

Smoke-Free Multi-Unit Housing: Design of a Mixed-Method Economic Impact Evaluation in North Carolina

Rachel Clad, Lindsay Tague, Allison Young, Rachel Zucker

Tobacco Prevention and Control Branch, North Carolina DHHS

Preceptor: Anna Stein, JD MPH

Faculty Advisor: Mike Bowling, PhD

*TPCB Capstone
Team
2013-2014*

We have neither given nor received any unauthorized assistance in completing this assignment.

Smoke-Free Multi-Unit Housing: Design of a Mixed-Method Economic Impact Evaluation in North Carolina

Rachel Clad, Lindsay Tague, Allison Young, Rachel Zucker

MPH Capstone Project, 2013-2014

II. Abstract

Background: With the reduced but persistent rate of smoking in the US, second-hand smoke exposure continues to be a pressing public health issue. According to the U.S. Department of Health and Human Services, there is no safe level of exposure to second-hand smoke (SHS). Exposure to SHS can cause lung cancer, coronary heart disease, and is especially dangerous for pregnant women, babies and children. Multi-unit housing (MUH) properties create particular challenges related to SHS exposure, as residents have no control over the smoking status of adjacent tenants. In MUH, tenants may be exposed to neighbors' SHS through multiple routes, including through doors, air vents, building cracks, hallways and patios. **Methods:** The 2012-2013 Tobacco Prevention Control Branch (TPCB) Capstone team conducted formative research on the barriers to smoke-free housing policies in North Carolina and created an informational campaign to raise awareness about the risks of tobacco and SHS among MUH property owners/managers (O/M) and tenants. The 2013-2014 TPCB Capstone team built on the foundation laid by previous teams and TPCB research to strengthen the case for going smoke-free from the perspective of MUH O/M. The project included formative research on the financial impact and perceptions of smoke-free policies as reported by MUH O/M and a review of the literature on cost analyses of smoke-free policies in MUH and other settings. We collaborated with experts to refine the constructs identified in our research and developed a quantitative survey instrument and a qualitative interview guide to be used to assess costs at a large North Carolina-based property management company. **Results:** Our formative research revealed six key constructs that capture the economic impact of smoking in MUH. Based on these, we produced a Quantitative Study Protocol that captures maintenance and turnover costs from financial documents and a Qualitative Study Protocol that captures maintenance workers' experience during the transition to smoke-free policies. We piloted the qualitative Interview Guide with maintenance workers from an MUH property and produced a Suggested Finalized Interview Guide. **Discussion:** Our deliverables represent the first step in building a compelling financial case for MUH to go smoke-free. This is especially important work as little research has been conducted at the intersection of smoke-free policies and MUH with regard to cost. Next year's TPCB Capstone team will sustain this year's work and be able to collect and analyze data efficiently using the tools and protocols developed this year.

III. Acknowledgements

Thank you to the many consultants and mentors who have helped us with this project. We extend a special thanks to: Anna Stein, MPH, JD; Janet Suttie, MPH; Mike Bowling, PhD; Meg Landfried, MPH; and Christine Agnew-Brune, MPH. We could not have accomplished our work without the input of researchers and MUH owners and managers including: Andrea Licht, MS; Mark Travers, PhD; Brian King, MPH, PhD; Michael Ong, PhD; Scott Wilkerson, CPA; Scott Alderman, MBA; Rick Allen, CPM; Lilia Lukowsky, MPH, PhD; Suzanne Maman, PhD; Kurt Ribisl, PhD; and Adrian Meyer, MS.

IV. Acronyms

Acronym	Definition
CDC	Centers for Disease Control and Prevention
CTG	Community Transformation Grant
HB	Health Behavior
MPH	Master of Public Health
MUH	Multi-unit housing
O/M	Owners/managers
POMS	Property Owners and Managers Survey
PPM	Partnership Property Management
SAS	Statistical Analysis System
SHS	Second-hand smoke
SF	Smoke-free
TPCB	Tobacco Prevention and Control Branch

Table of Contents

II.	Abstract	2
III.	Acknowledgements.....	3
IV.	Acronyms	4
VI.	Introduction	6
VII.	Background	8
VIII.	Methods.....	13
IX.	Results.....	18
X.	Discussion	20
XI.	Conclusion.....	22
XII.	Appendices.....	24
	Appendix 1. TPCB Logic Model	24
	Appendix 2a. List of Surveys Analyzed.....	25
	Appendix 2b. List of Experts Consulted	25
	Appendix 2c. List of MUH O/M Consulted	25
	Appendix 3. Deliverable Tables.....	26
	Appendix 4. Construct Matrix	29
	Appendix 5. Table of Key Variables.....	30
XIII.	References	31

VI. Introduction

Capstone and the Tobacco Prevention and Control Branch

This project was completed by four Master of Public Health (MPH) graduate students in partnership with Anna Stein, JD, MPH, at the North Carolina Tobacco Prevention and Control Branch (TPCB). TPCB works to counter the negative impact of tobacco among residents of North Carolina through the development of partnerships and policies to prevent smoking initiation, eliminate exposure to second-hand smoke (SHS), support users who are ready to quit, and identify and eliminate tobacco-associated health disparities (TPCB, 2014). The Branch is located in Raleigh, North Carolina, and serves all North Carolinians by implementing tobacco-free living programs and building the capacity of eight local coalitions with funds from the Centers for Disease Control and Prevention's (CDC) Office on Smoking and Health (TPCB, 2014).

Community Transformation Grant

The Tobacco Prevention and Control Branch has been working to promote the adoption of smoke-free (SF) policies in multi-unit housing (MUH) in North Carolina for the past several years. In 2011, NC received a 5-year community transformation grant (CTG) from the Centers for Disease Control and Prevention (CDC) to work on policy change in the fields of Tobacco-Free Living, Active Living, and Healthy Eating. One of the Tobacco-Free Living strategies of the CTG Project is to increase the number of North Carolinians who live in MUH properties covered by SF policies. TPCB is working with CTG grantees and other grantees in local health departments around the state to begin interventions designed to promote SF policies in MUH.

