To my beautiful Mom, Dana Erlene Platter
Your life helped my dreams become a reality.
May you Rest in Peace 05/01/2011.
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**COMPREHENSIVE OUTDOOR SMOKE-FREE POLICY:** Prohibits smoking in at least five of the seven major outdoor areas: outdoor dining areas, entryways, public events, recreational areas, service areas, sidewalks and worksites (Center for Tobacco Policy, 2010).

**CUES TO ACTION**
Cues to action are physical or environmental events that motivate and remind people to take action (Boen, Maurissen, & Opdenacker, 2010).

**ENVIRONMENTAL TOBACCO SMOKE:** The combination of mainstream and sidestream smoke (USDHHS, 2006).

**IN Voluntary /Passive Smoking:** Exposure to environmental tobacco smoke.

**Mainstream Smoking:** The smoke exhaled from an individual after taking a puff on a lit cigarette (USDHHS, 2006).

**Point-of-decision:** An intervention, which alters the physical environment that influences one to make a decision, based on posted signage. In this study, point-of-decision prompts were signs encouraging smoke-free zones in parks and were placed where the researcher believed were high intervention zones (Solar et al., 2010).

**Sidestream Smoking:** The smoke that comes off the end of a lit cigarette (USDHHS, 2006).
AN ASSESSMENT OF SMOKE-FREE SIGNAGE IN GAINESVILLE PUBLIC PARKS

By

HEATHER NICOLE PLATTER

May 2012

Chair: Kate Fogarty
Major: Family, Youth and Community Sciences

Secondhand smoke causes 46,000 deaths in nonsmokers within the US every year (USDHHS, 2006). In Florida, 2,750 adult nonsmokers die each year due to secondhand smoke exposure (Florida Charts, 2007). The objective of this study was to evaluate whether Smoke-Free Zone signage posted in park amenities (playgrounds, picnic pavilions, restrooms) would change smoking behaviors of park patrons.

A time-series quasi-experimental design was used where data were collected at the same time and in the same order every week in 10 amenities from four parks. The four parks served as a baseline, and then received the intervention. The researcher collected cigarette butts (n = 2,692) at park amenities (n=10) at baseline and follow-up in four different public parks. Baseline data were collected until a stable trend emerged, which was established at 6 weeks; signs were then introduced and remained during data collection period. Data collection during the intervention stopped once a stable trend emerged at 6 weeks.

Due to not having normally distributed data, the researcher ran several nonparametric Wilcoxon signed-rank tests to test the strength of the mean differences. The Wilcoxon signed-rank test showed that smoking at seven out of the ten individual
amenities decreased, with smoking at one playground, picnic pavilion and restroom that increased. The Wilcoxon signed-rank test determined that the data were significant at $p = 0.028$. However, grouped amenities (playgrounds, picnic pavilions, restrooms) did not experience a statistically significant change.

This study provides some of the first evidence on the impact of smoke-free signage that is not backed by law in parks using a reproducible measure. The implications of this study are important for states such as Florida that has pre-emptive clause legislation concerning smoke-free air, since this study researches posted signage that is not backed by law.
CHAPTER I
INTRODUCTION

Statement of the Problem

Environmental tobacco smoke (ETS), also known as secondhand smoke, is a prevalent yet avoidable health risk within the United States (Glantz & Parmley, 2001). Cigarette smoking and involuntary exposure to secondhand smoke is accountable for approximately 443,000 deaths each year within the United States, making it of top precedence to public health officials (See Figure A-1) (Adhikiari, Kahende, Malarcher, Husten & Asman, 2009; Dube et al., 2010). Smoking not only harms the health of smokers but the effects of secondhand smoke are deleterious to non-smokers.

Infants and children are at high-risk of disease due to secondhand smoke. Sixty percent of, or approximately 22 million, children in the U.S. are currently exposed to tobacco smoke (USDHHS, 2006). Children who are exposed to secondhand smoke have an increased risk for health problems and diseases including sudden infant death syndrome (SIDS) (430 cases/yr); acute respiratory infections; ear infections (+750,000 cases/yr); and severe asthma with more attacks and higher severity in 200,000 up to 1 million children (American Cancer Society, 2010; CEPA, 2006). Secondhand smoke exposure in children under 18 months old has caused anywhere between 50,000 to 300,000 lung infections resulting in 7,500 to 15,000 hospitalizations annually (American Cancer Society, 2010).

Adults also experience negative health effects from secondhand smoke. Lam and colleagues (2005) researched secondhand smoke and association with respiratory symptoms. The researchers used a standardized questionnaire on secondhand smoke at home and work, acute respiratory symptoms, and recent doctor’s visits. The
researchers reported that secondhand smoke exposure was strongly associated with an increased amount of respiratory symptoms such as coughing, throat problems and wheezing (Lam et al., 2005).

Secondhand smoke is also known to cause lung cancer in nonsmokers. The U.S. EPA report *Respiratory Health Effects of Passive Smoking: Lung Cancer and Other Disorders*, revealed that secondhand smoke is a human lung carcinogen that is responsible for lung cancer, which causes approximately 3,000 deaths a year (EPA, 2010). Secondhand smoke also causes 46,000 deaths due to heart disease each year (California Environmental Protection Agency [CEPA], 2006). Exposure to secondhand smoke can immediately harm a person’s health by affecting their heart and blood vessels and increasing their risk of heart disease by 25 to 30 percent (USDHHS, 2006). The adverse effects of these chemicals alter the cardiovascular system in the short-term and cause coronary heart disease in the long-term (USDHHS, 2006). Even minimal intake of secondhand smoke has negative effects that alter normal functioning of the heart, blood, and vascular systems that increase the risk of a heart attack (USDHHS, 2006).

Dube and colleagues (2010) used the 2009 National Health Interview Survey and the Behavioral Risk Factor Surveillance System to estimate national smoking prevalence. The results state that approximately 46.6 million U.S. adults smoke and that prior declines in smoking rates have stopped going down (Dube et al., 2010). Dube and colleagues (2010) found that an estimated 88 million nonsmoking American citizens are involuntarily exposed to environmental tobacco smoke. The Centers for Disease Control and Prevention recommends laws and policies to protect the public from secondhand
smoke exposure as well as cessation steps for current smokers and prevention strategies to keep young people from smoking. The Centers for Disease Control and Prevention (2011) suggests policy changes that include increasing the unit price of tobacco products; implementing smoke-free policies, regulations, and laws; providing insurance coverage of tobacco-use treatment; and limiting minors’ access to tobacco products.

**Policy and Secondhand Smoke Exposure**

The Surgeon General passed a federal smoking ban in 1971, and since then there have been reductions in smoking in sites such as work places, schools, bars, and restaurants (USDHHS, 2006). As of April 2011, 3,270 municipalities within the United States restrict smoking in particular areas (American for Nonsmokers’ Rights Foundation [ANR], 2010). These indoor smoking bans were a positive stride towards reducing smoking and nonsmoker’s contact with secondhand smoke (Fichtenberg & Glantz, 2002; Bauer, Hyland, Li, Steger, & Cummings, 2005).

The 1986 report of the Surgeon General, The Health Consequences of Involuntary Smoking (USDHHS, 2006), stated that the separation of smokers and nonsmokers within the same air space may reduce but not eliminate nonsmokers’ exposure to secondhand smoke. There has been a strong momentum to regulate smoking inside public settings but regulation of smoking in outdoor environments has not been studied until recently (Tynan, Babb, MacNeil, & Griffin, 2011). Even though there has been development towards smoke-free spaces indoors and outdoors in public spaces in the U.S., cigarette smoking and secondhand smoke still remain burdensome public health concerns.
Outdoor Smoke-Free Policies

Although restaurants, businesses, and schools have smoke-free policies for indoor areas, there is little information on acceptance and compliance with such policies for outdoor areas. Studies of effectiveness of outdoor smoke-free policies and successful approaches to enforce outdoor smoking bans are limited and have conflicting results. McMillen and colleagues (2003) researched adult attitudes and practices regarding smoking restrictions to limit child exposure to environmental tobacco smoke in outdoor spaces but it did not research adults’ compliance with the smoking restrictions. The authors reported that the majority of adults within the study were ignorant of the harmful effects of children exposed to secondhand smoke. However, the majority favored public smoking restrictions that advocates support for restriction policies (McMillen, Winickoff, Klein, & Weitzman, 2003).

Although outside policies concerning secondhand smoke are limited, they are starting to develop. Outdoor secondhand smoke is being referred to as “outdoor tobacco smoke” (Klepeis, Ott, & Switzer, 2007, p.522). Many researchers are discussing whether smoking should be prohibited in outdoor areas although there is no current consensus (Bloch & Shopland, 2000; Chapman, 2000; Chapman 2008; Thompson, Willson, & Edwards, 2008). Despite minimal research, governments within the U.S. are enacting smoking bans in outdoor areas like parks and beaches and outdoor areas around building entrances, schools and hospitals (Globalsmokefree Partnership, 2009). Cities such as New York are leading such tobacco bans in parks and beaches (Scheck & Colvin, 2011). Building entrances and outdoor areas of schools and hospitals often have high levels of secondhand smoke due to indoor smoking bans. The high levels of secondhand smoke outside of buildings is a consequence of
implementing indoor smoking bans but not outdoor property smoking bans (Brennan et al., 2010; Cameron et al., 2010; Repace, 2005).

College campuses are also increasingly incorporating smoke-free campus policies to decrease secondhand smoke (ANR, 2011). Although many policies concerning smoke-free campuses are being developed and implemented, research addressing the outcomes and impacts of these policies are limited (Seo, Macy, Torabi, & Middlestadt, 2011).

**Signage and Behavior Change**

Point-of-decision posted signage is used to change multiple types of behaviors (Nomura, Yoshimoto, Aezaki, & Sato, 2009; Ford & Torok, 2008; Boen, Maurissen, & Opdenacker, 2010). Signs with health-promoting messages have been found to have a positive effect on behavior change (Nomura et al., 2009; Ford & Torok, 2008; Boen et al., 2010). A good portion of research examines the behavior change effects of signs, but there is limited research on antismoking signage and behavior change. Research concerning public attitudes towards tobacco-free park policies is growing in prevalence (Klein, Forster, McFadden, & Outley, 2006). Klein and colleagues (2006) conclude that there is large public support of tobacco-free park policies, yet there are doubts concerning compliance.

Harris and colleagues (2009) researched compliance of an outdoor smoking ban with a multicomponent approach, which included signage. Results demonstrated that the use of multiple components increased compliance with the non-smoking policy (Harris, Stearns, Kovach, & Harrar, 2009) yet there was not enough evidence to discern which approach was most beneficial. Therefore, it is important to research individual approaches then possibly combine them in the future to test results of these combined...
effects. This research will elaborate on the posted signage method of the multicomponent approach used by Harris and colleagues (2009).

**Purpose**

The purpose of this study is to examine whether posted signage in selected amenities can alter smoking behaviors of patrons of parks within a suburban area in Florida. This study used one specific sign for this experiment (see Appendix B for sign). The phrase that was used on the sign was chosen based on recommendations from literature (Jacobson et al., 2007), City Commissions and the Director of Parks, Recreation and Cultural Affairs Department for the city parks in the study. This study will allow for a better understanding of whether a passive method such as signage can alter, or decrease smoking behavior among park patrons.

**Research Questions**

The questions that form the basis of this study are:

1. Does smoke-free zone signage placed at points-of-decision in Gainesville public parks decrease smoking within and around selected amenities (e.g. restrooms, playgrounds, picnic areas?)

2. How might smoking differ between amenities as a result of introduction of signs to parks?

**Significance**

This study aspires to generate knowledge about the effects of posted signage for altering individual smoking behavior. Learning about these effects will determine whether posted signage is associated with reduced smoking and therefore, secondhand smoke exposure of patrons in parks. Furthermore, there is currently no published research on smoke-free zone signage where there is no policy to back up the signs. This study provides some of the first evidence on possible impacts of smoke-free zone
signage in outdoor public parks where policy is lacking using a reproducible methodology. Smoke-free zone signage in city parks, which lack policies for outdoor smoking may or may not have an impact on park patrons.

**Hypotheses**

1. **Null Hypothesis**: Presence of signs will have no effect on smoking in parks.

