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IMPLEMENTATION EFFECTIVENESS OF CAMPUS TOBACCO-FREE POLICIES

Amanda Fallin
University of Kentucky, atfall2@uky.edu

ABSTRACT OF DISSERTATION

Amanda Fallin

The Graduate School

University of Kentucky

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IMPLEMENTATION EFFECTIVENESS OF CAMPUS TOBACCO-FREE POLICIES

ABSTRACT OF DISSERTATION

A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy in the
College of Nursing
at the University of Kentucky

By
Amanda Fallin

Lexington, Kentucky

Director: Dr. Ellen Hahn, Professor of Nursing

Lexington, Kentucky

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Tobacco use and secondhand smoke exposure are leading causes of preventable morbidity and mortality in the United States. Outdoor tobacco smoke exposure conveys many of the same risks as indoor secondhand smoke exposure. Tobacco-free campuses policies are an intervention to promote a positive social norm that encourages smoking cessation, as well as reduces exposure to outdoor tobacco smoke. This dissertation contains a review of the policy implementation literature; findings from a psychometric analysis of the newly developed Tobacco-free Compliance Assessment Tool (TF-CAT) to assess compliance with tobacco-free campus policies; and results of a campus intervention study to promote compliance. The TF-CAT protocol is designed to count cigarette butts, observe smokers, and use GIS mapping to display hot spots. A total of 413 observations in primary and secondary campus locations yielded compliance data on both the academic healthcare and main campuses. Results show support for the concurrent validity of the TF-CAT. Inter-rater reliability of the measure is strong, and the tool is feasible, though time- and resource-intensive. The intervention study tested the effects of an efficacy-based messaging campaign on the number of cigarette butts observed on campus. After distributing 6,000 message cards in high-traffic areas over three days, there were fewer cigarette butts per day per site post-intervention compared to pre-intervention (n = 312 observations; median = 4.7 vs. 1.9; U=2239, p=.004). It is crucial for tobacco control advocates to ensure implementation effectiveness of tobacco-free policies. Future research needs to refine methods to measure policy implementation effectiveness. In addition, interventions need to be developed and tested to promote policy implementation effectiveness.

KEYWORDS: Smoke-free Policy; Tobacco-free Policy; Policy Implementation; Compliance; College or University Policy.

Amanda Fallin

Student's Signature

April 29, 2011

Date

IMPLEMENTATION EFFECTIVENESS OF CAMPUS TOBACCO-FREE POLICIES

By

Amanda Fallin

Ellen J. Hahn, PhD
Director of Dissertation

Terry A. Lennie, PhD
Director of Graduate Studies

April 29, 2011

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This dissertation is dedicated to my family
and friends for all the support through this process.

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CHAPTER ONE

Introduction

Tobacco use is the number one cause of preventable death in the United States.[1] Secondhand smoke (SHS) exposure is also a known cause of mortality.[2] Smoking and SHS exposure are leading causes of lung cancer. These risk factors also lead to many negative health outcomes, including multiple types of cancers, cardiovascular disease, and pulmonary disorders.[2]

Although the health effects of exposure to indoor SHS have been long understood, results of recent research indicate that outdoor tobacco smoke (OTS) is also hazardous.[3] Tobacco-free campus policies promote a healthy norm that can lead to a reduction in smoking prevalence.[4] In addition, these policies have the potential to reduce exposure to OTS.

There has been a recent widespread increase in tobacco-free campus policies.[5] In November of 2008, the University of Kentucky healthcare campus went tobacco-free, and the main campus followed a year later in November of 2009. All forms of tobacco-use, including smokeless, spitless, e-cigarettes, and snus, are prohibited.[6]

The adoption of the tobacco-free policy is not sufficient to improve health outcomes. Effective implementation is also imperative. Implementation is the stage in the policy process that takes place after a policy is enacted.[7] This stage encompasses actions taken to follow the policy directives. Effective implementation of a tobacco-free policy encompasses multiple factors, ranging from management commitment to the policy, to preparation, to compliance with and enforcement of the policy.[8]

This dissertation contains five chapters. The second chapter is a comprehensive review of the literature, describing techniques for measurement of implementation effectiveness and recommending an evidence-based protocol. The third chapter presents a psychometric analysis and the feasibility of use for the newly developed Tobacco-free Compliance Assessment Tool (TF-CAT). The fourth chapter describes an intervention designed to improve compliance to a tobacco-free campus policy. The fifth chapter summarizes the results, presents limitations, and provides recommendations for researchers, policymakers and advocates, and public health professionals.

Ostrom's Institutional Analysis and Development (IAD) Framework guided this dissertation.[9] A key concept of the IAD is the action arena. An action arena consists of an action situation, or a specific institutional process, and actors, or the individuals involved in the action situation. For example, the adoption and implementation of a smoke- or tobacco-free campus policy is an action situation, and the Board of Trustees, university president, faculty, staff, students, and visitors are the actors.

The IAD is useful to guide the study of smoke- and tobacco-free policy implementation for several reasons. First, it allows researchers to investigate factors that influence policy implementation at multiple levels: the operational (individual behaviors), collective choice (policymaking decisions), and constitutional level (framework for policymaking). Second, it is applicable to both voluntary and public policies. Third, it allows for the examination of linked action arenas. This is appropriate, because the adoption and implementation of smoke- or tobacco-free policies (collective choice) ideally impacts individual's decisions to use tobacco products in certain locations (operational level).

The purpose of the second chapter, "Implementation Effectiveness of Smoke and Tobacco-free Campuses: A Comprehensive Review of the Literature," was to assess methods to measure implementation effectiveness of a tobacco-free campus policy. This chapter focused on factors influencing implementation effectiveness at the collective choice level (commitment, preparation, and enforcement) and operational level (compliance), as well as implementation barriers. Overall, there was no predominant measurement method. However, researchers tended to use one or a combination of four overall types: (1) document searches; (2) self-report (surveys, open-ended interviews and focus groups); (3) direct observation; (4) air quality monitoring. A theory based combination of all four methods would be optimal. This chapter presents a protocol for measuring implementation effectiveness that is a synthesis of current methods.

Policy compliance is one aspect of implementation effectiveness. Policy compliance is particularly important for policy designed to change behavior (e.g., the intent of a tobacco-free policy is to change tobacco users behavior).[7] The third chapter, "Tobacco-free Compliance Assessment Tool: Feasibility and Psychometric Properties", presents a newly developed tool to measure policy compliance. The tool measures compliance with two main constructs: cigarette butts and observed smokers.

In addition to describing the tool, this chapter presents the psychometric properties as well as the feasibility, in time and resources, of using the TF-CAT. This chapter is an analysis of data collected in a pilot study designed to assess compliance with a hospital tobacco-free policy (n=296 observations), as well as baseline data of an intervention study (n=117 observations). Inter-rater reliability of the measure is strong, and use of the tool is feasible, though time and resource intensive.

The fourth chapter, "An Intervention to Promote Compliance with a Tobacco-free Campus Policy" presents the results of an intervention based on the Theory of Planned Behavior that was designed to improve compliance with a tobacco-free campus policy. Ostrom acknowledges that within the IAD, behavior change theories can be incorporated to examine actors' choices.[9] The intervention was a large scale message campaign designed to raise awareness about the policy as well as the free nicotine replacement therapy available to students, faculty and staff. The message was positive and self-efficacy based, designed to increase nicotine users' perceived behavioral control over tobacco-use behaviors on campus. The TF-CAT, presented in chapter two, was used to monitor compliance. The week following the intervention, there was a statistically significant difference in cigarette butts found in hot spot areas.

The fifth chapter is a conclusion to this dissertation. It summarizes the findings of each chapter, and presents recommendations for future researchers, policymakers and advocates, and public health professionals. Future research needs to refine methods to measure implementation effectiveness. In addition, larger scale, multi-faceted interventions need to be developed and tested to promote implementation effectiveness. Policy advocates must recognize the importance of policy implementation, as well as policy adoption. To increase the likelihood that a policy will change behavior and improve health outcomes, policy advocates need to remain actively involved, promoting implementation effectiveness.

CHAPTER TWO

Measuring Tobacco-free Policy Implementation Effectiveness: A Literature Review

Background

Active and passive smoking contribute to multiple negative health effects, including cardiovascular disease, respiratory conditions, and many types of cancer.[2] Smoke and tobacco-free policies are public health interventions to reduce smoking as well as secondhand smoke (SHS) exposure.[10-13] Tobacco-free campus policy, a type of voluntary rule, is becoming increasingly common nationwide.[5]

Effective policy implementation is required to achieve desired policy outcomes.[14] Implementation is one of the five stages of policy development, which include: (1) agenda setting; (2) formulation; (3) adoption; (4) implementation; and (5) evaluation. Policy implementation consists of the actions and procedures necessary to follow through with the policy mandates once the policy has been adopted.[7]

Although effective implementation is important,[7] it is a frequently neglected stage of the policy process.[15] There is little in the literature about tobacco-free campus policy implementation, and there is currently no standard method for measuring implementation effectiveness of these policies. Ostrom's Institutional Analysis and Development (IAD) Framework[9] shows promise as a tool to guide measurement of tobacco-free policy implementation effectiveness. The framework has been used to guide the study of tobacco control policies.[8] In addition, the IAD is applicable to both voluntary and public policies.

Purpose

The purpose of this chapter is to develop a method to evaluate implementation effectiveness of tobacco-free university policies. The specific aims are to: (1) describe the IAD Framework and apply it to smoke- and tobacco-free policy implementation; (2) review the state of measurement of implementation effectiveness of smoke- and tobacco-free policies in the context of the IAD; (3) discuss the strengths and weaknesses of these measures; and (4) synthesize the current measurement methods and provide recommendations for a protocol to measure implementation effectiveness of tobacco-free university policies.

Methods

To determine methods currently used to measure smoke- and tobacco-free policy implementation effectiveness, a literature search of PubMed was conducted using the following key words: (1) tobacco-free; (2) smoke-free; (3) implementation effectiveness; (4) compliance; and (5) enforcement. It was necessary to expand the search beyond tobacco-free campuses to all types of smoke or tobacco-free policy, due to the limited body of literature on tobacco-free campuses. Articles were excluded that: (1) focused on policies other than smoke or tobacco-free policies, such as age of sale laws; (2) evaluated the outcomes of smoke or tobacco-free policies without focusing on implementation effectiveness; and (3) were published in languages other than English.

Results

Institutional Analysis and Development Framework

Ostrom's Institutional Analysis and Development (IAD) Framework provides a guideline for analyzing the impact of policy adoption and implementation on individual

behavior.[9] This framework is useful for analyzing tobacco-free policy implementation because it can explain the relationship between institutional policies and individual behavior; and it is applicable to both voluntary and public policies. This section briefly describes the IAD and provides an application to tobacco-free campus policy.

Framework Overview

Within the IAD, institutions can refer to any organization, ranging from families to companies to governments. The focus of the IAD is the action arena (see Figure 1),[9] which includes both the action situation and actors. The action situation describes an institutional process. The IAD can be applied to a wide range of action situations, including policy adoption and implementation. The actors are the individuals participating in the action situation.

Various external factors influence the action arena, including the biophysical world, community attributes, and rules in use. Biophysical factors include constraints place on the action situation by the physical environment (e.g., worksite density). Community attributes refer to values or culture that influence the action arena (e.g, community political orientation). Rules in use refer to both formal (e.g., laws and regulations) and informal rule structures (e.g., social norms).

According to the IAD, action arenas occur at three levels of analysis: the operational, collective choice, and constitutional levels. The operational level refers to the actors' behaviors in an institution. The collective choice level encompasses policy adoption and implementation. The constitutional level provides the framework within which policymaking takes place and it directs the entities and/or individuals eligible to make decisions.

Action situations can also be linked, indicating that the outcome of an action situation at one level directly impacts those at other levels. For example, the adoption of a tobacco-free campus policy is an action situation at the collective choice level (see Figure 2). The new policy becomes a rule-in-use, as a university rule or regulation. The policy is implemented according to standard operating procedures at the university level, which then has a direct impact on the action situation at the operational level: the individual decision to use tobacco products on campus or to quit smoking.

Application of the IAD to Smoke- and Tobacco-free Policies

Although the main focus of this dissertation is implementation effectiveness of tobacco-free campus policies, a benefit of using the IAD is that it is applicable to both voluntary and public policy. To illustrate this point, a comparison of the application of the IAD to public policy (e.g., smoke-free county ordinance) and voluntary tobacco-free university policy is provided in Table 1. The main difference between the application of the IAD to voluntary and public policies are the actors. For example, key actors at the collective choice level for enacting a smoke- or tobacco-free public policy are city council members or county magistrates at the local level or legislators at the state level. Key actors involved in adopting a voluntary smoke- or tobacco-free policy vary widely, and could range from restaurant and bar owners, to hospital management, to the Board of Trustees of a university.

Application of the IAD to tobacco-free university policies is summarized in Table 1. At the constitutional level, rules in use affecting university policy could include the state revised statutes. In Kentucky, KRS Chapter 164 is dedicated to post-secondary institutions.[16] For example, KRS 164.131 specifically describes rules in use related to the

Board of Trustees at the University of Kentucky.[17] Other rules in use could include the process for appointment of the university president. Community attributes or cultural factors that might impact this level are whether or not the state is tobacco growing, or whether there is a state smoke-free law.

At the collective choice level, the action arena would include the adoption and implementation of a tobacco-free campus policy (action situation) by the Board or Trustees, President or upper level university management (actors). Policy adoption may be impacted by whether the university receives tobacco industry funding and/or whether tobacco farming has influence through the College of Agriculture including cooperative extension agencies (community attributes/culture). Policy implementation may be heavily influenced by rules-in-use at the collective choice level. The university rules and regulations and standard operating procedures would impact factors such as the creation of a task force to oversee implementation and policy communication (e.g., signs, discussion at new employee orientation, and monitoring and enforcement). Ideally, the tobacco-free policy would change behaviors at the operational level, prompting individuals to quit using tobacco or changing their tobacco use patterns. Other factors that may influence behavior include social norms, such as the value individuals place on policy compliance and health. These individual behaviors contribute to the general level of policy compliance.

Current Methods of Measurement

Given the focus on measuring policy implementation effectiveness, IAD variables at the collective and operational levels are most relevant. Based on the current methods of measurement in the literature, important policy implementation variables to consider

are: (1) commitment, preparation and enforcement[8,18,19] (collective choice level)[9]; (2) compliance[20,21] (operational level)[9]; and (3) implementation barriers (occurring at any level).[9] This section is organized based on whether the literature is related to voluntary or public policy, as well as the type of measurement used (record review, self-report, observation or air quality measurement).

Collective Choice Level

Commitment. Commitment refers to the degree to which the key actors at the implementing agency are supportive of the policy[22] (e.g., Board of Trustees at a university with a tobacco-free policy). Demonstrating commitment to the policy is crucial for successful implementation. Examples of demonstrating commitment include the establishment of a task force with upper level management members, establishing sub-committees, and adequately funding policy implementation.[22 23]

Martinez and colleagues used the European Self-Audit Questionnaire (SAQ) to assess tobacco control policy implementation effectiveness at a smoke-free hospital.[22] The tool was created by experts in the field and has been pilot tested in multiple countries. The psychometric properties of the tool have never been tested.

The SAQ assesses nine factors, including commitment,[22] which is the focus of this section. The commitment section of the SAQ includes the following items: (1) hospital policy displayed on official documents; (2) a task force or committee is assembled to oversee policy implementation; (3) the head of the task force or committee is high ranking within the institution; (4) the initiative is funded; and (5) staff at all levels of the hospital are invested and are aware that they have a role to play in implementing

the policy.[22] This was the only study identified that measured commitment, and it was related to voluntary policy.

Preparation. Preparation is another crucial aspect of implementation effectiveness.[22] Between policy adoption and the time the policy goes into effect, there are certain necessary preparatory tasks. These could include removal of ashtrays, educational sessions or forums, posting signs, and notifying employees, students, and visitors.[18,22,24,25] These factors are related to rules-in-use at the collective choice level because university standard operating procedures guide decisions related to preparation for policy implementation.

Eleven papers describe methods to measure preparation for implementation.[18,19,22,24-31] One used record review,[28] four used self-report,[19,22,27,31] three used observation,[18,29,30] and three used a mixed method of both self-report and observation[24-26] (see Table 3).

Voluntary policies. Five of the eleven studies assessing preparation focused on voluntary policies, including schools,[19] hospitals,[22,25] and universities.[28] All of these groups of investigators used self-report methods. Only one study was identified that assessed preparation for a smoke-free policy in the university setting. Gerson and colleagues requested records from three major universities, and used this information to assess implementation effectiveness of smoke-free policies in residence halls.[28] Related to preparation, whether or not the university decided roommate housing assignments based on smoking status was assessed. This would be an example of a rule in use at the collective choice level. They also assessed whether or not the university was able to qualify for lower insurance rates.

