey:* "*The last time you purchased cigarettes, did you take advantage of coupons, rebates, buy 1 get 1 free, or any other special promotion?"*[232]

### *6.2.3 Data Analysis*

I conducted weighted and unweighted analyses using SAS 9.3 to generate sample characteristics and point estimates of support for POS provisions. I conducted separate analyses for the total sample and for current smokers. I used design-based population weights and accounted for stratification in the sampling design to generate estimates for the total sample and smoker population that corresponded to the national US population. GfK generated the weights for the complex sampling design accounting for oversampling of African-American, Hispanic, and young adult populations. I conducted linear regression using SAS survey

procedures to account for the complex sampling design and post-stratification weights. I included all demographic characteristics in multivariate analyses regardless of significance in bivariate analyses. Other control variables at the state level were only included if they were significant at the $p<.25$ level in bivariate analyses.[194]

**6.3 Results**

Table 6.2 shows the weighted and unweighted characteristics of the total sample and smokers only. Smokers in the weighted sample were comparable with current population estimates of 19% of US adults.[233] As with national estimates,[233] this sample had lower smoking rates with education attainment; 30% of the respondents with less than a high school education smoked, compared with 11% of respondents with at least a bachelor's degree. I also found an inverse relationship of smoking status with age. Nearly 30% of current smokers had an intention to quit in the next 6 months while 42% had made a quit attempt in the past year.

**Table 6.2 Weighted and Unweighted Characteristics of All Survey Respondents and Smokers Only**

| | Total sample n=17,507 | | Smokers only n=6,595 | |
|---|---|---|---|---|
| **Constructs** | **Unweighted % (CI) or Mean (CI)** | **Weighted % (CI) or Mean (CI)** | **Unweighted % (CI) or Mean (CI)** | **Weighted % (CI) or Mean (CI)** |
| Individual Characteristics | | | | |
| Smoking Status (%) (n=17491) | | | | |
| Non-Smoker | 62.3 (61.6, 63.0) | 79.3 (78.5, 80.0) | -- | -- |
| Current Smoker | 37.7 (37.0, 38.4) | 20.7 (20.0, 21.5) | -- | -- |
| Race/Ethnicity (%) | | | | |
| Non-Hispanic White | 79.5 (78.9, 80.1) | 68.1 (66.9, 69.3) | 78.4 (77.4, 79.4) | 68.7 (66.7, 70.6) |
| Non-Hispanic Black | 7.5 (7.1, 7.9) | 11.5 (10.7, 12.4) | 8.1 (7.5, 8.8) | 12.6 (11.2, 14.1) |
| Non-Hispanic Other | 3.2 (2.9, 3.4) | 5.5 (4.8, 6.1) | 3.6 (3.2, 4.1) | 4.6 (3.8, 5.5) |
| Non-Hispanic 2+ races | 2.7 (2.5, 2.9) | 1.4 (1.2, 1.6) | 2.6 (2.2, 3.0) | 1.7 (1.3, 2.0) |
| Hispanic | 7.1 (6.7, 7.5) | 13.5 (12.6, 14.4) | 7.3 (6.6, 7.9) | 12.4 (10.9, 14.0) |
| Education (%) | | | | |
| Less than high school | 4.0 (3.7, 4.3) | 6.8 (6.1, 7.5) | 5.5 (5.0, 6.1) | 9.9 (8.5, 11.2) |
| High school | 22.3 (21.6, 22.9) | 36.1 (34.9, 37.3) | 26.9 (25.8, 28.0) | 42.9 (40.9, 44.8) |
| Some college | 36.2 (35.5, 36.9) | 31.2 (30.1, 32.2) | 45.1 (43.9, 46.3) | 34.0 (32.3, 35.8) |
| Bachelor's degree or higher | 37.6 (36.8, 38.3) | 25.9 (25.0, 26.9) | 22.5 (21.5, 23.5) | 13.2 (12.2, 14.2) |
| Gender (%) | | | | |
| Male | 44.6 (43.9, 45.4) | 48.0 (46.8, 49.2) | 40.2 (39.0, 41.4) | 48.8 (46.9, 50.8) |
| Female | 55.4 (54.6, 56.1) | 52.0 (50.8, 53.2) | 59.8 (58.6, 61.0) | 51.2 (49.2, 53.1) |
| Household Income (%) | | | | |
| 0-24,999 | 15.5 (14.9, 16.0) | 14.1 (13.3, 15.0) | 23.3 (22.3, 24.4) | 22.8 (21.2, 24.4) |
| 25,000-49,999 | 32.8 (32.1, 33.5) | 28.2 (27.2, 29.2) | 37.5 (36.4, 38.7) | 32.8 (31.0, 34.6) |
| 50,000-74,999 | 20.6 (20.0, 21.2) | 19.6 (18.7, 20.5) | 19.9 (18.9, 20.8) | 19.1 (17.5, 20.6) |
| 75,000 or more | 31.1 (30.4, 31.8) | 38.0 (36.9, 39.2) | 19.3 (18.3, 20.2) | 25.4 (23.6, 27.1) |
| Age (years) (mean) | 50.5 (50.3, 50.8) | 46.9 (46.5, 47.3) | 46.6 (46.2, 46.9) | 44.2 (43.7, 44.8) |
| Smoker Characteristics | | | | |
| Intention to quit | | | | |
| Within 6 months | -- | -- | 31.6 (30.5, 32.8) | 29.9 (28.1, 31.6) |
| Not within 6 months | -- | -- | 68.4 (67.2, 69.5) | 70.1 (68.4, 71.9) |
| Quit Attempt in last year | | | | |
| Yes | -- | -- | 42.6 (41.4, 43.8) | 41.6 (39.7, 43.5) |
| No | -- | -- | 57.4 (56.2, 58.6) | 58.4 (56.5, 60.3) |

Regarding state level characteristics (Table 6.3), on average, smokers compared with non-smokers experienced lower cigarette taxes (marginally significant p=.05) and weaker smokefree air regulations (p=.04). Higher proportions of smokers compared with non-smokers lived in tobacco producing states ($X^2$=5.6 df=1 p=.02). Smoking status was unrelated to Synar compliance rates.

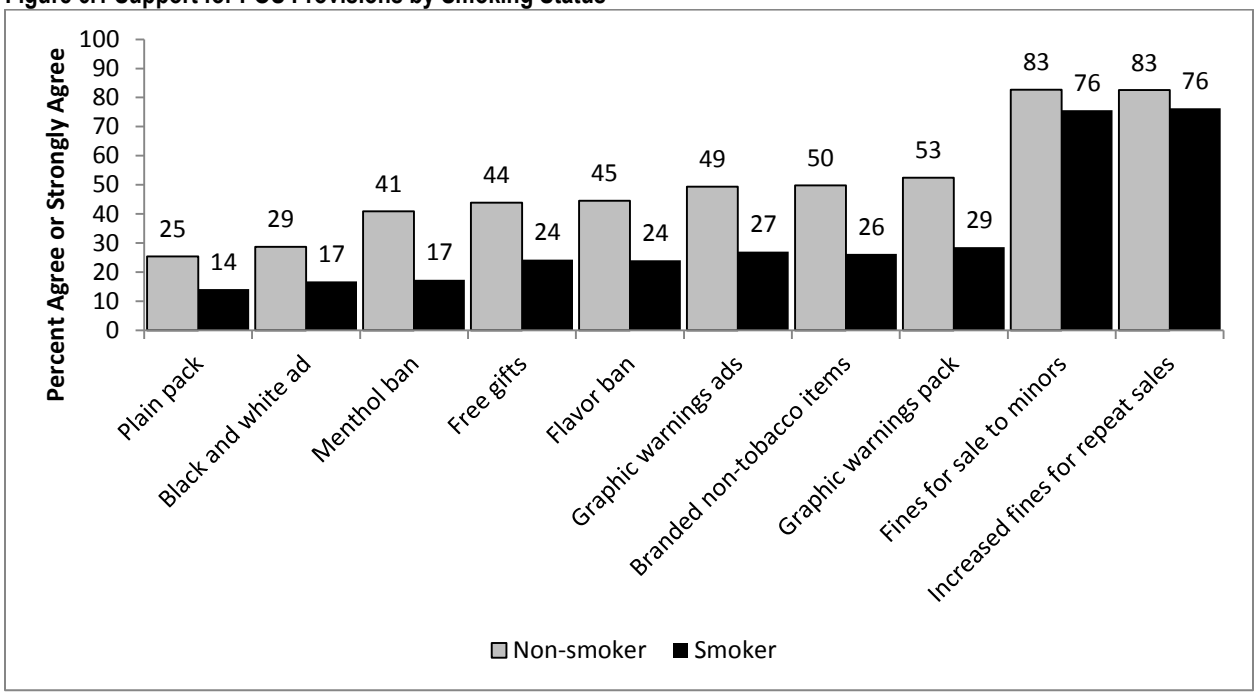
**Table 6.3 State-level Mean Characteristics of Non-smoker and Smoker Samples**

| State Level Characteristics | Non-smoker Only Weighted Mean or Percent (CI) n=10,896 | Smoker Only Weighted Mean or Percent (CI) n=6,595 | p-value* |
|---|---|---|---|
| Smokefree air policy index (mean) | 2.16 (2.13, 2.18) | 2.11 (2.07, 2.14) | .04 |
| Minor's Access (mean %) | 9.19 (9.09,9.28) | 9.32 (9.18,9.46) | .17 |
| State Excise Tax (mean $) | 1.50 (1.48, 1.53) | 1.46(1.42, 1.49) | .05 |
| Tobacco Producing State (%) | | | |
| Yes | 13.51 (12.68, 14.34) | 15.54 (14.24, 16.85) | .02 |
| No | 86.49 (85.66, 87.32) | 84.46 (83.15, 85.76) | |

*based on t-test or Rao-Scott chi-square test

For specific provisions (Figure 6.1), fewer smokers than non-smokers supported each provision. However, smokers and non-smokers generally showed the same pattern of support, with the least amount of support for advertising provisions of plain packaging (23% of the total sample) and black and white ads (26% support in the total sample), and the most for minor's access provisions (over 80% support in the total sample). There was mid-range support for bans on branded non-tobacco items and graphic warnings on cigarette packs and advertisements with agreement with these provisions from at least 45% of the total sample. Only 11% of the sample agreed with all 10 provisions. Among those who did not agree with each provision, a larger proportion reported neutral rather than disapproving views.

**Figure 6.1 Support for POS Provisions by Smoking Status**




The scale score for mean level of support for POS policies was 3.5, higher than the 'neutral' value of 3 in the total sample. This indicates, on average, a slightly positive opinion towards these policies. In adjusted analyses of the total sample, shown in Table 6.4, nonsmokers had significantly higher levels of support for POS policy compared with smokers (B=.53 p<.001) and females had more support than males (B=.19 p<.001). African-Americans (B=.09 p=.02) and Hispanics (B=.16 p=<.001) had more support than Whites. Support also increased with age; for every 10 years of age, level of support increased by .07 points (B=.07 p<.001). Support did not differ by educational status in either bivariate or multivariate analyses. Those of high income (greater than $75,000) had less support than those with income under $25,000 in multivariate analyses (B=-.10 p=.004). In bivariate analyses, those not living in tobacco producing states had higher support for POS policy than did those living in those states (B=.07 p=.02). Also, for every 1 dollar increase in state tax I found a small but significant increase in support in bivariate analyses (B=02 p=.03). No state variable was significant in multivariate analyses when accounting for individual factors. Additional analyses examining only

panel respondents found the same relationships except that in the panel sample, level of support was not significantly different for African-Americans compared with Whites. However, results were in the same direction (B=.05 p=.17). This is likely due to lower sample sizes particularly of African-American respondents in the panel sample and thus reduced power to detect a significant difference. Additionally, I conducted analyses of the full sample that controlled for panel membership. In bivariate analyses, respondents from the convenience sample had significantly less support than those from the panel (B=-.46, p<.001). Almost all convenience sample respondents were, by design, current smokers (96%) so lower policy support can be expected. In multivariate analyses controlling for additional demographic factors, including smoking status, this result was no longer significant (B=-0.01 p=.66). All other results were the same (analyses not shown).