   **Alternative Hypothesis**: Presence of signs will have an effect on smoking in parks compared to control.

2. **Null Hypothesis**: Provided there is evidence to support the first alternative hypothesis in which a reduction in the number of cigarette butts is found in points of decision from baseline to when signs are placed in parks, the likelihood of reduction in smoking across amenities will be equal (playground, bathrooms, and picnic areas).

   **Alternative Hypothesis**: Provided support is found for the first alternative hypothesis, playground amenities, compared to bathrooms and picnic areas will have the greatest reduction in number of cigarette butts found between baseline data collection and signage placement data collection.
CHAPTER 2
REVIEW OF LITERATURE

Introduction and Statement of the Problem

This literature review assesses secondhand smoke and its effects on the body along with evaluations of current research and policies on secondhand smoke in outdoor settings. Since there is a limited amount of research on smoke-free signage in relation to behavior change, this review will also assess other studies that have used signage in order to alter behaviors. Furthermore, it will introduce the Health Belief Model theoretical framework, which has been used and applied to multiple research studies concerning health-related behavior change.

There is currently little to no research on the effects of outdoor smoking policies and recommendations on altering people’s smoking behaviors (Lee et al., 2011; McMillen, Winickoff, Klein, & Weitzman, 2003; Seo et al., 2011). Researchers are starting to interview people on their attitudes and beliefs on tobacco policies but there is limited research regarding altering smoking behavior changes in outdoor settings (Lee et al., 2011; McMillen et al., 2003; Seo et al., 2011). The current research examines the effects of smoke-free zone signage that is not backed up by policy or ordinances on the behaviors of tobacco-smoking individuals in public parks. In this research, there are no formal consequences (e.g. monetary/legal sanctions) placed upon park patrons who smoke. Informal consequences such as non-smoking park patrons referring smokers to the posted smoke-free zone signage or asking them to refrain from smoking may occur. These informal consequences may cause smokers to refrain from smoking or move their smoking behavior away from amenities where signs are posted.
Tobacco use and secondhand smoke is a leading, yet preventable, cause of death in the United States with over 443,000 premature deaths related to smoking each year (See Figure A-1 in Appendix A) (Adhikiari, Kahende, Malacher, Pechacek & Tong, 2008). Globally smoking kills more than 5 million people a year (World Health Organization [WHO], 2007). Adhikiari and colleagues (2008) estimated this number will increase to 8 million by the year 2030 and then four out of five deaths will be related to tobacco use. Surgeon General Leroy E. Burney issued the first official federal statement in 1957 that smoking causes lung cancer (USDHHS, 2007). Since 1964, the Surgeon General has published over 30 separate reports on tobacco smoke, each containing more information on the linkages between tobacco and health problems related to use or exposure (USDHHS, 2012). Approximately 30 years later, researchers have discovered that secondhand smoke causes cancer, among other diseases, in individuals who do not smoke or use tobacco products (Adhikiari et al., 2008). Adhikiari and colleagues’ (2008) work using the National Health Interview Survey and the National Center for Health Statistics death certificate data estimated that secondhand smoke is the cause of 50,000 annual deaths in nonsmokers.

In 1986, the Surgeon General announced that secondhand smoke causes cancer and other health effects in non-smokers (ANR, 2012). Secondhand smoke is defined as a combination of gases and fine particles from smoke exhaled by the smoker (mainstream smoke) and smoke from a lit tobacco product (sidestream smoke) (See Figure A-2 in Appendix A) (National Toxicology Program, 2011; USDHHS, 2006; American Lung Association [ALA], 2007; Glantz & Parmley, 2001). These two forms of smoke are not the same. Carcinogens are found in higher concentrations within
sidestream smoke, which contains smaller particles that make it easier to enter cells within the body (American Cancer Society, 2010). Secondhand smoke is also called environmental tobacco smoke (ETS), involuntary smoking and passive smoking (ALA, 2007; Glantz & Parmley, 2001). The terms involuntary smoking and passive smoking describe non-smokers exposed to secondhand smoke (American Cancer Society, 2010). The most prevalent sources of secondhand smoke are cigarettes, followed by pipes and cigars (USDHHS, 2006).

**Exposure of Secondhand Smoke**

People can experience exposure to secondhand smoke regardless of whether there are laws regarding smoking in a given area. Most often individuals are exposed to secondhand smoke in their homes and cars or public places such as recreational settings, parks, restaurants and bars (Chriqui, Babb, Blair, Vaughn & MacNeil, 2005). Children and adults experience high amounts of secondhand smoke within the home, although children suffer the most from exposure because of their developing organs (Aligne & Stoffard, 1997; Levy, Rigotti & Winickoff, 2011; Jarvie & Malone, 2008; USDHHS, 2006). The World Health Organization (WHO) approximates that 700 million children worldwide are exposed to secondhand smoke in their homes (WHO, 2007). Smoking within cars is a large source of secondhand smoke exposure for both children and adults. Even if a window is rolled down, poisons from secondhand smoke can rise drastically within the vehicle in minimal time (American Cancer Society, 2010). The California Environmental Protection Agency (CEPA) stated that people are exposed to the same volume of airborne, secondhand smoke particles within an enclosed car as a firefighter in “four to eight hours fighting a California wildfire” (CEPA, 2012, p.2).
The Occupational Safety and Health Administration (OSHA) is the federal agency that regulates the health and safety of individuals in the workplace, which is the where nonsmoking adults experience the highest amounts of secondhand smoke exposure (American Cancer Society, 2010). OSHA, along with the National Institute for Occupational Safety and Health (NIOSH) recommends smoke-free workspaces due to the numerous carcinogens contained in secondhand smoke (American Cancer Society, 2010).

Outdoor secondhand smoke is a controversial topic, which means that research on its effects is greatly needed (Chapman, 1997; Chapman, 2000; Repace, 2000; Bloch & Shopland, 2000). Chapman (1997; 2000) argued that outdoor smoking bans create problems in the community and that there should not be bans in public venues such as beaches, outdoor cafes, or parks. Repace (2000) responded to this argument with the point that banning outdoor smoking is scientifically justifiable due to exposure of high levels of secondhand smoke to nonsmokers. Bloch and Shopland (2000) argued further about secondhand smoke as the main cause of outdoor smoking bans and discussed the consequences of cigarette butt litter, fire risk, and protecting residents from nuisances. A recently published study from Stanford reported the levels of outdoor air pollution found from secondhand smoke (Tobacco smoke, 2011). Results show that secondhand smoke is high near active smokers, and the levels are comparable to indoor secondhand smoke. In addition, secondhand smoke contains higher concentrations of carcinogens and toxic chemicals than smoke inhaled directly from cigarettes (Tobacco smoke, 2011; USDHHS, 2006). Such evidence necessitates taking
steps in creating smoke-free outdoor spaces, such as public parks, to keep non-smokers away from environmental tobacco smoke in outdoor spaces.

**Epidemiology of Secondhand Smoke in Florida**

Approximately 28,600 Floridian adults die yearly due to complications from their own smoking behavior, which accounts for over $6.32 billion in annual smoking-related Florida health care costs (Adhikiari, Kahende, Malarcher, Husten & Asman, 2009). An additional 2,750 adult nonsmokers die each year in Florida from secondhand smoke (Adhikiari et al., 2009). Florida charts (2007) surveys state that 19.3% of Florida residents regard themselves as a current smoker. In addition, 14.9% of Florida residents reported exposure to secondhand smoke within the last seven days (Florida Charts, 2007). Alachua County Florida reports that 15.5% of its residents are smokers. This is lower than the state of Florida average 19.3% of residents who consider themselves a smoker (Florida Charts, 2007). Approximately 16.4% of residents of the county in which the parks are located reported exposure to secondhand smoke over the last 7 days (Florida Charts, 2007). It is important to note that these statistics do not reflect the majority population of approximately 50,000 college students that live in this county.

**Safe Level of and Exposure to Secondhand Smoke**

The Surgeon General stated that there is no safe level of secondhand smoke (USDHHS, 2006). Secondhand smoke, no matter how limited exposure is, has a direct, harmful effect on a person’s health. The Surgeon General validates this claim in the newest report, *How Tobacco Smoke Causes Disease*, by clarifying that minimal exposure of secondhand smoke is indeed harmful. Brief exposure to secondhand smoke can cause several acute respiratory effects, such as respiratory symptoms.
(cough, asthma, wheezing) (Trinder, Croft & Lewis, 2000). Eisner and colleagues (1998) researched the effects of secondhand smoke on adults who already have asthma. Using a cohort study of 451 nonsmoking adults with asthma, the researchers studied 129 subjects who reported exposure to secondhand smoke. Results demonstrated that exposure to secondhand smoke was associated with worse asthma symptoms, more frequent hospitalizations or emergency department visits, and an overall worse health status (Eisner, Yelin, Henke, Shiboski & Blanc, 1998).

Ventilation systems in buildings, designated areas for smokers, and air cleaning do not reduce or eliminate secondhand smoke. Secondhand smoke, as stated prior, is a mixture of gases and very small particles that air-cleaning systems are unable to remove because of their miniscule size (USDHHS, 2006). The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) states that ventilation technology is not reliable in removing secondhand smoke and reducing health risks to people exposed to it (USDHHS, 2006). Furthermore, the ventilation and air conditioning systems in buildings move secondhand smoke throughout the building, meaning that more people will ultimately be exposed to it (USDHHS, 2006).

In 2007, the World Health Organization (WHO) recommended that 100% smoke-free environments be created in order to eliminate negative health effects related to secondhand smoke. The 2006 Surgeon General Report, The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General, stated that nonsmokers can only be protected from secondhand smoke is if smoking is eliminated from indoor spaces, although people are also exposed to secondhand smoke in the form of outdoor environmental tobacco smoke. There is a need for more research on
the effects of outdoor tobacco secondhand smoke exposure in order to see the side
effects of smaller amounts of outdoor exposure.

**Harmful Chemicals of Secondhand Smoke**

The National Toxicology Program (2011) stated that secondhand smoke contains
over 4,000 chemical compounds, of which 50 cause cancer and over 200 are
poisonous. In 2010, the Surgeon General Report How Tobacco Smoke Causes
Disease: The Biology and Behavioral Basis for Smoking-Attributable Disease: A Report
of the Surgeon General stated that there are now more than 7,000 chemicals in
secondhand smoke with at least 250 being poisonous. Currently there are at least 69 of
carcinogenic compounds in secondhand smoke such as cadmium, benzene, lead,
nickel, chromium, cadmium, and polonium-210 (Kim et al., 2001; Wu et al., 1995; Ferri

**Health Effects of Exposure to Secondhand Smoke**

Children’s health in relation to secondhand smoke is an important section to
review due to the nature of the current study. Children are frequent park attendees,
meaning that child patrons may experience low to high rates of exposure to secondhand
smoke. It is important to eliminate secondhand smoke since it causes dangerous
negative health problems in children (Jarvie & Malone, 2008; Mannino, Siegel, Husten,
Rose & Etzel, 1996; Samet, Lewit & Warner, 1994; Moshammer et al., 2006). Many
organizations are creating resolutions to support and adapt laws to prohibit smoking in
vehicles containing a minor (Committee on Environmental Health, 1997). The Centers
for Disease Control and Prevention recommends laws and policies to protect the public
from secondhand smoke exposure as well as cessation steps for current smokers and
prevention strategies to discourage young people from smoking (CDC, 2011).
Children are at risk of several health complications due to secondhand smoke exposure. They experience frequent ear infections, intense recurrent asthma attacks, respiratory symptoms such as coughing, sneezing and shortness of breath, along with respiratory infections like bronchitis and pneumonia (Jarvie & Malone, 2008; Moshammer et al., 2006; Samet et al., 1994; Mannino et al., 1996; American Academy of Pediatrics [AAP], 1986). There are up to 300,000 annual cases of bronchitis and pneumonia in children and 15,000 hospitalizations annually due to secondhand smoke (American Cancer Society, 2010; EPA, 1992). They also have a higher chance of sudden infant death syndrome (SIDS) (USDHHS, 2006; American Cancer Society, 2010; EPA, 2005; Anderson & Cook, 1997). Secondhand smoke also affects the bodily development of children younger than 18 months (AAP, 1986; Mannino et al., 1996; Moshammer et al., 2006).