Goldstein and colleagues conducted focus groups on a broad range of topics surrounding implementation of tobacco-free school policy, including preparation.[19] Martinez used the SAQ, and there are four sections that related to preparation: (1) communication; (2) education and training; (3) identification and cessation support; and (4) environment. The communication section assesses whether or not all patients, visitors and staff are aware of the policy. The education and training portion includes whether or not staff are trained on how to handle smokers, and whether clinical staff are trained to provide smoking cessation information. The identification and cessation support section includes whether or not patients who smoke are offered smoking cessation resources, and long-term follow-up on the progress of their smoking cessation. The environment assesses for appropriate signage and the removal of ashtrays.[22]

Public policies. Six groups of investigators assessing preparation focused on public policies.[18,24,26,27,29,30] One study was self-report,[27] two were a combination of self-report and observation,[25,26] and three were observation.[18,29 30]

Nimpitakpong[27] assessed preparation for policy implementation using self-report of business owners. These investigators conducted a survey among drugstore owners in Thailand, and one item assessed whether or not appropriate signage was used.[27]

Movsisyan[26] and Miller[24] assess preparation for smoke-free policy implementation using a combination of self-report and observation. Miller and colleagues asked bar owners in Australia what actions they had taken to prepare including removing ashtrays, communicating with patrons, constructing outdoor areas, erecting walls, and putting in air conditioning. These investigators also conducted inspections, and one of the observation variables was signage.

Chapman and colleagues assessed preparation in restaurants, based on whether or not there were ashtrays in smoke-free restaurants in New South Wales.[30] Two groups of investigators used observation methods to assess whether or not adequate preparation had taken place for smoke-free policy implementation in bars.[18,29] Weber and colleagues observed restaurants and bars in the Los Angeles area for ashtrays, outdoor smoking sections, and non-smoking signs.[29] Skeer and colleagues[18] used an in-depth observational tool to assess implementation effectiveness of a smoke-free law in Boston. Research team members conducted observations at each bar for approximately 30 minutes during peak hours (8:00PM through 1:00AM). The observational tool included items such as ashtrays and signs.

Among the eleven studies measuring preparation, the majority of the investigators focused on public policies and used self-report methods. None of the self-report methods used the same survey items or focus group prompts.

Enforcement. Enforcement refers to actions taken to ensure compliance with the policy directives (see Table 4). Enforcement is a collective choice level variable that is a rule in use. Examples include monitoring by security personnel or penalties for violators. Twelve papers reported measuring enforcement of a smoke- or tobacco-free policy (see Table 4). Five groups of investigators focused on voluntary policies[19,28,31-33] and seven focused on public policies[18,26,27,30,34-36]

Voluntary policies. Gerson and colleagues conducted a records review,[28] and four groups of investigators assessed policy enforcement with self-report methods.[19,31-33] Gerson and colleagues indirectly assessed enforcement by examining records related to the cost of security enforcement of the policy.[28]

Goldstein and colleagues interviewed North Carolina school key informants related to policy enforcement.[19] Martinez and colleagues also assessed policy enforcement broadly. The European SAQ includes one question on enforcement that assesses whether or not the policy is enforced as directed by standard hospital procedure.[22]

Shipley and colleagues asked hospital staff in Gateshead, United Kingdom at Queen Elizabeth Hospital about approaching individuals violating the smoke-free policy.[32] Participants were asked if they had ever approached a violator, including staff, visitors, or patients. Follow up questions included whether the participant would consider approaching a violator. If the participant responded negatively, there was an open ended follow-up question to assess the underlying reasons.

Public policies. Four groups of investigators focusing on public policy enforcement used self-report, one group used observation and two used a combination. Satterlund and colleagues[35] interviewed bar employees and other individuals involved in the enforcement of the smoke-free bar policy, including code inspectors and police officers. Chapman and colleagues[30] asked restaurant employees how customers responded if asked to comply with the policy.

Investigators also specifically assessed situations related to policy violators. Klein and colleagues asked Minnesota residents what types of punishments they would support for individuals violating park tobacco-free policies.[34] Possible choices included requesting violators to leave the premise or imposing a fine. Movsisyan and colleagues asked business administrators and managers if they supported punishing violators of

smoke-free policies.[26] Vardavas and colleagues asked individuals how they would respond if they witnessed an individual violating a smoke-free policy.[36]

The majority of investigators measuring enforcement used self-report methods. However, no two groups of investigators used the same survey questions or interview prompts. There were no notable differences in the way enforcement was measured for voluntary and public policies.

Operational Level

Compliance

Compliance refers to the degree to which individuals follow the directives of the policy. Based on Ostrom's framework,[9] compliance is an operational level variable. Compliance is based on individual actors' decisions to not use tobacco products in forbidden areas. Indicators of non-compliance could be individuals using tobacco products, cigarette butts, smell of smoke and exposure to (SHS).

Thirty-one studies were identified that measured compliance with smoke or tobacco-free policies (see Tables 5 and 6). The three predominant methods for measuring compliance include self-report (such as surveys or focus groups), observation, or air quality monitoring.

Voluntary policies. Nine groups of investigators assessed compliance with a smoke- or tobacco-free voluntary policy using self-report.[21,22,37-43] Three groups of investigators asked smokers about personal policy violations.[40,41,43] For example, Parks and colleagues[40] asked smokers the following: "When I am working at Addenbrooke's Hospital, I smoke on the site: (1) more than twice a day; (2) once or twice a day; (3) once a week; (4) once a month; (4) never". (p. 2).

Other groups of investigators asked key individuals whether or not they witnessed or were affected by non-compliance.[21,22,42] Foley and colleagues interviewed employees and inmates in two prisons in North Carolina to describe whether or not they had observed instances of non-compliance.[21] Martinez used the SAQ and assessed whether or not staff, patients and visitors are exposed to SHS.[22]

Four groups of investigators measured compliance with voluntary smoke- or tobacco-free policies using observation.[44-47] Two groups assessed compliance with hospital smoke-free policies.[44,47] These investigators selected key areas throughout the hospital and counted the total number of people as well as the number of smokers in each area. In addition to calculating the proportion of individuals smoking, Nagle and colleagues also assessed smokers' distance from the entrance.[47]

Two studies measured compliance with an outdoor smoke or tobacco-free policy, [45,46] including a smoke-free recreational arenas and a college campus. Harris and colleagues assessed compliance with a campus smoking policy.[46] The policy prohibited smoking 25 feet from all entrances. Every two minutes, investigators classified observed smokers as either non-compliant or compliant, depending on whether or not they were the appropriate distance from building entrances.

Two groups of investigators used air quality to monitor compliance to voluntary policies. Monitoring implementation using air quality measurement is one way to objectively assess compliance.[48] Air quality machines (MetOne monitor, TSI SidePack and TSI AM-510 photometer) are calibrated to measure the particulate matter (PM) in the air. Schick and Lee measured PM less than or equal to PM 2.5μg/m^3.

Both studies using air quality measurement to assess compliance with smoke-free policies evaluated voluntary policies.[48,49] Schick and colleagues measured compliance with a hospital smoke-free policy. Lee and colleagues measured air quality in a high school bathroom. These investigators placed the air quality monitor in the bathroom, and a team member stayed with the machine to ensure it was not damaged.[48]

Measuring PM 2.5µg/m^3 as a marker for cigarette smoke pollution is a valid tool. As would be expected, the passage of smoke-free laws has been associated with a significant decline in PM 2.5µg/m^3 [50-52]. In Kentucky, levels of 2.5µg/m^3 dropped in bingo halls, once compliance with the smoke-free law was accomplished.[52]

Public policies. Nine groups of investigators assessed compliance with public policies using self-report.[20,24,27,30,43,53-56] Three groups of investigators surveyed smokers about whether or not they had smoked inside various locations, including bars, pubs, and hospitality venues. For example, Cooper and colleagues assessed compliance with a smoke-free policy covering bars and pubs in New South Wales, Queensland, Tasmania, and Victoria, Western Australia.[55] Smokers were asked, "Did you go outside for a smoke?" (p. 380)

Three studies focused on employees, managers or business owners. Chapman and colleagues[30] surveyed restaurant employees and asked whether they had witnessed customers violating the smoke-free policy. Miller and colleagues (2002) interviewed managers five months after a smoke-free law was adopted, and followed up at eighteen months.[57] These investigators asked managers questions such as: “Do you think you are complying with the law?" If not, the follow up question was asked: "Why do you think

you may not be complying fully with the law?" (p. 40) Movsisyan and colleagues assessed business owner perception of policy compliance using 90 minute focus groups.

Two groups of investigators focused on employees and patrons.[20,56] Shopland and colleagues [56] asked employees of smoke-free restaurants, "During the past two weeks has anyone smoked in the area in which you work?" (p.348) Biener and colleagues focused on customers, and assessed compliance with a smoke-free policy in Boston.[20] Participants were selected for a random digit dial interview, and asked with what frequency they witnessed smoking at nightclubs and bars (never; rarely; sometimes; often; always).[20]

Eight studies measured policy compliance with smoke- and tobacco-free public policies using observation.[18,24,29,47,58-62] Among studies measuring compliance with smoke-free bar laws, some observations were conducted covertly. Skeer and colleagues' discretely measured compliance to bar smoke-free laws,[18] and this group of investigators had the most detailed observational protocol. Observers counted customers and smokers in the bar, as well as the gender of the smokers. Observers also assessed the number of bartenders, the number of bartenders smoking, as well as the gender of the bartenders. The smell inside the bar is also assessed (clear; musty-stale smoke; somewhat smoky; very smoky).

On the other hand, Weber and colleagues conducted their assessments using employees of the Environmental Health Division Services.[29] Steps were taken to increase the reliability of their measurement such as assessing for compliance first in order to reduce the chances of altering behavior.[29]

There is evidence to support reliability and validity of observation as a measure of compliance.[45-47,62] There was a high level of inter-observer reliability in a study of

smoke-free policy compliance at an outdoor recreational field.[45] Inter-observer reliability for counting cigarette butts and smokers was 100%. Additionally, two studies reported kappa values, which ranged from moderate to very good agreement. Rigotti and colleagues reported kappa values ranging from .5 +/- .25 for presence of cigarette butts and ashtrays to .86+/-.13 for presence of signs.[62] Harris and colleagues reported a kappa of .67 in observing compliance with a smoke-free policy at entryways.[46] There also is evidence to support the validity of observation as a measure of compliance. Nagle and colleagues evaluated an intervention to increase compliance with a smoke-free hospital policy, and measured compliance using observation.[47] As would be expected, an increase in compliance (4%) was reported after non-smoking signs were placed around the hospital.

The majority of researchers focusing on implementation effectiveness of smoke- or tobacco-free policies assess compliance as the only construct. Among the studies assessing compliance, the majority used either self-report or observation methods. However, none of these investigators used the same interview questions, focus group prompts, or observational protocols. In addition, there were no notable differences in the methods used to assess compliance with voluntary versus public policies.

Implementation Barriers

Barriers to implementation include any problems or issues that may impede policy implementation effectiveness. Examples vary widely, and could include issues that arise during any of the four stages of policy implementation (commitment, preparation, enforcement, and compliance). Examples of implementation barriers at the constitutional

or collective choice level could include the influence of tobacco farming. Implementation barriers at the operational level could include nicotine addiction of the actors.

Four studies were identified that evaluated implementation barriers using self-report (see Table 7). Implementation barriers for various types of smoke and tobacco-free policies were assessed at schools,[19] hospitals,[63,64] and workplaces.[26] Two of these studies were focused on voluntary policies[19,63] and two related to a public policy.[26,64]

Voluntary policies. Two groups of investigators assessed implementation barriers of voluntary policies.[19,63] Hollen and colleagues assessed possible implementation barriers among psychiatric facilities without smoke-free policies.[63] Hospital staff members were asked to select implementation barriers based on a prepared list of options. Examples of potential barriers assessed included: financial costs, state policies, or resistance from patients and staff.

Goldstein and colleagues assessed implementation barriers using interview methods to discuss factors affecting tobacco-free school policies. Participants were asked to provide recommendations for others considering implementation.[19] One barrier discussed was whether the community grew tobacco, which is an example of community attribute that might impede policy implementation.

Public policies. Two groups of investigators evaluated implementation barriers of public policies.[26,64] Movsisysan and colleagues assessed implementation barriers with businesses owners in Armenia using survey methods based on focus group responses.[26] Business administrators were asked to identify smoke-free policy implementation barriers including: (1) costs; (2) inadequate information related to policy; (3) no consequences for violation; (4) mentality or culture of tolerance; and (5) restricted space.

Discussion

To evaluate current methods to measure implementation effectiveness, this section includes: (1) a discussion of the strengths and weaknesses of the four predominant measurement methods (record review, self-report, air quality monitoring, direct observation); and (2) recommendations for an integrated protocol to monitor implementation effectiveness of tobacco-free campus policies at both the collective choice and the operational levels.

Strengths and Weaknesses of Current Measurement

Records Request. A strength of record review is that it provides investigators with objective data that is not reliant on participant self-report. Because a records request uses existing data, it is also relatively inexpensive. A weakness of records review is that official records are likely limited. For example, the official policy may be available, but community attributes that influenced the policy (e.g., the influence of the tobacco industry) may not be recorded. Therefore, other forms of data collection, such as self-report, observation and air quality measurement are needed to provide richer data related to implementation effectiveness.

Self-report. A strength of the survey method is the ability to collect data from a large sample, as well as from a geographically diverse area. For example, Borland and colleagues assessed smoke-free policy compliance in four countries using survey methods (the United States, United Kingdom, Canada and Australia).[53] One weakness of the survey method is that it relies on self-report, which may affect the validity and reliability of the results. Participants may be hesitant to report that they violate smoke-free policies, particularly in their workplace. Business owners may be reluctant to report

that they did not follow adequate procedures to prepare for smoke-free policy implementation.

Observation. A major strength of observation is that it allows investigators to monitor implementation effectiveness in a naturalistic setting. Several investigators discussed strategies for decreasing the likelihood that the observers would be noticed. For example, Eadie and colleagues measured implementation effectiveness in bars, and these investigators used a middle-aged man for data collection, who recorded observations on a newspaper.[58] Another group of investigators instructed their observers to order beverages so they would not stand out while measuring implementation effectiveness in San Francisco bars.[65] This is important because unlike surveys, which rely on participants to self-report, observation may produce more valid and reliable results.

Observation also allows for collecting more detailed information. Survey methods rely on participants to report whether or not they have smoked in public places, or witnessed smoking in public places. Observers may be able to collect more detailed information. Observers could look for secondary items, such as the smell of cigarette smoke, ashtrays, or no-smoking signs.

One weakness is that observation requires time and is resource intensive. For example, Harris and colleagues used 39 data collectors on a single college campus.[46] Additionally, observations typically offer only a snapshot of time at each venue. Moore and colleagues measured implementation effectiveness with smoke-free policy in bars. Two research assistants spent an hour observing each bar. Although they were able to collect firsthand, detailed observations, it was limited to a one-hour time slot.[65] Observation would make it impossible to know whether the smoking behaviors observed

at that time were similar to the typical patterns. In addition, there is some information that is not readily observable. For example, if an investigator were interested in studying barriers to implementation, conducting interviews or surveys with involved parties would likely provide more relevant information than observation.

Air Quality Measurement. A strength of air quality monitoring is the ability of the machine to objectively measure particulate matter even if smokers cannot be observed. For example, in a restaurant, if a worker is smoking out of sight in the back, air quality monitoring would quantify air pollution created by SHS, as measured by $PM_{2.5}$. One weakness of this method is that it requires purchasing specialized equipment, as well as training in the operation of the machine. There also is no standard for indoor air quality and some investigators use $35mg/m^3$, the Environmental Protection Agency's outdoor air standard.[51] Without a standard for indoor air quality, it can be challenging to interpret air quality data from indoor venues.

Recommendations

The research on smoke or tobacco-free policy implementation effectiveness lacks cohesion. The majority of the literature is devoid of theory. Also, most of the identified studies focus specifically on compliance, only one aspect of implementation effectiveness. While there are four common types of methods used to measure implementation effectiveness (record review, self-report, direct observation, and air quality monitoring), there is no predominant method.

There are strengths and weaknesses involved in all four types of measurement. Additionally, all four measurement methods have the potential to contribute unique results to an implementation effectiveness monitoring study. Record review is a relatively

inexpensive way to access a wealth of data. Surveying key informants provides the opportunity to gather data on compliance from individuals who are very familiar with the venue. Direct observation allows collection of detailed information, including number of smokers, as well as ashtrays, no-smoking signs, and odor of cigarette smoke. Monitoring $PM_{2.5}$ allows researchers to collect data on air pollution, regardless of whether or not smokers can be observed. It would be optimal for researchers to use a combination of all four methods to measure compliance with smoke-free policies.

Few studies measured implementation effectiveness of smoke or tobacco-free policies in an outdoor venue. Only two studies assessed implementation of a university-wide smoke-free policy. A triangulation of methods that is tailored for measurement of a tobacco-free campus policy will be presented.

Triangulation of Methods. A protocol for assessing implementation effectiveness of a tobacco-free university policy is recommended that relies on a triangulation of methods reviewed (see Table 8). The protocol incorporates the four major methods used in the literature (record review, self-report, observation, and air quality). It is structured using Ostrom's IAD,[9] focusing on variables at the collective choice level (commitment, preparation, enforcement) and operational (compliance), as well as implementation barriers, which can occur at any level.