**Table 6.4 Point Estimates, Unadjusted, and Adjusted Regression Coefficients for Scale Score of Support for POS Regulations in Total Sample**

| Constructs (n=17,399) | Weighted Support Mean (CI) | Unadjusted Coef.(CI) | Adjusted Coef.(CI) |
|---|---|---|---|
| Overall POS support | 3.46 (3.44, 3.48) | | |
| **Individual Characteristics** | | | |
| Smoking Status | | | |
| Non-Smoker | 3.57 (3.55, 3.60) | .55***(.51, .58) | .53*** (.48, .57) |
| Current Smoker | 3.03 (3.00. 3.06) | ref | ref |
| Race/Ethnicity | | | |
| Non-Hispanic White | 3.43 (3.41, 3.46) | ref | ref |
| Non-Hispanic Black | 3.52 (3.45, 3.59) | .09*(.01, .16) | .09* (.01, .16) |
| Non-Hispanic Other | 3.46 (3.36, 3.56) | .03 (-.08, .13) | .08 (-.02,.19) |
| Non-Hispanic 2 + races | 3.30 (3.15, 3.45) | -.13 (-.28, .02) | -.08 (-.22, .06) |
| Hispanic | 3.54 (3.48, 3.61) | .11**(.04, .18) | .16*** (.09, .23) |
| Education | | | |
| Less than high school | 3.45 (3.35, 3.55) | ref | ref |
| High school | 3.47 (3.43, 3.50) | .01 (-.08, .11) | -.01 (-.11, .09) |
| Some college | 3.43 (3.39, 3.46) | -.02 (-.15, .10) | -.01 (-.11, .09) |
| Bachelor's degree or higher | 3.48 (3.45, 3.52) | .03 (-.06, .13) | .01 (-.09, .12) |
| Gender | | | |
| Female | 3.56 (3.53, 3.58) | .21*** (.16, .25) | .19*** (.15, .23) |
| Male | 3.35 (3.32, 3.38) | ref | ref |
| Household Income | | | |
| 0-24,999 | 3.43 (3.38, 3.49) | Ref | ref |
| 25,000-49,999 | 3.46 (3.42, 3.50) | .03 (-.04, .10) | -.04 (-.11, .02) |
| 50,000-74,999 | 3.51 (3.46, 3.55) | .07 (-.00, .15) | -.01 (-.08, .07) |
| 75,000 or more | 3.43 (3.40, 3.47) | .00 (-.07, .07) | -.10** (-.18, -,03) |
| Age,10y | | .08 ***(.06, .09) | .07*** (.06, .08) |
| **State Level Characteristics** | | | |
| Smokefree Air Policy | | .02 (-.00, .04) | .01 (-.02, .03) |
| Minor's Access Policy | | .00 (-.01, .00) | .00 (-.01, .01) |
| Excise Tax (dollars) | | .02*(.00, .04) | .01 (-.01, .04) |
| Tobacco Producing State | | | |
| No | 3.47 (3.44, 3.49) | .07*(.01, .13) | -.03 (-.04, .10) |
| Yes | 3.40 (3.34, 3.45) | Ref | ref |

*p<.05 **p<.01 ***p<.001

I found largely similar patterns of support among smokers regarding age (B=.03 p=.005) and gender (B=.07 p=.02) as in the total sample shown in Table 6.5. African-American (B=.21 p<.001), Hispanic (B=.25 p<.001), and smokers of other race (B=.30 p<.001) had more support than White smokers. Among smokers, education or income were not significant correlates of support for POS policy in bivariate or multivariate analyses. Instead those with intention to quit smoking in the next six months (B=.27 p<.001) and those who had made a quit attempt in the past year (B=.23 p<.001) had more support for POS policy. Among smokers, state policy variables were not significantly associated with POS support in bivariate or multivariate

analyses. Addition analyses examined only panel respondents and found the same patterns of results, except that women did not have significantly different levels of support compared with males (B=.09, p=.06). Also, among smokers, respondents from the convenience sample did not differ from those on the panel regarding level of support in either bivariate (B=.03 p=.28) or multivariate analyses (B=.02, p=.53).

**Table 6.5 Point Estimates, Unadjusted, and Adjusted Regression Coefficients for Scale Score of Support for POS Regulations in Smokers Only Sample**

| Constructs (n=6,521) | Weighted Support Mean (CI) | Unadjusted Coef.(CI) | Adjusted Coef.(CI) |
|---|---|---|---|
| Race/Ethnicity | | | |
| Non-Hispanic White | 2.95 (2.92, 2.99) | ref | ref |
| Non-Hispanic Black | 3.21 (3.12, 3.29) | .25***(.16, .35) | .21***(.11, .30) |
| Non-Hispanic Other | 3.26 (3.13, 3.39) | .31***(.17, .44) | .30*** (.18, .43) |
| Non-Hispanic 2 + races | 2.90 (2.74, 3.06) | -.05 (-.21, .11) | -.01 (-.17, .15) |
| Hispanic | 3.18 (3.07, 3.29) | .22***(.11, .34) | .25***(.13, .36) |
| Education | | | |
| Less than high school | 3.01 (2.89, 3.13) | Ref | ref |
| High school | 3.02 (2.98, 3.07) | .02 (-.11, .14) | .05 (-.08, .17) |
| Some college | 3.01 (2.97, 3.06) | .00 (-.12, .13) | .02 (-.11, .15) |
| Bachelor's degree or higher | 3.08 (3.02, 3.14) | .07 (-.06, .21) | .07 (-.07, .21) |
| Gender | | | |
| Female | 3.05 (3.02, 3.09) | .06 (-.00, .12) | .07* (.01, .13) |
| Male | 3.00 (2.95, 3.05) | ref | ref |
| Household Income | | | |
| 0-24,999 | 3.03 (2.98, 3.09) | Ref | ref |
| 25,000-49,999 | 3.00 (2.95, 3.05) | -0.03 (-.10, .04) | -.02 (-.09, .06) |
| 50,000-74,999 | 3.06 (2.96, 3.13) | 0.03 (-.07, .12) | .04 (-.05, .13) |
| 75,000 or more | 3.02 (2.96, 3.09) | -0.01 (-.09, .08) | -.03 (-.13, .06) |
| Age,10y | | 0.01 (-.01, .03) | .03**(.01, .05) |
| Intention to Quit | | | |
| Next 6 months | 3.28 (3.23, 3.34) | .37***(.31, .44) | .27*** (.20, .33) |
| Not in the next 6 months | 2.91 (2.88, 2.95) | ref | ref |
| Quit Attempt in past year | | | |
| Yes | 3.21 (3.16, 3.26) | .33***(.26, .39) | .23*** (.17, .30) |
| No | 2.89 (2.85, 2.92) | ref | ref |
| **State Level Characteristics** | | | |
| Smokefree Air Policy | | .00 (-.03, .03) | .01 (-.03, .04) |
| Minor's Access Policy | | .00 (-.01, .01) | .00 (-.01, .01) |
| Excise Tax (dollars) | | .01 (-.01, .04) | .01 (-.03, .04) |
| Tobacco Producing State | | | |
| No | 3.03 (2.99, 3.07) | .02 (-.06, .09) | -.02 (-.11, .06) |
| Yes | 3.01 (2.96, 3.07) | ref | ref |

*p<.05 **p<.01 ***p<.001

I conducted several analyses among smokers examining policy self-interest as a moderator of the relationship between individual characteristics and policy support related to specific POS provisions. Table 6.6 shows the results of interactions of (1) race and menthol

smoking on support for a menthol ban, (2) intention to quit and exposure to advertising on support for graphic warnings, and (3) education level and use of price promotions on support for bans on POS promotions. Each analysis was conducted separately and controlled for race, intention to quit, education, gender, age, income, and quit attempts. I did not include state policy variables as covariates as they were non-significant in all models with or without interactions (analyses not shown).

**Support for a menthol ban.** Both race and menthol smoking status were correlates of support for a ban on menthol smoking (Model 1). African-American smokers had more support for a menthol ban than White smokers (B=.39, p<.001) and non-menthol smokers had more support than menthol smokers (B=.24, p<.001). However, the interaction term was not significant (p=.13) (Model 2), indicating that the relationship between race and support for a menthol smoking ban did not vary by menthol smoking status. In models with and without the interaction term, increasing age, women, those with intention to quit in the next 6 months, and those who had made a quit attempt in the past year were more supportive of a menthol ban (analyses not shown). Other covariates were non-significant.

**Support for graphic warnings.** Both quit intention and exposure to retail tobacco advertising were associated with support for graphic warnings on ads and packs (Model 1). Those with intention to quit in the next six months were more supportive of graphic warnings than those without an intention to quit (B=.36 p<.001). Those who reported exposure to retail tobacco advertising in the last month had more support for graphic warnings than those who did not report exposure (B=.09 p=.03). The interaction was also significant (Model 2), indicating that the relationship between intention to quit and support for graphic warnings was stronger for those who were exposed to retail tobacco advertising than for those not exposed (F-test 6.29 p=.01). Essentially, support for graphic warnings did not significantly differ for those without an intention to quit whether or not they were exposed to retail advertising. However, for those with intention to quit, smokers who reported exposure to retail advertising were more supportive of

graphic warnings than those not exposed. Support for graphic warnings was also stronger among African-Americans, Hispanics, and those of other race compared with Whites, with decreasing age, and among those who had attempted to quit smoking in the past year (analyses not shown).

**Support for bans on promotions.** Those who used price promotions at last purchase had less support for bans on promotions than those who did not use promotions (B=-0.13 p=.01). Among smokers, bans on promotion did not differ by education level (dichotomized as more than high school or high school or less) (p=.38). There was no significant interaction between education and use of promotions on level of support for promotion bans (p=.99). Support for bans on promotions was higher among women, those with intention to quit, those who had made a quit attempt in the last year, and with increasing age. African-Americans, Hispanics, and non-Hispanics of other races had higher levels of support for a ban on promotions than Whites (analyses not shown).