Moshammer and colleagues (2006) evaluated the effect of secondhand smoke exposure on lung functioning in 20,000 school-aged children in nine different countries within Europe and North America. The researchers reported that prenatal and postnatal secondhand smoke exposure caused harmful effects to children’s lungs, their functioning, and their development. The American Academy of Pediatrics (1986), and Mannino and colleagues (1996) both found that secondhand smoke exposure is associated with slower lung development and an increased risk of respiratory infections. Several research studies have discovered that childhood exposure to secondhand smoke may lead to cancer in adulthood (Wang et al. 2000; Committee on Environmental Health, 1997; Sun et al., 1996).
Sudden infant death syndrome (SIDS) is the leading cause of death in healthy babies (Anderson, Johnson, & Batal, 2005; Task force, 2005; USDHHS, 2006). Infants exposed to secondhand smoke and mothers who smoke during pregnancy increases the risk of SIDS significantly (Anderson, Johnson, & Batal, 2005; USDHHS, 2006; USDHHS, 2004; Dejmek et al., 2002). Woodward and Laugesen (2001) and Michell and colleagues (1997) stated that mothers who smoke during pregnancy have the highest risk for SIDS. A large case-cohort study in New Zealand reviewed all births from 1991 to 1993 and found 2323 SIDS cases in the cohort, which were compared to a control of 1,200 births. The research found that maternal smoking was the strongest risk factor for SIDS (Michell, Tuohy, & Brunt, 1997). Anderson and colleagues (2005) researched whether maternal prenatal smoking significantly increases risk of SIDS. The researchers conducted a retrospective cohort study using 10-year data from the Colorado Infant Death Registry to identify causes of infant death (n=1573), which compared mothers who reported prenatal smoking versus mothers who reported no prenatal smoking. Anderson and colleagues discovered 598 cases of SIDS and that infants born to smoking mothers confirmed an increased risk of SIDS. In the final analysis, the researchers suggested a link between 80% of the SIDS deaths and maternal smoking.

Cigarette smoking is responsible for approximately 90% of deaths in adult men and 80% of deaths in adult women resulting from pulmonary disease (COPD) or lung cancer (Lange, Nyboe, Appleyard, Jensen, & Schnohr, 1990). Lange and colleagues (1990) conducted a longitudinal study with 7,420 women and 6,336 men from 1976 to 1978 and then again in 1987. Several men and women died during that time, which the
researchers found that COPD-related death was associated with cigarette smoke (individuals self-reported tobacco use). Research shows that nonsmokers exposed to secondhand smoke have a 20-30% higher chance of developing lung cancer (Zhong, Goldberg, Parent, & Hanley, 2000; Zhong, Goldberg, Gao, & Jin, 1999; Hacksaw, Law, & Wald, 1997). Zhong and colleagues (1999) researched incidences of lung cancer in nonsmoking women who live in China. The researchers utilized a case-control study of 504 women to evaluate the relationship between lung cancer and exposure to secondhand smoke, which was compared to a control group of 601 nonsmoking women. Exposure to secondhand smoke was assessed through personal interviews with the study participants. The research suggests that long-term exposure to secondhand smoke increases a nonsmoker’s risk of lung cancer. Zhong and colleagues (2000) did another similar study on exposure of secondhand smoke and the risks of lung cancer using 35 case-control and five cohort studies with instances of lung cancer and secondhand smoke exposure from 1981 to 1999. Results suggested that lung cancer risk increases as levels of exposure to secondhand smoke increase (Zhong et al., 2000). Hackshaw and colleagues (1997) sought out to estimate the risk of lung cancer in non-smokers exposed to secondhand smoke by analysis of 37 epidemiological studies of 4626 nonsmokers. Nonsmokers who lived with a smoker had a 24% increased risk of lung cancer, which was statistically significant at P<0.001 (Hackshaw et al., 1997).

Secondhand smoke causes over 3,400 nonsmokers’ deaths due to lung cancer each year (Adhikiari et al., 2008). The following chart shows the steps that link secondhand smoke exposure to cancer.
Secondhand smoke causes death from other diseases as well. Nonsmokers experience a heightened risk (25-30%) of developing heart disease if they are exposed to secondhand smoke (Law & Wald, 2003; Law, Morris & Walk, 1997; He et al., 1999; USDHHS, 2006). Coronary heart disease due to secondhand smoke kills approximately 46,000 nonsmokers a year (Adhikiari et al., 2008; American Cancer Society, 2010).

When nonsmokers are exposed to secondhand smoke, the smoke automatically makes their blood platelets sticky, which increases a person’s risk for heart disease (Elwood et al., 1991; Steinber, Parthasarathy, Carew, Khoo, & Witztum, 1989). Burghuber and colleagues (1986) experimented with involuntary smoking where a group of smokers and nonsmokers sat in a room 20 minutes after cigarettes were smoked. Smokers did not experience changes in their platelets; however, nonsmokers experienced a significant change that made nonsmokers have platelet sensitivity similar to smokers (Burghuber et al., 1986).

Individuals who already suffer from heart disease are at an extremely high risk for the progression of the disease if they are around secondhand smoke, even with minimal exposure. The U.S. Department of Health and Human Services (2006) recommends taking precautions to avoid exposure to secondhand smoke.
Disparities in Secondhand Smoke Exposure

The 1998 Surgeon General Report *Tobacco Use among U.S. Racial/Ethnic Minority Groups* reports differences in tobacco use among racial/ethnic minority groups. The report states that African American and Southeast Asian men frequently use tobacco products, whereas Asian American and Hispanic women use tobacco least frequently (USDHHS, 1998). This research will collect data from public parks in many different areas where race, socio-economic status (SES), and occupation may affect the amount of smoking found.

There are no known disparities between races and ethnic groups in susceptibility to addiction to nicotine, however the tobacco industry often targets specific racial groups, which creates disparities (USDHHS, 1998). As the rates of tobacco use in non-Hispanic whites declined, the tobacco industry targeted African Americans in order to create positive relationships through several means. Tobacco companies are donating money to minority education programs, sponsoring cultural events, initiating scholarship programs for minorities and using extreme advertising and merchandising to this racial target (USDHHS, 1998). The tobacco industry targets African Americans with specific brands of cigarettes, mostly menthol-flavored brands (USDHHS, 1998). African Americans had the highest rate of secondhand smoke exposure in 2007-2008 at 55.9% (Kaufmann et al., 2010; Pirkle, Bernert, Caudill, Sosnoff, & Pechacek, 2006). This may be a reason as to why African Americans experience the worst health effects due to smoking and secondhand smoke, experiencing twice-as-high rates of disease than white men and women (USDHHS, 1998). Non-Hispanic whites were exposed to 40.1% of secondhand smoke while Mexican Americans had a 28.5% exposure rate (Kaufmann et al., 2010; Pirkle, Bernert, Caudill, Sosnoff, & Pechacek, 2006).
There is no single factor influencing different racial or ethnic groups' tobacco use. Several factors that influence tobacco use include socio-economic status of an individual, particular cultural characteristic of an individual, stress, advertising to specific racial groups and effective tobacco control initiatives (USDHHS, 1998).

Current research shows that low socio-economic status is the greatest predictor of tobacco use (Tobacco-free Maine, 2008; Anderson, Oto-Kent, Porter, Brown, Quirk, & Johnson, 2004). Kaufmann and colleagues declared that secondhand smoke exposure is higher for low-income individuals. Kaufmann and colleagues (2010) reported that 60.5% of people under the poverty line in the US were exposed to secondhand smoke between 2007 and 2008. King and colleagues (2011) researched current smoking rates among adults utilizing the National Health Interview surveys and the 2010 Behavioral Risk Factor Surveillance survey. The survey is administered to a nationally representative random probability sample of adults older than 18. Current cigarette smokers were defined in the survey as someone who had smoked more than 100 cigarettes in their lifetime and reported smoking “every day” or “some days”. The research suggests that adults who live below the poverty level used almost double the tobacco products than adults who live at or above the poverty level (King, Dube, Kaufmann, Shaw & Pechacek, 2011).

Johnson and Wang (1996) found that children in low-income households with parental smokers reported a poor diet quality compared to low-income households without smokers. Singh, Siahpush and Kogan (2007) published a study revealing that children from lower socioeconomic backgrounds had up to 10.6 times higher chances to be exposed to secondhand smoke than children from higher socioeconomic
backgrounds. Low-income individuals are also at a higher risk for smoking as well as secondhand smoke exposure (Anderson, Oto-Kent, Porter, Brown, Quirk, & Johnson, 2004; Adhikari et al., 2008).

Although occupational disparities regarding exposure to environmental tobacco smoke have decreased, there are still cases of inequality despite having laws that protect nonsmokers from exposure in enclosed workplaces. Arheart and colleagues (2008) found that construction workers, blue-collar workers, and service workers still experience high levels of environmental tobacco smoke despite limiting their exposure to secondhand smoke. Other researchers found that food and bar service workers are at high risk of secondhand smoke exposure since several bars and restaurants are still exempt from many state and municipality laws that prohibit indoor smoking (Shopland, Anderson, Burns, & Gerlach, 2004; Siegel, 1993; Siegel, 2003). Siegel (1999; 2003) describes secondhand smoke in existing workplaces as the “5 B’s” (bars, bowling alleys, billiard halls, betting establishments, and bingo parlors) in which an employee may inhale secondhand smoke equivalent to smoking 16 cigarettes during an 8-hour shift.

**Economic Costs and Benefits of Secondhand Smoke**

Tobacco companies are one of the most profitable corporations within the United States, with approximately 45 billion dollars spent annually on tobacco by U.S. residents (BBC News, 1999). In the United States, over 120,000 tobacco farms provide more than 450,000 jobs for U.S. citizens (WHO, 1999; WHO 2008). Due to recent laws and tax increases, Florida experiences the largest amount of advertising and promotion of tobacco products, for which the tobacco industry spends $930.4 million, a significant part of the $13.36 billion spent nationwide (Boone, 2008).
Although tobacco companies provide benefits for workers, the cost for purchasing tobacco products are not the only financial costs that the nation’s taxpayers incur. The United States loses $92 billion due to the medical costs of tobacco-related deaths, not including the $81 billion spent annually on healthcare for tobacco-related illness (WHO, 1999; WHO, 2008). Florida spends an estimated $6.32 billion annually on tobacco health care costs (Florida Charts, 2007; Robert Wood Johnson Foundation [RWJF], 2008). Despite the tobacco industry spending $930.4 million in advertising within Florida, Florida only spends $60.2 million on tobacco use prevention (RWJF, 2008). These costs directly affect smokers and nonsmokers in Florida and throughout the United States. Florida households pay approximately $582 in state and federal taxes due to smoking-related government expenditures (Florida Charts, 2007). Research shows that a decline of tobacco users in the United States is correlated with positive financial and health benefits (Boonn, 2008; Lindblom, 2008).

Laws Regarding Exposure to Secondhand Smoke

Laws and policies towards smoke-free spaces aim to eliminate, or at least minimize, rates of exposure to secondhand smoke. State and local laws and policies help protect nonsmokers from exposure to secondhand smoke, thus reducing any negative health effects related to exposure. As of January 2, 2012 there are a total of 971 municipalities within 39 U.S. states that have some sort of smoke-free law concerning workplaces, restaurants and freestanding bars (ANR, 2012a). Only 493 municipalities within 23 states are 100% smoke-free in all three of those locations whereas 3,487 municipalities have laws that are not fully 100% smoke-free in those three venues (ANR, 2012b). The Pro-Children Act (PCA), enacted in 1994, prohibits smoking in federally funded facilities that serve children (Pro-Children Act, 2001).
Globally, 66 nations have at least one type of 100% smoke-free law, where 46 of those nations include both restaurants and bars within those laws (ANR, 2012c). The Wendell H. Ford Aviation Investment and Reform Act did not go into effect until 2000, making all flights to and from the United States 100% smoke-free (ANR, 2005).