To assess commitment, investigators may begin with a records request, which is a method used by Gerson and colleagues.[28] The policy may be requested and evaluated for clarity and clear objectives. In addition, key documents, such as contracts, could be requested, to assess whether or not the tobacco-free policy is included.[22] Key stakeholders (individuals directly involved in the policy adoption and implementation

process) may be interviewed using a modified version of the section of the SAQ on commitment as a guide. Key items include: a task force overseeing policy implementation; task force leadership in upper management; the resources available to the group; faculty, staff, and student ownership of the policy.[22]

To assess preparation, a records request may be filed for whether or not roommate selection is made on the basis of smoking behaviors [28] (a rule in use). The record request may also include steps taken to prepare for policy enactment, including removal of ashtrays, posting of signs, and initiation of smoking cessation therapy programs, including the sale of nicotine replacement therapy.

Next, interviews and focus groups could be conducted with key stakeholders. Interviews could focus on the four relevant sections of the SAQ, modified for a university campus. These sections include: (1) communication; (2) education and training; (3) identification and cessation support; (4) environment.[22] Using this tool, researchers can assess whether: (1) faculty, staff, students and visitors are aware of the policy; (2) faculty, staff and students are trained on the policy; (3) there is a university health services' protocol for offering cessation programs to students who smoke; (4) signs are posted appropriately and ashtrays are removed. Focus groups could ask key stakeholders to describe actions that they have taken to prepare for policy enactment.[26]

Researchers could then conduct a windshield survey or observational walk through of the campus to assess for preparation for tobacco-free policy enactment. Skeer and colleagues have developed an in-depth observational protocol, which could be adopted for university campuses.[18] Researchers could observe for signs related to the tobacco-free campus policy, as well as removal of ashtrays.

To assess enforcement, investigators could begin with a records review to determine university procedure for reporting and handling policy violators. Key stakeholders could be surveyed to determine whether or not the policy is enforced using standard protocols. Also, key stakeholders could be surveyed to determine if they have provided training for faculty, staff and students on how to handle individuals violating the policy.[22]

To assess compliance, investigators could begin with self-report methods. Students, faculty and staff could be randomly selected to participate in a survey on compliance. Surveys could include: (1) how often they see smokers violating the policy on campus; and (2) whether or not they personally violate the tobacco-free campus policy. Next, investigators could conduct a windshield survey or observational walk-through of campus. They could note "hot spots" or areas where smokers or cigarette butts are noted on campus. Based on the windshield survey or campus walk through, "hot spots" could be selected for a detailed compliance assessment. Compliance assessment could include noting smokers as well as cigarette butts found in selected areas. Air quality could also be measured in identified "hot spots" around campus.

To assess implementation barriers, surveys and focus groups could be conducted with both policy stakeholders (e.g., task force members) and individuals directly affected by the policy (e.g., faculty, staff and students). Based on Shipley's protocol, [32] individuals could be asked if they have ever or would ever approach an individual violating the policy. For those who respond negatively, interviewers could assess what barriers stop them from doing so. Focus groups could also broadly assess for other implementation barriers at the collective choice level (e.g., community attributes and

rules in use) and individual level (e.g., nicotine addiction, lack of information about the policy).

Implications for Future Research

In this paper, a protocol for the measurement of implementation effectiveness of tobacco-free campus policies was presented. Future studies are needed to pilot test this measure. Researchers may consider using this measure to compare or predict implementation outcomes of tobacco-free campus policies. In addition, more in-depth study of the differences in the implementation process for voluntary versus public policies is needed. There were no notable differences in the methods for measuring implementation effectiveness between the two types of policies. However, it is possible that different constructs predict implementation effectiveness for voluntary versus public policies. Future research is also needed to tailor this protocol to implementation effectiveness of other types of health policies. For example, researchers might use this protocol to measure implementation of policies to increase physical activity in schools or reduce ventilator- associated pneumonia in hospitalized patients.

Conclusions

Secondhand smoke exposure is a serious public health threat that increases the risk of negative health outcomes. Smoke-free policies are optimal public health solutions to reduce SHS exposure and prevent adverse health outcomes.[66,67] Tobacco-free campus policies are a growing trend with the potential to reduce secondhand exposure and prompt tobacco cessation. However, in order for the policy to have the desired effect, effective policy implementation is necessary.

The IAD is a useful tool to guide studies of tobacco-free policy implementation effectiveness. Within the IAD, the collective choice and operational levels are most relevant to policy implementation. The four stages of policy implementation include: commitment, preparation, enforcement, and compliance. Implementation barriers are factors that impede effective implementation, and they can occur at any stage of implementation. There are three main methods for assessment of implementation effectiveness: self-report, direct observation, and air quality monitoring. In this paper, methods for measuring implementation effectiveness were reviewed, and strengths and weaknesses are presented. A protocol for measuring implementation effectiveness reflecting a synthesis of methods is recommended.

Table 2.1 The Application of the IAD to Voluntary and Public Policies

Dimension	**Variable**	**Public Policy (e.g., municipal smoke-free ordinance)**	**Voluntary Policy (e.g., Tobacco-free University Policy)**
Constitutional	Rules in Use	State constitutions: Allocation of power to enact smoke-free policies to local level policymakers (e.g.., city councils, fiscal courts, Board of Health)	State constitutions: allocation of power to enact smoke-and tobacco-free policies to universities; process for formation of Board of Trustees; election of university president; smoke-free community policies
	Community Attributes (Culture)	Farming or tobacco growing state	Farming/tobacco growing community;
Collective Choice	Community Attributes (Culture)	Community income, education level, voter liberalism, and tobacco growing status	Receiving tobacco industry funding, or influence of tobacco farmers through College of Agriculture or cooperative extension agencies
	Action Arena	Actors: Local government members; Action situation: Local level smoke-free policy adoption and implementation	Actors: University Board of Trustees, President, upper level university management
	Rules-in-Use	Standard operating procedures: Creation of a task force to oversee implementation; policy communication (e.g., signs or publication in newspaper); monitoring and enforcement (e.g., health department or police officers as enforcement agency)	University Rules and Regulations; Standard Operating Procedures (creation of Task Force to oversee implementation; policy communication (e.g., signs, new employee orientation), monitoring and enforcement (e.g., university security)
Operational Level	Rules-in-Use	Social norms: value health versus individual liberty; value placed on policy compliance	Social norms: Value health versus individual liberty; value placed on policy compliance

Table 2.1 (continued)

Dimension	**Variable**	**Public Policy (e.g., municipal smoke-free ordinance)**	**Voluntary Policy (e.g., Tobacco-free University Policy)**
	Action Arena	Actors: business owners, employees and patrons; action situation: individual choice to follow policy regulations (leading to a general level of policy compliance)	Actors: Faculty, staff, students and visitors at the university; action situation: policy compliance (individual behavior affected by knowledge and control)
	Outcome	Reduction in secondhand smoke and smoking prevalence	Reduction in smoking rates and reduction in secondhand smoke

Table 2.2 Factors related to Implementation Effectiveness by Institutional Analysis and Development Framework (IAD) Level

Factor	**IAD Level**	**Definition**
Commitment	Collective Choice	• Policy clearly stated • Policy has clear objectives • Policy is evidence-based
Preparation	Collective Choice	• Actions taken between the time of policy adoption and the date the policy takes effect. • Examples could be communication about the policy, removal of ashtrays, and implementation of tobacco treatment programs.
Enforcement	Collective Choice	• Actions taken to improve compliance with the policy directives. Examples could include scripting to remind violators, monitoring by security personnel, or penalties for violators.
Compliance	Operational	• Degree to which individuals follow the directives of the policy. • Indicators of policy compliance are fewer individuals smoking, cigarette butts, smell of smoke and exposure to secondhand smoke.
Implementation Barriers	Collective Choice or Operational	• Barriers are any problems or issues that arise that impede implementation effectiveness. • Barriers at the collective choice level could be community attributes (e.g., culture supportive of tobacco farmers). Barriers at the operational level could be knowledge or control of the behavior of smoking (e.g., information about the policy or access to nicotine replacement therapy).

Table 2.3 Measurement of Implementation Effectiveness: Preparation

Author/ Year	**Policy**	**Preparation**	**Method**
Chapman, 2001	New South Wales restaurant policies-mostly public policies	Assessed for evidence of preparation, such as ashtrays	Observation
Gerson, 2005	Three major universities in the United States-Voluntary	Records request from Residence Life, regarding roommate placement based on smoking	Records Request
Goldstein, 2003	Schools in North Carolina-Voluntary	Focus groups conducted on a broad range of topics surrounding tobacco-free schools, including preparation	Self-report
Kia, 2008	Smoke-free hospitals in the North Coast-voluntary	Case study of smoke-free policy implementation in the North Coast area; assessed education and signs	Self-report and observation
Miller, 2007	Bars in South Australia-Public policy	Possible preparatory steps assessed included: ashtray removal, communicating with customers, work on outdoor areas, altering the infrastructure (e.g.: air conditioning walls).	Self-report and observation
Martinez, 2009	Hospital in Spain-voluntary	Assessed communication regarding policy, education of staff regarding policy, the system set up to provide patients with smoking cessation information, and the environment (removal of ashtrays and placement of signs).	Self-report
Movsisyan, 2010	Businesses in Armenia	Focus groups and surveys; broad assessment of smoke-free policy, including implementation barriers; questionnaire developed	Self-report and observation
Nimpitakpong, 2010	Drugstores in Thailand-Public policy	Non-smoking signs	Self-report
Skeer, 2004	Bars in Boston, MA-public policy	Observed ashtrays and non-smoking signs	Observation

Table 2.3 (continued)

Author/ Year	**Policy**	**Preparation**	**Method**
Weber, 2003	Restaurants or bars in Los Angeles, CA-public policy	Observation of non-smoking signs, ashtrays and non-smoking areas	Observation
Vitasairi, 2010	Hospitals in Thailand-public policy	Hospital representatives reported whether or not signage was present	Self-report

Table 2.4 Measurement of Implementation Effectiveness: Enforcement

Author/Year	Location	Enforcement	Method
Chapman, 2001	South Wales restaurants-mostly public	8-item questionnaire; observation of smoker response to being asked to stop violating the policy	Self-report and observation
Goldstein, 2003	North Carolina schools-voluntary	18 questions; broad assessment of smoke-free policy including enforcement	Self-report
Klein, 2007	Parks-Public policy	Violation penalties	Self-report
Movsisyan, 2010	Businesses in Armenia-Public policy	Focus groups and surveys; broad assessment of smoke-free policy including enforcement	Self-report
Nimpitpakong, 2010	Pharmacies-Public policy	Staff reaction to policy violation ("do nothing; ask them to stop/leave; tell them where they can smoke; give advice to quit smoking")	Self-report
Shipley, 2008	Hospital in Gateshead, United Kingdon-Voluntary	Staff asked how they would react to policy violators (Would they approach someone smoking? If they responded negatively, a follow up was asked regarding why they would not approach smokers?)	Self-report
Vitavasiri, 2010	Hospitals in Thailand	Hospital representatives reported whether there were punitive measures for violations (i.e., fines)	Self-report

Table 2.5 Measurement of Implementation Effectiveness: Compliance (Survey)

Author/Year	Location	Procedure
Biener, 2007	Bars in Boston, MA-Public Policy	Participants asked the frequency at which they witness violators in bars or nightclubs (never; rarely; sometimes; often; always)
Borland, 2006	Drinking establishments, bars and pubs in the United States, Canada, United Kingdom, Australia-Public policy	Participants were asked: "The last time you did so (visited the venue), did you smoke indoors?" (p. 35)
Bourne, 2004	Workplaces in Arkansas-public policy	"During the past two weeks, has anyone smoked in the area in which you work?"
Bronaugh, 1990	Psychiatric unit in New Jersey-voluntary policy	Compliance was assessed via survey
Chapman, 2001	Restaurants in New South Wales-mostly public policy	Restaurant employees were interviewed regarding whether they had witnessed policy violations
Cooper, 2010	Bars, pubs and drinking establishments in Australia (Queensland, Tasmania and Western Australia)-public policy	Smokers were asked, "Did you go outside for a smoke?" (p. 380) Participants were also asked, "The last time you visited, were people smoking inside the pub or bar?" (p. 380)
Foley, 2010	Prisons in North Carolina-voluntary policy	Compliance was assessed through structured interviews
Kia, 2008	Smoke-free hospitals in the North Coast-voluntary	Case study, included assessment of compliance
Ma, 2010	Indoor workplaces in China-mostly voluntary	Smokers were asked, “Do you usually smoke in the workplace?” (p.404) Non-smokers were asked: "Are you usually exposed to SHS in the workplace?" (p. 404)
Martinez, 2008	Hospitals in Barcelona-voluntary	Smokers were asked whether or not they smoked in particular locations within the hospital (examples include the cafeteria or in offices)
Miller, 2007	Bars in South Australia-public policy	Owners self-reported if they believed the bar was in compliance
Nelson, 2003	Day care centers in the United States-comparison of voluntary and public policy	Assessed whether or not day care centers were complying with smoke-free policies

Table 2.5 (continued)

Author/Year	**Location**	**Procedure**
Nimpitakpong, 2010	Drugstores in Thailand-Public policy	Managers were asked about allowing smoking
Parks, 2008	Hospital in Cambridge, UK-voluntary	Respondents were asked: "When I am working at Addenbrooke's Hopsital, I smoke on the site" (p. 2)
Sabido, 2006	Hospital in Barcelona-voluntary	Smokers were asked where and how much they smoked while in the hospital
Satterlund, 2009	Bars in California	Interviewed bar employees and individuals involved in enforcement
Shopland, 2004	Food service establishments in the United States-public policy	Participants working in a smoke-free location were asked, "During the past two weeks has anyone smoked in the area in which you work?" (p. 348)
Trinidad, 2004	Schools in California	Participants were asked, "How many students who smoke obey the rule prohibiting smoking on school property?" (p. 468) and "As far as you know, do any teachers smoke on your school's grounds?" (p. 468)
Yong, 2010	Air conditioned restaurants, karaoke bars, and coffee bars in Malaysia and Thailand-Public	Respondents were asked if they had violated the policy the last time they were in a hospitality location

Table 2.6 Measurement of Implementation Effectiveness: Compliance (Observation)

Author/Year	Location	Procedure
Chapman, 2001	Restaurants in South Wales-mostly public policy	Policy violations
Dawley, 1983	Hospital (indoors)-voluntary	Policy violators and their locations
Eadie, 2008	Bars (indoors), Scotland-public policy	Observed for violations of bar smoke-free policies
Goodin, 1997	Businesses-public policy	Cigarette butts and smell of cigarettes
Harris, 2009	Campus (outdoors)-voluntary policy	Smokers were observed and categorized into compliant or non-compliant based on whether or not they were the appropriate distance from entrances
Kia, 2008	Smoke-free hospitals	Case study, included observations of cigarette butts or smokers on grounds
Miller, 2002	Restaurants-public policy	Policy violators and smoke-free signs
Miller, 2007	Bars in South Australia-public policy	Smoking room designation
Moore, 2006	Bars in San Francisco-public policy	Two research assistants went to each bar and observed for one hour.
Nagle, 1996	Hospitals in Australia-voluntary policy	Smoking rate as well as location of smokers
Pikora, 1999	Recreational fields, Australia-voluntary policy	Observers selected random seats to assess for smokers with binoculars
Rigotti, 1993	Retail stores in Cambridge-public policy	Policy violators and smell of smoke
Satterlund, 2009	California bars-public policy	Observation in bars (ethnographic study)
Skeer, 2004	Bars in Boston-public policy	Observers noted smokers
Vardavas, 2011	Public places in Greece-public	Respondents were asked how they would respond to instances of policy violation
Weber, 2003	Restaurants/bars in California-public policy	Investigators assessed for violations, as well as smoke-free signs

Table 2.7 Measurement of Implementation Effectiveness: Implementation Barriers

Author/Year	Location	Implementation Barriers	Method
Goldstein, 2003	School districts in North Carolina-voluntary	Asked to provide recommendations for others considering implementation	Self-report
Hollen, 2010	Psychiatric hospital-voluntary	Participants were asked to seelct implementation barriers from a prepared list	Self-report
Movsisyan, 2010	Businesses in Armenia-public policy	Focus groups and surveys; broad assessment of smoke-free policy, including implementation barriers	Self-report
Ratschen, 2008	Hospitals in New Zealand-public policy	Used unpublished questionnaire and site visits to assess factors related to implementation, including barriers	Self-report and observation

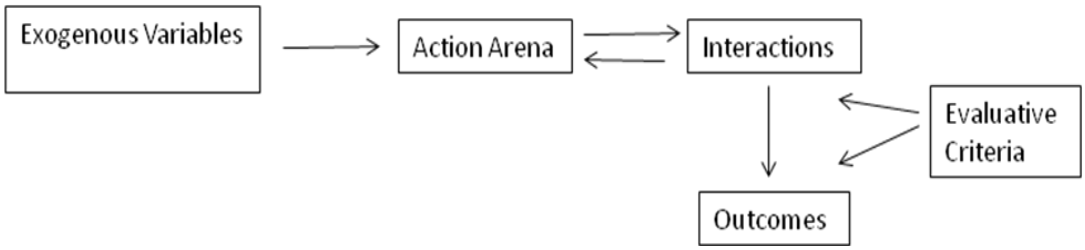
Table 2.8 Proposed Protocol for Measuring Implementation Effectiveness of a Tobacco-free Campus Policy

Stages	**IAD**	**Protocol**
Commitment	Collective Choice	Records Request Copy of the policy Self-report Conduct surveys with key stakeholders (individuals familiar with the implementation process) using a section of the SAQ[22] on commitment.
Preparation	Collective Choice	Records Request Records request of university steps taken to prepare for policy enactment, including removal of ashtrays, posting of signs, and initiation of smoking cessation therapy programs, including the sale of nicotine replacement therapy. Self-report Conduct interviews and focus groups with key stakeholders. Interviews should include four relevant sections of the SAQ.[22] Focus groups should ask key stakeholders to describe actions taken to prepare for policy enactment. Observation Observers should conduct a windshield survey or detailed walk-through of campus. During this period, observers should note steps university leadership has taken to prepare for tobacco-free policy implementation, including removal of ashtrays and sign postage.
Enforcement	Collective Choice	Records Request Records review to determine university procedure for reporting and handling policy violators. Self-report Interview key stakeholders related to policies in place to train individuals to approach violators.