Goals of the Capstone Project

Despite research evidence of the negative health effects of tobacco, North Carolina has a low rate of voluntary smoke-free policy adoption in MUH. In order to build a compelling financial case for MUH owners/managers (O/M), we employed our skills and expertise from key stakeholders (see

Appendix 1, TPCB Logic Model: Inputs and Appendix 2) to design a mixed methods study describing the potential costs and savings of going smoke-free. The overall goal of our activities was to set the foundation for the study to be conducted by a future Capstone team. In the first semester, we obtained IRB approval to collect financial data from MUH O/M and produced a Literature Review that examined the state of the field of smoke-free MUH. These findings and formative key informant interviews were summarized in a Research Plan that also proposed recommendations for study design. Based on our formative work, in the second semester, we developed both Quantitative and Qualitative Study Protocols that detail a survey plan and methods for next year's Capstone team to carry out (see Figure 1 below for a list of deliverables and Appendix 3 for detailed descriptions of the deliverables). These documents will aid in the project transition. We anticipate that the outcomes of the study will include a change in MUH O/M beliefs on the cost-effectiveness of implementing smoke-free policies, an increase in the adoption of these policies, and, ultimately, an improvement in health outcomes among MUH vulnerable populations (see Appendix 1, TPCB Logic Model: Outputs and Impact).

Figure 1. TPCB Capstone Team Deliverables

- **IRB approval**
- **Literature Review: Impact of Smoking-Related Costs and Methods of Cost-Evaluation of Smoke-Free Policies**
- **Research Plan detailing economic impact study design**
- **Quantitative Study Protocols and Recommendations**
 - Collection Methods and Database Mockup
 - Proposed Analysis Methods
- **Qualitative Study Protocols and Recommendations**
 - Interview Guide
 - Pilot Test Findings
 - Suggested Finalized (unpiloted) Interview Guide

Overview of Capstone Summary Report

This Summary Report will detail the process by which the Tobacco Prevention and Control Branch (TPCB) Capstone team arrived at our deliverables and will discuss how and why our results are

important for informing the work of TPCB. The Summary Report includes a literature review of the available published literature on the epidemiology and prevalence of smoke-free policies in the United States, and the economic impact of implementing smoke-free policies in MUH and other industries. The Methods section details the process of our deliverable development, followed by the Results section that describes our findings. Finally the Discussion section provides insight into opportunities and barriers of the issue and steps to be taken to promote project sustainability.

VII. Background

Epidemiology and Prevalence of Smoke-Free Policies in the United States

There are an estimated 79 million persons living in MUH in the United States, 9% of whom live in subsidized housing (King, Babb, Tynan & Gerzoff, 2012). A large proportion of these individuals are children, elderly, or disabled, and are thus at higher risk for disease and premature death attributed to SHS exposure (King et al., 2010). Risk of SHS exposure is particularly high in MUH. Data indicate that a disproportionately high number of current cigarette smokers reside in MUH properties as compared to the national average (CDC, 2009), and that environmental tobacco smoke transfer from public and private smoking spaces to non-smoking spaces occurs frequently in MUH (Hewett et al., 2007, King et al., 2010; Levy et al., 2013;). One study estimates that nearly 30 million MUH residents who do not smoke are exposed to SHS from other units in their private living unit (King et al., 2012). Nonsmokers exposed to SHS have a 25-30% increased risk of heart disease and a 20-30% increased risk of lung cancer (HUD, 2010). Despite this evidence of increased risk, a review of the literature points to a dearth of complete or partial smoke-free laws or policies on MUH properties in the United States.

Out of approximately 3,400 public housing authorities in the United States, only 230 have implemented any smoke-free MUH policy, representing 27 states (Smoke-free Environments Law Project, 2011). Please note that though this is the most recent data available, it's likely that many more public housing authorities have adopted smoke-free MUH policies since 2011. Few studies exist that

provide detail on the state of domestic smoke-free MUH policies. Cramer, Roberts, and Stevens (2011) surveyed MUH managers in Nebraska to discern their attitudes and behaviors toward implementing smoke-free policies. Of those who responded, 72% indicated they allowed smoking on their properties, while only 16% reported having a comprehensive smoke-free policy. Another study showed that only 9% of MUH owners and managers in two counties in New York surveyed by King et al. (2010) reported that their buildings were smoke-free. Even in California, known for its progressive smoking policies, nearly half of the 343 properties surveyed by Ong (2012) had no smoke-free policy.

Though the literature points to differences in MUH operators' interest in implementing smoke-free policies on their properties – just 3% of owners reported being very interested in designating smoke-free buildings (Hewett et al., 2007) - it is clear that the majority of renters of MUH units favor living in smoke-free buildings. Seventy percent of renters reported being at least somewhat interested in renting designated smoke-free units (Hewett et al., 2007) with some expressing willingness to pay more for this feature (Henrikus et al., 2003). Renter preferences alone, however, have not sufficiently motivated MUH owners and managers to change their smoking policies. MUH owners and managers frequently cite cost-related reasons as perceived barriers to implementing a smoke-free policy, such as fears of an increase in operating costs. MUH owners expect increased vacancy and turnover rates, tenant objections, loss of market share, and potential enforcement problems upon adopting smoke-free policies (Cramer, 2011; Hewett et al., 2007; King et al., 2010). MUH managers and owners who have implemented smoke-free policies on their properties, however, have refuted these concerns. Many have seen mostly neutral or positive effects of these policies on vacancies, turnover, and staff management (Cramer, 2011; Hewett et al., 2007). Additional research on the costs associated with implementing smoke-free policies in MUH has the potential to positively influence their widespread adoption and should be explored.

The Economic Impact of Smoke-Free Policies in MUH

While few studies have been conducted on smoking-related costs in multi-unit housing properties, the existing literature consistently estimates cost savings in conjunction with smoke-free policies. While one study examined the impact of smoke-free policies at a national level, the majority of research that has been conducted on this topic focuses on maintenance costs and insurance costs at the property level, collected through surveys with property owners and managers.