**Table 6.6 Self-interest as a Moderator of the Relationship between Individual Characteristics and Policy Support†**

| **Support for a Menthol Ban (n=5,637)** | **Model 1 Main effects Coef. (95% CI)** | **Model 2 Interaction Coef. (95% CI)** | **F-test (P value)** |
|---|---|---|---|
| | | | Model 1 |
| Race | | | 19.60 (<.001) |
| Non-Hispanic White | Ref | | |
| Non-Hispanic Black | 0.39*** (0.22, 0.56) | | |
| Menthol Smoking Status | | | 10.57 (.001) |
| Non-menthol smoker | Ref | | |
| Menthol Smoker | 0.24** (0.10, 0.39) | | |
| | | | Model 2 |
| Race x Menthol Smoking Status | | | 2.28 (.13) |
| Black x Non Menthol Smoker | | 0.62*** (0.34, 0.90) | |
| White x Non Menthol Smoker | | 0.33*** (0.18, 0.49) | |
| Black x Menthol Smoker | | 0.54*** (0.32, 0.77) | |
| White x Menthol Smoker | | ref | |
| **Support for Graphic Warning Labels (n=6,492)** | **Model 1 Main effects Coef. (95% CI)** | **Model 2 Interaction Coef. (95% CI)** | **F-test (P value)** |
| | | | Model 1 |
| Intention to Quit in next six months | | | 52.72 (<.001) |
| No | Ref | | |
| Yes | .36*** (.26, .45) | | |
| Exposure to Retail Advertising | | | 4.88 (.02) |
| No | Ref | | |
| Yes | .09*(.01, .17) | | |
| | | | Model 2 |
| Intention x Exposure | | | 6.29 (.01) |
| Intent Yes x Exposure Yes | | 0.51*** (0.37, 0.65) | |
| Intent No x Exposure Yes | | 0.02 (-0.07, 0.12) | |
| Intent Yes x Exposure No | | .25*** (.14, 0.37) | |
| Intent No x Exposure No | | ref | |
| **Support for Bans on Promotion (n=6,450)** | **Model 1 Main effects Coef. (95% CI)** | **Model 2 Interaction Coef. (95% CI)** | **F-test (P value)** |
| | | | Model 1 |
| Education | | | 0.76 (0.38) |
| High school or less | Ref | | |
| More than high school | -0.04 (-.13, .05) | | |
| Use of Promotion | | | 6.33 (0.01) |
| No | Ref | | |
| Yes | -.13*(-.24, -.03) | | |
| | | | Model 2 |
| Education x Promotions | | | 0.0 (0.99) |
| More than HS x Promotion Yes | | -0.17* (-0.30, -0.04) | |
| More than HS x Promotions No | | -0.04 (-.14, .06) | |
| HS or less x Promotion Yes | | -0.13 (-.30, .03) | |
| HS or less x Promotion No | | ref | |

*p<.05, **p<.01, ***p<.001

†All analyses controlled for race, intention to quit, education, gender, age, income, and quit attempts

### 6.4 Discussion

In this nationally representative sample, support for a variety of POS policies followed demographic trends found in support for other tobacco control policies (e.g., smokefree air, tobacco tax).[37,40] Non-smokers had more support for POS policies than smokers. African-Americans and Hispanics in the total sample as well as among smokers had more support for policy than Whites. However, unlike prior studies which found SES differences,[40,41] I did not find differences in support by education level. I only found differences in SES in the total sample and not among smokers. Those of the highest income level had less support for POS policies than those of the lowest income level only in multivariate, but not bivariate analyses.

On average, the highest level of support was for minor's access provisions that have been in place the longest. I found the lowest average support for advertising restrictions like black and white advertisements and plain packs. These are newer provisions that may be unfamiliar to the US public. As plain packs were implemented in Australia, research found higher support among smokers using the plain packs compared with those still using branded packs.[234] Black and white ads were ruled unconstitutional on First Amendment grounds and are now unlikely to be implemented in the US (Discount Tobacco City & Lottery, Inc. v. United States, 674 F.3d 509, 518 (6th Cir. 2012)). Among smokers, intention to quit and recent quit attempts had a stronger effect on level of support for POS policy than did most demographic factors; although in a cross sectional study design I cannot assess whether interest in quitting enhances support for policy or whether those with support for policy are more interested in quitting.

Tobacco control state level variables, particularly state cigarette tax and living in a tobacco producing state may have a small influence on support in bivariate analyses. Dixon et al. found higher support for anti-tobacco policies including restrictions in public smoking and bans on cigarette advertising in a non-tobacco producing state vs. a tobacco producing state and also found that individual residents who profited from tobacco had less support for tobacco

control policies than those who did not.[47] Similarly, a study of African-Americans found that those in the Midwest, Northeast, and West had over two times the level of support for a tobacco tax increase than did those in the 'Tobacco South.'[226] However, in this study, individual-level factors are much stronger in influencing support for POS provisions than are state factors.

Finally, self-interest variables of use of menthol cigarettes and use of price promotions did not act as significant moderators of the relationship between demographic factors and level of support for a ban on menthol cigarettes and a ban on promotions respectively. Instead, these variables acted as significant independent variables of level of support in expected directions, i.e, those using menthol or promotions were less supportive of bans. In contrast, exposure to advertising did modify the relationship between quit intentions and support for graphic warning labels; however, this relationship was in an unexpected direction. Prior studies found that exposure to tobacco advertising has a direct association with reduced support for tobacco policy[148] and more positive attitudes toward the tobacco industry.[175] I found that those with an intention to quit who reported exposure to retail adverting had the most support for graphic warnings. This may suggest that when smokers make a conscious decision to quit smoking they may also become more aware of tobacco advertising in their environment and, thus perhaps see the value of graphic warning at POS in supporting their quit intention. *Direct effects* of self-interest are most likely in situations where there is a substantial and clear stake in the issue;[46,164] use of menthol and promotions may have given smokers just such a clear stake in the regulatory outcome of a menthol ban or bans on promotions. However, the interplay between exposure to advertising and graphic warnings in a store may not have been as clear to smokers and thus had a more nuanced effect as a moderator.[165] Thus, self-interest factors can help to explain variation in smokers' level of support for specific POS provisions, however, close attention should be paid to how any given self-interest variable can be expected to influence support.

*Strengths and Limitations.* The strengths of this study included the large sample size of over 17,000 and high response rate among a nationally representative sample of US adults. For instance, this sample included over 1,300 African-Americans and 1,200 Hispanic respondents, including over 500 African-American smokers and close to that many Hispanic smokers. It also covers a broader range of tobacco control provisions affecting the point-of-sale than found in other studies.[40,112,235] Finally, it can provide national estimates of support for POS policies adjusting for geographic variation and state policy factors.

As an online survey, the sample may not fully represent those of low SES, low literacy, or homeless populations. However, to overcome these limitations the Knowledge Panel uses address-based sampling, oversamples cell-phone only households, and provides netbooks and high speed internet access to households that do not have them. Social desirability bias is also a potential limitation of all questionnaires of attitudes and behaviors. Online surveys result in less social desirable responses than other survey modes which may minimize this possibility.[236] Additionally, respondents had diverse opinions of the various tobacco control provisions, indicating this was not a substantial concern.

Another limitation is that I was not able to control for political ideology of respondents, which may influence support for policy.[237] However, smokers and non-smokers may have similar party affiliation and political ideological profiles.[46] Another study of support for a menthol ban found that in the total population, ideology from liberal to conservative did not significantly predict support for a ban;[112] thus controlling for this variable may not have substantial changed the results.

Additionally, measurement of use of menthol cigarettes by coding typical cigarette brand was likely subject to measurement error. Many common brands, such as Marlboro, include both menthol and non-menthol varieties thus likely underestimating menthol cigarette use among smokers. Asking smokers to indicate whether their current brand was menthol may avoid this issue in the future.

## 6.5 Conclusions

This study suggests that nationally, other than minor's access policies which have large majority support among both non-smokers and smokers, moderate to poor levels of support exist for a variety of other POS policies affecting advertising, product bans, promotion restrictions, and graphic warnings. Unsurprisingly, support for all policies was weaker among smokers than non-smokers. I also found that support for POS policies nationally was lower than support for emerging retail policy options among New York City adults.[221] In that study, 57% of respondents favored a display ban on tobacco products, 53% favored prohibiting price promotions, and 67% favored raising the minimum age to purchase tobacco products from 18 to 21. New York has a strong tobacco control climate with the highest tobacco tax in the nation,[238] a comprehensive smoke-free law since 2003,[239] and a statewide media campaign, *Tobacco Marketing Works,* about the dangers of tobacco marketing in retail stores. Perhaps stronger support for POS policies is possible in the context of an explicit tobacco control focus on POS.

These findings suggests that changes in social norms about retail tobacco sales and marketing policies have not occurred to the extent to which they have for other areas of tobacco control. For instance, support for smokefree air laws has increased over time[240] and commonly generate majority to near universal support based on venue among both smokers and non-smokers.[241] This is likely to be based both on changing norms and personal experience with the benefits of smokefree environments. More respondents had neutral rather than disapproving views for all of those restrictions, even ones with the lowest levels of support. Thus, there is an opportunity for tobacco control advocates to promote more positive attitudes toward these policies as a way to enhance implementation and enactment of POS policies. Such efforts would also help to shift social norms and help counteract the effects of tobacco sales and marketing at the point of sale.

Additionally, this study found substantial differences in support among subgroups, including higher support among non-smokers, non-White, older, and female populations. Among

smokers, quit intentions and past quit attempts were also associated with more support. Self-interest among smokers such as smoking menthol cigarettes, exposure to retail advertising, and use of coupons also affects support for specific related policies. Tobacco control advocates and the FDA can build on existing levels of public support to promote and maintain controversial policy changes in the retail environment.

# CHAPTER 7 SYNTHESIS/DISCUSSION

The goal of this dissertation study was to examine theoretical factors based on Mazmanian and Sabatier's public policy Framework[9,25] associated with implementation of tobacco control policies at the point of sale. I conducted two studies to examine the role of retailer opinions (Study 1) and public opinions (Study 2) about policy as significant factors that may be associated with policy implementation. In Study 1, I examined retailer opinions and factors associated with those opinions in relation to retailer compliance with POS policies. In Study 2, I focused on individual characteristics as well as self-interest factors that may influence public and smoker opinions about policy as part of the larger social normative context of policy implementation at POS. In this chapter, I synthesize results across the two studies, identify strengths and limitations of the research, and discuss the implications of the findings for future public health research and practice.

## 7.1 Synthesis of Findings

### *7.1.1 Summary of Findings about Study Aims*

*Study 1 Aims.* The first aim of the study was to examine the relationship between theoretical factors associated with the extent of behavioral change required to implement the policy (a factor associated with "tractability of the problem") and retailer compliance. This aim sought to understand whether factors that affected the extent to which retailers had conditions in place that would support compliance, i.e., they were aware of the regulation, they had formal sources in place to learn about regulations, and they did (or did not) experience barriers to complying with regulations. Of these factors, the study found that retailer barriers to compliance with tobacco control regulations were associated with retailer compliance with Tobacco Control Act POS provisions. Awareness of the Tobacco Control Act or having a formal source of

information about regulations was not associated with retailer compliance. These relationships were consistent whether compliance was treated as an independent or dependent variable. In final models, using noncompliance as a dependent variable, as hypothesized, with higher levels of barriers, stores had over 5 times the odds of noncompliance with Tobacco Control Act policies. This finding was consistent with the theoretical model that the more change that the policy requires of implementers (operationalized as barriers), policy compliance is reduced.

The second aim of the study was to examine the extent to which retailer support for regulations was associated with retailer compliance as suggested by theory. The study found support for this aim, with increasing retailer support associated with decreased odds of noncompliance. Additionally, I hypothesized that retailers influenced by social normative expectations, would have higher support for provisions that were in place the longest. I found partial support for the hypothesis that retailer support was higher for minor's access provisions and restrictions on promotions compared with advertising restrictions, graphic warning labels, and product bans. Minor's access provisions had higher average levels of support than counter-advertising (graphic warnings), advertising, and product restrictions. Promotions had higher average support than advertising and product restrictions, but not higher support than graphic warnings.