Table 2.8 (continued)

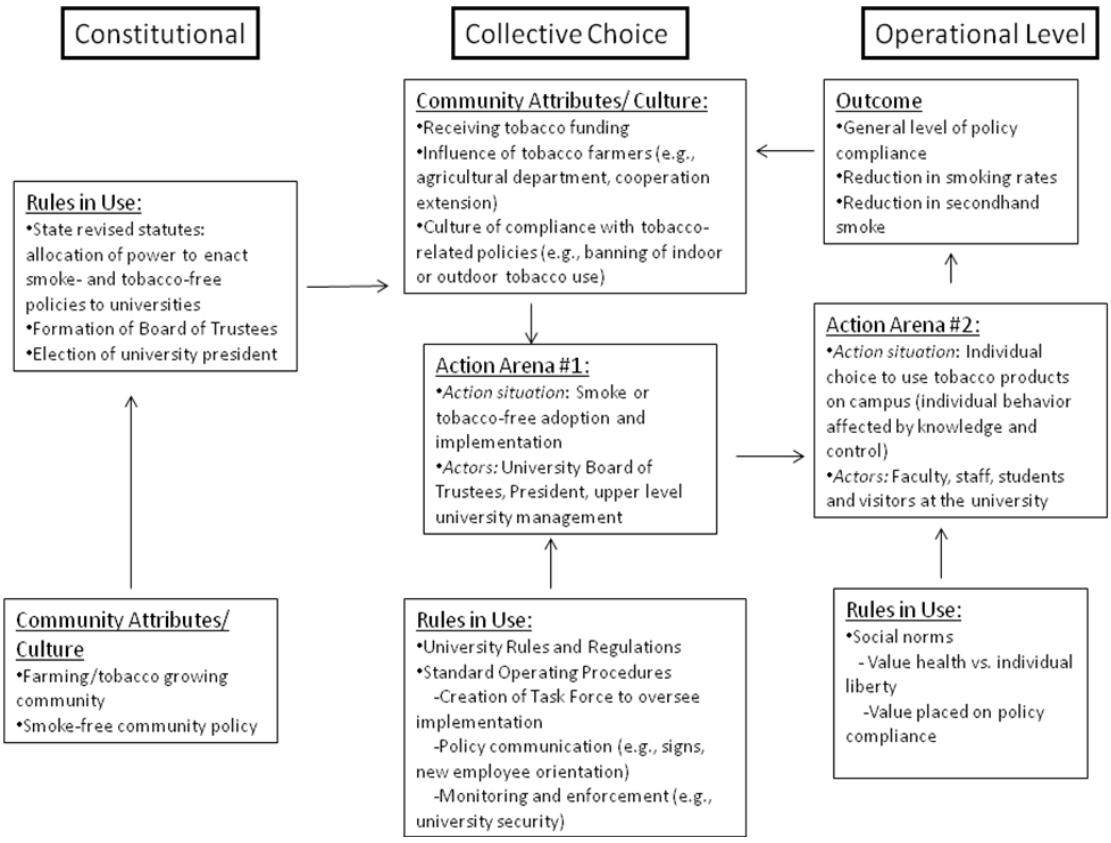
Stages	**IAD**	**Protocol**
Compliance	Operational	<u>Self-report</u> Students, faculty and staff should be randomly selected to participate in a survey on compliance. Survey should include: (1) how often they see smokers violating the policy on campus; (2) whether or not they personally violate the tobacco-free campus policy. <u>Observation</u> During windshield survey or detailed walk-through of campus, observers should also note "hot spots" or areas where smokers or cigarette butts are noted on campus. Prior to beginning the assessment, observers should review the locations where complaints have been received and include those areas. Based on the windshield survey or campus walk through, "hot spots" should be selected for a detailed compliance assessment. Compliance assessment should include noting smokers as well as cigarette butts found in selected areas using the TF-CAT. <u>Air Quality Monitoring</u> Air quality should be measured in identified "hot spots" around campus.
Implementation Barriers	Collective Choice or Operational	<u>Self-report</u> Focus groups should be conducted with university administration and individuals involved in the implementation. Interview students, faculty, and staff not directly involved in policy implementation to assess whether or not they have ever approached a violator. If not, ask them to describe reasons that they have not. Open ended prompts should be included, such as asking participants to identify barriers to implementation.

Figure 2.1 Factors Influencing the Action Arena



Source: Ostrom, E. (2005). Understanding Institutional Diversity. Princeton, N.J. Princeton University Press. (p. 13)

Figure 2.2 Application of the IAD to a Voluntary Tobacco-free University Policy[9,68]



CHAPTER THREE

Tobacco-free Compliance Assessment Tool (TF-CAT)

Background

Smoking is the leading preventable cause of mortality in the United States, contributing to over 450,000 deaths in 2005.[1] There are 7,000 chemicals in tobacco smoke, including approximately 70 carcinogens.[2] Upon inhalation, tobacco smoke enters the bloodstream, which can lead to blood vessel and organ damage throughout the body. Short-term exposure to tobacco smoke can lead to a stroke or heart attack. Long term exposure damages DNA, harms the immune system and can cause multiple types of cancer.[2]

Secondhand smoke (SHS) exposure is also a major public health threat. Exposure to any amount of SHS can lead to negative health outcomes. Short-term exposure to SHS places an individual at approximately 80-90% the cardiovascular risk of firsthand smoking.[69] Although the risks of indoor SHS exposure are well documented, the science of outdoor tobacco smoke (OTS) exposure is an emerging field. The risk of OTS exposure is dependent on multiple factors, such as wind speed and weather conditions.[3,70] However, OTS can pose a risk similar to or equal to that of indoor exposure.[3] In an outdoor setting, secondhand smoke can cause nausea, dizziness, headache, and respiratory irritation in bystanders within four feet of the smoker, and is noticeable 23 feet away.[70]

Smoke- and tobacco-free policies are the suggested public health strategy to reduce SHS and OTS exposure and prevent negative health outcomes.[71] These policies promote a healthy environment that encourages cessation, as well as reduced exposure to

OTS. There has been a recent increase in smoke- or tobacco-free campus policies in U.S. colleges and universities. As of January 2011, there were 466 colleges and universities with smoke-free campuses.[5] From 1992 to 2008, the proportion of smoke-free hospital campuses increased from 3% to 45%.[72] An additional 15% of hospitals were in the planning stages of adopting a smoke-free campus policy.

On November 19, 2008, the University of Kentucky Chandler Medical Center implemented a tobacco-free campus policy. One year later, on November 19, 2009, the entire campus (adjacent to the healthcare campus) went tobacco-free. According to the policy, all forms of tobacco use are prohibited including smoking (cigarettes, e-cigarettes, hookahs/water pipes, and pipes) as well as smoke-less tobacco (snus and chewing tobacco).[73] Tobacco use is prohibited on all university property in Fayette County Kentucky. Since the university does not have jurisdiction over the easement from city or state-owned streets that run through campus (i.e., sidewalks, gutters, or medians), the policy does not technically cover those areas. However, individuals are asked to respect the intent of the policy and not use tobacco in these areas.[73]

Adoption of smoke- and tobacco-free policies alone is not sufficient to promote public health. Policy implementation is also crucial. Implementation is one of the five stages of the policy process, [7] but little research has focused on this phase.[15] The implementation stage refers to steps taken to carry out policy mandates. [74,75] Effective policy implementation can only be achieved if there is a match between the original goals of the policies and the outcomes of the policy. [14]

One aspect of implementation effectiveness is compliance. Compliance refers to the degree to which individuals follow the directives of the policy. Compliance is a

crucial aspect of policies that are designed to alter behavior.[7] Given that the adoption of these policies is a relatively new trend, measurement of compliance with these policies is in its early stages.

Investigators use different approaches to measuring compliance with smoke- or tobacco-free policies in restaurants,[24,29] bars [18,65] and indoor areas of hospitals. [33,40,76] Indicators of non-compliance are: individuals using tobacco products, cigarette butts, smell of smoke and exposure to SHS. There are few published studies measuring compliance with outdoor policies using observational methods.[45,46,76,77] Pikora and colleagues assessed smoke-free policy compliance in a sports facility.[45] Dawley and colleagues assessed compliance with a non-smoking policy in a hospital setting.[76]

Harris and colleagues was the only published study that measured compliance with a university smoke-free policy that prohibited smoking within 25 feet from buildings.[46] Smokers were classified as either compliant/non-compliant, based on whether or not they were smoking at the appropriate distance from buildings.[46] The literature is limited in measurement of policy compliance, and there is not an accepted method to assess compliance with outdoor smoke- or tobacco-free policies.

Purpose

The purpose of this study was to describe the psychometric testing and feasibility of using the Tobacco-free-Compliance Assessment Tool (TF-CAT). The first specific aim was to investigate concurrent validity of the TF-CAT by comparing the number of cigarette butts found in areas covered by the tobacco-free policy with the number of butts found on sidewalks not under the control of the policy. It was hypothesized that there would be more cigarette butts found in areas covered versus those not covered by the

policy. The second specific aim was to evaluate the inter-rater reliability of the TF-CAT. The third specific aim was to describe the feasibility of using the tool.

Methods

Design

This was a prospective, descriptive study to assess compliance with a tobacco-free campus policy. There were two phases of the study: (a) Phase I was a pilot study with the newly developed TF-CAT over an 8-week period in Fall and Winter 2008-2009 on the healthcare campus only; and (b) Phase II includes baseline data collection from an intervention study during Spring 2010. The unit of analysis for this study is observation periods.

Sample

The sample consists of observation periods, which were defined as each visit to a secondary location. Primary locations were defined as the general area for data collection, and secondary locations were the specifically targeted area. For example, a specific building could be a primary site, whereas secondary sites could be the south parking lot and the steps outside the north entrance. Secondary locations were needed so the research team could be clear about the exact area being monitored.

The study sample for Phase I was 296 observation periods. Data were collected at 37 secondary sites (see Table 1) on the healthcare campus, and each of the sites was visited once a week for eight weeks. Of these sites, 27 were officially covered by the policy and nine were not. One of the secondary sites on the periphery of the healthcare campus was not covered by the policy. However, midway through data collection on the

healthcare campus, the main campus went tobacco-free, and this site was subsequently covered.

The sample for the Phase II of the study on main campus was 117 observation periods. Data were collected at 39 secondary sites on main campus. Of these sites, 36 were officially covered by the policy and three were not. During the baseline week, these sites were visited three times over a one week period (see Table 1).

Measures

Tobacco-free Compliance Assessment Tool. The tool was developed to assess compliance with a tobacco-free policy (see Figure 1). Cigarette butts discarded on the ground and observations of smokers were selected as the two main indicators of non-compliance. These variables are supported by the literature. [44,46,59,77]

The tool was designed for data collection at specific predetermined locations. These locations include primary and secondary sites, as described above. Since it is impractical to count cigarette butts and smokers on an entire campus, specific locations were purposively selected.

For Phase I, primary and secondary locations were chosen in close collaboration with the grounds crew at the healthcare campus. This was practical, because on the healthcare campus, a member of the grounds crew specifically clears cigarette butts every morning and afternoon.

The grounds crew members supplied a detailed map of the campus and made recommendations for certain areas where they frequently saw smokers or cigarette butts. Based on these recommendations, a list of healthcare campus locations was developed. The timing for data collection was also determined based on the grounds crew schedule.

In order to avoid the loss of data, the data collector developed a morning and afternoon route designed to end before the cigarette butts were removed by the grounds crew.

On main campus, the grounds crew procedures differed. Unlike the healthcare campus, the grounds crew does not specifically make rounds to clear cigarette butts. Therefore, the grounds crew had less detailed information available on locations of cigarette butts. In addition to consulting with the grounds crew, locations on main campus were selected based on observational rounds through campus, as well as areas where policy violations had been reported.

During Phase I, data collection took place once a week for eight weeks (296 observational periods). In Phase II, in the baseline week of an intervention, data collection took place three times in one week (117 observational periods). At each secondary site, the number of smokers at the site, as well as discarded cigarette butts were counted. In between Phase I and II, the TF-CAT was modified after Phase I to record the gender of smokers observed.

The raw count of cigarette butts was handled differently in analysis between Phase I and Phase II. In Phase I, it could be assumed that the cigarette butts found on the ground had been discarded by a smoker in the preceding 24 hours, due to the grounds crew's cleaning schedule. Because this was not the case on main campus, the number of cigarette butts collected was divided by the number of days in between data collection.

Other variables that might affect compliance were also measured including time of day, whether the specific location was under the jurisdiction of the university, and weather conditions including average temperature, precipitation, wind speed, and humidity. Weather data were recorded from www.weather.gov before beginning data

collection. In addition, the data collector also recorded a subjective description of the current weather status (i.e., sunny, rainy, cold, etc.).

Procedures

On the first day of Phase I data collection, the data collector counted the cigarette butts on the ground and did not collect them. However, during the course of the study, some areas did not appear as though the cigarette butts were being cleaned by the grounds crew. In order to avoid double counting, the protocol was altered on the second day of the study. Cigarette butts were picked up and discarded after counting them.

For Phase II data collection, it was impossible to base the time schedule around the grounds crew. The original plan was to collect data three times a week, twice during the day, and once during the evening since it was anticipated that more people might smoke outside during the evening. Due to logistics and time constraints, it was impossible to visit each location before dark. Only smokers were counted during the evening time periods.

To assess inter-observer reliability, four secondary sites were randomly selected. The primary data collector and an independent observer followed the route together. At each of the four sites, both the primary data collector and the independent observer counted smokers. The primary data collector counted cigarette butts from these sites, and then placed them in a marked plastic bag. After finishing the route, the independent observer counted the cigarette butts.

Data Analysis. Geographical Information System Analysis (GIS) maps were created using ArcMap Version 9.3. Cigarette butts were used as the primary measure of compliance, because there was very little variability observed in the number of smokers.

The median number of smokers per site was less than one during Phase 1 and II. For the data collected in Phase II of the study on the main campus, the raw number of cigarette butts collected was divided by the number of days in between data collection. This was done for Phase II of the study because the number of days in between data collection varied, a few days of data collection were postponed due to weather, and the grounds crew did not regularly clear the cigarette butts.

Two GIS maps were created to display the geographic distribution of cigarette butts, one for each phase of the study. All secondary locations were pinpointed using a satellite image of the area. For each site, the number of cigarette butts was averaged and the GIS software split the sites into three groups based on natural breaks in the frequency of cigarette butts collected. The maps were first used to descriptively assess geographic patterns in the number of cigarette butts. Second, the secondary sites were divided into violation versus non-violation sites. Although individuals were asked to respect the intent of the policy and not use tobacco on city or state-owned sidewalks, smokers in these areas were technically not in violation of the policy. Comparing cigarette butts in areas not technically covered by the policy compared to areas covered provided some support for the validity of the tool.

Statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 17 (Chicago, IL). To test the hypothesis, it was necessary to determine whether or not there was a statistically significant difference in number of cigarette butts counted in areas covered by the policy versus areas not covered by the policy. The Mann-Whitney U test was selected because the number of cigarette butts per location was not normally distributed. For Phase I on the healthcare campus, the site that

became covered midway through data collection was excluded. For Phase II on the main campus, the number of cigarette butts collected at each site was divided by the number of days in between data collection, for reasons described above. The number of smokers per site was not used for the statistical analysis because of the lack of variability. An *a-priori* alpha of <.05 was selected for comparisons of distributions between violation and non-violation sites using the Mann-Whitney U test.

To address the second specific aim, the inter-rater reliability of the TF-CAT was evaluated during Phase II of the study. Four of the secondary sites, or approximately 10%, were selected using an online random number generator.

Results

Sample Characteristics

Phase I. Per observation, the cigarette butt count per site ranged from 0-642, and the median per observation was 6.0 (see Table 2). The range of smokers observed during a single observation period was 0-17, with a median of zero. The average temperature was 52˚F; the average humidity was 71%; and the average wind speed was 7mph.