A study conducted by King, Peck, and Babb (2013) is the only study that estimates the annual national cost savings that could be incurred with the prohibition of smoking in all US subsidized housing. These costs savings were calculated by examining three variables: health care costs related to SHS, costs of renovation of units that permit smoking, and smoking-attributable fire costs in U.S. subsidized housing. Health care expenditures were assessed using Minnesota residents as a representative sample population. Costs were derived from health insurance claims made by non-smokers in previously published data from Minnesota's largest health insurer and from living costs, which were multiplied by the state-specific number of subsidized housing residents (excluding Alaska). Renovation costs were estimated by calculating state-specific turnover estimates for subsidized housing (# of occupied subsidized housing units x average annual turnover rate x estimated prevalence of adult smoking x adjustment for the 30% of smokers with smoke-free rules). This estimate was multiplied by an estimate of the excess cost of renovating a single unit that permits smoking (\$820), obtained from the Smoke-free Coalition of Maine. Finally, fire costs were calculated by multiplying the total number of subsidized housing residents in the United States by National Fire Protection Association estimates of the annual per capita loss from all U.S. fires (\$203), which includes property damage (\$62) and deaths and injuries (\$141).

King and colleagues estimated the U.S. could save \$521 million per year (range: \$270-\$892 million) with the implementation of smoke-free policies in all subsidized housing (King et al., 2013). Of the \$521 million, it is estimated that \$341 million of the savings would be attributed to SHS-related

health care (range: \$169–\$611 million), \$108 million of the savings would be attributed to renovation expenses (range: \$61–\$169 million), and \$72 million to smoking-attributable fire losses (range: \$41–\$113 million) (King et al., 2013). As evidenced by the wide ranges in the findings for this study, much of the extant research in this area is imprecise.

Data that is often cited by existing cost analyses comes from Smoke Free New England (2009). They report estimates of turnover costs for units occupied by non-smokers, light smokers and heavy smokers. Smoke Free Housing New England asked public housing authorities to track their costs and to break down costs as precisely as possible. This was a groundbreaking effort to collect smoking-related cost data, but no formal process or survey was used. This informal process calls into question the validity of the data, as the four housing authorities may have interpreted costs differently or used different definitions of “light” and “heavy” smoking tenants.

Another study, conducted by Ong et al. (2012), used a computer-assisted telephone survey to collect financial information on smoking-related costs at the property level from owners and managers of MUH. The aim of the study was to determine whether smoke-free policies have prevented smoking-related costs and what economic benefits, if any, are associated with implementing completely smoke-free policies. According to the results of his survey, Ong predicts that smoke-free policies in MUH across the state of California could save property owners \$18,094,254 each year (Ong et al., 2012). Mirroring King et al.’s 2013 study, the range of smoking-related costs reported in the work of Ong et al. is extremely large. Smoking-related operating costs for partially smoke-free multiunit properties with a recently vacated unit, for example, ranged from \$0 to \$83,000. The fact that Ong’s study is unique in this field illustrates for further research.

Other research has demonstrated the importance of making economic arguments to bolster the passage of smoke-free policies in MUH (Pizacani, Laughter, Menagh, Stark, Drach, & Hermann-Franzen, 2011). Pizacani et al. (2011) determined that while health-related arguments were unconvincing to

landlords, “high renter demand for smoke-free housing, the desire to reduce smoking-related costs (lower turnover and maintenance costs), and the fact that smoke-free policies are legal were powerful arguments with property managers.” Making the financial case for smoke-free policies led to two large housing providers successfully implementing smoke-free policies in properties comprising over 13,700 units in the Portland-Vancouver metro area (Pizacani et al., 2011). Additional research that bolsters the business case for MUH to go smoke-free is important to convince property owners and managers to implement these policies.

Recent Developments in Smoke-Free MUH Policy

Smoke-free MUH research has gained momentum in the past several years, resulting in several new projects. In 2009, The Roswell Park Cancer Institute administered a survey to apartment owners and managers assessing SHS exposure as well as MUH smoking policies and their impact on vacancies and turnover. In North Carolina, the Community Transformation Grant Project recently completed a survey to study smoke-free policies in affordable MUH. This survey examines property and unit characteristics, the state of smoking policies and environments, as well as the costs related with smoking policies (Community Transformation Grant Project, 2013).

Currently, the Tobacco Prevention and Control Program of the Los Angeles Public Health Department in California is piloting an MUH operator survey on MUH smoke-free policies. This survey is a part of an effort to assess the costs and other factors impacted by smoke-free policies in MUH, including: smoking-related issues; knowledge, attitudes, beliefs, and intentions related to smoke-free policies; and operator demographics (LA County Department of Health, 2012). The survey will rely on close interaction between property managers and tenants, as well as site visits, to determine smoking status on a unit level. This survey is currently being piloted among 9 MUH owners to assess survey feasibility, including level of question comprehension and comfort with the length of the survey.

Rationale for Capstone Project Assessing Costs Associated with Smoking in MUH

Though the MUH smoking policy field writ large is in its early stages and existing research is limited and imprecise, this research points to the importance of an accurate assessment of the economic impact of smoke-free policies in MUH. The literature also illuminates the importance of targeting MUH leadership in implementing policy change, as well as emphasizing economic outcomes rather than public health consequences in working with landlords (Pizacani et al., 2011). The study we designed will add thorough and accurate smoking-related cost information to the body of knowledge on this topic. Our results offer insights into the economic impact of MUH smoke-free policy implementation and will ideally contribute to the widespread adoption of these policies, ultimately resulting in improved health outcomes of MUH renters.

VIII. Methods

Orientation to TPCB and Stakeholders

To become oriented to the project, the TPCB Capstone team met with our preceptors during May 2013 to discuss initial ideas for the Capstone project. We again met in August 2013 to have a more focused discussion on the project direction. Two members of the Capstone team attended a Community Transformation Grant meeting in October to meet with key stakeholders for the project, including researchers in the field of smoke-free MUH policies and MUH O/M from North Carolina. This series of meetings helped to orient the Capstone team to TPCB and the salient issues related to smoke-free policies in MUH.

We submitted an IRB application and received an IRB exemption on November 7, 2013 since our research focus on economic impact was deemed non-Human Subjects Research.