Florida has 100% workplace and 100% restaurant smoke-free laws (American Nonsmokers’ Rights Foundation, 2010). The Florida Clean Indoor Air Act (FCIAA) was enacted in 1985 to reduce secondhand smoke exposure (FDOH, 2007). Later the act was elaborated upon and passed in 2003 (Florida Statues – Chapter 286 – Part II) to prohibit smoking within a workplace (S.386.204, F.S.). Laws other than the FCIAA are only voluntary due to the preemptive clause within the FCIAA that states that no locality has the authority to enact any law more stringent than the state laws (FDOH, 2007a). Therefore, the posted signage use to discourage smoking behavior within this study is merely a request, not an enforceable law or city ordinance.

Outdoor smoking bans within the United States have increased from 30 bans in 1999 to at least 1124 bans in 2007 (Koch, 2007). As of January 2012, there are 590 municipalities nationwide with smoke-free park laws (ANR, 2012d). Two of these municipalities are within Florida, which means they are disregarding the preemptive clause within the FCIAA.

In addition to reducing secondhand smoke exposure to nonsmokers, research has demonstrated that these state and local actions increase smokers’ attempts to quit (USDHHS, 2006). Smoke-free laws “have been shown to decrease daily tobacco consumption and to increase smoking cessation among smokers” (USDHHS, 2000,
These laws also decrease the amount of children who start smoking and increase the number of successful quitting attempts by current smokers (TFK, 2010).

**Current Literature Review**

The prevalence of outdoor smoking bans is increasing in recent years, however little research has been conducted on the effectiveness of these bans. Cities such as New York and Traverse City in Northern Michigan are trying to ban tobacco in all outdoor parks (Scheck & Colvin, 2011; McCray, 2012). Several studies have found indoor smoking bans to be effective (Skee, Land, Cheng, & Siegel, 2004; Weber Bagwell, Fielding, et al., 2003; Lee, Moore, & Martin, 2003). However, due to indoor air act laws to back up the bans, there is enforcement and consequences if the laws are broken. For example, someone caught smoking in New York’s Central Park is subject to a $50 fine (Hanisco, 2011). Therefore, outdoor smoking bans that lack enforcement and punishment must be examined to determine whether smokers comply with the ban.

Many college campuses are now creating policies to be smoke-free, or at least designating smoking sections around campus (Harris, Stearns, Kovach, & Harrar, 2009). College campuses are some of the first outdoor areas that have created policies to become smoke-free. Examination of the strategies that change behavior and how these policies affect smoking behaviors are limited (Harris et al., 2009). For example, the University of Florida is a smoke-free campus; however, there are no consequences if someone is caught smoking. Santa Fe College in the same area has smoking sections; however, violations in non-smoking areas are enforced and people caught smoking are ticketed. Despite such policies, smoking still occurs on campus, although at reduced rates; therefore, research is needed to test these policies and subsequent behavior change.
Harris and colleagues (2009) used an enforcement package on a college campus in which compliance of the current smoking policy was tested. The campus policy was that no smoking was allowed within 25 feet of buildings; if someone smoking was within that zone, they are noncompliant with the policy. The enforcement package used four different strategies: 1) moving cigarette receptacles out of the 25-foot smoke-free zone; 2) creating ground markings that outline the zones; 3) adding signs about the outdoor smoking ban; and 4) handing out positive reinforcement cards redeemable for a free drink at the student building to compliant smokers and reminder cards to noncompliant smokers. The positive reinforcement cards provided incentive for smokers to move their behavior and the reminder cards merely stated the smoking ban and the students’ support for the ban.

The researchers discovered that the enforcement package was successful in increasing compliance and moving smoking behavior away from no-smoking zones (Harris et al., 2009). However, the behavior changes reduced after the removal of the enforcement package although it remained higher than in the control setting. Although this study had a positive change regarding the enforcement of a policy, it had several methodological limitations. The four-component approach was applied as a combination; therefore, no examination was made of which component had the most impact (or whether certain components did not make an impact at all). In contrast, the following research will examine potential effects of one of the four component approaches on patrons’ smoking behavior: posted signage.

Another research study looked at the impact of different forms of tobacco-free college campuses (n=19). Lee and colleagues (2011) identified differences for
cigarettes smoked at five main campus-building entrances by type of smoking policy. The variety of schools’ smoking policies in the study included having: no smoke-free policy; designated smoking areas; 100% tobacco-free policies with smoking policy signage; and 100% tobacco-free policies with receptacles in no-smoking sections. One hundred percent tobacco-free policies did not have enforcement of the policy, however most compliance issues were based on norms and peer pressure (Lee et al., 2011).

Two of the 100% tobacco free schools had signage at all building entrances and four had signage at some entrances. Five of the medium policy strength schools (ones with designated smoking and non-smoking areas) had signage at all entrances and two had some at some entrances. There were no receptacles in 100% tobacco-free policy building entrance areas (for those schools with 100% tobacco-free policies and receptacles-noted as a limitation in the study’s sample), however low, and medium policy schools had receptacles in building entrance areas.

The researchers had volunteer students collect cigarette butts within a 15 feet radius of five main building entrances at two different time intervals. The second collection occurred 7 days later with the same volunteers in the same areas. Lee and colleagues (2011) calculated rates of cigarettes smoked each individual day and created a campus score that was an average of the five buildings in order to run statistical analyses. As policy strength increased, there was a smaller amount of cigarette butts in non-smoking areas. Tobacco-free campuses (n=6) had the lowest amounts of cigarette butts, which was significant at p<0.02 compared to colleges with low strength tobacco policies. This shows that only 100% smoke-free policies were associated with reduced cigarette butts due to signs that were placed at all or at some
of the building entrances. This newly published research is an important basis for this study and its replication in park amenities.

Despite the growing number of tobacco-free park policies, there is little known about the attitudes of the public towards these laws (Klein et al., 2007). Over 70 communities in Minnesota ban or limit tobacco use in parks and recreational grounds, though little is known about public support for these policies. Klein and colleagues (2007) administered surveys to the public and some park officials, finding that 70% of respondents favored tobacco-free park policies. However, concerns centered on enforcement and compliance issues. Therefore, even though there is some research on people’s attitudes on signs stating there is a smoke-free policy, there is a gap in the research on whether it will cause behavior change.

A case study examined how a 12-year-old was able to get a city council to adopt a resolution that made city parks smoke-free (Henriques, Newton, & Marshak, 2003). The city council granted the resolution and put up signage indicating that the parks were smoke-free. The researchers administered a survey to see what community members thought of the signage; 93% of respondents were in favor of the new signage. Although there was a great amount of participants in favor of the signage that makes the city parks smoke-free, it cannot be determined whether the signs had any effect on the frequency of smoking with the parks. A similar study researched the Young Lungs at Play campaign that designed and implemented smoke-free signage into parks (Jacobson et al., 2007). Jacobson and colleagues (2007) stated that the campaign was a success in terms of making antismoking messages more visible to children and
having adults model good health habits as well, though they make no mention on the compliance of park patrons’ smoking behaviors.

Social pressure by non-smokers may aid in compliance; however, Chaloupka and colleagues (2008) in their paper examining enforcement issues for tobacco control policies stated that enforcement must be used to improve compliance. Lazuras, Eiser, and Rodafinos (2009) surveyed college students in Greece regarding non-compliance with tobacco-control policies such as smoking bans. Participants who were smokers reported that they were more likely to smoke in an area where smoking was prevalent and seemed socially acceptable. In addition, smokers in the study had more negative attitudes towards smoking bans compared to non-smokers, meaning that they are less supportive of these bans and are more likely to be non-compliant (Lazuras et al., 2009). Therefore, it is important to research what will move the smoking behavior of individuals. The following section will discuss signage and behavior change.

**Signage and Behavior Change**

Signs are a behavioral stimulus that have been deemed effective in treating multiple problems through behavior changes (Jason & Liotta, 1982). The important factor being investigated is that there is no additional enforcement other than the signs themselves. All research concerning signage must only rely on signs for behavior change. Since outdoor smoking bans using signage are a newly studied topic, it is important to investigate studies that use signage alone to assess whether they alter human behavior. Due to a limited amount of research concerning signage and smoking behavior (Harris et al., 2009), research that investigates using posted signage as an impetus to behavior change will also be reviewed.
Dawley and colleagues (1980) studied compliance behavior towards no-smoking signs by employees and patients in a hospital setting. Three baseline data points were collected prior to putting up smoking and nonsmoking sections in the hospital area. The researchers took time samples of 10 minutes for three weeks to determine if signs alone moved smoking behaviors to a smoking section. The researchers observed that dividing the areas of smoking and nonsmoking immediately had an effect of decreasing smoking in the nonsmoking section. This is a limitation within the study because the baseline data that were collected did not have a separation of smoking and nonsmoking areas, which means signs were not the only variable introduced. Results demonstrated positive compliance among employees and patients for the first week, but the second week the results returned to pre-treatment baseline levels (Dawley, Morrison, & Carrol, 1980). The researchers stated that employees knew there was no enforcement of the policy, so they started smoking again. If employees are smoking in nonsmoking sections, then patients will most likely smoke there as well because the staff members are.

Dawley and colleagues (1981) did another study with posted signage using either negatively- or positively-worded no-smoking signs to determine which would reduce smoking the most in a hospital main lobby. The researchers believed that the negatively worded signage would have a greater effect in reducing smoking. Using observational methods, the results showed that both types of signage produced higher compliance rates, although the positively worded signs were more effective. It may be useful to use positive worded signage in order to gain compliance in future studies.
Another study used no-smoking signs to decrease smoking in a section of a university cafeteria (Jason & Liotta, 1982). There was a 10-day period where observers created baseline data points of smoking within the targeted area through an observational data methodology. The researchers observed individuals who smoked within the target area every day of the week for 50 minutes. This was followed by a 16-day period of having no-smoking signage posted in the targeted area. Next, a second baseline was established for 5 days (removal of prior signs), followed by 10 days of posted signage and verbal prompting (telling a smoker to move or stop the smoking behavior). A third baseline was then established, and then no-smoking signage was posted for 8 days while verbal prompting was introduced the last 5 days. Signage alone within this study produced only minimal changes in smoking behavior, however prompting and signage had a greater effect on compliance. A limitation in this study was that they used the same area to test different versions (signs, signs and verbal prompting). This study could have been stronger if the researchers used three randomly assigned university cafeterias where one was a control, one only had signs, and one had signs and verbal prompting.

The primary researcher took part in an observational study that occurred prior to conducting the current research. Platter, Pokorny and Ryant (2011) observed four zones within a community plaza in the same region in which the parks study was done to observe smoking behaviors. Observations were within specific targeted areas for five-minute intervals. The researchers did two observations during the control (no signage present) and seven observations during the intervention (signs were present). After the signs were placed throughout the community plaza, smoking behavior showed no stable
trends and there were no noticeable chances in observed smoking rates. However, mid-day was discovered as the high time of park patrons and smoking behaviors. However, there is a large homeless population that frequently attends the plaza during this period.

Ford and Torok (2008) studied whether posted signage increased or decreased physical activity on a college campus. This study is part of several studies that have evaluated signage and its effectiveness to change behavior of individuals to take the stairs (Ford & Torok, 2008; Anderson, Franckowiak, Snyder, Bartlett, & Fontaine, 1998; Boen et al., 2010; Nomura et al., 2009). This study utilized three phases: baseline, intervention, and removal of intervention. During the intervention period, there was a significant increase in stair-use that was maintained post-intervention. The limitation in this research is that they only investigated post-intervention data for one week, which means that the long-term effectiveness of the signs is unknown.

Another study investigated the effectiveness of posted signage for increasing stair use in a train station (Nomura et al., 2009). The researchers used a 2-week baseline and a 4-week intervention but did not do any post-intervention data. The study was also published in a newspaper article in order to see if that had any effect on influencing the use of stairs due to the signs. The signage was effective in changing behavior, though the published article had no known effect. Boen and colleagues (2010) also tested the impact of signage to increase stair usage in a train station. However, this study had a baseline, first intervention, post-intervention and second intervention measurements. The results found significant increases in stair use during and after intervention. The researchers also cite that “repeated exposure to a health sign might have a longer term effect” (Boen et al., 2010, p. 183).
The Health Belief Model

The Health Belief Model is a widely utilized theory and a conceptual framework that is applied to multiple research studies concerning health behavior change (Becker & Rosenstock, 1984). Irwin Rosenstock, Godfrey Hochbaum and Stephen Kegels first developed the Health Belief Model in the 1950’s to explain why the population was not utilizing free health services (Burns, 1992; Mikhail, 1981). It was later further developed by Irwin Rosenstock in order to understand usage of health services and was later expanded by Becker (Rosenstock, 1966). It is often used to explain a variety of health behaviors such as sexual risk behaviors and HIV, vaccination, screening, tobacco use, clinic utilization and drunk driving (Janz & Becker, 1984; Brown, DiClemente & Reynolds, 1991; Bandura, 1989; Rosenstock, Strecher & Becker, 1994).