With some exceptions, more cigarette butts were observed in areas located near the perimeter of the healthcare campus. Among the violation sites, the six locations with the highest frequency of cigarette butts were all located near the perimeter. One exception to this was the Parking Structure near the outer edge of the healthcare campus in which only six cigarette butts were counted. Compliance with the policy was best in central areas of the healthcare campus (see Figure 2).

Phase II. Cigarette butts per day per site ranged from 0-116, with a median of 3.4. At a single site, during one observation, the range of smokers was 0-5, with a median

of zero. Throughout data collection, the average temperature was 59˚F, the average humidity was 56%, and the average wind speed was 6mph (see Table 2). The median number of cigarette butts collected per site per day when the temperature was equal to or below 57˚F was 2.3, compared to 4.1 when the temperature was above 57˚F.

Unlike the healthcare campus, where more cigarette butts were found on the periphery, on main campus, fewer cigarette butts were found on the edges of campus (see Figure 3). Spatially, it appears that more cigarette butts were found in areas that are somewhat hidden (i.e., behind a large tower) and in areas with highest traffic in evenings and night (i.e., dorm areas).

Validity

Cigarette butts. Based on spatial analysis (see Figure 4-5), more cigarette butts were counted in areas not covered by the tobacco-free policy on the healthcare campus (Phase I), but this was not the case on the main campus (Phase II). There were one exception on the healthcare campus, but excluding this area, the range of cigarette butts counted in the areas not covered by the policy was 50 to 210, compared to zero to 53 in areas covered by the policy. However, on the main campus there appears to be no relation between location violation status and number of cigarette butts.

The results of Mann-Whitney U tests provided further support for the hypothesis. On the healthcare campus, the median number of cigarette butts located in non-violation areas was 31, compared to 3 in violation areas (see Table 3). On the main campus, there was no statistically significant difference between cigarette butts found in violation versus non-violation areas.

Inter-observer Reliability

Support for the inter-observer reliability of the TF-CAT was strong. The percentage agreement between the data collectors and independent counters ranged from 96.8%-100 % across the four randomly selected sites. Support for the inter-observer reliability of the TF-CAT was also good with regard to counting smokers. The percentage agreement between the data collectors and independent observer was 100% at the four randomly selected sites (see Table 4).

Feasibility

Based on Phase I and Phase II studies, the TF-CAT is feasible, but time- and labor-intensive. On the healthcare campus, one data collector spent approximately an hour per day of data collection, for a total of eight hours over the eight week period. Data collection on the main campus, which covers a much larger area, required more time. For one week of data collection, the data collectors spent a combined total of 31 hours and 17 minutes, which is approximately .80 FTE.

Anecdotally, there were some issues with using the TF-CAT to monitor compliance. First, although efforts were made to discreetly observe and document tobacco use, the nature of data collection was not conducive to privacy. By wearing gloves and picking up cigarette butts, it is likely that the data collectors attracted attention. In one case, an observer documented that someone began smoking when they were observed collecting cigarette butts. In other cases, data collectors noticed that individuals who were smoking relocated when they noticed the observer. It may be beneficial to count cigarette butts first, and make a second round to count smokers.

Discussion

Results of the psychometric testing of the TF-CAT provide some support for the concurrent validity of the tool. To test the validity of the tool, the hypothesis that there would be fewer cigarette butts found in areas covered by the policy versus areas not covered by the policy was supported on the healthcare campus, but not on the main campus. It is possible that this is a reflection of compliance with the policy, rather than an issue with the tool. According to anecdotal reports from members of the UK Tobacco-free Task Force, enforcement of the policy on the healthcare campus is more stringent than on main campus. In addition, the healthcare campus policy had been in effect longer than on main campus.

In addition, smoking prevalence among healthcare providers is lower than the general public.[78] Results of a recent nationwide study indicated less than 6% of healthcare providers (other than nurses) smoke. The prevalence of smoking among nurses is higher at 13%, but still lower than the national average.[78] However, this would not fully explain the difference, because there are patients and visitors on the healthcare campus.

It is also possible that this was related to the timing of the data collection. On the healthcare campus, data were collected over an eight week period, versus one week on main campus. Time since policy adoption may have also had an impact on compliance. The policy on the healthcare campus had been in place longer at the time of data collection. Between 1998 and 2002, compliance with a smoke-free policy increased from 45.7%-75.8% among bar customers in Los Angeles.[29]

Additionally, inter-rater reliability of counting cigarette butts and smokers was very high. The TF-CAT is a time- and resource-intensive tool, but feasible for measuring

compliance. The TF-CAT may be more useful to measure compliance in smaller areas, such as a healthcare campus, versus large campuses.

The format of the TF-CAT allows the data to be analyzed spatially, which can help identify geographic patterns in compliance with the tobacco-free policy. Certain "hotspot" areas were identified using maps created in GIS. This information could be used to guide interventions to improve compliance. For example, more tobacco-free campus signage could be placed in hot spot areas. The map could also be used to target enforcement. Security, administrators, or student groups could use these maps to guide strategies to improve compliance with the tobacco-free policy. Administrators and faculty near areas with a high frequency of cigarette butts could be notified of compliance issues and asked to approach violators using a firm, yet compassionate message. The campus community may be encouraged to take a more active role in enforcing the policy if they were provided a visual representation of the compliance issues. GIS maps could also help policymakers assess the efficacy of interventions to improve compliance. Data could be collected pre and post-intervention, and then mapped, to allow spatial analysis of any changes in compliance.

Limitations

There are limitations to the use of the TF-CAT to measure compliance. Data collectors can only count cigarette butts that are discarded on the ground. Because the ashtrays were removed once the tobacco-free policy was adopted, it was expected that most smokers would discard their cigarettes on the ground. However, it is possible that smokers might walk through an area without discarding their cigarette, or they might dispose of the butt in a trash can.

Second, the TF-CAT does not determine the number of smokers who violate the policy. If 20 cigarettes are counted, it is unknown whether two people smoked 10 cigarettes in the same location, or if 20 different people violated the policy. One possible option would be for the observers to spend more time at each location to obtain a more accurate picture of the number of smokers; however, the time required for this option may be cost-prohibitive.

Another threat to the validity of the TF-CAT is the lack of inclusion of smokeless tobacco. It is difficult to determine if someone is using smokeless tobacco. Unlike traditional cigarettes, which are routinely discarded on the ground, there may be no "evidence" of smokeless tobacco use left behind. Only a few chew tobacco pouches were found on the ground. This is an issue that needs to be addressed to improve the reliability of the TF-CAT.

There were some challenges involved in designing the protocol for inter-observer reliability. It would have been ideal to have two independent observers collect data. However, the number of smokers in an area constantly changes, and the data collector typically picked up cigarette butts, counted and discarded them.

Implications for Future Research

Although the TF-CAT is intended to measure compliance with campus tobacco-free policies, the data yields evidence of non-compliance (cigarette butts and smokers). The TF-CAT does not capture the percentage of smokers who comply with the smoke-free policy. For example, Harris and colleagues measured compliance with a smoke-free policy on a university campus. The policy prohibited smoking within 25 feet of the entrance to buildings. Smokers observed between 0-25 feet were categorized as non-

compliant, and those standing 25-50 feet away were following the policy. [46] With a comprehensive tobacco-free campus policy it is more difficult to classify smokers as 'compliant', because smokers must leave the grounds entirely.

Another option to measure compliance with a tobacco-free policy would be to survey staff, patients and visitors. There are drawbacks to self-report, including social desirability bias. However, a survey of tobacco users could complement an objective measure of non-compliance such as the TF-CAT.

One method that could be adapted was Parks and colleagues' study of compliance among smokers at a hospital.[40] Smokers were asked, "While I am working at Addenbrooke's Hospital, I smoke on the site: more than twice a day/once or twice a day/once a week/once a month/never (p. 2)." This question could be modified to assess faculty, staff, students, patients and visitors' self-reported compliance with the tobacco-free policy.

Conclusion

The TF-CAT may be a useful tool to monitor compliance with tobacco-free campus policies. The layout of the tool readily allows for spatial analysis using mapping software. Once maps are created, they can serve as a user-friendly guide to improve compliance. There also is some evidence to support validity of the TF-CAT. Future studies are needed to demonstrate the efficacy and feasibility of using the TF-CAT on healthcare and college/university campuses.

Table 3.1 Study Sample Characteristics by Location and Duration of Data Collection

	Phase I (*n* =296)	**Phase II (*n* =117)**
Location	Healthcare Campus	Main Campus
Duration of Data Collection	8 weeks	1 week
Days of Data Collection	8	8
Primary Locations	11	24
Secondary Locations	37	39

Note. The unit of analysis is the observational period

Table 3.2. Weather Characteristics, Cigarette Butts, and Smokers Per Site

	Phase I (*n*=296)	**Phase II (*n*=117)**
Temperature (˚F)	51.9±12.4	62.3±7.6
Humidity (%)	71.1±9.8	51.3±2.9
Wind Speed (mph)	7.1±. 3.7	6.5±6.1
Cigarette butts per site	6 (1, 25.5)	4.7 (1.5, 15.1)*
Smokers per site	0 (0,0)	0(0, 0)

Note: *=cigarette butts per site per day between observations

Table 3.3. Cigarette Butts Found in Violation vs. Non-violation Sites

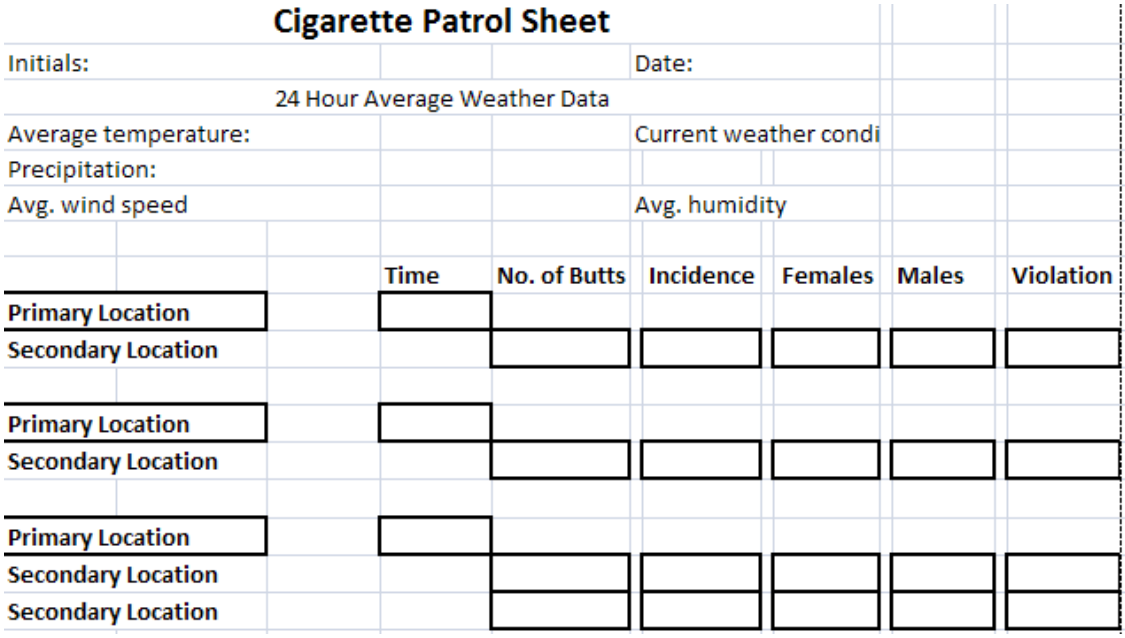
	Healthcare Campus (Phase I)		**Main Campus (Phase II)**	
	Violation Area (*n*=216)	**Non-Violation Area (*n*=72)**	**Violation Area (*n*=72)**	**Non-Violation Area (*n*=6)**
Cigarette Butts	3.0 (0.0-9.0)	31.0 (6.25-66.0)*	5.2 (1.5-16.6)	2.8 (.6-7.5)

Note: Results based on a Mann-Whitney U test; *=statistically significant at $p<.001$

Table 3.4. Inter-observer Reliability for Cigarette Butts on Main Campus (Phase II)

	Data Collector #1	**Data Collector #2**	**% Agreement**
Site #1	31	32	96.8%
Site #2	2	2	100%
Site #3	76	77	98.7%
Site #4	1	1	100%

Figure 3.1. Tobacco-free Compliance Assessment Tool (TF-CAT)



Cigarette Patrol Sheet

Initials: Date:

24 Hour Average Weather Data

Average temperature: Current weather condi

Precipitation:

Avg. wind speed Avg. humidity

	Time	No. of Butts	Incidence	Females	Males	Violation
Primary Location						
Secondary Location						
Primary Location						
Secondary Location						
Primary Location						
Secondary Location						
Secondary Location						

Figure 3.2. Total Cigarette Butts Collected on Healthcare Campus (Phase I)

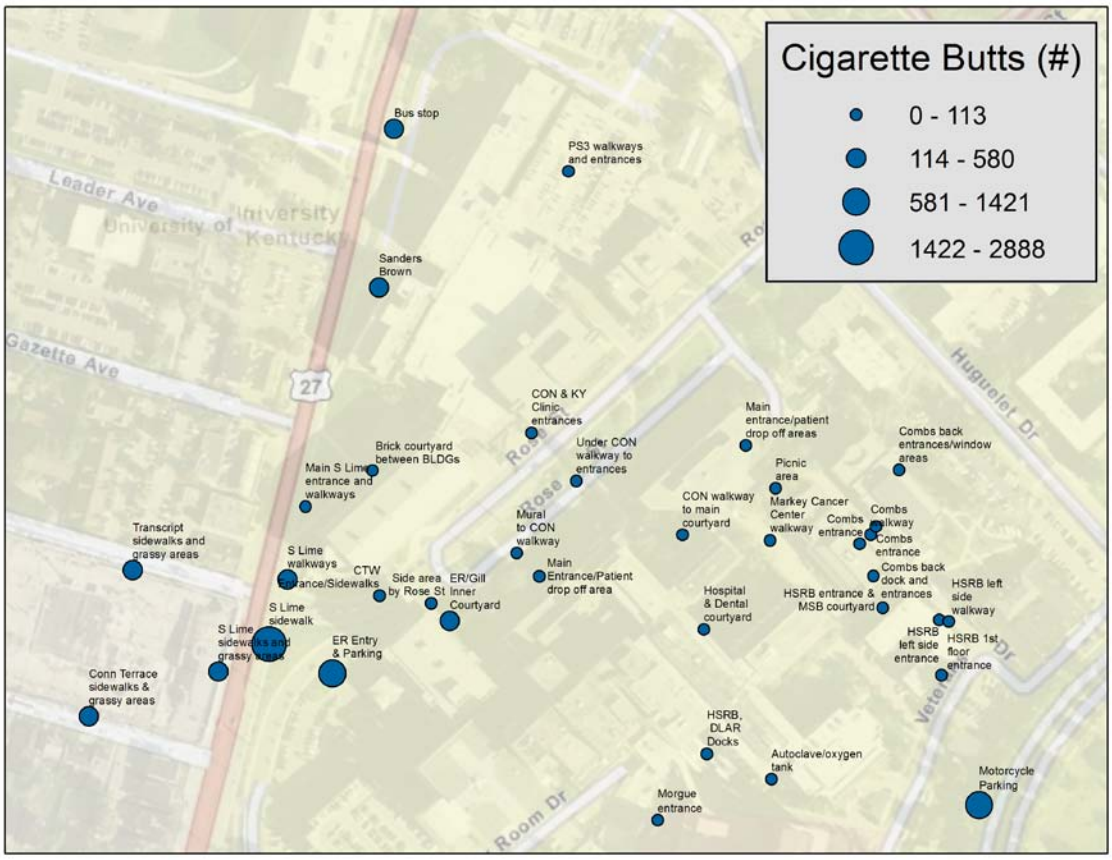


Figure 3.3. Cigarette Butts per Day on Main Campus (Phase II)