*Study 2.* The third aim of the study examined the relationship between three important characteristics – race, education, and smoking status – on the level of public support for POS policies among a nationally representative sample of US adults. The purpose of this aim was to determine whether the same pattern held for support for POS provisions as for other types of tobacco control provisions such as support for smokefree air laws or tobacco taxes.[37,40] I hypothesized that similar to support in other areas of tobacco control[37,40,41] (1) non-smokers would have more support than smokers, (2) African-Americans would have more support than whites, and (3) those of higher education level would have more support than those of lower education. I found support for the first two hypotheses. This study cannot definitely say why

these patterns exist. However, support by non-smokers may result from being less affected by tobacco control regulations than smokers.[46] Support among African-Americans may be associated with general support for governmental programs[242] or specific concerns about tobacco industry marketing to African-Americans.[156] Education level was unrelated to level of support for POS provisions in this sample. Some studies have found higher education levels associated with higher support for cigarette taxes[40,226] and smokefree air restrictions.[40] However, the effects of education on support for POS policies may not follow that pattern. Similar to this study, a study of support for point of purchase display bans found no association with education level.[105] This suggests that regardless of education level, individuals may be unaware of the potential benefits of tobacco control provisions at POS.

I also hypothesized that based on self-interest, individuals would have more support for minor's access provisions and advertising restrictions than product, counter-advertising, and promotions. I posited that these provisions would affect youth and retailers more than adult respondents, so they would have less self-interest in these provisions. This hypothesis was only supported regarding minors' access provisions. Similar to findings from the retailer study, minors' access provisions, followed by graphic warnings, and promotion restrictions had the highest level of support. Product and advertising restrictions had the lowest levels of support. This suggests, that similar to retailers, public support may be higher for provisions that have been enacted the longest. Alternatively, it may suggest that consumers have positive attitudes toward advertising[243] giving them a more self-interested stake in (and thus less support for) advertising restrictions.

The fourth aim of the study found that self-interest, over and above demographic factors, played a role in smokers support for POS policies. I examined the role of self-interest as a moderator of the relationship between individual characteristics on support for specific linked POS provisions. This followed prior research that suggested that self-interest was best conceptualized as a moderator, rather than a direct effect, in situations where the relative

importance/salience of the policy may vary widely even among those who were self-interested in the outcome.[165] Direct effects of self-interest are most likely in situations where there is a substantial and clear stake in the issue (such as the impact of tobacco taxes on smokers).[164] From this research, it appears that use of promotions and use of menthol cigarettes did indeed give smokers a substantial stake in the bans on promotions or menthol respectively. On the other hand, respondents may not have been vested in their passive exposure to tobacco advertising.

As a result, I did not find support for the hypothesis that menthol cigarette smoking status moderated the relationship between race and support for a menthol ban. I also did not find support for use of promotions as a moderator of the relationship between education level and support for a ban on promotions. Instead I did find that both of these self-interest variables had a direct effect on the outcome. Menthol cigarette smokers had significantly less support for a menthol ban than did non-menthol smokers, over and above the effect of race. Additionally, those that used promotions had lower support for bans on promotions than did smokers who did not use promotions.

I did find support for the hypothesis that exposure to retail advertising moderated the relationship between intention to quit and support for counter-advertising (graphic warnings). I hypothesized that this would be an attenuated relationship where those with intention to quit would have higher support for counter-advertising than those with no intention to quit, but this relationship would be weaker (suppressed) among those who were exposed to advertising. Instead, I found that this relationship was intensified, such that exposure to advertising strengthened the effect of intention to quit on support for counter-advertising measures. Overall, I found support for examining self-interest as an important construct in understanding smoker support for specific POS provisions. How self-interest is conceptualized, as a moderator or direct effect as well as the direction of the effect, needs careful consideration.

### *7.1.2 Retailer and Public Support for POS Policies*

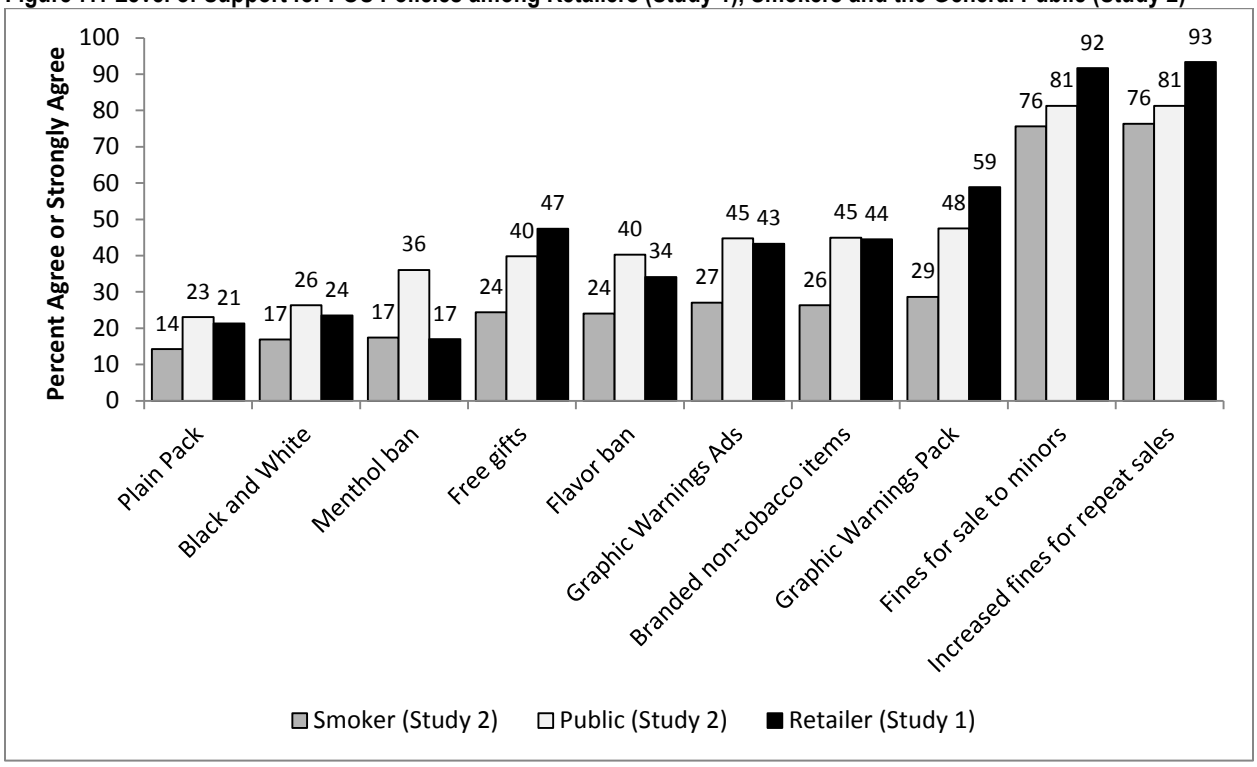
One of the key findings across the two studies was to identify the level of support for a variety of POS policies that are or could be enacted under the Tobacco Control Act. The two studies used distinct study populations, Study 1 retailers in North Carolina and Study 2 a nationally representative sample of US adults. They were linked, however, by using the same (or slightly modified) questions about support for POS policies. Though levels of support are not directly comparable across these populations, it is still instructive to examine patterns of support for retailers (from Study 1) and for the general public and smokers (from Study 2) across the two studies, shown in Figure 7.1.

The tobacco industry has often used retailer associations and smokers' rights groups as front groups for opposing new regulations.[244] However, the level of support among retailers for most of the provisions more closely resembled the level of support among the general public than among smokers. In fact, retailer support for minors access provisions, graphic warnings on packs, and for bans on gifts with purchase was 7-12 points higher than support among the general public. Level of support for a menthol ban (17% among retailers and smokers) was the only provision where retailer level of support was closer to that of smokers than the general public (including both smokers and non-smokers). Retailers may believe a ban on menthol cigarettes would directly affect their business in ways that other POS provisions would not. However, the overall pattern of findings suggest that though retail trade associations (e.g. National Association of Tobacco Outlets) and specific retailers have been opponents of tobacco control regulations and allies of the tobacco industry,[19,87,131] individual retailers' support for tobacco control POS policies are at least as varied as the public at large and are more supportive in some cases.

Patterns of support among the public and particularly among smokers for sales and marketing provisions of the Tobacco Control Act show that no provision had more than 50% support. Only minor's access regulations enjoy the majority levels of support found in other

areas of tobacco control such as smokefree air restrictions.[241] The level of national support for these regulations was also lower than support for emerging POS regulations among New York City adults.[221] In that study, 57% of respondents favored a display ban on tobacco products, 53% favored prohibiting price promotions, and 67% favored raising the minimum age to purchase tobacco products from 18 to 21. New York has a strong tobacco control climate with the highest tobacco tax in the nation,[238] a comprehensive smoke-free law since 2003,[239] and a statewide media campaign, *Tobacco Marketing Works,* about the dangers of tobacco marketing in retail stores (http://www.tobaccofreenys.org/Tobacco-Marketing-Works-NY.html). Perhaps stronger support for POS policies is possible in the context of an explicit tobacco control focus on POS.

**Figure 7.1 Level of Support for POS Policies among Retailers (Study 1), Smokers and the General Public (Study 2)**




### *7.1.3 Support for Theories of Policy Implementation*

Mazmanian and Sabatier identify several theoretical factors influencing policy implementation including the extent of behavioral change required, retailer and public support.[25]

I applied this theory to understand factors associated with compliance with tobacco control provisions in the retail environment. This public policy framework also fits well with strategies using social norms change in increasing support for tobacco control measures to influence policy enactment, enforcement, and compliance.[137]

Study 1 found that theoretically derived factors of barriers and retailer support are associated with retailer compliance. Study 2 found that demographic factors associated with public support for POS provisions are similar to those related to other tobacco control areas. Additionally, self-interest may affect the level of support for specific provisions among smokers. However, public support for POS sales and marketing provisions are weaker than for other areas of tobacco control like smokefree air policies,[240,241] which have capitalized on social norms changes.[137] For instance, evaluations of smokefree air policies in bars and restaurants show that such efforts have shifted social norms, which further support compliance with the policy over time.[43,245] For example, from 1992 to 2007 public support for bans on smoking in restaurants and bars has increased nearly 20 percentage points corresponding to substantial increases in bans on smoking in indoor spaces and increased public awareness of harms of secondhand smoke exposure.[246] In contrast, public support for all POS provisions excepting minors' access was under 50%. In addition, support for specific provisions was often lower than found in prior studies using the same question wording. For example, in a 2009 national telephone survey of adults in the Social Climate Survey of Tobacco Control, Winickoff and colleagues, used a 4 point scale with no neutral option, and found support for a ban on flavored cigarettes at 70% and support for a ban on menthol cigarettes at 56%.[235] This compares with 40% and 36% support found in this study. These findings suggest that tobacco control advocates may need to enhance the level of public support for these policies through social norms campaigns specifically aimed at POS. Such an approach can help to further enhance the climate for compliance with tobacco control regulations at POS nationally.[137]

Mazmanian and Sabatier also suggest several different patterns or scenarios that implementation can take over time.[25] Almost all policies will be enacted under suboptimal conditions (based on factors considered important in the Policy Implementation Framework), but implementation can still occur. For the POS policies that are currently in effect under the Tobacco Control Act, the most likely implementation is the "Effective Implementation" scenario. In this scenario, implementation, including retailer compliance, increases rapidly after policy enactment and then levels off at a relatively high level. The authors suggest that this pattern is most likely in programs which address a limited and well-defined set of problems and seek moderate changes in the status quo as in the case with current policies. Additionally, this implementation pattern is more likely when non-compliance is visible such as through inspections and possible fines, and there is enough support of constituency groups and the public exists to maintain existing levels of compliance. In making this assertion, I follow evidence based on the enactment of the Synar Act establishing minor's access restrictions. Synar rates of illegal sales to minors fell from 40% in 1997 to 28% in the year immediately following enforcement, with steady declines thereafter. Currently, rates have hovered around 10% or lower since 2006.[227] With active enforcement of sales and marketing provisions now in place in all but two states (as of February 2014), Tobacco Control Act *enacted* provisions are likely to follow this same pattern. Additionally, I found higher levels of support among both retailers and the public for policies that had been enacted. Combined support and active enforcement, suggests that implementation of these types of provisions will continue to rise and then plateau at a high level over time.