The Health Belief Model is frequently used to explain and predict health behaviors in diverse populations using different constructs that help explain health behavior. The Health Belief Model encompasses six components to explain health behavior: perceived susceptibility, perceived benefits, perceived barriers, perceived seriousness/severity, cues to action, and self-efficacy. Each construct, alone or in combination, is able to predict health behavior (Hayden, 2009). Many of the components of the health belief model will be discussed in this research, such as perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action. Each component is important to study in terms of changing a health behavior. The following table shows examples of each construct within the health belief model in relation to smoking in park amenities.
Table 2-1: The health belief model and smoking in park amenities

<table>
<thead>
<tr>
<th>Construct</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived susceptibility:</td>
<td>Smokers may or may not believe that adults or children in park are susceptible to negative health effects associated with secondhand smoke.</td>
</tr>
<tr>
<td>Perceived severity:</td>
<td>Smoking in a park with recommended no-smoking areas may have high severity due to socially related consequences. Individuals may not have a high severity because there is no law governing smoking near signs.</td>
</tr>
<tr>
<td>Perceived benefits:</td>
<td>Able to relieve a sudden urge or need to smoke.</td>
</tr>
<tr>
<td>Perceived barriers:</td>
<td>Addiction, social norms and barriers (nonsmokers approaching smoker in park), habit of smoking outside.</td>
</tr>
<tr>
<td>Cues to action:</td>
<td>Posted signage in park amenities.</td>
</tr>
<tr>
<td>Self-efficacy:</td>
<td>Belief in the ability to not smoke for short-term in park amenity.</td>
</tr>
</tbody>
</table>

The researcher utilized the theoretical construct perceived susceptibility. The signs posted in park amenities within this study ask smoking park patrons to refrain from smoking due to the health and safety consequences associated with secondhand smoke. Smokers may or may not believe that adults or children in park are susceptible to negative health effects associated with secondhand smoke. However, what is written on the signs demonstrate what a smoker may believe the perceived susceptibility of their action is on other park patrons.

This research also used the construct perceived seriousness. This construct is an individual’s belief about the seriousness or severity of a disease (Hayden, 2009). In this research, the construct addresses a park patron’s belief about the seriousness of consequences associated with the posted signage. Signs are seeking to change normative behaviors of park patrons in smoking by changing the environment. Therefore, a person’s behavior may stem from the beliefs they have about the trouble, or lack thereof, a sign would create if they smoked in this area. Since these signs may
help change park norms around smoking, a smoker may feel uneasy about smoking in a park amenity with smoke-free signage posted.

This research looked at the perceived benefits and barriers of smoking in a park amenity that has posted smoke-free zone signs. The benefit of smoking in park amenities for a smoker is that they are able to relieve their need, or craving, to smoke. There are several barriers for a park patron who is a smoker. Smokers are addicted biologically to the nicotine within cigarettes and to the social addition due to smoking habits and social interactions. Addiction may make it difficult for these park patrons not to smoke. Park patrons who are smokers may also have a habit of smoking outdoors, which may make it difficult for them not to smoke in a park amenity.

This research utilized the construct cues to action. Research has shown that cues to action are an important part of triggering action in people and can influence behavior of individuals (Hayden, 2009). The construct addresses posted signage, an external cue that motivates behavior regarding smoking in public parks. The signs are a cue to action that may motivate people to move their smoking behaviors outside of the targeted park amenities. The posted signage may be a cue that also influences nonsmokers to tell smokers to move or stop their smoking behaviors within park amenities.
CHAPTER 3
METHODS

Purpose

The purpose of this study was to assess the impact of posted Smoke-Free Zone signage on park patrons smoking behavior among different amenities (playgrounds, restrooms, and picnic pavilions) in public parks in Gainesville, Florida. This study aimed to discover whether posted anti-smoking signage that is not backed by law in public parks would be associated with patrons’ smoking behaviors in different amenities. This is a first study of its kind to address possible effects of smoke-free zone signage that have no ordinance or law attached to them.

Design

This study used a time-series quasi-experimental design to determine how posted signage in parks affects behavioral smoking change. Quasi-experimental designs replicate the features of a classic experimental design except that such design lacks a random assignment to a control and experimental group (Greeno, 2002). Time-series is a research design where the same variables are measured at different times (Jupp, 2006). A time-series quasi-experimental design was used to establish a baseline measure in order to discover trends and describe changes throughout the study. It also helped determine whether there are any treatment effects due to the presence of posted signage. The time-series design also allowed the researcher to collect data in park amenities at the same time each week on the scheduled data collection day. The four parks used in this research had a control observation period (no signage) of 6 weeks, then an intervention observation period (posted signage) of 6 weeks. The researcher had to collect data for 6 weeks in order to establish a steady baseline. Once an
established baseline was achieved, the intervention (signage) was introduced into the four parks and their amenities.

Sample Selection

Population

The theoretical population for this study is all recreational parks within Northern Florida. The researcher does not have access to the entire theoretical population. Therefore, the researcher used an accessible population of parks within the City of Gainesville, Florida. The accessible population represents the theoretical population in terms of parks because they are similar to other recreational parks within Northern Florida.

Sample

This study used a non–probability sample, known as criteria sampling. Criteria samples are commonly used in quasi-experiments (Swisher, 2012). Criteria samples select the participant due to specific characteristics such as criteria, homogeneity, and matched (Swisher, 2012). The researcher wanted each park to be as similar as possible in terms of amenities. Therefore, there was a need to gain information about the parks through pre-observations before selecting the sample. The sampling frame for this project was a list of 39 parks within the City of Gainesville, Florida received by Steven R. Philips, the Director of Director of Parks, Recreation and Cultural Affairs Department for the City of Gainesville. Sampling frames strengthen non-probability samples because you can use the frame to select sample subjects (Swisher, 2012). The researcher originally had eight matched parks based on amenities and size, but signage was inserted into the four intervention parks early, therefore eliminating the establishment of a baseline in the intervention parks. Despite the parks having the
necessary amenities, it was discovered that foot traffic, residential area, SES of park patrons all accounted for types of use of the parks that makes it difficult to match parks based on amenities. Therefore, the researcher only used the four control parks and did the intervention after establishing a baseline data trend. Despite the change in design, the current design negates threats to validity due to the parks serving as their own control over time. There was no need to control for foot traffic in each park because it is assumed that it stayed constant due to within subject design.

Park patrons are users of a park who may or may not smoke tobacco. There was no social interaction between the researcher and park patron, nor were they the unit of analysis or measurement; however, data were collected through the gathering of cigarette butts found in the targeted amenities within all four parks. The quantity of cigarette butts, the dependent variable in this research, cannot be linked with specific individuals. IRB approval was received and can be seen in Appendix D.

**Collection Zones**

The collection zones were the same for each park, with minor adjustments due to different physical layouts. This study’s collection zone procedure replicated Dr. Steven B. Pokorny’s unpublished research (Pokorny, 2012). The collection zone procedure collected cigarette butts within 25 feet of established buildings in order to examine the current tobacco policy on a college campus (Pokorny, 2012). This study methodology also replicates Lee and colleagues’ (2011) research on cigarette butts near building entrances on college campus that have smoke-free policies. The researchers looked at five different campus buildings to better capture differences of smoking patterns in different areas. This is similar to the current study methodology, as the researcher is looking at three different amenities to better capture differences of smoking patterns in
different park amenities. The researchers used a 15-foot radius from the largest main entrance of the buildings in which volunteer student aids collected cigarette butts and recorded the number that were collected (Lee et al., 2011). Lee and colleagues (2011) had volunteers collect cigarette butts during the pilot testing and the protocol implementation. During the pilot testing volunteers cleaned up cigarette butts in the 15-foot radius from building entrances. Then the same volunteers returned 7 days later to cleanup a second time and to count the cigarette butts. The current methodology differs from the Lee and colleagues (2011) study concerning the frequency of data collection. The current study establishes a baseline measure through six weeks of data collection at each park amenity versus a one-time data collection at each building amenity as performed in Lee and colleagues’ (2011) study. A baseline measure was used in the current research because it allows the researcher to look for trends regarding the dependent variable before the treatment is implemented.

Lee and colleagues (2011) included the point that collected cigarette butts do not capture the range of smoking behaviors in these areas in their work; however, cigarette butts are a tangible way to access data on smoking behavior in outdoor areas, other than more costly observational methods. Moreover, secondhand smoke exposure of non smokers in a studied outdoor area is not quantified by collecting cigarette butts (Lee et al., 2011). Also mentioned by Lee and colleagues (2011) are limitations similar to this study. They were unable to control for cleanup of cigarette butts in outdoor facilities by ground staff and that this could bias results towards the null hypothesis that signage, policy, or other intervention could accompany a reduction in smoking behavior as indicated by number of cigarette butts collected at a given time. The researchers also
did not finish collecting cigarette butts from campuses in the same period. There may be variability in measuring the 15 foot areas because each building was different (similar to amenities being different in parks). The study also had a small sample size and the results are limited to its geographic location of community colleges. The researchers recommended replication of the study to expand the results to other campus settings.

Other studies concerning litter research use a similar methodology as well, where they pick up and count evidences of human littering behavior (Crump, Nunes, & Crossman, 1977; Clark, Burgess, & Hendee, 1972). Keep America Beautiful (2009) examined litter and littering in America, which used a similar methodology involving litter in roadways, including collecting and counting cigarette butts. The study explored the composition of litter including its volume, locations found, and cost to the community (Keep America Beautiful [KAB], 2009). Furthermore, the study explored the frequency of littering, variables that contribute to littering, and the efficiency of different methods to reduce litter. Roadways were the focal point in this research, which accounts for 3.8 million miles in the United States (KAB, 2009). In order to estimate litter in roadways, the researchers would select random samples of 240 roadway segments. The researchers had multiple samples so they selected 300 by 15 foot areas where the researcher made observations of densely littered areas (4 or more inches of trash in a given area). The researchers performed a “meander count” in each of the areas and following the count, they photographed sample sites and rated them from 1 to 5 with one signifying no litter and five signifying extremely littered (KAB, 2009). The researchers used the percentage of litter to statistically weight and estimate frequency
of litter across all roadways. Tobacco products made up 38% of the trash in extremely littered areas.

In the current study, the collection zones focused on the amenities chosen in the initial observation period. Different amenities were chosen in order to assess differences in smoking patterns within and around different amenities. The collection zone for cigarette butts extended from zero to 25 feet from pavilions, playgrounds and restrooms. The collection area was where smoking is not recommended, which is 0 to 25 feet from each amenity. To estimate square footage of these areas, a 25-foot measurer was used to mark the 25-foot violation zone around each specified amenity or sign. Cones were used to mark the boundary lines around each selected area. Only cigarette butts within 25 feet of signs posted in and around amenities were counted. During each week throughout data collection, the boundary lines between the zones were clearly marked with rope and cones. Data were collected on the same day of every week at approximately the same time of day unless weather prohibited researchers from collecting at the same time.

Procedure

Through collaborating with Steven R. Phillips, the Director of Parks, Recreation and Cultural Affairs Department for the City of Gainesville, a list of parks within Gainesville, Florida was received. This project researched and utilized four different parks from a sampling frame of thirty-nine Gainesville parks. A matrix was created from the sampling frame which listed parks based on amenities such as land acres, special facilities, ball fields, nature trails, exercise/jog trails, paved trails, unpaved trails, basketball (# of goals), picnic areas, playgrounds, racquet ball courts, rest rooms, tennis courts, skate parks, and board walks (See Appendix C).
Parks were chosen for the study due to having the same type of amenities. In order to assess the similarities of the suggested parks, each park was pre-observed to visually confirm if amenities and parks were similar. The initial observation stage also allowed the researcher to discover the amenities in need of posted signage for possible treatment.