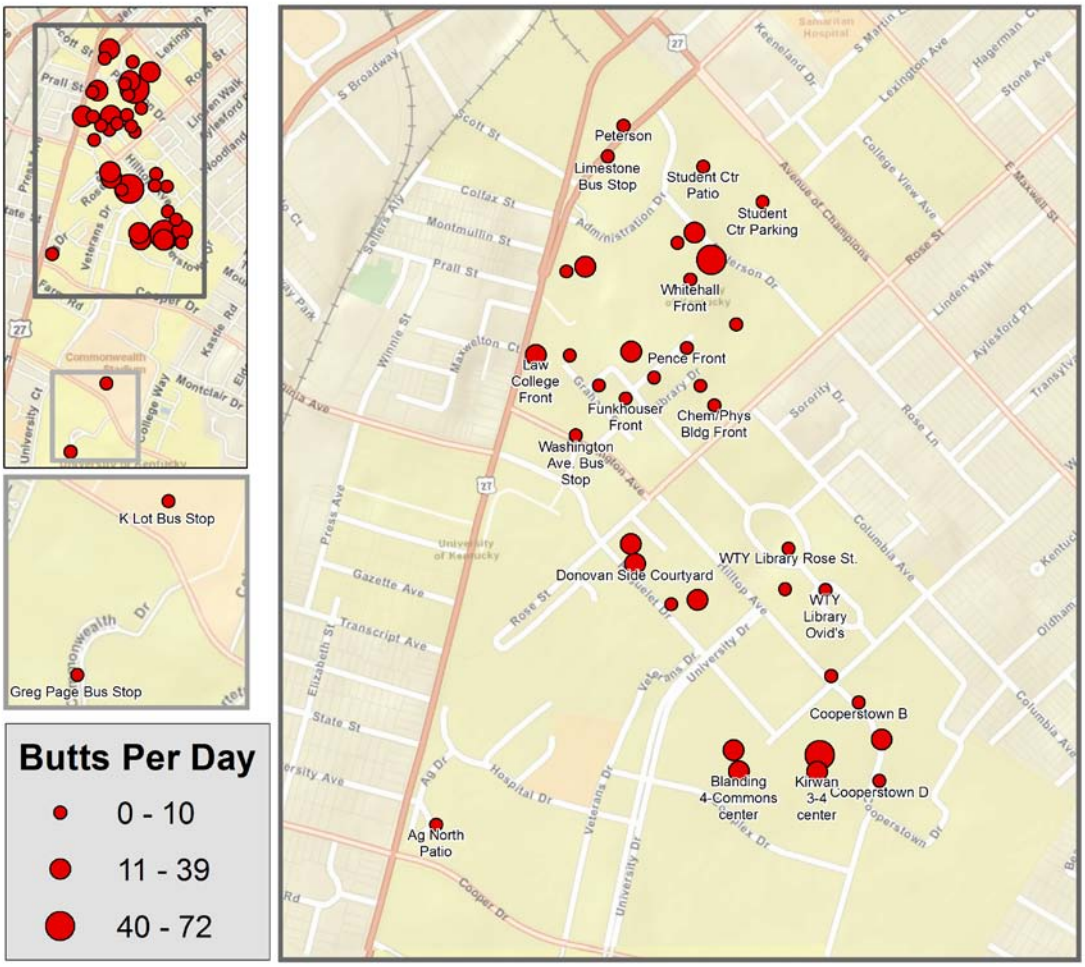


Figure 3.4. Cigarette Butts Per Day By Violation Status on the Healthcare Campus (Phase I)

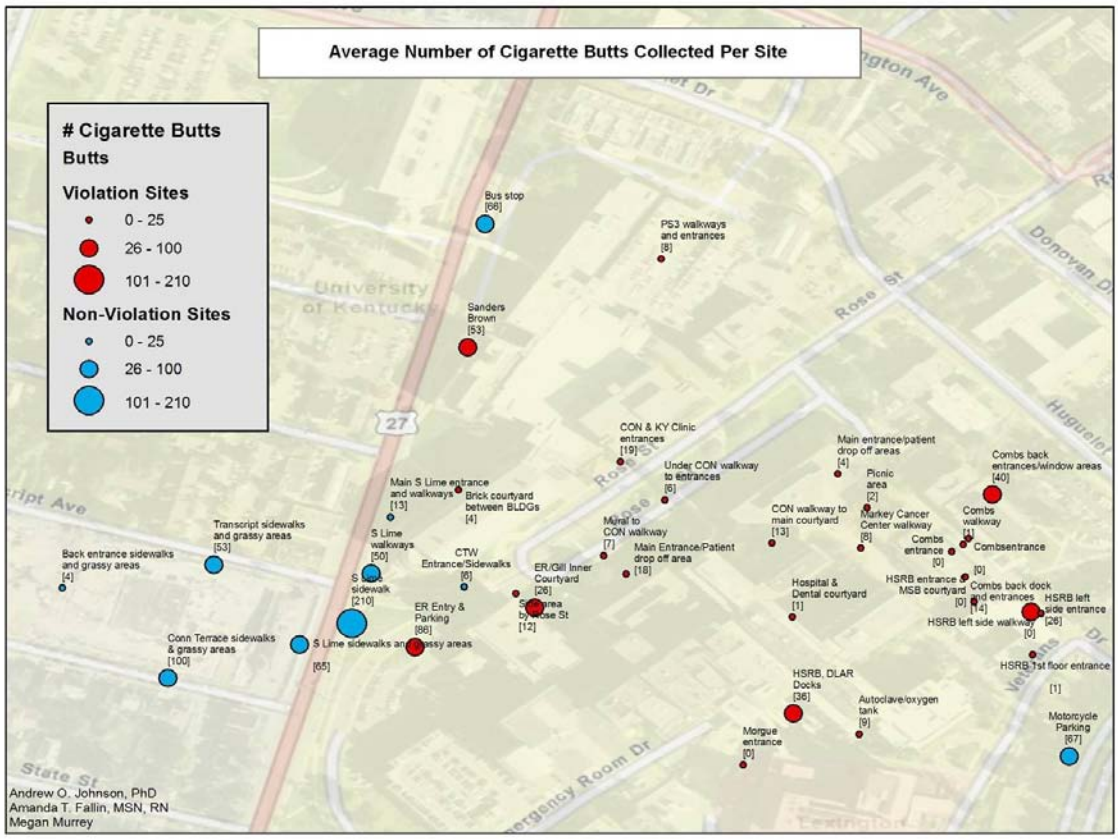
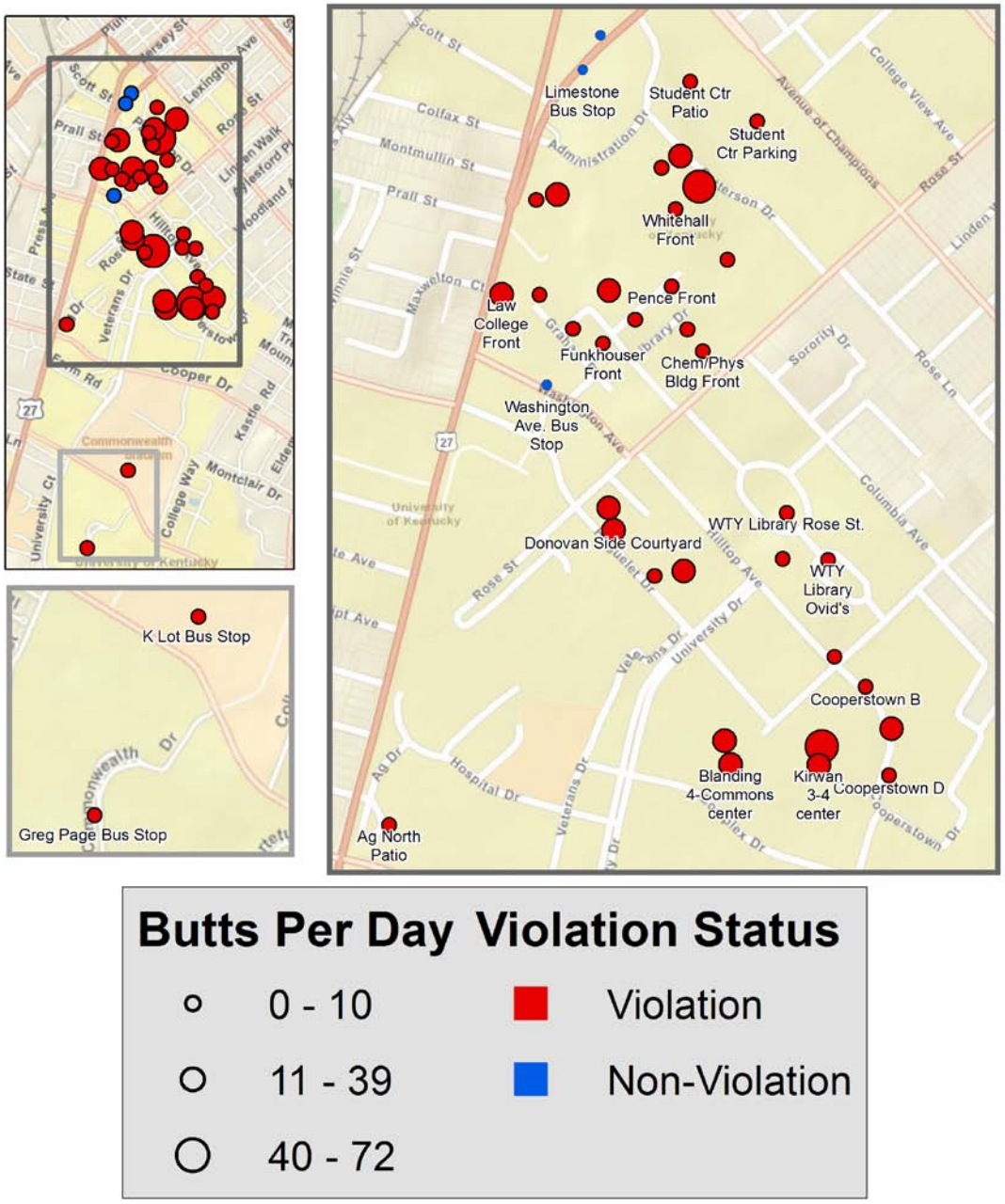


Figure 3.5. Cigarette Butts Per Day by Violation Status on Main Campus (Phase II)



CHAPTER FOUR

An Intervention to Increase Compliance with a Tobacco-free University Policy

Background

Active smoking and passive smoke exposure are public health hazards associated with multiple adverse outcomes. Tobacco smoke causes permanent damage to the DNA, alters heart and lung tissue, and leads to heart disease, respiratory ailments, and many types of cancer.[2] More than one in every five young adults between the age of 18 and 24 report smoking.[79] It is estimated that 23% of college students are current smokers,[80] and over 80% are exposed to secondhand smoke (SHS).[81]

Tobacco-free campus policies have demonstrated success in reducing smoking rates.[4] In addition, these polices have the potential to reduce exposure to outdoor tobacco smoke. Although it is dependent on wind speed, air pollution associated with outdoor tobacco smoke can reach levels similar to indoor SHS.[3] It can cause headaches and dizziness, as well as irritation of the eyes, nose and throat. Outdoor tobacco smoke is particularly dangerous for individuals with pre-existing respiratory conditions.[70]

Smoke- and tobacco-free campuses are a relatively new trend. In 1992, only 3% of the nation's hospitals were smoke-free.[72] In 2008, the proportion had increased to 45%, and another 15% of hospitals were planning to enact a smoke-free policy. These policies are also gaining popularity on college campuses. Approximately 400 colleges and universities are currently smoke- or tobacco-free.[5]

Tobacco-free campus policies adoption is not enough to change behaviors or health outcomes; successful implementation is also necessary.[7] Implementation effectiveness can be judged based on whether or not the policy outcomes achieve the

policymakers' goals.[14] In order for smoke- or tobacco-free policies to reduce smoking prevalence and outdoor tobacco smoke exposure, policy compliance is necessary. Compliance is defined as whether or not affected individuals follow the policy mandates. Compliance is a crucial element of implementation effectiveness.[7]

The University of Kentucky adopted a tobacco-free policy in November 2009. The policy is comprehensive, banning the use of tobacco products on all university property. Compliance with the policy has been a challenge. Direct observation reveals smokers as well as cigarette butts in some locations where smoking is prohibited. Non-compliance is an issue with smoke-free policies nationally and internationally.[21,82] Over half of college students in Greece who currently smoke have violated a smoke-free policy.[82]

Research is needed to determine effective ways to improve compliance with university-wide tobacco-free policies. Harris and colleagues tested an intervention designed to increase compliance with a campus policy prohibiting smoking within 25 feet of building entrances.[46] The intervention consisted of clearly marking the 25-foot boundary, moving all ashtrays outside this area, and putting up signs. In addition, a message card campaign was tested to increase awareness about the policy. Individuals following the policy and smoking outside the 25 foot radius were given a positive message card with a free drink coupon. Individuals observed smoking inside the 25 foot radius were given a card with a message reminding them of the policy. Compliance was measured before, during and after the intervention. The percentage of smokers complying with the policy increased from 33% before to 74% during the intervention. Compliance decreased to 54% the week after the intervention.

The Theory of Planned Behavior (TPB) has been used to guide studies of intention to smoke,[83] smoking initiation,[84] smoking behavior,[85] and smoking cessation.[86,87] According to the TPB, three major factors influence behavioral intention: attitudes, subjective norms, and perceived behavioral control. Behavioral intention then is associated with behavior change (see Figure 1).[88]

Perceived behavioral control may be an important target for influencing compliance with tobacco-free campus policies, because tobacco use is addictive. Perceived behavioral control refers to the degree to which an individual believes that he or she has the ability to accomplish a specific task.[89] It is based largely on two specific factors: self-efficacy and controllability. Self-efficacy refers to the associated level of difficulty, and controllability refers the level of control individuals have over accomplishing the task.[89] According to a recent nationwide study, only 25% of smokers believed they stop smoking at any time.[90] College student smokers in Greece with high scores on the Heaviness of Smoking Index, a tool designed to measure tobacco addiction, violated smoke-free policies more than those with lower scores.[82]

All three TPB factors (attitude, subjective norms, and perceived behavioral control) predicted smoking intentions among rural Virginia high school students[91] and Dutch adolescents.[84] In addition, Nehl and colleagues found that perceived behavioral control was the strongest predictor of smoking intention among undergraduate students in an urban university in the south.[85] Perceived behavioral control was considered to be an appropriate target for interventions with diverse populations. Unlike attitudes and subjective norms, perceived behavioral control was associated with smoking intention among both Caucasian and African American student populations. One study did not find

a significant association between perceived behavioral control and smoking cessation among University of Oslo students.[87] However, the majority of evidence supports that this is an appropriate target for an intervention designed to impact smoking behaviors.

Purpose

The purpose of the study was to test the effects of a population-based self-efficacy message card campaign on compliance with a tobacco-free campus policy. The specific aims were to: (a) determine if distribution of self-efficacy message cards increases compliance with a tobacco-free campus policy; (b) determine reaction to the distribution of self-efficacy message cards on campus; (c) determine the feasibility of a large scale self-efficacy message card campaign on a university campus, as evidenced by time and financial investment. The hypothesis was that distribution of self-efficacy message cards would increase compliance with a tobacco-free campus policy.

Methods

This study was a quasi-experimental pre-post design using purposive sampling. The unit of analysis was observational periods. The sample for this study was 312 observational periods. Thirty-nine sites were selected on campus, and they were each visited eight times. Cigarette butts were counted and smokers were observed.

The target population for the study was students, faculty and staff members, and visitors to the University of Kentucky. Based on number of students versus faculty, staff and visitors, it was estimated that the majority of individuals passing through the high traffic areas during the self-efficacy message card campaign would be students. It was expected that the characteristics of the target population would be representative of the student body at the University of Kentucky. In the Fall 2008-09 semester, there were

26,913 students enrolled in the University of Kentucky; 13,955 females and 12,958 males and the majority (19,493) were under age 24. The majority of students (21,986) were Caucasian, and 1,627 students were African American.[92]

Intervention. The population-based, self-efficacy message card campaign consisted of distributing approximately 6,000 self-efficacy message cards across the campus. The intent of the cards was to increase awareness of the policy. Additionally, the cards included a self-efficacy message with a web link to resources for UK faculty/staff and students who wish to stop using tobacco or reduce/eliminate their nicotine cravings while on campus (see Figure 6). The self-efficacy message card was designed to increase students' perceived behavioral control, based on the Theory of Planned Behavior.[88] The back of the card had a coupon for a free fountain drink to be redeemed at on-campus dining locations. The free drink coupon was included to decrease the likelihood that the cards would be discarded as litter.

The cards were distributed on three consecutive weekdays when most classes were in session. An additional weekday was planned as a back-up day for card distribution, in case of poor weather conditions. In two areas, cards were distributed from 11:00 AM to 1:00 PM. From 5:00 to 7:00 PM, cards were distributed in the other two areas. These locations and times were selected based on pedestrian traffic.

Cards were distributed by teams of two students or staff on the research team. One interventionist offered a self-efficacy message card to each person who walked by using the following script, "*This is about the tobacco-free campus policy, along with a coupon for a free fountain drink.*" The other member of the research team observed and took field notes (see Figure 5). Throughout the process of card distribution, the research

team member taking field notes documented verbal and non-verbal reactions of individuals who were offered a card. All individuals passing through four high traffic areas on campus were included in the study and were offered tobacco-free campus self-efficacy message cards. The areas were selected based on recommendations made by team members familiar with general routines and traffic flow on campus.

Measures

Tobacco-free Compliance Assessment Tool (TF-CAT). For the purposes of this study, compliance was operationally defined as the number of cigarette butts counted on the ground and number of observed smokers. The TF-CAT (see Figure 2) was developed and pilot tested for use on the University of Kentucky Chandler Medical Center campus and it has high inter-rater reliability.[93] The TF-CAT is designed for site-specific compliance monitoring.