However, the most likely scenario for controversial provisions that have been blocked by tobacco industry litigation is far more murky. The "Rejuvenation Scenario" is a possible outcome of provisions such as the graphic warnings. In this scenario, an initial burst of enthusiasm right after enactment is followed by the undermining of the statute (in this case through legal decisions). This leads to a long period of 'quiet and generally ineffectual activity' in the agency.[25]

[p. 283] Finally, when socioeconomic conditions change there may be rising support among constituency groups and the public which leads to 'rejuvenated' effort and moderate implementation over time. If conditions change again, these 'reforms' can again erode.

FDA proposed graphic warning labels in 2011 which were to be implemented in 2012. However, the particular warnings were vacated by court ruling.[211] Graphic warnings are now in that quiescent period where FDA may reformulate warnings that can withstand court challenge and strengthen the evidence base for the effectiveness of this strategy in addressing public health priorities. Should the next round of warning labels withstand legal challenge, the evidence of this study of relatively high levels of retailer and public support for these measures suggests that sufficient support may exist to maintain these warnings over time and see widespread implementation.

In contrast, of the provisions examined in this this study, a possible menthol ban is the least likely[3] to result in implementation in the current environment. Possible action on this provision is currently in the 'trough' period of low level of activity at FDA and high opposition. FDA has currently called for additional study of the impact of a menthol ban to provide more support to the scientific basis for a ban.[247] This is certainly necessary to enhance the legal case for a ban in preparation for the lawsuit that will inevitably follow any such action. However, the findings from this study that both retailer and public support for this provision is low, suggest that there is not a broad existing constituency that favors implementation. This may dampen the political will at FDA to implement a ban at all. If public health advocates want to promote a ban, they would be well-served by working to shift social norms in support of these provisions among both retailers and the public in order to improve the climate for implementation.

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[3]Advertising restrictions of black and white ads were deemed too broad a restriction on commercial free speech, and will not be enacted (*Discount Tobacco & Lottery v. United States*).

## 7.2 Strengths and Limitations

### *7.2.1 Strengths*

This study can help to fill gaps in understanding of the factors associated with compliance with tobacco control regulations affecting retail stores enacted under the Tobacco Control Act. Few studies apply theories of public policy[25] and public opinions[46,47] to the context of tobacco control policy implementation in retail stores.[16] Few studies also link retailer opinions to objective measures of retailer compliance with tobacco control policies.[85,86,129] And none to date do so in relation to compliance with newer sales and marketing provisions of the Tobacco Control Act. Study 2 also provides a large sample size and high response rate among a nationally representative sample of US adults. It also allows for the ability to provide national estimates of the level of support for POS provisions as well as of subpopulations.

### *7.2.2 Limitations*

As noted in Chapter 5, limitations of study 1 include the temporal sequence of data collection with store audits of compliance conducted first, followed by the retailer interviews. This study design limits the ability to draw causal inferences. I conducted the analysis both using compliance as an independent variable and as an dependent variable with consistent results in either direction. This study was also conducted in 3 counties in North Carolina, which limits the generalizability of the findings. Also measurement issues, such as one-item measures and lack of variability in response options, may have affected the ability to detect associations between awareness and source of information about regulations and compliance.

Limitations of study 2 discussed in Chapter 6 include the possibility that in an online survey, the sample may not fully represent those of low SES, low literacy, or homeless populations. However, aspects of the sampling design for the underlying internet panel are designed to address these limitations. Additionally, measurement of menthol cigarette use by coding usual brand was likely subject to measurement error. Additionally, I was not able to

control for political ideology, which may influence overall support for regulations.[237] Asking respondents about these issues directly may avoid these limitations in the future. Finally, across both studies, social desirability could have affected answers about retailer or public support for tobacco control provisions, but variation in response across provisions suggests this was not a major concern.

Across the two studies, one of the biggest limitations was the inability to directly link retailer and public opinions with retailer compliance. Theory and empirical evidence suggest that these factors are inter-related – retailer attitudes and behaviors may affect public attitudes and behaviors and the converse. For example, retailers have provided pro-tobacco industry petitions and materials to their customers to build public opposition to regulations among smokers.[244] A recent study in New York state linked youth and retailer data and found that youth living in counties with more retail cigarette advertising were more likely to have positive attitudes about smoking.[72]

Conversely, retailer compliance with minors' access provisions has improved when faced with community-level interventions that emphasize retailer education, community involvement, and media strategies to promote norms restricting cigarette sales to minors.[248,249] Community mobilization has also worked to reduce the amount of tobacco advertising on the exterior of retail stores in compliance with local ordinances.[250] We can provide a fuller picture of the role of shifting norms on retailer compliance by adding assessments of retailer attitudes and attitudes of the public in communities surrounding retail stores to longitudinal studies of retailer compliance.

## 7.3 Future Directions

### *7.3.1 Implications for Future Research*

Based on findings, several areas warrant additional research. First, it is important to design studies to explicitly test theories of policy implementation in retail stores. Cross-sectional studies provide valuable insight into potentially relevant factors, but are unable to determine

causal and reciprocal effects of opinions on retailer compliance. A stronger test of theory would link retailer opinions and compliance with public opinions toward those policies in neighborhoods surrounding those stores. A longitudinal study design that tracked changes in attitudes among retailers, the public and smokers linked with retailer compliance over time would provide the strongest test of theories of policy implementation. Longitudinal data would also help to construct mediation and moderation pathways on how retailer and public opinions may influence each other as well as whether those relationships are similar for all types of retailers. Such information is essential in identifying intervention points that can help public health agencies assist retailers in compliance as well as what messages can affect public support for tobacco control in retail stores.

Second, this work identifies factors associated with smoker support for policies. Smokers and 'smokers' rights' groups are usually seen as antagonistic toward tobacco control policies.[42,160] This research demonstrates that individual policy support may be related to the extent to which a smoker is directly affected by the policy as well as by smoker's intention to quit. Future research should identifying additional self-interest variables that may affect smoker's support for specific policies.

### *7.3.2 Implications for Public Health Practice*

The findings from this study reveal that tobacco retailers and smokers as well as the general public have some support for tobacco control POS policies. Retailers should be engaged as valuable stakeholders in tobacco control efforts at POS as their support is associated with their compliance with policies. Enforcement of these provisions will help to promote compliance, but retailer support and acceptance of these policies is key to making long-term, sustainable changes. For example, a retailer education intervention to reduce sales of loose cigarettes found that some retailers "complied" with the law by moving loose cigarettes behind the counter, rather than by ending sales.[249] Public health agencies should encourage

retailer compliance through enforcement, education, and social norms interventions that influence retailer barriers and increase their support for these policy changes.

Results of this research indicate that media campaigns or other tobacco control social norms change strategies focused on tobacco marketing at POS may be a useful strategy to improve support for POS provisions of the public. Improved support can change norms about tobacco at POS and thus influence the environment around retailer compliance with POS provisions. Smokers are of particular concern in these efforts as they may benefit the most from policies that support quitting, but may also have the most resistance to these policy changes. This study found that smokers' intention to quit was strongly associated with level of support for tobacco control provisions perhaps suggesting that smokers' see the value of such provisions in supporting their quit intention. Social norms change campaigns may be particularly beneficial for smokers who want to quit.

In conclusion, efforts to improve compliance with tobacco control POS policies must consider both retailer and public support in creating a more positive climate for tobacco control in the retail environment. Social norms change and policy implementation approaches can help to support retailers in complying with the letter and spirit of the law, so that the full public health benefits of the Tobacco Control Act at POS can be achieved.

## APPENDIX A: DATA COLLECTION INSTRUMENTS

Study 1 Instruments

- Retailer Audit -- FDA Family Smoking Prevention and Tobacco Control Act

  Retailer Compliance Checklist

- Retailer Interview – Retailer Survey for Red Flag Campaign Evaluation

Study 2 Instrument

- Public Survey – Health Media Collaboratory Survey Study 2 Items Only

## A.1 Study 1 Instruments

Store ID_____Store Name _____

**Q1.1 Type of Store** (check one)

- ☐1 Supermarket & Other Grocery
- ☐2 Convenience Store
- ☐3 Tobacco Store
- ☐4 Gas Convenience Store
- ☐5 Warehouse clubs and supercenters
- ☐6 News dealers and Newsstands
- ☐7 Beer, Wine, and Liquor Store
- ☐8 Pharmacy and drug stores
- ☐9 Discount Department Stores
- ☐10 Other Gasoline Stations
- ☐99 Don't Know

Q1.2 Store Location (check one)

- ☐1 Stand alone Store
- ☐2 Joined with other stores
- ☐3 In a shopping center or strip mall

*Tracking Data*

*Date/Time:* _____

*Interior Auditor:* _____

*Exterior Auditor:* _____

| *Audit Status* | Exterior | Interior |
|---|---|---|
| Audit Complete | ☐1 | ☐1 |
| Refused, Audit Incomplete | -- | ☐2 |
| Audit Incomplete, Reattempt (specify) | ☐3 | ☐3 |
| Retailer out of business | ☐4 | ☐4 |
| Could not locate retailer | ☐5 | ☐5 |
| Address located, retailer not found | ☐6 | ☐6 |
| Does not sell tobacco to consumers | ☐7 | ☐7 |

| **Q2. Adult-only facility?** | | **Y** | **N** | |
|---|---|---|---|---|
| 2.1 | Is a temporary structure for distributing free samples of smokeless tobacco? | ☐1 | ☐2 | If any item 2.1 – 2.5 is **N, skip to Q3,** otherwise continue |
| 2.2 | Has a law enforcement officer checking photo ID for 18 or 19 years old? | ☐1 | ☐2 | |
| 2.3 | Does not sell, serve, or distribute alcohol? | ☐1 | ☐2 | |
| 2.4 | Is not located adjacent to or across from a youth-oriented space? | ☐1 | ☐2 | |
| 2.5 | Is enclosed by a barrier of opaque material without exterior tobacco ads? | ☐1 | ☐2 | |

| **Q3. Exterior** | **Number of ads** (enter 00 if none) |
|---|---|
| 3.1 Ads in parking lot/property? (provide number of ads) | |
| 3.1.1 Menthol cigarette ads? | ☐☐ |
| 3.1.2 Non-menthol cigarette ads? | ☐☐ |
| 3.1.3 Menthol OTP ads? | ☐☐ |
| 3.1.4 Non-menthol OTP ads? | ☐☐ |
| 3.1.5 Non-tobacco ads? | ☐☐ |
| 3.2 Building Exterior Ads? (provide number of ads) | |
| 3.2.1 Menthol cigarette ads? | ☐☐ |
| 3.2.2 Non-menthol cigarette ads? | ☐☐ |
| 3.2.3 Menthol OTP ads? | ☐☐ |
| 3.2.4 Non-menthol OTP ads? | ☐☐ |
| 3.2.5 Non-tobacco ads? | ☐☐ |