This project used a quasi-experimental design for the four parks. The four parks did not receive any treatment for the first six weeks, in which a baseline in the rate of cigarette butts collected in each park stabilized. Then the four parks had Smoke-Free Zone signage posted near selected amenities, where placement was established in the pre-observation stage. Cigarette butts were collected in the parks before signage was placed in order to compare cigarette butts before and after the parks had posted signage. After approximately six weeks of data collection, signs were posted into the parks. Data collection with the signs took place for an additional six weeks when a stable trend emerged, as it did in six weeks of data collection prior to signage being placed.

Cigarette butts were collected within a twenty-five foot parameter surrounding all selected amenities within all four parks. Each cigarette butt found in all four parks within the twenty-five foot perimeter around the amenities was counted as evidence of smoking in the park.

The primary researcher with consultation with the secondary researcher and Co-Chair determined sign placement within selected amenities. The signs were located at point-of-decision areas, such as around bathroom doors, entrances to amenities, and
inside picnic pavilions. Each park received different amounts of signage depending on amenity size and number of entrances into the amenity.

Data were collected by the primary researcher, secondary researcher and trained volunteers. Volunteers were trained prior to the start of data collection. The researcher took volunteers to a park that was not included in the study and demonstrated how to properly measure amenity areas and collect cigarette butts. Volunteers used plastic gloves and large sandwich bags to collect cigarette butts. After the demonstration, volunteers were able to practice measuring amenity areas and collecting cigarettes properly. Volunteers were also able to ask questions during this time regarding the research. When the researcher or a trained volunteer was questioned about what they were doing, they briefly explained that they were collecting data.

The dependent variable is the amount of cigarette butts found (lower amount, same amount, or higher amount). The independent variable in this thesis is the posted signage.

**Data Collection**

The data collection procedure involved the collection of cigarette butts in the selected amenity areas in the four parks. The amenities were selected due to high volume use reviewed during an initial observation of the parks. There was a twenty-five foot parameter used around each amenity for consistency in collection purposes. In the week prior to the first baseline assessment, each park was cleared of all cigarettes within the twenty-five foot parameter of the selected amenities. This gave a clean, fresh start in order to establish a data trend in each of the four parks. Data collection started in week one. For the subsequent six weeks, the researcher collected, counted (twice), recorded and properly disposed of cigarettes within the twenty-five foot parameter of the
targeted amenities in each of the four parks. Cigarette butts count as evidence of smoking behavior of a park patron.

**Sign Development**

The primary researcher in partnership with co-chair committee member Dr. Steven Pokorny from Alachua County Health Department and Tobacco Free Alachua, and Steven R. Philips, the Director of Parks, Recreation and Cultural affairs for the City of Gainesville developed the no-smoking signs for this study. All prior no-smoking signage was researched for wording examples (Examples of signage can be found in Appendix B.) Dawley and colleagues (1981) found that positively-worded no-smoking signs reduced smoking more than negatively-worded no-smoking signs. After numerous trials, all partners decided upon the phrase “For the Health and Safety of our Kids Please Help us Keep This Park Smoke-Free as Requested by the Gainesville City Commission. Thank you.” Table A-3 shows the amount of signs per amenity in each park.

**Data Analysis**

Nonparametric methods were used to assess mean differences in terms of rank order (Wilcoxon’s signed rank test). The nonparametric Wilcoxon’s test was important because it does not depend upon normally distributed data. Comparisons were made between the means over the six weeks cigarette butts were collected when no signage was present in parks, as compared to mean numbers of cigarette butts collected in the following six weeks in which signage was posted. The cigarette butts in amenities of each park before and after signage were the point of comparison.

The researcher tested whether signage had any effect in reducing the amount of cigarette butts by comparing means in cigarette butts collected during the baseline period versus means during intervention period. The researcher also tested which
amenity had possibly the greatest change in means of cigarette butts collected between baseline data collection and intervention data collection.
CHAPTER 4
RESULTS

Over the twelve-weeks of data collection, 2,692 cigarette butts were collected in four public parks (n=4). Of the 2,692 cigarette butts, 1,648 were collected during the baseline period and 1008 were collected during the intervention period. The researcher collected 64.78% of cigarette butts in the picnic pavilion amenities (n=4); 28.49% of cigarette butts were collected from playgrounds (n=4); and 6.72% of cigarette butts were collected from restrooms (n=2). One observation day was skipped for Greentree park during week 4, but the researchers split the data from week 5 in half to fill in week 4 because it was double the normal amount. Due to missing data because of weather, days without data were filled in with the average of all prior data points. This method, mean substitution, is common in research where imputation-replacing the missing values with an estimate, such as the mean of the observed values for the variable (Grace-Martin, 2001). Greentree and Roper parks during Week 6 did not have any data, so the researcher took the mean of weeks 1-5 to fill in the average for the missing data. This also happened in Week 7 for Northeast and Possum parks and week 12 for Greentree and Roper parks. Tables A1 and A2 show the collected data.

Table 4-1: Parks and amenities

<table>
<thead>
<tr>
<th>Park</th>
<th>Amenity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast</td>
<td>Playground</td>
</tr>
<tr>
<td></td>
<td>Picnic Pavilion</td>
</tr>
<tr>
<td></td>
<td>Restroom</td>
</tr>
<tr>
<td>Possum</td>
<td>Playground</td>
</tr>
<tr>
<td></td>
<td>Picnic Pavilion</td>
</tr>
<tr>
<td>Greentree</td>
<td>Playground</td>
</tr>
<tr>
<td></td>
<td>Picnic Pavilion</td>
</tr>
<tr>
<td></td>
<td>Restroom</td>
</tr>
<tr>
<td>Roper</td>
<td>Playground</td>
</tr>
<tr>
<td></td>
<td>Picnic Pavilion</td>
</tr>
</tbody>
</table>
Northeast park and Greentree park were the only two parks with a restroom amenities. Every park had at least a playground amenity and a picnic pavilion amenity.

Table 4-2: Cigarette butts collected by amenity

<table>
<thead>
<tr>
<th>Amenity</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Playground</td>
<td>767.00</td>
<td>28.49</td>
</tr>
<tr>
<td>Picnic Pavilion</td>
<td>1744.00</td>
<td>64.78</td>
</tr>
<tr>
<td>Restroom</td>
<td>181.00</td>
<td>6.72</td>
</tr>
</tbody>
</table>

Overall, 2,692 cigarette butts were collected in 10 amenities within 4 different parks. The majority of cigarette butts were found in picnic pavilions, followed by playgrounds and lastly restrooms.

Table 4-3: Cigarette butts collected by amenity during baseline

<table>
<thead>
<tr>
<th>Amenity</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Playground</td>
<td>481.40</td>
<td>29.21</td>
</tr>
<tr>
<td>Picnic Pavilion</td>
<td>1108.00</td>
<td>67.23</td>
</tr>
<tr>
<td>Restroom</td>
<td>94.60</td>
<td>5.74</td>
</tr>
</tbody>
</table>

This table (4-3) describes the number of cigarette butts collected during the baseline data collection. The percentages here are the amenity frequency out of 1,648.

Table 4-4: Cigarette butts collected by amenity after signage placement

<table>
<thead>
<tr>
<th>Amenity</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Playground</td>
<td>285.60</td>
<td>28.33</td>
</tr>
<tr>
<td>Picnic Pavilion</td>
<td>636.00</td>
<td>63.09</td>
</tr>
<tr>
<td>Restroom</td>
<td>86.40</td>
<td>8.57</td>
</tr>
</tbody>
</table>

This table (4-4) describes the number of cigarette butts collected in the intervention period when signage was placed. The percentages here reflect the amenity frequency out of 1,008.

The researcher wanted to test whether the number of cigarette butts collected would change once signage was placed in park amenities. As covered in the researcher’s hypotheses, an expectation was that the amount of cigarette butts collected would decline after signage was placed in amenities. Due to the number of
parks and amenities being low, the data were not normally distributed. Therefore, the researcher conducted several nonparametric Wilcoxon signed-rank tests to compare mean numbers of cigarette butts collected in each park amenity before and after signage was placed (averaged over 6 times per week before and 6 times per week after. Nonparametric tests are used when the sample is not normally distributed (Lowry, 2011). The Wilcoxon signed-rank test is similar to the paired sample t-test, but for data that are not normally distributed (Wilcoxon, 1945). The following tables show Wilcoxon test results for overall amenities in parks and for each amenity individually.

Table 4-5: Ranks comparing baseline data collection with signage data collection over all 10 amenities in parks (4).

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean Rank</th>
<th>Sum of Ranks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Pre Negative Ranks</td>
<td>7a</td>
<td>7.00</td>
<td>49.00</td>
</tr>
<tr>
<td>Positive Ranks</td>
<td>3b</td>
<td>2.00</td>
<td>6.00</td>
</tr>
<tr>
<td>Ties</td>
<td>0c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td></td>
<td>10</td>
</tr>
</tbody>
</table>

Table 4-5 provides results on the comparison of cigarette butts in parks and their amenities before (pre) and after (post) introduction of signage. Seven amenities had a lower amount of cigarette butts after signage was placed. However, three amenities had a higher amount of cigarette butts after signs were placed. None of the amenities experienced zero change in the cigarette butt amounts.

Table 4-6: Test statistic of overall amenities *p<0.05

<table>
<thead>
<tr>
<th></th>
<th>Post-Pre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z</td>
<td>-2.191b</td>
</tr>
<tr>
<td>Asymp Sig (2-tailed)</td>
<td>.028</td>
</tr>
</tbody>
</table>

The Wilcoxon signed-rank test indicated that the introduction of signage was associated with a statistically significant change in cigarette butts collected at baseline and signage conditions in amenities within parks. The p value was statistically significant at .028.
The following two box plots show the average number of cigarette butts found during the baseline data collection period and the during the collection period after signage was placed.

Figure 4-1: Box plots of average cigarette butts found during the baseline data collection period at different parks. Note that the center bold line represents the median rate, the box represents the 25th through the 75th percentiles and the whiskers show the range of rates.

Figure 4-2: Box plots of average cigarette butts found during data collection period after signage was placed at different parks and amenities. Note that the center bold line represents the median rate, the box represents the 25th through the 75th percentiles and the whiskers show the range of rates.
The researcher also wanted to test whether type of amenity was related to differences in reduction of number of cigarette butts from baseline to signage placement conditions. A Wilcoxon signed-rank test was used to analyze each park amenity.

Table 4-7: Ranks of picnic pavilion amenity

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean Rank</th>
<th>Sum of Ranks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Pre</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative Ranks</td>
<td>3a</td>
<td>3.00</td>
<td>9.00</td>
</tr>
<tr>
<td>Positive Ranks</td>
<td>1b</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Ties</td>
<td>0c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4-7 provides data on the comparison of cigarette butts in the picnic pavilion amenities before (pre) and after (post) introduction of signage. Three of the four picnic pavilion amenities had a lower amount of cigarette butts after the treatment. One picnic pavilion amenity had a higher amount of cigarette butts after signs were placed. None of the picnic pavilion amenities showed zero change in the average cigarette butt amounts collected across baseline and signage conditions.

Table 4-8: Test statistic of picnic pavilion amenity

<table>
<thead>
<tr>
<th></th>
<th>Post-Pre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z</td>
<td>-1.461b</td>
</tr>
<tr>
<td>Asymp Sig (2-tailed)</td>
<td>.144</td>
</tr>
</tbody>
</table>

The Wilcoxon signed-rank test indicated that the introduction of signage in picnic pavilion amenities was not associated with a statistically significant decrease in cigarette butts collected between baseline and signage collection.

Table 4-9: Ranks of playground amenity

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean Rank</th>
<th>Sum of Ranks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Pre</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative Ranks</td>
<td>3a</td>
<td>3.00</td>
<td>9.00</td>
</tr>
<tr>
<td>Positive Ranks</td>
<td>1b</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Ties</td>
<td>0c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4-9 provides data on the comparison of cigarette butts in the playground amenities before (pre) and after (post) introduction of signage. Three of the four playground amenities had a lower amount of cigarette butts collected after signage was introduced. One of the playground amenities had a higher average amount of cigarette butts after signage was introduced. None of the playground amenities experienced zero change in the average number of cigarette butt collected at baseline and signage conditions.