To select locations, a list of "hot spots," or areas on campus where there are high levels of non-compliance with the tobacco-free campus policy was generated. These hot spots were identified by walking through campus and observing smokers, as well as cigarette butts. Areas were also suggested by the campus maintenance crew, as well as areas where complaints had been received by the Tobacco Task Force. The list of hot spots was narrowed down to 24 primary locations, the general building or road. Then, each of these primary locations was divided into secondary locations. Secondary locations were specific enough to direct data collectors to the appropriate areas to count cigarette butts. For example, the law school was a primary location, and the back patio of the building was a secondary location.

For each location, the monitor used the TF-CAT to document the time he or she arrived, as well as the number of cigarette butts, the incidence of tobacco users (as well as gender), and whether using tobacco in that site was a violation according to the policy. Some sidewalks within the campus boundary are owned by the city or state, and not technically covered by the policy. However, the Tobacco-free Task Force asks individuals to respect the intent of the policy and refrain from using tobacco in those locations.[6] (See Figure 3 for map of the policy boundaries.)

The TF-CAT also documents general information such as the monitor's initials, date, and weather information. Relevant weather information included average temperature, precipitation, average wind speed, current weather conditions, and average humidity.

Field notes. As the tobacco-free self-efficacy message cards were distributed, one member of the research team took field notes. Field notes included the researcher's initials, date/time/location, weather conditions, number of people using tobacco, and additional relevant details about the site (e.g., an event taking place). At the end of the distribution period, the team members at each location conferred, and field notes were added.

Feasibility. To analyze the third specific aim, time and financial investment were determined. Time was estimated in terms of hours spent monitoring compliance and distributing cards. Financial investment included the actual costs of the self-efficacy message cards and fountain drinks. Dining Services kept track of the number of cards redeemed for a free drink, which could be used to estimate actual project expenditures.

Procedure

Monitoring compliance. Monitoring compliance consisted of counting cigarette butts as well as smokers. To avoid double counting cigarette butts, the monitors picked them up (while wearing gloves), counted and discarded them. Monitors counted and recorded the number of smokers who were visible from the secondary site.

One week of practice monitoring compliance took place before the official start of the intervention. This week gave data collectors the chance to familiarize themselves with the procedure. The grounds crew was notified of the project, and agreed to clear the cigarette butts from the areas selected for this study before beginning data collection. This thorough cleaning of the cigarette butts and the week of practice ensured that the study sites were completely cleared of old cigarette butts at the commencement of active monitoring.

Prior to initiating data collection, the plan was to monitor compliance during the day on Tuesday, during the late afternoon on Thursday, and during the day on Saturday. However, after the practice week, it was determined that it was not feasible to fully monitor compliance beginning on Thursday afternoon due to safety concerns and difficulty seeing the cigarette butts after dark. The schedule was altered to conduct partial compliance monitoring on Thursday afternoons. The data collectors visited each of the sites and simply counted smokers and not cigarette butts. See Table 1 for the full monitoring schedule by number of observations.

Data Analysis

Statistical analysis was conducted using SPSS v17. Descriptive analyses included calculating means and standard deviations, or medians and quartiles, depending on the

distribution of the data. To test the hypothesis, the rate of cigarette butts picked up per day was calculated. The rate was used instead of the raw number, because the amount of time between data collection periods varied. Because the cigarette butt data were not normally distributed, the number of butts per day per site was compared pre- to post-intervention using the Mann Whitney U test. Due to low variability, the number of smokers before and after the intervention was not used as a measure of compliance in hypothesis testing.

In addition, ArcGIS v9.3 was used to calculate a post-pre rate ratio of cigarette butts collected per day and per site. Sites were excluded that did not have at least 10 cigarette butts per day during either the pre- or post-intervention period. Of the 39 secondary sites, 27 were included in the analysis.

Results

Sample Characteristics

Of the 312 observation periods, 117 were in the pre-intervention period, 78 were during the intervention week, and 117 were post-intervention (see Table 1). Of the 312 observation periods, 195 were full (data collectors counted both cigarette butts and smokers), and 117 were partial (data collectors counted only smokers) observations. The number of cigarette butts per day at a single site ranged from 0-116, with a median of 3.4. The number of smokers at a single site ranged from 0-5, with a median of zero. Because of the lack of variability, the number of smokers was not used to test the hypothesis.

Change in Compliance

The median number of cigarette butts per day pre-intervention was 4.7, during the intervention was 4.0, and after the intervention was 1.9 (see Table 2). Based on Mann-

Whitney U, the number of cigarette butts per day per site found post-intervention was significantly lower than the number found pre-intervention (Chi square: 8.103, p=.004). The sum of the ranks among cigarette butts per day at each site pre-intervention was 88.8, compared to 68.2 post-intervention.

According to spatial analysis, 18 sites (66.6% of the sites) had a post-pre ratio of .11-.75, indicating a decrease in cigarette butts per day (see Figure 7). Five sites (18.5% of the sites) had a post-pre ratio of .75-1.30, indicating a small or no change. Four sites (14.8% of the sites) had a post-pre ratio 1.31-19.20, showing an increase in cigarette butts per day.

Reaction to Campaign

The vast majority of individuals passing by politely accepted the cards without comment, or simply remarked, *"Thank you."* Among those who refused a card, the majority did not read the content of the self-efficacy message. People listening to MP3 players, talking on cell phones, or walking with a group were more likely than those walking undistracted or with a group to walk by without accepting a card. Some people read the card, and others immediately placed it in a pocket or purse.

Among individuals that read the self-efficacy message and commented made both negative and positive remarks. An example of a positive statement was: "*Tobacco-free UK. I love it!*" A negative remark was: "*No thank you, I believe in freedom."*Another was, *"For the record, I personally don't agree with the tobacco-free law. I feel as though it is a violation of human rights and I do not smoke."*

The interaction from most individuals was very brief. However, handing out the self-efficacy message cards provided an opportunity for some students to engage in

dialogue either about the policy or about tobacco treatment resources. Several students discussed enforcement of the policy. An example was, *"I haven't seen a difference in enforcement since policy started."* Another example was, *"Are you raising awareness? I heard it was student driven. Students are those who enforce it."*

Among individuals using tobacco products at the time they were offered the card, the reaction was mixed, and included verbalization of guilt, laughter, and anger. Examples include, *"I was taking a dip when you gave me that card and now I feel guilty."*Another example was, "*I don't comply with this ban so I don't deserve it."* Several read the card and laughed or smiled. An example of a remark included, "*Oh, that is kind of funny. My bad."* A few smokers receiving the card reacted angrily. For example, one individual smoking said, *"I was just about to light up."* As he walked off, he lit a cigarette. Another example was an individual who flashed his pack of cigarettes.

Overall, there were very few negative reactions to the self-efficacy message card campaign. The free drink on the card may have motivated individuals to take the card. One individual remarked, *"Free soft drink for not smoking? Thank you!"* Another was, *"Wow, a free drink."* According to a dining services representative, 15% of the cards were redeemed for a fountain drink.

Feasibility of Campaign

Excluding the practice phase, a total of 86 hours and 47 minutes were spent monitoring compliance. During the eight periods of data collection, between two and four individuals monitored compliance. The number of hours spent was multiplied by the number of monitors. Thirty-one hours and 17 minutes were spent during the pre-intervention phase; 21 hours and 44 minutes during the intervention phase, and 33 hours

and 46 minutes were spent during the post-intervention phase. The personnel needed to monitor compliance was equivalent to .72 FTE per week for a total of three weeks. In addition, approximately 24 hours during one week was spent distributing self-efficacy message cards. Eight people per day during the 3-day intervention were needed; two people at each of the four intervention sites. The personnel needed to deliver the intervention was equivalent to .6 FTE for one week.

The intervention was relatively inexpensive. All the interventionists and data collectors were research staff or students at the university, so there were no direct personnel costs. Dining Services donated 900 fountain drinks (15% of the 6,000 cards redeemed). The Tobacco-free Task Force donated $1,600 for printing the message cards.

Discussion

The self-efficacy message card campaign was intended to raise awareness about and promote compliance with the tobacco-free campus policy. The results of this study support the hypothesis that a self-efficacy message card campaign increased compliance with a tobacco-free campus policy. Overall, the campaign was received positively. The campaign was time intensive, but not cost prohibitive.

Future research is needed to design and test the most effective messaging to increase compliance with tobacco-free campus policies. Formative research with student, faculty, staff and visitor feedback prior to initiating a campaign would be helpful. Berkowitz and colleagues describe the use of formative evaluation to guide VERB, a public health campaign focused on physical activity among children.[94] Prior to initiating the campaign, focus groups were held with children and their parents to develop an effective message that would resonate with participants.

The intervention tested in this study included only one channel of communication. This study was based on Harris and colleagues' study, which incorporated multiple methods.[46] Given that signage and ashtray removal had occurred previously, only the message distribution component was applicable. Future studies could incorporate additional communication channels. For example, during the week of the awareness campaign, ads could run in the student newspaper, email alerts could be sent, and flyers could be placed in high traffic areas. By using multiple channels, it is likely that the message would reach more people. Although more people may receive the message, this type of campaign may be difficult to evaluate.[95] It may not be possible to determine which media channels were the most effective in promoting compliance.

The intervention was evaluated using several methods. The main outcome variable including the change in median cigarette butts per day per site. Other variables included qualitative reaction to the campaign and percentage of drink coupons that were redeemed. However, optimal evaluations include examination of many possible outcomes.[96] The evaluation of this intervention would have been enhanced by examination of whether students blogged about the issue, wrote letters to the campus paper, or discussed the project in class.

It is noteworthy that the post-pre ratio of cigarette butts per day increased at four sites on campus. Two of these were sites that were not technically covered by the policy because they were sidewalks adjacent to streets not owned by the university. It could be speculated that smoking increased at these sites because individuals were complying with the policy. Future studies need to assess where people go to smoke on campus. It seems likely that there may be smoking on the periphery of campus and in hidden areas, as well

as the city and state-owned sidewalks that are not officially covered by the policy. If individuals congregate in these locations, the outdoor tobacco smoke exposure poses a risk to pedestrians. Research is needed to evaluate outdoor tobacco smoke exposure at the boundaries of tobacco-free campuses.

The intervention was designed to increase smokers' perceived behavioral control by raising awareness about tobacco treatment resources available on campus. Future research is needed to study behavioral attitudes and subjective norms[88] in relation to policy compliance. For example, it is possible that adoption of a tobacco-free policy would change the social norm to discourage tobacco use and promote cessation. However, if policy compliance is poor, it is possible that this change in subjective norm may not occur. It is also possible that adoption of a tobacco-free policy would change attitudes toward smoking, particularly if there is a widespread educational campaign preceding the policy change.

Limitations

Based on these data, it is not possible to determine if weather conditions would have had an effect on compliance. Data collection was postponed twice due to rain. In addition, data were collected in April and May, and the weather was moderate throughout data collection. Future studies could assess the impact of extremes weather conditions on policy compliance.

Based on the nature of data collection, it would be very difficult to collect data in the dark. However, it is possible that there are more violations at night, particularly in areas that are highly populated at that time, such as dorms or the library.

It is possible that some of the cigarette butts may have been disturbed in between data collection periods. For example, rain or wind may have resulted in the loss of some cigarette butt data. However, it is unlikely that there would have been a significant loss of data, because cigarette butts are not biodegradable.[97] On the first day of data collection during the practice week, approximately 6,000 cigarette butts were collected. Also, the median number of cigarette butts collected on the first day during the practice week was much higher than during any of the other data collection periods. The median of cigarette butts per day was 21.0 in the practice period, compared to 4.7 during pre-intervention, 4.0 during the intervention, and 1.9 after the intervention. It seems likely that cigarette butts remain in the location where they are discarded.

In addition, it is possible that other factors influenced policy compliance. For example, it is standard practice at the University of Kentucky for a member of the Tobacco-free Task Force to email Deans or other building administrators in the vicinity of hot spot areas on campus. If these individuals took action during the time of the study, it is possible this may have impacted compliance. However, any effect was likely minimal, because these email reminders about the policy were in place before the intervention began. Also, the selected secondary sites were located in many campus locations.

Conclusion

A self-efficacy message card awareness campaign designed to enhance perceived behavioral control improved compliance with a tobacco-free policy on a large university campus. The reaction to the campaign was largely positive. Though time-consuming, the campaign was not cost prohibitive. Future studies are needed to test different messages,

as well as to use multiple communication channels, such as radio or newspaper ads. In addition, future research might consider measuring outdoor tobacco smoke exposure at policy boundaries, as well as interventions targeting behavioral attitudes and subjective norms. A large scale self-efficacy message campaign, based on the TPB, shows promise as an intervention to promote compliance with tobacco-free campus policies.

Table 4.1. Schedule of Compliance Monitoring and Number of Observations

Date	**Time (AM/PM)**	**Observations**	
		Full	**Partial**
Practice			
4/6	AM	39	
4/8	PM	39	
4/10	AM	38	
Total		116	
Pre-Intervention			
4/13	AM	39	39
4/15	PM		
4/17	AM	39	
Total		78	39
During Intervention			
4/20	AM	39	
4/22	PM		39
Total		39	39
Post-Intervention			
4/28	AM	39	
4/29	PM		39
5/4	AM	39	
Total		78	39
Overall Total		195	117

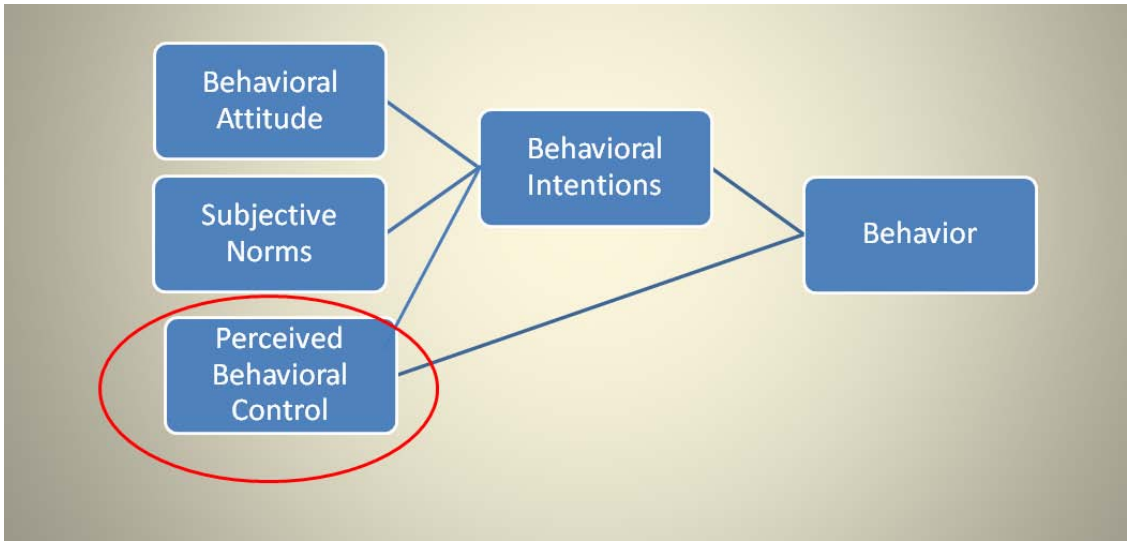
Note. Full monitoring included counting cigarette butts and numbers of smokers; partial monitoring included counting number of smokers only

Table 4.2. Sample Characteristics and Outcome Variable

	Practice	**Pre-Intervention**	**During Intervention**	**Post-Intervention**
Mean ± SD or Median (25^{th}, 75^{th})				
*Temperature (F)	55±10.8	62.3±7.6[a,b]	56.0±2.0[a]	56.7±7.4[b]
±Wind Speed (MPH)	9.6(3.6-15.2)	6.1(4.9-8.3)[c]	4.9(4.4-5.3)[c]	5.7(5.3-10.7)[c]
*Humidity (%)	53.0±14.8	51.3±2.9[d]	57.0±0.0[d]	59.0±3.8[d]
┼Cigarette butts/ # of days in between collection per site	21.0 (6.0, 75.3)	4.7(1.5,15.1)[e]	4.0(1.5, 13.0)[e]	1.9(.7, 6.9)[e]

Note. Practice was not included in any statistical tests; [a]$p \leq .001$; [b]$p \leq .001$; [c]$p \leq .001$; [d]$p \leq .001$; [e]$p = .004$; *ANOVA and Bonferoni post-hoc test; ± Kruskal-Wallis test; ┼Mann-Whitney U

Figure 4.1. Theory of Planned Behavior



Source: Ajzen I. The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes.* 1991;50:179-211.