Research Methods – Phase I: Formative Research

In order to understand the state of the field of smoke-free policies in MUH, the TPCB Capstone team reviewed the existing surveys in the field and conducted interviews with researchers in the field of SF MUH and MUH O/M from properties in North Carolina. The parsing of research articles and surveys

to identify gaps or thin research in the field required the application of our research methods training. This process revealed the importance of a critical eye, especially when the data are impressive. This section describes each of these approaches in more detail.

Existing Surveys Reviewed

The TPCB Capstone team reviewed five existing surveys in the field of smoke-free policies in MUH to assess best practices for measuring economic impact. When these surveys were not available publicly, the TPCB team requested the surveys from researchers. Although not all surveys specifically targeted cost, the surveys we reviewed all included some questions related to costs associated with smoking policies in MUH including constructs related to administrative costs, vacancy and turnover costs, and maintenance costs. It was clear from the review that several of the surveys were heavily influenced by surveys that had come before them, evidenced by similar or even identical questions across surveys. (See Appendix 2a for a complete list of surveys.)

We catalogued and analyzed information from the survey review in a Construct Matrix using Microsoft Excel (See Appendix 4 for a screenshot of the matrix). Questions from each survey were sorted by construct which provided a visual representation of the survey crossover and showed the spectrum of question formats.

Interview Participants

The Capstone team had little previous experience evaluating economic research or MUH policies. The subject matter for this project prompted us to expand our own understanding of economic and housing terminology and measurement through research and reaching out to experts in the field. It demanded humility in our own limitations and ultimately enabled us to accomplish more than we could have on our own.

To provide context for the information we gathered during the literature review and the survey review, we interviewed six researchers in the field of tobacco policy and MUH, a detailed list of whom

can be found in Appendix 2b. We were put in contact with these researchers through the Gillings School of Global Public Health (Dr. Bowling) and our Preceptor's existing connections.

To complement these interviews and gain the on-the-ground perspective of policies in practice in MUH, we spoke with three MUH O/M of MUH in NC (informants listed in Appendix 2c). These informants were selected based on their existing relationships with TPCB and previously expressed interest in contributing to smoke-free policy research. After an introduction by our Preceptor via email, the Capstone team reached out via email to contact researchers and MUH O/M and followed up by phone to conduct our interviews. These contacts were used to expand our network and put us in contact with additional individuals. As the project changed throughout the course of the year, it was essential to our project to maintain open and clear communication channels with stakeholders. We did this through regular email and phone updates and soliciting advice during these communications when needed. These contacts provided input on the constructs we extracted from the existing surveys and best practices for collecting data from properties. We also took the opportunity to discuss what kind of financial documents would be available at various levels of management and the feasibility for different survey administration methods.

All interviews were conducted over the phone using a semi-structured interview format. Notes of each interview were collected concurrently in a Google Document shared within the team.

The data gathered in these interviews, along with information from our literature review and review of existing surveys comprised our Research Plan deliverable. This document enumerated six constructs that were consistently identified in existing research on smoke-free policies in MUH. The Research Plan contained researcher and expert quotes and survey items sorted according to construct, and concluded with three proposed survey designs for statistical analysis during the study. Coordinating this process across media and authors was an exercise in refining concepts and thorough editing.

Our Literature Review and Research Plan equipped us with a list of key design elements to incorporate into our survey design and instruments. These elements dictated that our instruments should 1) focus on turnover costs, 2) examine changes in costs and labor both before and after the transition to smoke-free policies, and 3) include a qualitative component, in order to identify smoking related costs that are not specifically delineated on financial documents.

Research Methods – Phase II: Qualitative and Quantitative Pilot

The Research Plan and formative research identified gaps in the literature and provided a direction for our Capstone project. After consulting with our Preceptors, it was clear that a study design that paired the annual financial statements that detail operative expenses related to turnover costs with qualitative data from maintenance workers would provide the most complete picture of the economic impact of passing smoke-free policies in MUH in NC. With this direction, our Capstone team sought to lay the foundation for next year's team to carry out the study by creating Quantitative and Qualitative Study Protocols and Recommendations. For these Protocols we piloted draft documents with North Carolina MUH companies and compiled finalized Protocols so that next year's team can quickly begin their data collection.

The results of the feasibility tests and final Study Protocols and Recommendations are described in the Results section below. Based on the availability of data and timing of smoke-free transitions, the Capstone team decided to test the feasibility of the qualitative component with PPM and test the quantitative component with Landura Management Associates.

Qualitative Pilot

We developed research questions for the Interview Guide based on the findings in the Research Plan and conversations with our Preceptor, who has several years of experience working with MUH partners. Professor Suzanne Maman, an expert in qualitative research methods, provided feedback on

our research questions and we presented a final draft to our Preceptor. We piloted the draft interview guide with a convenience sample of two maintenance workers at PPM and revised it to reflect their feedback and our findings. For the qualitative component, we developed an interview guide to be used to interview maintenance workers about their work experiences before, during, and after the transition to smoke-free policies. We piloted this instrument with 2 maintenance workers who were recruited through an email to Rick Allen of PPM and were interviewed with the permission of their property manager. The interviews were conducted via telephone and lasted approximately 30 minutes each. The outcomes of the pilot test are discussed in the Results section.

Quantitative Instrument Development

Our Preceptor provided us with sample financial documents from two NC-based MUH property management companies. The first documents, called RD Forms, include annual financial data for a single property. Rick Allen of PPM also provided us with sample operational financial documents. The sample forms we received were monthly expense reports for all operations. Through our research and discussions with our Preceptor, we identified important line items from the documents that would be important for analysis.

The documents we received were PDF documents. Recognizing the logistical challenge of collecting hundreds of paper documents, the team met with Adrian Meyer, a database professional and employee of Lineberger Cancer Center, to discuss best methods for collecting and storing financial data. Our faculty advisor, Professor Mike Bowling, provided further input on the best way to code variables within this data for use in SAS (a statistical analysis program). With this knowledge, we created a Table of Key Variables to describe how the data will be stored in Microsoft Excel (see Appendix 5).