Table 4-10: Test statistic of playground amenity

<table>
<thead>
<tr>
<th></th>
<th>Post-Pre</th>
<th>Z</th>
<th>Asymp Sig (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative Ranks</td>
<td></td>
<td>-1.461b</td>
<td>.144</td>
</tr>
</tbody>
</table>

The Wilcoxon signed-rank test indicated that the introduction of signage in playground amenities was not associated with a statistically significant decrease in cigarette butts.

Table 4-11: Ranks of restroom amenity

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean Rank</th>
<th>Sum of Ranks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Pre</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative Ranks</td>
<td>1a</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Positive Ranks</td>
<td>1b</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Ties</td>
<td>0c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4-11 provides data on the comparison of the restroom amenities before (pre) and after (post) introduction of signage. One of the restroom amenities had a lower amount of cigarette butts after signage was introduced. However, one of the restroom amenities had a higher average amount of cigarette butts collected after signs were introduced. None of the restroom amenities experienced zero change in the cigarette butt amounts collected across baseline and signage conditions.

Table 4-12: Test statistic of restroom amenity

<table>
<thead>
<tr>
<th></th>
<th>Post-Pre</th>
<th>Z</th>
<th>Asymp Sig (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative Ranks</td>
<td></td>
<td>-.447b</td>
<td>.655</td>
</tr>
</tbody>
</table>
The Wilcoxon signed-rank test showed that the introduction of signage in restroom amenities was not associated with a statistically significant decrease in cigarette butts collected at baseline and signage conditions.

Figure 4-3: Box plots of average cigarette butts during the control data collection period at different amenities. Note that the center bold line represents the median rate, the box represents the 25th through the 75th percentiles and the whiskers show the range of rates.

Figure 4-4: Box plots of average cigarette butts during the intervention data collection period at different amenities. Note that the center bold line represents the median rate, the box represents the 25th through the 75th percentiles and the whiskers show the range of rates.
The researcher also ran a Wilcoxon signed-rank test for each individual park (with either 2 or 3 amenities) to test for a statistical difference between baseline and signage cigarette butt collection times.

Table 4-13: Ranks of Northeast park

<table>
<thead>
<tr>
<th>N</th>
<th>Mean Rank</th>
<th>Sum of Ranks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative Ranks</td>
<td>3a</td>
<td>2.00</td>
</tr>
<tr>
<td>Positive Ranks</td>
<td>0b</td>
<td>0.00</td>
</tr>
<tr>
<td>Ties</td>
<td>0c</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

The ranks table provides data on the comparison of the amenities within Northeast park before (pre) and after (post) introduction of signage. All of the amenities in Northeast park had a lower amount of cigarette butts after signage was introduced. None of the amenities experienced zero or positive change in the cigarette butt amounts collected between baseline and signage conditions.

Table 4-14: Test statistic of Northeast park

<table>
<thead>
<tr>
<th>Post-Pre</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-1.604b</td>
</tr>
</tbody>
</table>

Asymp Sig (2-tailed) .109

The Wilcoxon signed-rank test indicated that the introduction of signage in Northeast park was not associated with a statistically significant change in amount of cigarette butts collected at baseline and signage conditions.

Table 4-15: Ranks of Possum park

<table>
<thead>
<tr>
<th>N</th>
<th>Mean Rank</th>
<th>Sum of Ranks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative Ranks</td>
<td>2a</td>
<td>1.50</td>
</tr>
<tr>
<td>Positive Ranks</td>
<td>0b</td>
<td>0.00</td>
</tr>
<tr>
<td>Ties</td>
<td>0c</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

Table 4-15 provides data on the comparison of the amenities within Possum park before (pre) and after (post) introduction of signage. Both of the amenities within
Possum park had a lower amount of cigarette butts collected after the signage was introduced. None of the amenities experienced zero or positive change in the average number of cigarette butts collected between baseline and signage conditions.

Table 4-16: Test statistic of Possum park

<table>
<thead>
<tr>
<th></th>
<th>Post-Pre</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Z</td>
<td>-1.342b</td>
<td></td>
</tr>
<tr>
<td>Asymp Sig (2-tailed)</td>
<td>.180</td>
<td></td>
</tr>
</tbody>
</table>

The Wilcoxon signed-rank test indicated that the introduction of signage in Possum park was not associated with a statistically significant change in average number of cigarette butts collected between baseline and signage conditions.

Table 4-17: Ranks of Greentree park

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean Rank</th>
<th>Sum of Ranks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Pre Negative Ranks</td>
<td>1a</td>
<td>3.00</td>
<td>3.00</td>
</tr>
<tr>
<td>Positive Ranks</td>
<td>2b</td>
<td>1.50</td>
<td>3.00</td>
</tr>
<tr>
<td>Ties</td>
<td>0c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4-17 provides data on the comparison of the amenities in Greentree park before (pre) and after (post) introduction of signage. One of the amenities had a lower amount of cigarette butts after the treatment. However, two of the amenities in Greentree park had a higher amount of cigarette butts after the treatment of signs. None of the restroom amenities experienced zero change in the number of cigarette butts collected between baseline and signage conditions.

Table 4-18: Test statistic of Greentree park

<table>
<thead>
<tr>
<th></th>
<th>Post-Pre</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Z</td>
<td>.000b</td>
<td></td>
</tr>
<tr>
<td>Asymp Sig (2-tailed)</td>
<td>1.000</td>
<td></td>
</tr>
</tbody>
</table>
The Wilcoxon signed-rank test indicated that the introduction of signage in Greentree park was not associated with a statistically significant change in average number of cigarette butts collected between baseline and signage conditions.

Table 4-19: Ranks of Roper park

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean Rank</th>
<th>Sum of Ranks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Pre Negative Ranks</td>
<td>1a</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Post-Pre Positive Ranks</td>
<td>1b</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Ties</td>
<td>0c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

The ranks table provides data on the comparison of the amenities in Roper park before (pre) and after (post) introduction of signage. One of the amenities had a lower amount of cigarette butts after the treatment. However, one of the amenities had a higher amount of cigarette butts after the treatment of signs. Neither of the amenities had zero change in the average number of cigarette butts collected between baseline and signage condition.

Table 4-20: Test statistic of Roper park

<table>
<thead>
<tr>
<th></th>
<th>Post-Pre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z</td>
<td>-0.447b</td>
</tr>
<tr>
<td>Asymp Sig (2-tailed)</td>
<td>.655</td>
</tr>
</tbody>
</table>

The Wilcoxon signed-rank test indicated that the introduction of signage in Roper park was not associated with a statistically significant change in average number of cigarette butts collected between baseline and signage conditions.
CHAPTER 5
DISCUSSION

The results section tested the main hypotheses from this research. The results indicate evidence to support the first hypothesis. In the following sections, I will discuss the main results and their possible meanings. I will also discuss other findings in this research that were discovered. This section will also address implications of this research, limitations and suggestions for future research.

Main Findings

The first alternative hypothesis noted in this research was that the presence of signs would have an effect on smoking in parks compared to the control. The researcher can reject the null hypothesis, as there was a difference in cigarette butts between the control and intervention periods for all parks and amenities. Due to the data not being normally distributed, a Wilcoxon signed-rank test was computed, which indicated that the introduction of signage was associated with a statistically significant change in cigarette butts found in amenities within parks. The p-value was statistically significant at .028.

Overall, the introduction of smoke-free zone signage was associated with a decreased number of cigarette butts found in the four parks. The mean of cigarette butts found in all parks was 28.07 in the control (no signage) period and decreased to 16.80 during the intervention (signage) period. Other than possible third variables (to be discussed in limitation section), one interpretation may be that individuals occupying these amenities may have had a higher perceived seriousness of the consequences to smoking, which led them to move their smoking behavior away from non-smoking sign areas. The minimal decrease in cigarette butts found by restrooms may be due to
changing social norms about smoking and the fewer number of park patrons in restroom areas. As the least occupied space of the three amenities, restrooms areas may pose lesser chance for non-smoking patrons to point out signage and ask smokers to stop. In other words, there may have been a lower perceived seriousness for smokers in restrooms to experience social norm pressure, as compared to playgrounds and picnic pavilions frequented by more patrons.

Although the intervention (signage) was associated with a significant decrease of cigarette butts found within park amenities, the amount of variability across amenities was unexpected. This may be explained by the differences in the physical layouts of the parks and their amenity areas. It may also be explained due to the amount of usage of specific amenities. For example, in Northeast Park, in data collection in both baseline and when signage was introduced, there were three times as many cigarette butts in the playground than the restroom, and three times as many cigarette butts in the picnic pavilion than the playground. This gave the park a large variability from the mean. In terms of amenities, the amount of cigarette butts found in playgrounds ranged from three to 36, picnic pavilions ranged from nine to 111, and in restrooms from one to 17. This resulted in large standard deviations.

Surprisingly there was no confirmation of the second alternative hypothesis, dependent upon rejection of the first null hypothesis, which was supported by a statistically significant reduction in cigarette butts found from baseline to when signs were placed in park amenities. The researcher was unable to reject the null in the second hypothesis that playground amenities would experience a greater change or reduction in number of cigarette butts found than for other park amenities. The
playground amenity p-value was not statistically significant. The Wilcoxon signed-rank test showed that both playgrounds and picnic pavilions experienced three out of four amenities as decreasing in cigarette butts, however they were not statistically significant.

In this study, point-of-decision prompts were signs encouraging smoke-free zones in parks and were drawn out to be placed where the researcher believed were high intervention zones (Solar et al., 2010). The researcher believes that sign placement may influence the decrease in cigarette butts in amenities. The researcher hypothesizes that if signage within and around the playground amenity was placed in point-of-decision areas that the researcher originally decided, then the playground amenity would have experienced a much greater decline in cigarette butts than the other two amenities.

Despite the researcher mapping out point-of-decision placement for each sign in every amenity, some of the signs were not placed in the correct spots. In addition, signs were not placed within the playground as they were in the picnic pavilions, but within the 25 feet perimeter surrounding the amenity. Several volunteers in the study stated that signage was much less obvious in the playground amenities compared to the picnic pavilion amenities.

**Other Findings**

The researcher investigated each neighborhood the four parks were in regarding median income to see if there was a link between median income and the decrease in cigarette butts collected after signs were posted in park amenities. Information about each individual park neighborhood, its median income, and mean differences in cigarette butts after smoke-free zone signs were posted is provided here.
Greentree park is situated in a predominately African-American neighborhood, Highland Court Manor, which has the lowest median income of all four parks at $24,948 (City-data, 2009). The population is the highest of the four park neighborhoods at 2,333 people (City-data, 2009). Greentree park had the lowest mean difference between before and after the placement of signage and had the highest p-value of 1.00 which was not statistically significant.

Roper park is situated in the second lowest median income neighborhood, known as the Duckpond, at $32,520, however it is predominately Caucasian with a population of 1,610 (City-Data, 2009a). This park had the second lowest mean difference between before and after the placement of signage. It had the second lowest p-value of 0.655, which was not statistically significant.

Northeast park is the second highest median income neighborhood at $39,506 (City-Data, 2009b). The neighborhood, Northeast District, is predominately Caucasian with a population of 1,236. This park had a p-value at 0.109 and was not statistically significant.

Possum park is in the neighborhood Appletree and has the highest median income out of all four parks at $44,184 with a small population of 98 (City-Data, 2009c). This park had a p-value at 0.180 and was not statistically significant.

**Implications**

The implications of median income of a neighborhood and mean differences of each park’s results are important to note because the two lowest income neighborhood parks showed minimal change in collected cigarette butts after smoke-free zone signage was introduced and the two higher income neighborhood parks experienced the greatest decrease in collected cigarette butts, once smoke-free signage was
introduced. However, none of the parks showed a statistically significant change in amount of cigarette butts collected between baseline and signage conditions. There are several factors in which low socio-economic factors influence smoking behaviors of park patrons. Manfredi, Cho, Crittenden, and Dolecek (2007) discuss three factors that limit smoking cessation, “(i) limited relevance of concerns about the health risks of smoking, (ii) weak social norms favoring quitting and (iii) high daily stress” (p. 748).