# Interior Audit

**Q4. Tobacco Products and Availability** — Y / N

4.1 E-cigarettes available? ☐1 ☐2

4.2 Flavored **cigarettes** available? (e.g., clove, candy-flavors NOT menthol) ☐1 ☐2
(if yes, list brands sold)

4.2.1 Brand 1? ☐☐

4.2.2 Brand 2? ☐☐

4.2.3 Brand 3? ☐☐

4.2.4 Other Brands? (please specify)

---

**Q5. Merchandising** — Y / N

5.1 Self-service of cigarettes? ☐1 ☐2
( if yes, list brands sold)

5.1.1 Brand 1? ☐☐

5.1.2 Brand 2? ☐☐

5.1.3 Brand 3? ☐☐

5.1.4 Other Brands? (please specify)

---

5.2 Vending machine present? ☐1 ☐2

5.3 Visible cigarettes sold in less than pack of 20 (e.g., "loosies,") ☐1 ☐2

5.4 Smokeless tobacco available in less than individual unit? ☐1 ☐2

5.5 Are any packs displayed sideways or endways? ☐1 ☐2

5.6 Is top 50% of pack obscured? ☐1 ☐2
(select YES if packs are intentionally obscured)

**Number of displays** (enter 00 if none)

5.7 Movable cigarette and smokeless tobacco displays? ☐☐
(provide number of displays)

**Q6. Gifts** — Y / N

6.1 Are gifts given with tobacco product sale? (e.g., merchandise, etc.) ☐1 ☐2

6.2 Are catalogs listing gifts for redemption with proof of purchase available? (e.g., "Marlboro miles," "Camel cash") ☐1 ☐2

**Q7. Advertising** — Number (enter 00 if none)

7.1 Interior tobacco ads? (provide number of ads) ☐☐

7.2 Interior branded functional items? (provide number of items) ☐☐

| | Y | N |
|---|---|---|
| 7.3 Audio advertising of tobacco products? | ☐1 | ☐2 |
| 7.3.1 If yes, audio ads using music or sound effects? | ☐1 | ☐2 |
| 7.4 Video advertising of tobacco products? | ☐1 | ☐2 |
| 7.4.1 If yes, video in color | ☐1 | ☐2 |
| 7.4.2 Video using music or sound effects | ☐1 | ☐2 |
| 7.5 Advertising of **brand name** tobacco event sponsorship? (not corporate name) | ☐1 | ☐2 |
| 7.6 Branded non-tobacco product available? (e.g., hats, t-shirts, etc.)? | ☐1 | ☐2 |
| 7.6.1 If yes, type of product(s) | | |

---

**Q8. Promotion** — Y / N

8.1 Any tobacco promotion with sale or special price ☐1 ☐2

8.2 Any tobacco promotion with multi-pack promotion (e.g., buy one get one free) ☐1 ☐2

**Q9. Labeling** — Y / N

9.1 Smokeless tobacco available? ☐1 ☐2
(if NO, skip to 9.2)

9.1.1 New warning labels on smokeless tobacco packaging? ☐1 ☐2

9.1.2 New warning labels on smokeless tobacco advertising? ☐1 ☐2

9.2 Cigarette sold with labeling indicating modified risk? (e.g., "light", "low tar", "mild") ☐1 ☐2
(If yes, indicate brands sold)

9.3.1 Brand 1? ☐☐

9.3.2 Brand 2? ☐☐

9.3.3 Brand 3? ☐☐

9.3.4 Other Brands? (please specify)

**Brand List**

| | |
|---|---|
| 01 | Alpine |
| 02 | American Spirit |
| 03 | B&W private Stock |
| 04 | Baileys |
| 05 | Barclay |
| 06 | Benson and Hedges |
| 07 | Best Value |
| 08 | Cambridge |
| 09 | Camel |
| 10 | Capri |
| 11 | Carlton |
| 12 | Chesterfield |
| 13 | Doral |
| 14 | Eve |
| 15 | GPC |
| 16 | Harley Davidson |
| 17 | Kent |
| 18 | Kool |
| 19 | L&M |
| 20 | Lark |
| 21 | Lucky Strike |
| 22 | Magna |
| 23 | Marlboro |
| 24 | Maverick |
| 25 | Merit |
| 26 | Misty |
| 27 | Monarch |
| 28 | Montclair |
| 29 | More |
| 30 | Newport |
| 31 | Now |
| 32 | Pall Mall |
| 33 | Parliament |
| 34 | Players |
| 35 | Private Label |
| 36 | Raleigh |
| 37 | Salem |
| 38 | Satin |
| 39 | State Express |
| 40 | Sterling |
| 41 | Style |
| 42 | Tareyton |
| 43 | Triumph |
| 44 | True |
| 45 | Vantage |
| 46 | Viceroy |
| 47 | Virginia Slims |
| 48 | Winston |

**Retailer Survey for Red Flag Campaign Evaluation**

**A: TRACKING DATA** [RECORD PRIOR TO ENTERING STORE.]

A1. ENTER TODAY'S DATE ___ ___ ___ (M D Y)

A2. ENTER TIME OF DAY ___ ___ AM/PM (Start) circle ___ ___ AM/PM (End) circle

A3. ENTER INTERVIEWER INITIALS _____

A4. ENTER STORE ID ___ ___ ___ ___ ___ ___

A5. ENTER STORE NAME _____

A6. NOTE STORE ADDRESS _____

_____

A7. CIRCLE ATTEMPT NUMBER 1st 2nd 3rd

A8. SELECT STORE TYPE

SUPERMARKET & OTHER GROCERY
CONVENIENCE STORE [IF Y, THEN INCLUDE **E**]
TOBACCO STORE
GAS CONVENIENCE STORE [IF Y, THEN INCLUDE E]
WAREHOUSE CLUBS AND SUPERCENTERS
NEWS DEALERS AND NEWSSTANDS
BEER, WINE AND LIQUOR STORE
PHARMACY AND DRUG STORE
DISCOUNT DEPARTMENT STORES
OTHER GASOLINE STATIONS
DON'T KNOW

A9. STORE TRACKING

OUT OF BUSINESS
COULD NOT LOCATE
SURVEY REFUSED
SURVEY COMPLETED
SURVEY NOT COMPLETED -- REATTEMPT
SURVEY NOT COMPLETED –RESPONDENT INELIGIBLE

**INTRODUCTION AND CONSENT**

[INTERVIEWER INSTRUCTIONS: ENTER THE STORE, INTRODUCE YOURSELF, AND ASK TO SPEAK TO THE STORE MANAGER OR OWNER. IF HE/SHE IS NOT AVAILABLE, TALK TO THE CLERK.]

Hi, my name is_____, and I am doing a research study for the University of North Carolina at Chapel Hill to learn more about how stores deal with issues relating to selling tobacco products and food. I am interviewing people at about 349 stores that sell tobacco. The questions take about ten minutes.

You do not have to participate in this survey unless you want to, and you do not have to answer any questions you do not want to answer. I will step aside to allow you to serve customers when you need to. I will not ask you for your name or any identifying information, and this is the only time I will contact you. If you are eligible and decide to participate, we'd like to give you a $20 Walmart™ gift card as a thank you.

All research on human volunteers is reviewed by a committee that works to protect your rights and welfare. We will ask for your opinions of laws on how tobacco products are sold; that could be uncomfortable. Although, we hope you will enjoy it. Dr. Kurt Ribisl is the lead researcher for this study. You can call him at 919 843 8042 with any questions. You could also contact the IRB if you have questions about being in a research study. Their telephone number is 919 966 3113.

Do you have any questions? Y N [ANSWER ACCORDING TO PROTOCOL]

Would you be willing to answer some questions for us? Y N

[IF YES, GO TO ELIGIBILITY. IF NO, THANK AND LEAVE STORE.]

Good. To see if you are eligible I just have one question.

B1. What is your role in the store? Are you the…

- □1 Owner
- □2 Manager (includes shift manager, assistant manager)
- □3 Clerk (Cashier)
- □4 Other employee (INELIGIBLE, END SURVEY, EXIT STORE)
- □9 REFUSED (INELIGIBLE, END SURVEY, EXIT STORE)

Do you agree to be in the study? Y N

[IF Y and 1-3 to B1, PROCEED TO QUESTION B2; IF OTHER, THANK THEM FOR THEIR TIME, TELL THEM THEY ARE NOT ELIGIBLE FOR THE STUDY, AND EXIT THE STORE.]

**B: RED FLAG CAMPAIGN**

There are different ways that clerks decide whether their customers are old enough to buy tobacco products.

B2. Are you aware that the NC driver's license has different color backgrounds, based on a person's age?

□1 YES
□2 NO
□9 REFUSED

B3. Please describe what the different colors mean?

□1 YES – CORRECTLY DESCRIBED (100%)
□2 YES – INCORRECTLY DESCRIBED (>100%)
□3 NO – UNABLE TO DESCRIBE
□9 REFUSED

B4. How often do you use the color system to know whether you can sell a customer tobacco or alcohol? Do you use it…

□1 Most of the time
□2 Some of the time
□3 Rarely
□4 Never/ Do not use color system
□9 REFUSED

B5. Would you say North Carolina's color-coded driver's licenses are helpful or not helpful to know whether you can sell tobacco to a customer?

□1 HELPFUL
□2 NOT HELPFUL
□3 DON'T KNOW
□4 DOESN'T USE
□9 REFUSED

B6. Tell me how much you agree or disagree with the following statements
You can answer…
Strongly disagree
Disagree
Neutral
Agree
Strongly Agree

| | STRONGLY DISAGREE | DISAGREE | NEUTRAL | AGREE | STRONGLY AGREE | REFUSED |
|---|---|---|---|---|---|---|
| B6a. Underage smoking is no longer a problem in this area. | □1 | □2 | □3 | □4 | □5 | □9 |
| B6b. Tobacco retailers have the power to stop underage teens from smoking | □1 | □2 | □3 | □4 | □5 | □9 |
| B6c. Checking ID is an easy way to avoid selling tobacco to people under 18. | □1 | □2 | □3 | □4 | □5 | □9 |
| B6e. In North Carolina, stores that sell tobacco products to minors (people under 18) will get caught and penalized. | □1 | □2 | □3 | □4 | □5 | □9 |

B7. Have you ever heard of the Red Flag Campaign?

□1 YES
□2 NO [IF NO, SKIP TO B9]
□9 REFUSED

B8. Can you tell me what the campaign is about? [WRITE IN VERBATIM]

_____

_____

_____

[SHOW RED FLAG POSTCARDS.]
B9. Do you recognize these postcards?

□1 YES
□2 NO
□9 REFUSED

**C: POLICY KNOWLEDGE/AWARENESS/ATTITUDES**

The next questions ask about policies that people are talking about that may affect how tobacco is sold in retail stores.

C1. In 2009, the President signed a law that gave the US Food and Drug Administration (FDA) power to regulate tobacco products. Have you heard of this law before?