Data Management

Next we pilot tested the data management and collection process. We collected feasibility data from the interviews with maintenance workers using Audacity audio recording software and transcribed it manually in Microsoft Word. These data will not be used as part of the final sample. We transferred the audio files, transcripts and Suggested Finalized Interview Guide from the qualitative pilot along with the Database Mockup to our Preceptor for refinement and use by next year's Capstone team.

Dissemination of Formative Research and Study Design

The Capstone team was fortunate to present our project to both the TPCB staff and the CTG staff at NC DHHS in Raleigh, NC. Our Capstone products will be delivered to several audiences, including our Preceptor who is the legal liaison for TPCB and CTG, fellow MPH graduate students on next year's team and ultimately MUH owners and managers. Tailoring documents and concepts for these audiences has honed our skills in writing and presenting ideas for diverse readers.

In addition to sharing the Qualitative and Quantitative Study Protocols and Recommendations, the 2013-2014 TPCB Capstone team will meet with next year's Capstone team in April 2014 to help ground them in the project and familiarize them with TPCB. This will serve to pass on institutional knowledge and help jumpstart the project in the fall.

IX. Results

Formative Results

The formative research findings are described in the Research Plan that was delivered to TPCB's Preceptors in December 2013. Through the formative process described above, we elicited six key constructs which contribute to the financial impact of adopting smoke-free policies:

- 1) Cleaning/Maintenance Expenses Related to Turnover** – includes costs of cleaning, repairs and maintenance, painting and decorating, and trash collection.
- 2) Vacancy** – measures the number of units currently vacant which impacts economic success of the property.
- 3) Smoking Status and Policies** – defines a property's restrictions on smoking and tobacco.
- 4) Fire-related Expenses** – measures costs of damage due to smoking-related fires.

- 5) **Administrative Expenses** – measures costs related to advertising and enforcing smoke-free policies.
- 6) **Manager Beliefs** – refers to the personal beliefs of property owners and managers related to the appropriateness, legality, morality, perceived benefits, perceived barriers, and economic impact of implementing smoke-free policies in MUH

Based on our interview findings, we determined that three constructs most directly influenced costs associated with smoking policies and were most feasible to assess through available financial documents:

- 1) **Cleaning expenses related to unit turnover**
- 2) **Maintenance expenses related to unit turnover**
- 3) **Smoke-Free Policies**

Pilot Results

The primary results from our project included Quantitative and Qualitative Study Protocols and Recommendations which include a Suggested Finalized Interview Guide and Database Mockup.

Qualitative Interview Guide:

The pilot was successful in capturing descriptive data about maintenance workers' experience of turning over smoking units and their perceptions about property-wide SF policies. Our interviews revealed that maintenance workers experience the downsides of smoking in MUH first-hand. The interviewees provided data about the cleaning and turnover process and detailed the extra paint, cleaning time and supplies, and more frequent carpet and HVAC replacements that a smoking unit requires.

The pilot was also successful as a feasibility study for the Qualitative Interview Guide. Both interviewees were asked about the interview process itself and the completeness of the questions we asked. Both participants reported that the process was unobtrusive and would not add any questions. During the interviews, we determined that collecting additional information about interviewees' work history (length of time working at the property) and property/tenant characteristics (mostly senior tenants, etc.) would provide context to the data collected.

From our pilot, we also determined that phone surveys are a feasible method for conducting the qualitative component of our survey. Through conversations with Dr. Maman and Dr. Bowling, we determined that the upcoming Capstone team should interview 15-20 maintenance workers at properties that vary in location and size. This should allow the team to reach saturation of themes for the qualitative research. The interviews should take approximately 20-30 minutes, so this number of interviews will not be overly burdensome for the team to conduct.

Quantitative Database Mockup

The Quantitative Study Protocol and Recommendations includes a Database Mockup to guide the collection and analysis of cost data from MUH properties. The design for this database was informed by formative research with database professionals and included key elements such as 1) relational tables, 2) abilities to cross-examine data for accuracy, 3) the ability to easily search and analyze data. We collected all financial data that was available, with the idea that the results from future qualitative interviews and future Capstone work will guide the final analysis process, using this database.

X. Discussion

The 2013-2014 TPCB Capstone team produced deliverables that will serve as ready-made tools for conducting a mixed-methods study to show the economic impact of SF policies in MUH. The evidence-based Qualitative Study Protocol and Recommendations supports the exploration of maintenance workers' experiences in transitioning MUH to SF policies. This is an area that has not yet been researched and provides a unique insight into the impact of MUH SF policies. The Quantitative Study Protocol and Recommendations enables TPCB to gather and analyze financial data from properties across North Carolina, showing the property-level and aggregate financial impact of passing SF policies. Together, these tools form the basis of an important new look at the case for voluntary passage of MUH SF policies. The results from this study will bolster arguments that can be used to convince MUH O/M that implementing a SF policy is not only vital for resident health, but is also a wise

financial decision, which is especially important in North Carolina where state law prohibits local government from restricting smoking in MUH.

Limitations

Throughout the project, we balanced big ideas with real-world limitations. Our initial research plan suggested several analysis methods that, while methodologically strong, were not always feasible given property timelines and TPCB's resources. For instance, one way to strengthen this study would be to work with a cross section of property management companies across the state, rather than focusing on one management company. Realistically, however, few companies have implemented universal SF policies, and we were able to save time and resources by leveraging the strong relationships that TPCB previously developed with certain MUH O/M. Given adequate time, another strategy that would bolster the financial case for implementing SF policies would be exploring a wider variety of costs and savings that are incurred during policy implementation. For example, over time insurance costs may decrease due to fewer smoking-related fires, or one-time costs may be incurred during implementation as smoking huts or signs are installed at properties. While investigating these costs would provide a more complete picture of the financial implications of SF policies, the realities of research timelines means that waiting several years to assess some costs is unrealistic. Similarly, the complexity of assessing multiple cost areas would demand resources and time that those carrying out the study will not have. Designing our project within these logistical restrictions, however, ensures that the study is realistic and increases the likelihood of its future completion.