Figure 4.2. Self-efficacy Message Cards

Figure 4.3. Tobacco-free Compliance Assessment Tool (TF-CAT)

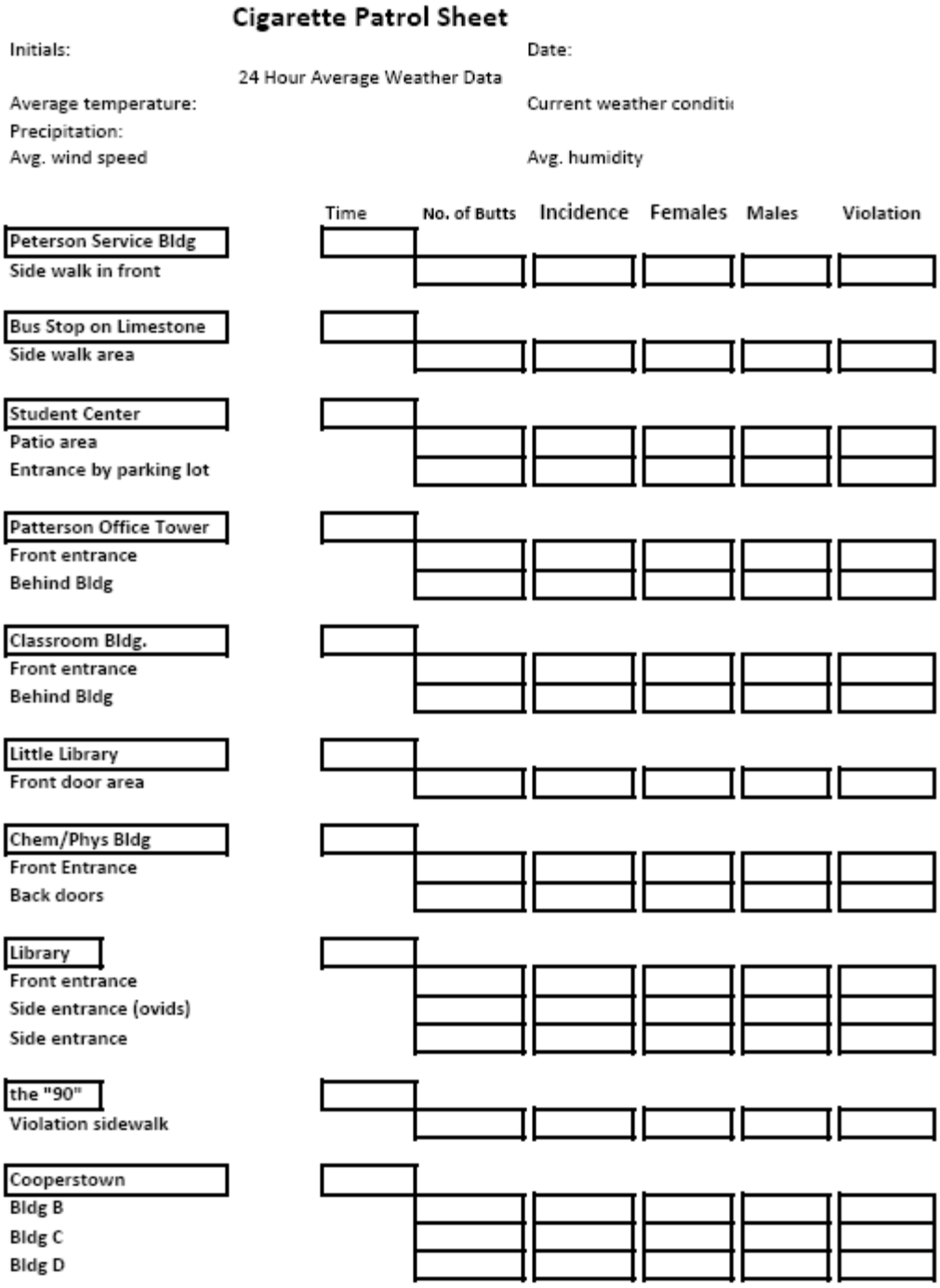
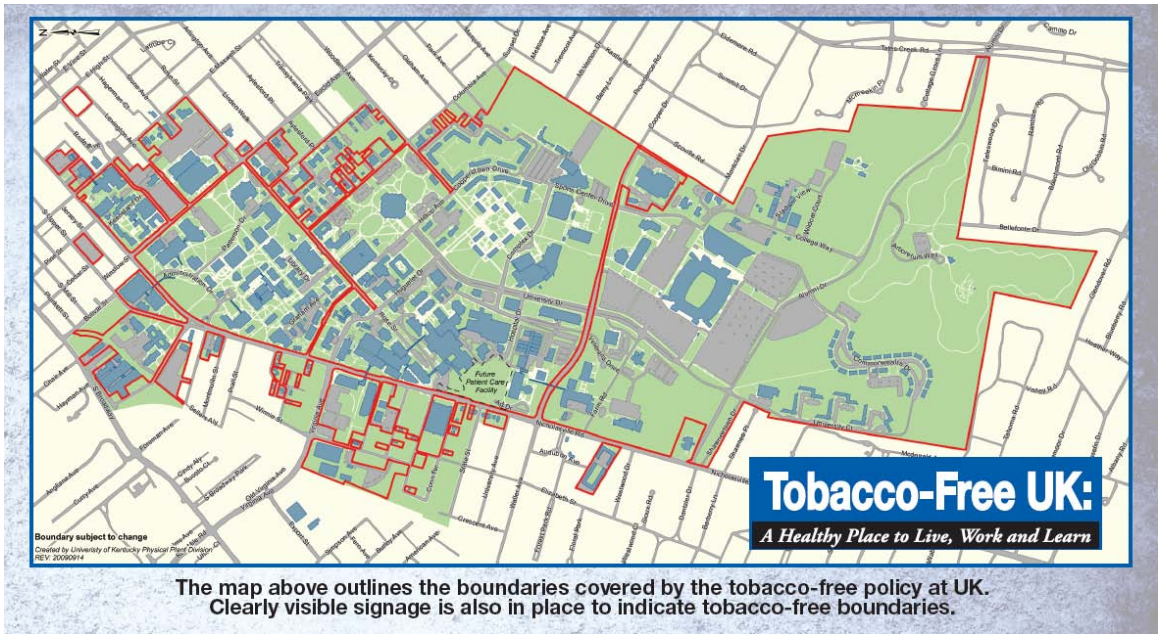


Figure 4.4. Map of University of Kentucky Tobacco-free Policy Boundaries



Source: (University of Kentucky, 2010)

Figure 4.5. Field Notes Data Collection Tool

An Intervention to Increase Compliance with a Smoke-free Campus Policy: Data Collection Tool*

Your Initials:
Date/Time:
Weather Conditions (temperature, sunny vs. cloudy, windy?):

Location:

Any additional relevant details about the site (ie: an event is taking place):

Total Number of Cards Distributed (please subtract the number remaining from the number you started out with):

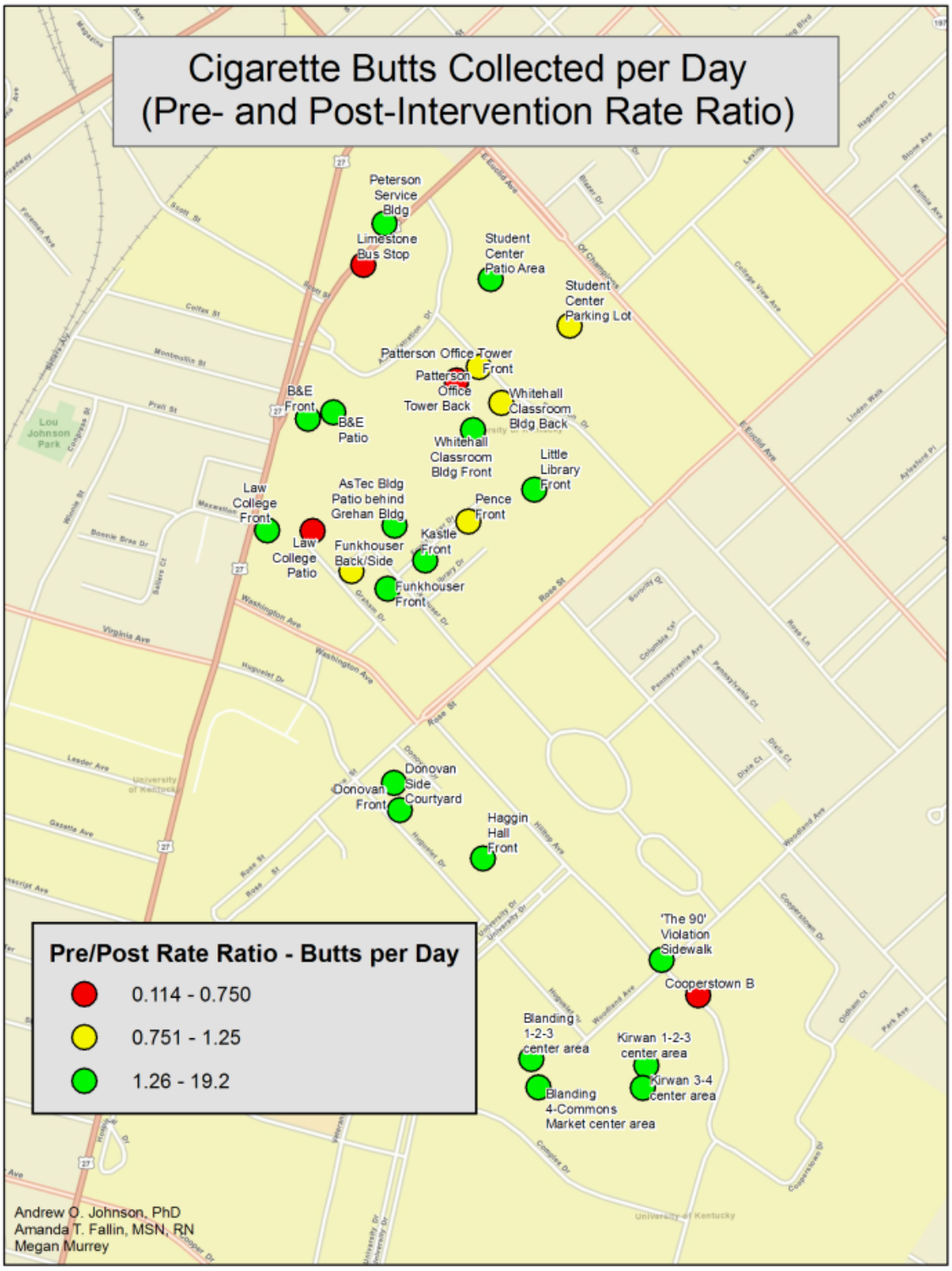
Total Number of Cards Discarded as Litter (please pick up and count the number of cards that are on the ground that you notice in your area):

Please describe in as much detail as possible any dialogue or verbal remarks related to the card distribution (those who take the card or those who pass by and make a remark either to the individual passing out the card or others). Please do not identify participants by name or other identifiers.

Please describe in as much detail as possible other nonverbal reactions participants have to the intervention (ie: throwing down card, laughing, angry looks). Please do not identify participants by name or other identifiers.

Answer this question after debriefing with your partner:
About what percentage of males and females did you notice in this location? Did you notice any differences by gender in those who took the cards versus those who refused them?

Figure 4.6. Cigarette Butts Collected Per Day (Pre and Post Intervention Rate Ratio)



CHAPTER FIVE

Conclusion

Three papers were presented in this dissertation: (1) “Measuring Tobacco-free Policy Implementation Effectiveness: A Comprehensive Review of the Literature”; (2) “Tobacco-free Compliance Assessment Tool”; and (3) “An Intervention to Promote Compliance with a Tobacco-free Campus Policy”.

The first paper was a comprehensive review of the literature on measuring implementation effectiveness of smoke- and tobacco-free policies. The purpose of this paper was to recommend an evidence-based protocol for measuring policy implementation effectiveness. Ostrom’s Institutional Analysis and Development[9] Framework (IAD) and a literature review were used to structure this protocol.

The action arena, or a specific institutional process, is a major focus of the IAD.[9] Action arenas can occur at multiple levels, including the operational (day to day activities in an institution), collective choice (institutional policy making) and constitutional (framework within which an institution can enact policies) level. Action situations can be linked, so the results of an action situation at one level may directly impact an action situation at another level.

The IAD[9] is useful for structuring a protocol to measure implementation effectiveness of smoke- and tobacco-free campus policies. Smoke and tobacco-free policies are designed to influence individual behavior. The IAD provides a framework for assessing the impact of actions at the collective choice level (i.e., tobacco-free campus policy adoption and implementation) on behavior at the operational level (i.e., the individual decision to not use tobacco products in prohibited areas).

A literature review was conducted to identify current methods for assessing implementation effectiveness of smoke- and tobacco-free policies. Using the IAD as a guide, the current measurement methods were reviewed and strengths and weaknesses of each were discussed. The literature was synthesized and a protocol for measuring implementation effectiveness of tobacco-free campus policies was presented.

The second paper was a psychometric and feasibility analysis of the Tobacco-free Compliance Assessment Tool (TF-CAT). This tool was developed and pilot tested on a healthcare campus, and data from the baseline of an intervention was also used. The data collected on the healthcare campus (Phase I) and baseline data from the intervention study on main campus (Phase II) were analyzed in the second paper. Results of the psychometric paper indicate strong inter-observer reliability and provide some support for the validity of the TF-CAT.

The TF-CAT is feasible to measure compliance with a tobacco-free campus policy, but it is time intensive. During Phase I on the healthcare campus, compliance data were collected for one hour a day over an eight week period, for a total of eight hours. On main campus, during Phase II, data collectors spent 31 hours and 17 minutes during one week, or approximately .80 FTE.

The third paper describes an intervention designed to increase compliance with a tobacco-free campus policy. The intervention was a large scale self-efficacy message card campaign, based on the Theory of Planned Behavior.[88] According to Ostrom,[9] individual behavioral theories can fit into the IAD at the operational level. The cards included information on tobacco treatment resources available on campus to faculty, staff and students. Four high traffic areas were selected on campus, and 6000 self-efficacy

message cards were distributed. Harris and colleagues successfully improved compliance with a smoke-free campus policy with an intervention that included a message card campaign.[46]

To determine if there was an improvement in compliance with the policy, the TF-CAT was used to measure compliance the week before, during and after the intervention. The median number of cigarette butts found on campus was lower after the intervention compared to before the intervention (n = 312 observations; median = 4.7 vs. 1.9; p=.004). Reaction to the campaign was positive overall. This study provides some support for the use of a self-efficacy message card campaign to improve compliance with tobacco-free campus policies.

Future Research

Future research is needed to advance the science in the area of implementation effectiveness of tobacco-free policies. In the first paper, a protocol for measuring implementation effectiveness of tobacco-free campus policies was presented. This protocol needs to be pilot tested for feasibility of use. In addition, the psychometric properties of this tool need to be evaluated, including validity and inter-observer reliability. In the future, there is the potential to use this tool to compare and predict implementation effectiveness on campuses across the nation. In addition, future research could apply the IAD to adoption and implementation of other types of health-related policies.

The second paper in this dissertation presented the psychometric properties of the Tobacco-free Compliance Assessment Tool (TF-CAT). The third paper presented an intervention to improve compliance with a tobacco-free campus policy. Both of these

studies were conducted at the same large, land grant university. These studies need to be replicated on other campuses to increase generalizability. In addition, both of these studies focused on compliance, one aspect of implementation effectiveness. Future studies are needed to evaluate all five factors of implementation effectiveness (commitment, preparation, enforcement, compliance and implementation barriers).

The intervention showed improve compliance presented in the third paper consisted of distributing self-efficacy message cards. The intervention showed promise in improving compliance to a university tobacco-free policy. However, future research might expand the intervention to include multiple methods to increase exposure to the intervention, such as campus radio and newspaper.

Policy Implications

The results of this dissertation have policy implications. Effective implementation of tobacco-free policies is crucial for these policies to improve health outcomes. Policymakers may consider the wide range of factors affecting implementation effectiveness, including commitment, preparation, enforcement, compliance and implementation barriers. Prior to policy adoption, policymakers could consider developing an implementation plan that addresses each of these factors. In addition, tobacco-free policy advocates need to remain actively involved in the process beyond policy adoption. Awareness of factors related to implementation effectiveness may help advocates most effectively influence the process.

Public Health Implications

There are also public health implications to the results of this dissertation. First, college wellness professionals could use the TF-CAT to assess compliance on university

campuses. The design of the tool allows for data to be conveniently graphically displayed. A map of “hot spots” could be created to guide policy enforcement. Identification of “hot spots” could also be used to guide campus interventions to promote tobacco treatment resources. Second, college wellness professionals could consider replicating the self-efficacy message card intervention to improve compliance.

Monitoring compliance using the TF-CAT and conducting the intervention was somewhat time and resource intensive. However, college wellness professionals may consider creative ways to collect compliance data or conduct an intervention to improve compliance. For example, interested student groups may volunteer their time for data collection. A class may also take on data collection as a service learning project. Enhancing implementation effectiveness of campus tobacco-free policies may reduce smoking prevalence and exposure to secondhand smoke.

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Vita

Date of Birth 07/06/1984

Place of Birth Owensboro, KY

Educational Background

Year	Degree	Institution
2007	Bachelor of Science in Nursing	University of Kentucky
2009	Master of Science in Nursing	University of Kentucky

Professional Positions Held

Year	Employer	Title
05/10-present	Kentucky Center for Smoke-free Policy	Staff Associate
05/09-present	Tobacco Policy Research Program	Community Advisor
01/10-05/10	University of Kentucky College of Nursing	Clinical Faculty

Scholastic and professional honors

Year	Honors	Institution
2011	Graduate Student Podium Presentation Award	University of Kentucky College of Nursing
2009	Graduated Summa Cum Laude	University of Kentucky College of Nursing

Amanda Fallin

Signature