□1 YES
□2 NO
□3 DON'T KNOW
□9 REFUSED

C2. How do you usually hear about new government laws for how tobacco products are sold (like, needing to put cigarettes behind the counter)? Tell me yes, no, or does not apply for each.
Do you hear from…

| | Yes | No | Not Apply | REFUSED |
|---|---|---|---|---|
| C2a. Government agencies | ☐1 | ☐2 | ☐3 | ☐9 |
| C2b. Tobacco Companies | ☐1 | ☐2 | ☐3 | ☐9 |
| C2c. Corporate Office (for chain stores) | ☐1 | ☐2 | ☐3 | ☐9 |
| C2d. Retail or Trade Associations (like convenience store or grocery associations) | ☐1 | ☐2 | ☐3 | ☐9 |
| C2e. Other stores | ☐1 | ☐2 | ☐3 | ☐9 |
| C2f. Your boss or store manager | ☐1 | ☐2 | ☐3 | ☐9 |
| C2g. News (TV or newspapers) | ☐1 | ☐2 | ☐3 | ☐9 |
| C2h. Friends or family | ☐1 | ☐2 | ☐3 | ☐9 |
| C2i. Customers | ☐1 | ☐2 | ☐3 | ☐9 |
| C2j. Any other source? [WRITE IN] | | | | |

C3. How would you like to learn more about laws that affect how you sell tobacco in your store? Tell me yes or no for each.

| | YES | NO | REFUSED |
|---|---|---|---|
| C3a. In person training | ☐1 | ☐2 | ☐9 |
| C3b. Online training (internet) | ☐1 | ☐2 | ☐9 |
| C3c. Websites | ☐1 | ☐2 | ☐9 |
| C3d. By mail | ☐1 | ☐2 | ☐9 |
| C3e By telephone | ☐1 | ☐2 | ☐9 |
| C3f. Any other way? [WRITE IN] | | | |

C4. Tell me how much you agree or disagree with the following statements. There are no right or wrong answers. We just want to know what you think.
You can answer…
Strongly disagree
Disagree
Neutral
Agree
Strongly Agree

| | STRONGLY DISAGREE | DISAGREE | NEUTRAL | AGREE | STRONGLY AGREE | REFUSED |
|---|---|---|---|---|---|---|
| C4a. Tobacco advertising should be restricted to only black and white text; no colors or pictures should be permitted | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐9 |
| C4b. Tobacco companies should be required to sell cigarettes in plain packages – that is, in packs without any brand names or fancy designs | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐9 |
| C4c. At least 50% (half) of the front of a cigarette pack should be used to display warnings and pictures showing the health hazards of smoking | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐9 |
| C4d. Stores that sell tobacco should be required to post warning signs that include graphic images and written warnings detailing the dangers of tobacco use and information on how to quit. | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐9 |
| C4e. Merchants who sell tobacco to minors should be fined | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐9 |
| C4f. Penalties should be gradually increased for store owners who repeatedly sell cigarettes to minors | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐9 |
| C4g. Cigarettes with added flavorings like cherry, chocolate, lime and mint should be prohibited | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐9 |
| C4h. Menthol cigarettes should be prohibited just like other flavored cigarettes | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐9 |
| C4i. Tobacco companies should not be allowed to offer promotional items (t-shirts or free cigarettes) to encourage the purchase of cigarettes | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐9 |
| C4j. Advertising cigarette brand names on shirts, jeans, and other clothing should be banned | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐9 |
| C4k. Stores that sell tobacco in North Carolina should be required to have a tobacco retailer license. | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐9 |
| C4l. Stores located near schools should not be allowed to sell tobacco | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐9 |
| C4m. Restricting tobacco advertising in stores near schools would protect kids | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐9 |

C5. [ONLY ASK TO OWNER/MANAGER, IF CLERK SKIP TO D1]

Other retailers tell us that it can be hard to follow new government laws for how tobacco products are sold, like needing to put cigarettes behind the counter.

Tell me how much you agree or disagree with the following statements
You can answer…
Strongly disagree
Disagree
Neutral
Agree
Strongly Agree

| | STRONGLY DISAGREE | DISAGREE | NEUTRAL | AGREE | STRONGLY AGREE | REFUSED |
|---|---|---|---|---|---|---|
| C5a. Making changes to how tobacco is sold hurts my business | □1 | □2 | □3 | □4 | □5 | □9 |
| C5b. It is too costly to make the types of changes that are required | □1 | □2 | □3 | □4 | □5 | □9 |
| C5c. It takes too much time to make the changes they are asking for | □1 | □2 | □3 | □4 | □5 | □9 |
| C5d. It is too hard to redo the store space and displays | □1 | □2 | □3 | □4 | □5 | □9 |

## D: SMOKING BEHAVIOR

Okay. The next question is about smoking.

D1. Do you now smoke cigarettes every day, some days, or not at all?
- □1 EVERYDAY
- □2 SOME DAYS
- □3 NOT AT ALL
- □9 REFUSED

## E: HEALTHY STORE CONCEPT TEST [ONLY FOR CONVENIENCE STORES OR GAS CONVENIENCE FROM TRACKING DATA] **[ONLY ASK TO OWNER/MANAGER, IF CLERK SKIP TO END]**

E1. Now we will ask about selling healthy foods in your store. When I say “healthy foods”, I’m talking about things like fruits, vegetables, whole wheat bread, and low fat milk. Tells us how much you agree or disagree with the following statements.
You can say…
Strongly disagree
Disagree
Neutral
Agree
Strongly Agree

| | STRONGLY DISAGREE | DISAGREE | NEUTRAL | AGREE | STRONGLY AGREE | REFUSED |
|---|---|---|---|---|---|---|
| E1a. On average, I feel the food sold in my store is healthy. | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐9 |
| E1b. If I stock more healthy foods, my customers would buy them. | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐9 |
| E1c. If I stock more healthy foods, my customers will eat healthier. | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐9 |
| E1d. I should play a role in increasing the availability of healthy foods in this neighborhood. | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐9 |

E2. Would you be interested in offering more healthy foods?
- □1 YES [GO TO E3]
- □2 NO [GO TO END]
- □3 DON’T KNOW
- □9 REFUSED

E3. What major changes could you realistically do to sell more healthy foods in your store? Tell me yes or no for each.

| | YES | NO | REFUSED |
|---|---|---|---|
| E3a. Add new equipment (like shelving or new refrigerator) | ☐1 | ☐2 | ☐9 |
| E3b. Change to new suppliers who have affordable healthy foods | ☐1 | ☐2 | ☐9 |
| E3c. Participate in WIC, a nutrition program for Women Infants and Children | ☐1 | ☐2 | ☐9 |
| E3d. Stock less junk food (chips, soda, pastries) | ☐1 | ☐2 | ☐9 |
| E3e. Any other way? [WRITE IN] | | | |

[END] Those are all my questions. Thank you for your time. [GIVE $20 GIFT CARD] Have a nice day. I am going to just look around the store briefly and then I'll be leaving.[CONTINUE TO F1].

[BE SURE TO RECORD STORE ID# AND GIFT CARD #ID NUMBER TOGETHER ON GIFT CARD PHOTOCOPY. THIS IS IMPORTANT.]

**F: STORE OBSERVATION FOR RED FLAG ITEMS**

| | YES | NO |
|---|---|---|
| F1. IS A RED FLAG POSTER VISIBLE IN THE STORE? | ☐1 | ☐2 |
| F2. ARE RED FLAG STICKERS VISIBLE IN THE STORE? | ☐1 | ☐2 |
| F3. ARE RED FLAG BUTTONS VISIBLE IN THE STORE? | ☐1 | ☐2 |
| F4. ARE RED FLAG OVERSIZED POSTCARDS VISIBLE IN THE STORE? | ☐1 | ☐2 |
| F5. ARE 'WE CARD' SIGNS VISIBLE IN THE STORE? | ☐1 | ☐2 |

**G: NUMBER OF CASH REGISTERS IN STORE**

G1. RECORD THE TOTAL NUMBER OF REGISTERS, STAFFED AND UNSTAFFED. _____

**H: INTERVIEWER NOTES**

H1. WAS THE RESPONDENT ABLE TO ANSWER THE SURVEY IN ENGLISH?

Y N

H2. DID THE RESPONDENT RECEIVE A GIFT CARD?

Y N

H2. ADD NOTES.

**A.2 Study 2 Instruments**

# PART VI: ROSE ITEMS

## CONSTRUCT O: UNC/SHYANIKA ROSE PROJECT

**[SP, GRID, REPEAT THE OPTIONS EVERY 5 ITEMS]**

O1. Please tell us how much you agree or disagree with each of the following statements. There are no right or wrong answers. We just want to know what you think.

1 = Strongly disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly agree

1…Tobacco advertising should be restricted to only black and white text; no colors or pictures should be permitted.
2…Tobacco companies should be required to sell cigarettes in plain packages—that is, in packs without any brand names or fancy designs.
3…At least 50% (half) of the front of a cigarette pack should be used to display warnings and pictures showing the health hazards of smoking.
4…Stores that sell tobacco should be required to post warning signs that include graphic images and information on how to quit.
5…Merchants who sell tobacco to minors should be fined.
6…Penalties should be gradually increased for store owners who repeatedly sell cigarettes to minors.
7…Cigarettes with added flavorings like cherry, chocolate, lime, and mint should be prohibited.
8…Menthol cigarettes should be prohibited just like other flavored cigarettes.
9…Tobacco companies should not be allowed to offer promotional items (t-shirts or free cigarettes) to encourage the purchase of cigarettes.
10…Advertising cigarette brand names on shirts, jeans, and other clothing should be banned.

# BOX O2

[**A2=1-2, SMOKES EVERY/SOME DAYS**, GO TO O2. ELSE, SKIP TO O3.]

[DISPLAY PICTURE FOR ALL: ZOOM IN THE IMAGE WHEN RESPONDENTS CLICK ON IT]

[DISPLAY:]
*Click on the picture for a larger view*


**[SP, A2=1-2, SMOKES EVERY/SOME DAYS, SHOW THE QUESTION AND THE PICTURE ON THE SAME SCREEN]**

Rose

O2. Looking at the picture, do you think that if stores had graphic warning labels on cigarette packs and ads that it would make you more likely to **buy cigarettes**, less likely to **buy cigarettes**, or would it make no difference to you?

1 = A lot more likely
2 = A little more likely
3 = No difference
4 = A little less likely
5 = A lot less likely

[DISPLAY:]

*Click on the picture for a larger view*

**[SP, ALL RESPONDENTS, SHOW THE QUESTION AND THE PICTURE ON THE SAME SCREEN]**

Rose O3. Looking at the picture, do you think that if stores had graphic warning labels on cigarette packs and ads that it would make you more likely to **visit the store**, less likely to **visit the store**, or would it make no difference to you?

1 = A lot more likely
2 = A little more likely
3 = No difference
4 = A little less likely
5 = A lot less likely

**[SP, A4=>0, SMOKED IN PAST 30 DAYS]**

CTS O4. The last time you purchased cigarettes, did you take advantage of coupons, rebates, buy 1 get 1 free, or any other special promotion?

1 = Yes
2 = No

**[SP]**

GATS O5. In the **last 30 days**, have you noticed any advertisements or signs promoting cigarettes in stores where cigarettes are sold?

1 = Yes
2 = No
3 = Not applicable

# APPENDIX B: ADDITIONAL ANALYSES

## B.1 Additional Analyses for Study 1

I conducted alternative analyses for compliance as an outcome that used a structural equation modeling approach using an WLSMV estimator (Table B.1). The final model mirrored the final model from the GEE analysis presented in Table 5.3 and 5.4. These analyses showed that model fit was poor ($\chi^2$ =346.96 df=263 p=.0004, CFI=.75 TLI=.72, RMSEA .03 90% CI .025, .046). Chi-square values were significant and TLI and CFI were both well below the .95 cut off values that are preferred for good model fit. Specific estimates are probit coefficients which cannot be easily converted to odds ratios reported in the GEE analyses. However, the final model showed the same pattern of results as found in the GEE analyses. Support for POS provisions in this analysis is negatively associated with non-compliance and Barriers are positively associated with non-compliance. No other covariates were significant in these analyses. All other models (not shown) had the same pattern of results.