Recommendations

After the TPCB Capstone team completes the 2013-2014 project, we recommend TPCB take several steps to ensure that the proposed research is successfully carried out. First, TPCB will need to successfully hire an intern in order to set up logistics for data collection over the summer. TPCB has begun this recruitment process. TPCB will also need to work with the 2014-2015 Capstone team to

collect data, perform appropriate analyses, and write up the results in a manuscript and other dissemination formats as desired. Though our TPCB Capstone team has prepared the tools and protocols for the study to be ready for use, some modifications may be necessary as the future Capstone team begins implementing the surveys. Otherwise, we recommend that the Capstone team adheres to the plans we propose this year, since our plans take into consideration previous research as well as TPCB's needs and resources.

Sustainability

This is a one-time project, so short-term sustainability of our work will take the form of successful implementation of our study design by next year's Capstone team. In the long-term, dissemination of relevant results to policy makers, MUH property managers and owners, and other relevant stakeholders will be vital for the sustainability and relevance of our research results. The TPCB staff, including Anna Stein, will continue their work as tobacco control champions and are invaluable in sustaining and disseminating the work of all UNC MPH Capstone teams.

XI. Conclusion

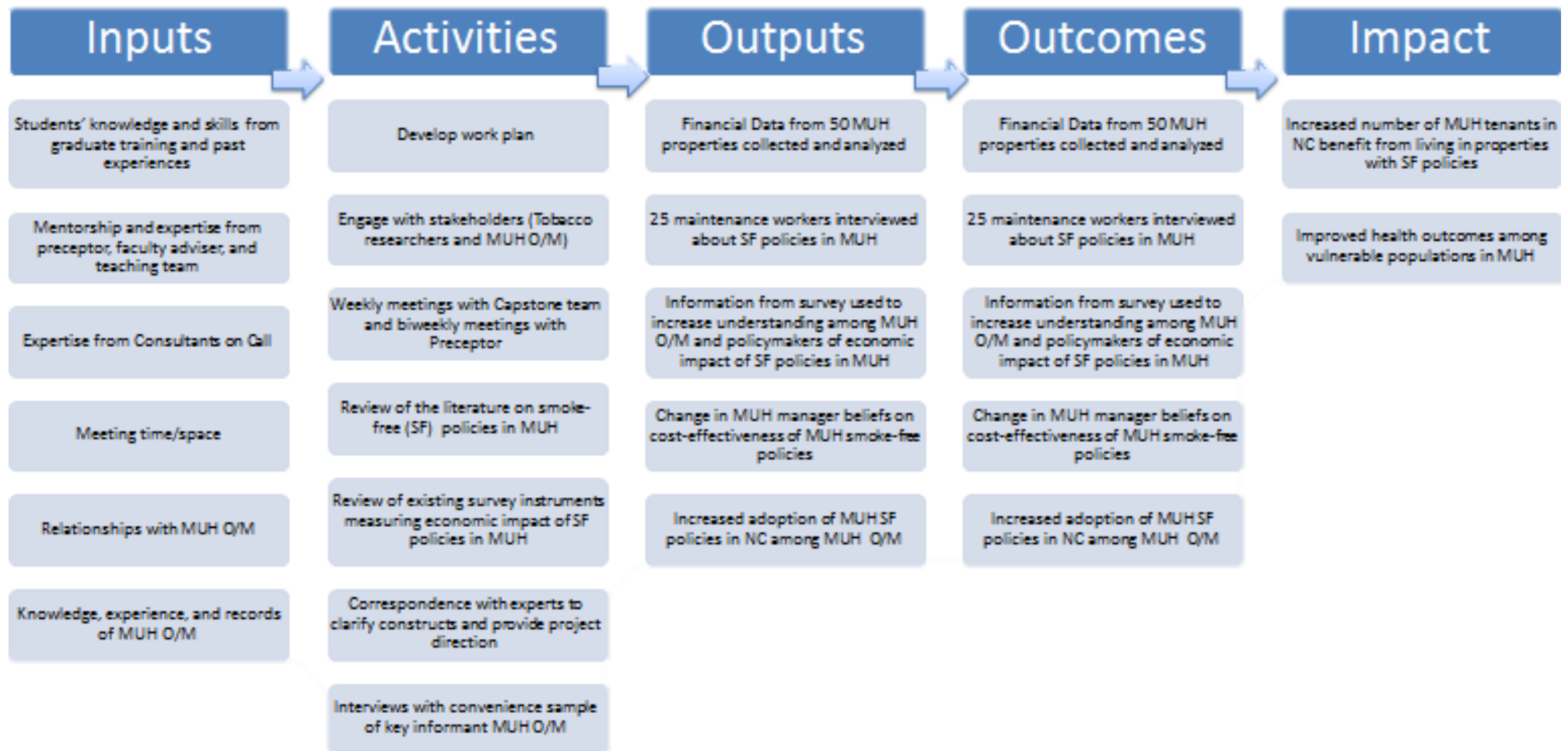
The TPCB Capstone team investigated the state of the field in smoke-free housing in MUH with the goal of better understanding the economic impact of passing MUH smoke-free policies. Two things became clear through our interviews and research: only a small percent of MUH properties nationally have smoke-free policies in place, making SHS a persistent health hazard for populations living in MUH, and there is a dearth of evidence to support the financial case for passing smoke-free policies in MUH.

Using the literature, interviews with researchers, MUH O/M, and existing survey instruments, the Team identified the need for data illustrating the comprehensive impact of passing smoke-free policies in MUH and devised tools for its collection and management. By pilot testing both qualitative and quantitative instruments, the 2013-2014 TPCB Capstone team has developed tools that will allow next year's Capstone team to move forward quickly as they begin their data collection and analysis.

Working with diverse stakeholders in a dynamic funding environment, the team capitalized on the opportunity to apply knowledge from the Health Behavior program and hone skills in project management and networking. Our hope is that this project paves the way for North Carolina to lead the charge in voluntary smoke-free policies in MUH.

XII. Appendices

Appendix 1. TPCB Logic Model



Acronyms

MUH	Multi-unit housing
O/M	Owners and Managers
SF	Smoke-free
SHS	Second-hand smoke

Appendix 2a. List of Surveys Analyzed

These surveys are not in the published literature and were obtained by contacting study authors directly.

- Property Owners and Managers Survey (POMS) – Department of Housing and Urban Development
- National Survey of Apartment Owners and Managers – Roswell Park Cancer Institute
- Ong et al. (2012) Survey
- Smoking Policies in North Carolina Multi-unit Affordable Housing – NC TPCB
- Smoke-Free Multi-Unit Housing Policy Study: Operator Survey – LA County (In Development)

Appendix 2b. List of Experts Consulted

- **Dr. Mike Bowling**, Research Associate Professor, Departments of Health Behavior and Biostatistics
- **Andrea Licht**, Department of Health Behavior, Roswell Park Cancer Institute
- **Dr. Mark Travers**, Research Scientist, Department of Health Behavior, Roswell Park Cancer Institute
- **Dr. Brian King**, Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention
- **Dr. Michael Ong**, Associate Professor, Department of Medicine, General Internal Medicine and Health Services Research, UCLA
- **Dr. Lilia Lukowsky**, Epidemiologist for MUH study, Tobacco Control and Prevention Program, Los Angeles County Department of Public Health

Appendix 2c. List of MUH O/M Consulted

- **Rick Allen**, Vice President/Chief Operating Officer at Partnership Property Management
- **Scott Alderman**, President at Landura Management Associates
- **Scott Wilkerson**, Principal and Chief Operating Officer at Ginkgo Residential

Appendix 3. Deliverable Tables

Deliverable I: IRB Application	
<i>Format:</i>	Online application with supplemental drafts of interview materials
<i>Purpose:</i>	To ensure that the research is ethical, respectful of subjects, and that study findings will be appropriately disseminated
<i>Intended Audience(s):</i>	UNC Office of Human Research Ethics, TPCB
<i>Activities:</i>	<ul style="list-style-type: none"> • Drafted IRB application • Finalized and submitted IRB application • Modified IRB application in spring to incorporate qualitative study component
<i>Recommendations:</i>	<ul style="list-style-type: none"> • Next year's TPCB team should keep the IRB application up-to-date as changes in the study occur over the next year

Deliverable II: Literature Review	
<i>Format:</i>	5 page narrative report
<i>Purpose:</i>	To summarize the literature on methods currently being used to study and report on smoke-free policies' impact on cost and best practices for evaluating costs. Served as formative research for the Evaluation Plan and background for a manuscript.
<i>Intended Audience(s):</i>	TPCB, 2014-15 HB Capstone team
<i>Activities:</i>	<ul style="list-style-type: none"> • Consulted with experts (economists) to direct our review of the literature and to determine evaluation methodology. • Evaluated the ideas, research methods, and results of each publication; used to identify key constructs • Consulted with researchers and owners/managers on identified constructs and asked for feedback/input on construct validity • Developed literature review outline • Composed literature review draft • Draft was reviewed by preceptor • Finalized literature review • Disseminated literature review to TPCB and included in Capstone Summary Report
<i>Recommendations:</i>	<ul style="list-style-type: none"> • Use literature review findings to inform the 2014-2015 Capstone team's research

Deliverable III: Research Plan	
<i>Format:</i>	Narrative report, 1 page per construct
<i>Purpose:</i>	1. To describe how the team will collect data on cost. 2. To describe feasibility and appropriateness of collecting data on identified constructs.
<i>Intended Audience(s):</i>	NC Division of Public Health and applied research partners
<i>Activities:</i>	<ul style="list-style-type: none"> • Located existing research measuring smoking-related cost to managers incurred by MUH management and properties

	<ul style="list-style-type: none"> • Determined how cost information is recorded and maintained at multi-unit housing properties through informal key informant interviews with convenience sample of MUH managers • Used data and expert feedback to draft research plan with rationale for including or excluding each cost construct • Edited and finalized research plan • Disseminated research plan to TPCB for use in guiding spring semester pilot study
<i>Recommendations:</i>	<ul style="list-style-type: none"> • TPCB should follow the research plan to guide next year's Capstone team's collection of cost data. • Future research on cost impact of smoke-free policies should also reference the research plan to find relevant research and expert opinions on key constructs to measure in cost-related studies.

Deliverable IV: Quantitative Study Protocols and Recommendations	
<i>Format:</i>	Electronic collection instrument and narrative report including contact list, collection methods protocols and database mockup, and suggested analysis methods.
<i>Purpose:</i>	To assess the costs associated with the implementation of smoke-free MUH policies
<i>Intended Audience(s):</i>	TPCB and 2014-15 HB Capstone team
<i>Activities:</i>	<ul style="list-style-type: none"> • Identified related, previously validated assessment tools and created draft survey instrument based on existing surveys • Created associated Microsoft Excel database mockup • Discussed drafts of instruments with statistics expert • Finalized instrument and decided on appropriate analysis methods • Identified how to collect financial documents • Collected sample of available documents • Designed database mockup and database design diagram for compiling data • Piloted database with sample documents • Based on pilot, revised database tools • Developed protocols for future use of database and disseminated protocol report to TPCB
<i>Recommendations:</i>	<ul style="list-style-type: none"> • Next year's TPCB Capstone team should build off of our quantitative results by making final adjustments to the collection instruments and database and using the instrument and associated results database in their survey of properties statewide

Deliverable V: Qualitative Study Protocols and Recommendations	
<i>Format:</i>	Interview guide and narrative report including contact list, data

	collection and data storage protocols
<i>Purpose:</i>	To assess the experiences of maintenance workers during the implementation of smoke-free MUH policies
<i>Intended Audience(s):</i>	TPCB and 2014-15 HB Capstone team
<i>Activities:</i>	<ul style="list-style-type: none"> • Interviewed experts and reviewed literature to determine content of existing qualitative studies in this field • Conducted informal interviews with MUH managers and maintenance staff to inform interview guide development • Developed research questions, interview questions, and probes for both outcome and process evaluation questions. • Reviewed draft of interview guide with qualitative research expert and finalized draft • Developed a timeline for the pilot test of interview guide • Contacted property managers to identify managers to interview as part of piloting the interview guide • Piloted interview guide instrument with two properties • Recorded feedback and took notes on interview proceedings • Transcribed interviews • Based on observations and feedback, revised survey instruments • Developed protocols for future use of survey instruments and disseminated protocol report to TPCB
<i>Recommendations:</i>	<ul style="list-style-type: none"> • Next year's TPCB Capstone team should use our finalized interview guide to make final adjustments to our qualitative survey. They will use this deliverable to continue exploring the experience of maintenance workers at properties undergoing transitions to smoke-free policies.