**Table B.1 Structural Equation Model of Compliance as a Dependent Variable**

| | **SEM Model Individual, Store, Neighborhood, and county Probit Coef (p-value)** |
|---|---|
| **POS Support** | **-.19 (.04)** |
| **Barriers** | .50 (.00) |
| **Source of Information** | -1.08 (.10) |
| **Awareness** | .06 (.79) |
| | |
| **Individual Characteristics** | |
| **Smoking Status** | |
| Never Smokes | ref |
| Current Smoker | -.21 (.48) |
| **Respondent Type** | |
| Store Owner | -.34 (.55) |
| Store Manager/Clerk | ref |
| | |
| **Store Characteristics** | |
| **Store Type** | |
| Grocery/Supermarket | ref |
| Gas Station/Gas Convenience | .27 (.51) |
| Convenience | .23 (.62) |
| Drug Store/Pharmacy | .86 (.07) |
| Tobacco Store | .87 (.21) |
| Other Store | -.39 (.72) |
| **Total Tobacco Marketing** | .002 (.85) |
| **Proximity to School** | |
| > 1000 feet | ref |
| Within 1000 feet | .13 (.70) |
| **Store Retailer Neighborhoods** | |
| %Black | -.02 (.41) |
| %Hispanic | .13 (.70) |
| % Bachelors or More | -.01 (.45) |
| % Family Poverty | .02 (.23) |
| **County** | |
| Durham | ref |
| Buncombe | .71 (.54) |
| New Hanover | -.13 (.91) |

Table B.2 shows additional analyses that replace the source of information variable shown in Table 5.2. Instead of examining source of information as whether or not a retailer cited a formal source, in these analyses I look at whether or not they cited a government agency as a source of information about tobacco control regulations. This model looking at government source of information had poorer fit indices compared with the model using formal source of information. CFI and TLI were under established cutoff criteria of .95 (RMSEA =.02, CFI .90, TLI .93).This analysis shows that pharmacy/drug stores compared with grocery/supermarkets were

*less* likely to cite a government agency as a usual source of information about regulations (B=-1.15, p<.05). Conversely, stores in neighborhoods with more Hispanic residents (B=.04, p=.01) and in New Hanover versus Durham were *more* likely to cite a government source of information (B=.90 p=.003). All other results were non-significant.

**Table B.2 Multivariate Structural Equation Model of Barriers, Awareness, Government Source of Information, and Support for POS Policies**

| **IVs (n=249 except as noted)** | **Barriers (n=162)** | | **Awareness** | | **Govt Source of Information** | | **Support for POS** | |
|---|---|---|---|---|---|---|---|---|
| | B (SE) | p-value | B (SE) | p-value | B (SE) | p-value | B (SE) | p-value |
| **Compliance** | | | | | | | | |
| Noncompliant | .89 (.27) | .001 | .07 (.20) | .72 | .17 (.25) | .49 | -.44 (.20) | .03 |
| Compliant | ref | | | | | | | |
| **Individual Factors** | | | | | | | | |
| **Smoking Status** | | | | | | | | |
| Smoke every or some days | .16 (.22) | .46 | .29 (.22) | .18 | .36 (.22) | .10 | -.47 (.16) | .004 |
| Smokes no days | ref | | | | | | | |
| **Respondent Type** | | | | | | | | |
| Owner | .43 (.21) | .04 | .49 (.33) | .14 | -.25 (.38) | .52 | -.55 (.25) | .03 |
| Manager/Clerk | ref | | | | | | | |
| **Store Factors** | | | | | | | | |
| **Store Type** | | | | | | | | |
| Grocery Store/Supermarket | ref | | | | | | | |
| Gas Station/ Gas Convenience | .13 (.30) | .67 | -.02 (.28) | .94 | -.23 (.31) | .45 | -.77 (.25) | .002 |
| Convenience | .38 (.35) | .28 | -.18 (.30) | .56 | .51 (.37) | .17 | -.41 (.33) | .21 |
| Drug Store/Pharmacy | -.11 (.38) | .77 | .04 (.32) | .91 | -1.15 (.58) | .05 | -.62 (.28) | .03 |
| Tobacco Store | 1.24 (.48) | .01 | .43 (.52) | .41 | -5.59 (226) | .98 | -1.16 (.51) | .02 |
| Other Store | .53 (.46) | .25 | -.56 (.59) | .35 | -4.15 (273) | .99 | -.66 (.50) | .19 |
| **Amt. Tobacco Marketing** | -.003 (.006) | .56 | -.01 (.01) | .24 | .01 (.01) | .20 | .009 (.005) | .06 |
| **Proximity to School** | | | | | | | | |
| Within 1000 ft | -.005 (.28) | .98 | .14 (.25) | .59 | -.20 (.32) | .51 | .27 (.20) | .19 |
| Greater than 1000 ft | ref | | | | | | | |
| **County** | | | | | | | | |
| Buncombe | -.05 (.43) | .90 | .19 (.39) | .63 | .40 (.41) | .32 | -.62 (.36) | .08 |
| New Hanover | .05 (.33) | .87 | .10 (.32) | .75 | .90 (.30) | .003 | -.92 (.27) | .001 |
| Durham | Ref | | | | | | | |

Table B.3 shows similar analyses as shown in Table 5.3, again examining government source of information, rather than formal source of information. Stores with a government source of information had significantly higher odds of noncompliance only in Model 4 with retailer opinions, individual, store, and neighborhood covariates (AOR 4.19 95%CI 1.01, 17.31). When adding county as a covariate in Model 5, this result was no longer statistically significant. Other results were substantively unchanged, though tobacco stores were less likely to be noncompliant though this was a marginally significant effect.

**Table B.3 Barriers, Awareness, and Source associated with Noncompliance with POS Provisions**

| Constructs [AOR (95% CI)] (n=161) | Model 1 Barriers Awareness and Source | Model 2 Individual Covariates | Model 3 Individual and Store Covariates | Model 4 Individual, Store and Neighborhood Covariates | Model 5 Individual, Store, Neighborhood, and County Covariates |
|---|---|---|---|---|---|
| **Barriers** | **2.25 (1.34, 3.79)** | **2.42 (1.39, 4.24)** | **2.62 (1.48, 4.66)** | **5.24 (2.41, 11.37)** | **7.07 (2.74, 18.20)** |
| **Government Source of Information** | 1.96 (.70, 5.54) | 2.17 (.01, .88) | 2.13 (.79, 5.70) | **4.19 (1.01, 17.31)** | 3.19 (.52, 19.53) |
| **Awareness of Regulations** | 1.88 (.77, 4.59) | 1.95 (.78, 4.86) | **2.58 (1.14, 5.81)** | 2.65 (.95, 7.39) | 2.23 (.63, 7.90) |
| **Individual** | | | | | |
| **Respondent Type** | | | | | |
| Store Owner | | .64 (.56, 2.60) | .68 (.16, 2.96) | .80 (.11, 6.10) | .45 (.05, 1.16) |
| Store Manager | | 1.00 (ref) | 1.00 (ref) | 1.00 (ref) | 1.00 (ref) |
| **Smoking Status** | | | | | |
| Never Smoker | | 1.00 (ref) | 1.00 (ref) | 1.00 (ref) | 1.00 (ref) |
| Current Smoker | | .56 (.20, 1.54) | .57 (.21, 1.52) | .29 (.08, 1.05) | .26 (.06, 1.16) |
| **Store** | | | | | |
| **Store Type** | | | | | |
| Grocery Store/Supermarket | | | 1.00 (ref) | 1.00 (ref) | 1.00 (ref) |
| Gas/ Gas Convenience | | | 1.04 (.25, 4.37) | 1.07 (.18, 6.55) | 1.17 (.24, 5.77) |
| Convenience | | | 2.13 (.38, 12.07) | 1.22 (.15, 9.74) | 1.95 (.07, 51.31) |
| Drug Store/Pharmacy | | | 3.92 (.78, 19.60) | 4.67 (.60, 36.60) | 7.87 (.77, 80.63) |
| Tobacco Store | | | .46 (.03, 6.60) | .13 (.01, 2.43) | **.04 (.00, .89)** |
| Other Store | | | .89 (.08, 10.56) | 1.85 (.09, 36.71) | 1.42 (.05, 43.47) |
| **Tobacco Marketing** | | | 3.60 (.33, 39.10) | 1.02 (99, 1.06) | 1.02 (.97, 1.06) |
| **Proximity to School** | | | | | |
| Greater than 1000 ft. | | | 1.00 (ref) | 1.00 (ref) | 1.00 (ref) |
| Within 1000 ft. | | | .50 (.11, 2.26) | 1.01 (.17, 6.07) | .51 (.11, 2.42) |
| **Neighborhoods** | | | | | |
| %Black | | | | **.89 (.84, .94)** | **.91 (.85, .96)** |
| %Hispanic | | | | .96 (.81, 1.13) | .99 (.85, 1.17) |
| % Bachelors + | | | | **.94 (.90, .99)** | .97 (.93, 1.02) |
| % Family Poverty | | | | **1.13 (1.03, 1.23)** | **1.12 (1.07, 1.19)** |
| **County** | | | | | |
| Durham | | | | | 1.00 (ref) |
| Buncombe | | | | | 6.21 (.26, 149.54) |
| New Hanover | | | | | .32 (.02, 6.29) |

### B.2 Additional Analyses for Study 2

Here I provide the descriptive statistics for the questions that asked about whether respondents would be more likely, less likely, or whether it would make no difference to visit a store with graphic warnings and black and white text on ads (Table B.4). I also asked smokers whether they would be more or less likely to buy cigarettes in such a store or whether it would make no difference. Both questions referenced the picture shown in Appendix A. These questions did not fit well into the Study 2 manuscript on policy support and will be addressed in a manuscript separate from the dissertation.

About 75% of respondents thought that the graphic warnings would make no difference to their shopping behavior and just under that percentage of smokers thought it would not make a difference in buying cigarettes. Almost 9% of respondents would be more likely to shop at stores with graphic warnings, while 15% would be less likely to shop at such stores. If stores had graphic warnings, 11% of smokers would be more likely to buy cigarettes while 15% would be less likely to buy cigarettes.

**Table B.4 Descriptive Statistics of Visiting Stores or Buying Cigarettes in Stores with Graphic Warnings**

| **Looking at the picture, do you think that if stores had graphic warning labels on cigarette packs and ads that it would make you…** | **More likely to visit the store, less likely to visit the store, or would it make no difference to you?** | **More likely to buy cigarettes, less likely to buy cigarettes, or would it make no difference to you?** |
|---|---|---|
| | Total Sample (n=17383) Weighted Percent (95% CI) | Smokers only (n=6578) Weighted Percent (95% CI) |
| A lot more likely | 3.4 (2.9, 3.8) | 5.3 (4.4, 6.1) |
| A little more likely | 5.2 (4.7, 5.8) | 5.7 (4.9, 6.6) |
| No difference | 76.0 (75.0, 77.1) | 73.8 (72.1, 75.5) |
| A little less likely | 8.3 (7.7, 9.0) | 10.7 (9.5, 11.9) |
| A lot less likely | 7.0 (6.4, 7.7) | 4.5 (3.7, 5.3) |

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