Appendix 4. Construct Matrix

	A	B	C	E
1	Constructs	Question	Response	Data Source
2	Maintenance: Staff time	C10. Since the smoke-free policy went into effect, has the amount of staff time devoted to smoking-related issues increased, decreased, or stayed the same?	Increased Decreased Stayed the same	NC MUH Survey, QC10
3	Maintenance: Staff time	50. What effect do you think restricting smoking in any of your units/buildings would have on overall staff time?	<ul style="list-style-type: none"> • Increase • Decrease • Stay the Same 	Roswell survey, Section D, Q50
4	Cleaning: Turnover	12. How hard is it to remove the signs and smell of tobacco smoke from an apartment when turning it over for a new tenant?	<ul style="list-style-type: none"> • Very Hard • Somewhat Hard • A Little Hard • Not at All Hard 	Roswell survey, Section B, Q12
5	Cleaning: Turnover	31. Since you started offering smoke-free units and/or buildings, has the cost of apartment turnover, for example painting, re-carpeting, and clean up increased, decreased, or stayed the same?	<ul style="list-style-type: none"> • Increased • Decreased • Stayed the Same 	Roswell survey, Section C, Q31
6	Cleaning: Turnover	38. On average, how much does it cost to turn over (for example: carpeting, painting) one of your non-smoking units for new tenants.	Average Cost of Turnover \$_____._____	Roswell survey, Section D, Q52

Appendix 5. Table of Key Variables

Column	Description	Data Type	Values
Property_ID	The unique identifier for each property. This identifier should be used universally across all analysis materials.	Primary Key (no repeated values)	01 to 51
Observation	Numerical representation of the financial period of the document. For this study, observations are annual, where each observation represents a different year.	Integer (4 possible values)	1 = 2010 2 = 2011 3 = 2012 4 = 2013
Cost_Item1	This is where important cost line items will be pulled out for analysis, such as paint costs and carpet cleaning costs, etc.	Dollar Amount	\$0.00 - X
Cost_Item2	This is where important cost line items will be pulled out for analysis, such as paint costs and carpet cleaning costs, etc.	Dollar Amount	\$0.00 - X
Turnover_Rate	The turnover rate represents the number of units turned over during an observation period for a given property.	Integer	0 - n
Occupancy_Rate	Percentage of property units that are occupied.	Percentage	0-100%

XIII. References

- CDC. National Health Interview Survey. 2009 data release.
www.cdc.gov/nchs/nhis/nhis_2009_data_release.htm.
- Community Transformation Grant Project (2013), Smoking Policies in North Carolina Multi-unit Affordable Housing Survey Instrument. Unpublished Instrument. Raleigh, NC.
- Cramer ME, Roberts S, Stevens E. Landlords attitudes and behaviors regarding smoke-free policies: implications for policy change. *Public Health Nursing*. 2011; 28(1):3-12.
- Department of Housing and Urban Development. NOTICE: H 2010-21: Optional Smoke-Free Housing Policy Implementation. September 15, 2010 (notice). Accessed October 4, 2013, at portal.hud.gov/huddoc/12-22hsgn.pdf.
- Hennrikus D, Pentel PR, & Sandell SD. Preferences and practices among renters regarding smoking restrictions in apartment buildings. *Tobacco Control*, 2003; 12: 189-194.
- Hewett, MJ, Sandell, SD, Anderson, J, Niebuhr, M. Secondhand smoke in apartment buildings: Renter and owner or manager perspectives. *Nicotine Tob Res* 2007;9(1):S39-S37.
- HHS. (2013). Secondhand Smoke. Retrieved September 19, 2013, from [beTobacco.gov: http://betobaccofree.hhs.gov/health-effects/secondhand-smoke/index.html](http://betobaccofree.hhs.gov/health-effects/secondhand-smoke/index.html)
- King BA, Travers MJ, Cummings KM, Mahoney MC, Hyland AJ. Secondhand smoke transfer in multiunit housing. *Nicotine Tob Res* 2010;12(11):1133-41.
- King BA, Babb SD, Tynan MA, Gerzoff RB. National and State Estimates of Secondhand Smoke Exposure among U.S. Multiunit Housing Residents. *Nicotine & Tobacco Research*. 2012.
- King BA, Peck RM, & Babb SD. Cost savings associated with prohibiting smoking in U.S. subsidized housing. *American Journal of Preventive Medicine*. 2013; 44(6):631-634.
- Levy DE, Rigotti NA, Winickoff JP. Tobacco smoke exposure in a sample of Boston public housing residents. *Am J Prev Med* 2013;44(1): 63-6.
- Los Angeles County Department of Public Health, Healthy Housing Solutions, Inc., and Westat (2012). Smoke-Free Multi-Unit Housing Policy Study: Operator Survey. Unpublished Instrument. Los Angeles, CA.
- Ong MK, Diamant AL, Zhou Q, Park HY, Kaplan RM. Estimates of Smoking-Related Property Costs in California Multiunit Housing. *American Journal of Public Health*. 2012; 102(3):490-493.
- Pizacani B, Laughter D, Menagh K, Stark M, Drach L, Hermann-Franzen C. Moving multiunit housing providers toward adoption of smoke-free policies. *Prev Chronic Dis* 2011;8(1):A21.
http://www.cdc.gov/pcd/issues/2011/jan/10_0015.htm. Accessed 12 Nov 2013.

Smoke-Free Environments Law Project, The Center for Social Gerontology. Housing Authorities/Commissions which have adopted smoke-free policies. January, 2011. <http://www.tcsg.org/sfelp/>.

Smoke-Free Housing New England. 2009. www.smokefreehousingne.org. Data as reported in National Center for Healthy Housing: Reasons to Explore Smoke-Free Housing. http://www.nchh.org/Portals/0/Contents/NCHH_Green_Factsheet_Smokefree.pdf