Health concerns relate to the researchers use of the health belief model’s construct, perceived susceptibility. People who are Low-SES are often less educated on the health risks of smoking and secondhand smoke than high-SES people (Manfredi, Lacey, Warnecke, & Buis, 1992). Park patrons in low-socioeconomic neighborhoods within this study may not believe that other park patrons are in danger of their secondhand smoke, therefore ignoring smoke-free zone signs.

Social norms also play a large part in people’s smoking behaviors. Research shows that if smoking is a habitual and valued lifestyle in low-SES individuals, then social norms regarding non-smoking may be weaker than smoker’s group-specific norms and lifestyles that reinforce their smoking behavior (Cockerham, 2000). However, motivation to change ones smoking behavior is often due to a person’s internal need to comply with societal norms (Montano & Kasprzyk, 2002; Manfredi et al., 1992). In regards to the other findings in this research, the perceived severity of smoking in a park with smoke-free zone signs reflects park patrons personal thoughts on the consequences associated with their smoking behavior. Some park patrons may have a high severity due to socially related consequences such as a nonsmoker approaching a smoker within a park amenity and referring to the posted smoke-free zone signs.
Individuals who are low-SES often experience more daily stressors than socio-economically advantaged groups (Gottlieb & Green, 1993; Lacey et al., 1993; Romano, Bloom, & Syme, 1991; Turner & Avison, 2003). Low SES groups experience stressors more frequently, but have fewer resources to control their stress (Gottlieb & Green, 1993; Lacey et al., 1993; Romano, Bloom, & Syme, 1991; Turner & Avison, 2003). Therefore, they use cigarette smoking to gain emotional control (USDHHS, 2001; Todd, 2004). If park patrons are stressed, they may be more inclined to seek the perceived benefits of smoking versus dealing with any barriers of smoking.

Socioeconomic status is a combination of education, income and occupation (American Psychological Association, 2012) therefore low-income neighborhoods are a part of low socioeconomic status. Current research suggests that people in low-SES communities develop academic skills slower than high-SES communities (Morgan, Farkas, Hillemeier, & Maczuga, 2009) and that reading competence is correlated with a low-literacy environment (Aikens & Barbarin, 2008). Therefore, park patrons in low-median income neighborhoods have a higher chance of being less educated and having a lower reading literacy than higher-income neighborhoods. This is important to note because park patrons in low-median income neighborhoods may not be able to read the signs, which are considered the cue to not smoke in park amenities. However, there is a universal no-smoking graphic on the signs, which may help those with illiteracy.

Self-efficacy is related to a person’s ability to do something (Becker & Rosenstock, 1984). Daily stress is a major barrier for low-SES groups in achieving self-efficacy (Manfredi et al., 2007). If a park patron has a low self-efficacy in their ability to not
smoke in a specific period or place, then most likely they will be unable to refrain from smoking despite the posted smoke-free zone signs around park amenities.

Posted no-smoking signage exemplifies to the park community that compliance is implicit, even as a mere recommendation. A passive method such as recommended no-smoking signage may make smokers in the recommended no-smoking area feel uncomfortable due to social norms that are promoting compliance. This may heighten their perceived seriousness of the behavior and make them stop or move their smoking behavior. Signage that has no ordinance or law backing them may have no other leverage on behavior other than altruism or the formation of new social norms. Therefore, compliance to smoke-free zone signage would be based on norms, peer pressure and general rule abiding. Signage may make it easier for non-smokers to announce their displeasure with someone smoking and ask them to move, which may be an unintended positive consequence of this study.

Non-law enforced signage may be the best option to empower the rights of nonsmokers when states, such as Florida, have preemptive clause legislation. There are currently 12 states with a preemption clause for smoke-free air (See Figure A-3 in Appendix A) (Tobacco Prevention Network of Fl, 2011). Due to the preemption clause of the Florida Clean Indoor Air Act, local governance cannot create local laws or ordinances for smoke-free air to parks, beaches, recreation areas, music venues, outdoor workplaces, etc (Tobacco Prevention Network of Fl, 2011). Since the results of this study show almost a 50% decline in cigarette butts in all parks within and around amenities such as playgrounds, picnic pavilions, and restrooms, it may be beneficial to input posted signage into parks, or other areas listed above. However, the author
recommends replication of the study in order to increase confidence so that it can be
generalized to other settings. If replication can be reached, then recommendation to
local governance should be made.

**Limitations**

This study has several important limitations. Individuals were not the unit of
measure within the research but number of cigarette butts found within established
amenities. Cigarette butts do not capture all smoking behaviors in public parks;
however, cigarette butts are a proxy for smoking behavior (Lee et al., 2011). Therefore,
this data collection method does not assess all forms of smoking behavior.

The researcher was also unable to control for cleanup of cigarette butts in public
parks by park staff or patrons. Another methodology to use in order to capture smoking
behavior is observational data. Researchers could conduct a direct observation study in
a natural setting where they would observe human behavior and look for signs of
smoking within park amenities. The researchers could do a disguised or non-disguised
observation. If the researchers did a non-disguised, they would be able to follow up
observations with a questionnaire from the park patron. The researcher would have to
do several daily observations at each park, which makes it difficult without multiple
researchers. In addition, an observational method may not allow the researcher to
observe all smoking behavior as it may happen most in the evening or afternoon.

This study cannot generalize statistically because it is using a non-probability
sample, however non-probability samples “are just as valid as probabilistic samples”
(Swisher, 2012, pg 1). It also has a small sample size, which further limits the results to
its geographic location and only in public parks.
Another limitation is missing data. The researcher utilized mean substitution to make up for missing data. Research shows that replacing missing data with an estimate such as the mean of the observed values for the variable is common (Grace-Martin, 2001).

Another limitation is a threat to this study’s internal validity. All four parks were surveyed by collecting, counting and recording of all cigarette butts. The collection of the cigarette butts may not be completely accurate due to not being able to see them by trash, leaves, dirt or other individuals picking or cleaning them up. Although, counting of the cigarette butts occurred twice in order to reduce measurement error. The researchers were to measure 25 feet around each amenity for its collection zone. There may be variability due to different amenity layouts; however, the same researchers outlined the 25 feet around each amenity each time, which helps decrease variability.

Despite these threats, the study had strong internal validity because a case-control design was used, meaning that the same parks were subjected to the control and intervention treatment. Items such as trash bins remained the same throughout the study. Therefore, if cigarettes were being discarded there in the control, they would still have the same chance of being discarded in the intervention. History threats such as parties within the parks can possibly increase the amount of cigarette butts found. However, since the parks remained the same throughout the study, the parks had the same chance to have a party during the control period and the intervention period.

**Future Research**

The researcher recommends that this study be replicated in other park locations. However, the researcher advocates adding an observational component to the current methods in order to account for what effect, or lack of effect is due to the posted
signage. For example, non-smoking park patrons may be approaching smoking park patrons in amenities to point out the smoke-free zone signage, which may account for the decrease of cigarette butts. It is important to use different seasons to increase confidence that the findings can be generalized to other settings.

The researcher also recommends replicating the study and adding a verbal reinforcement component. This may aid in decreasing smoking behaviors in public parks. Due to the additional results that suggested that higher median income neighborhoods experienced a greater reduction in cigarette butts compared to lower income neighborhoods experiencing the least reduction in cigarette butts, the researcher recommends replication of this design comparing high SES neighborhoods with low SES neighborhoods.

Furthermore, the researcher advises future researchers to take part in placement of the signs. Due to someone else placing signage in this study, the signs were not placed in the point-of-decision areas that the researcher wanted. The researcher believes that if signs were properly placed, there may have been a chance for a higher success rate.
### Table A-1: Baseline, no signage

<table>
<thead>
<tr>
<th>Park</th>
<th>Amenity</th>
<th>WK1</th>
<th>WK2</th>
<th>WK3</th>
<th>WK4</th>
<th>WK5</th>
<th>WK6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast</td>
<td>Restroom</td>
<td>12.00</td>
<td>9.00</td>
<td>4.00</td>
<td>17.00</td>
<td>16.00</td>
<td>9.00</td>
</tr>
<tr>
<td>Northeast</td>
<td>Playground</td>
<td>36.00</td>
<td>31.00</td>
<td>27.00</td>
<td>14.00</td>
<td>23.00</td>
<td>21.00</td>
</tr>
<tr>
<td>Northeast</td>
<td>Picnic</td>
<td>111.00</td>
<td>79.00</td>
<td>76.00</td>
<td>138.00</td>
<td>95.00</td>
<td>77.00</td>
</tr>
<tr>
<td>Possum</td>
<td>Playground</td>
<td>27.00</td>
<td>14.00</td>
<td>35.00</td>
<td>20.00</td>
<td>31.00</td>
<td>14.00</td>
</tr>
<tr>
<td>Possum</td>
<td>Picnic</td>
<td>38.00</td>
<td>14.00</td>
<td>22.00</td>
<td>26.00</td>
<td>13.00</td>
<td></td>
</tr>
<tr>
<td>Greentree</td>
<td>Restroom</td>
<td>1.00</td>
<td>10.00</td>
<td>3.00</td>
<td>5.00</td>
<td>4.00</td>
<td>4.60</td>
</tr>
<tr>
<td>Greentree</td>
<td>Playground</td>
<td>25.00</td>
<td>26.00</td>
<td>26.00</td>
<td>25.00</td>
<td>26.00</td>
<td>25.60</td>
</tr>
<tr>
<td>Greentree</td>
<td>Picnic</td>
<td>16.00</td>
<td>21.00</td>
<td>9.00</td>
<td>17.00</td>
<td>16.00</td>
<td></td>
</tr>
<tr>
<td>Roper</td>
<td>Picnic</td>
<td>44.00</td>
<td>50.00</td>
<td>45.00</td>
<td>54.00</td>
<td>62.00</td>
<td>51.00</td>
</tr>
<tr>
<td>Roper</td>
<td>Playground</td>
<td>3.00</td>
<td>3.00</td>
<td>10.00</td>
<td>7.00</td>
<td>6.00</td>
<td>5.80</td>
</tr>
<tr>
<td><strong>Sums</strong></td>
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<td>306.00</td>
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<tr>
<td><strong>Averages</strong></td>
<td></td>
<td>31.30</td>
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<td>25.20</td>
<td>31.90</td>
<td>30.60</td>
<td>23.70</td>
</tr>
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</table>

### Table A-2: Intervention, with signage

<table>
<thead>
<tr>
<th>Park</th>
<th>Amenity</th>
<th>WK7</th>
<th>WK8</th>
<th>WK9</th>
<th>WK10</th>
<th>WK11</th>
<th>WK12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast</td>
<td>Restroom</td>
<td>7.20</td>
<td>9.00</td>
<td>7.00</td>
<td>8.00</td>
<td>7.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Northeast</td>
<td>Playground</td>
<td>10.80</td>
<td>14.00</td>
<td>15.00</td>
<td>17.00</td>
<td>4.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Northeast</td>
<td>Picnic</td>
<td>37.40</td>
<td>40.00</td>
<td>53.00</td>
<td>51.00</td>
<td>28.00</td>
<td>15.00</td>
</tr>
<tr>
<td>Possum</td>
<td>Playground</td>
<td>16.80</td>
<td>35.00</td>
<td>25.00</td>
<td>6.00</td>
<td>8.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Possum</td>
<td>Picnic</td>
<td>15.00</td>
<td>17.00</td>
<td>21.00</td>
<td>9.00</td>
<td>12.00</td>
<td>16.00</td>
</tr>
<tr>
<td>Greentree</td>
<td>Restroom</td>
<td>8.00</td>
<td>6.00</td>
<td>10.00</td>
<td>4.00</td>
<td>8.00</td>
<td>7.20</td>
</tr>
<tr>
<td>Greentree</td>
<td>Playground</td>
<td>18.00</td>
<td>13.00</td>
<td>17.00</td>
<td>8.00</td>
<td>8.00</td>
<td>12.80</td>
</tr>
<tr>
<td>Greentree</td>
<td>Picnic</td>
<td>12.00</td>
<td>9.00</td>
<td>31.00</td>
<td>17.00</td>
<td>13.00</td>
<td>16.40</td>
</tr>
<tr>
<td>Roper</td>
<td>Picnic</td>
<td>47.00</td>
<td>35.00</td>
<td>31.00</td>
<td>27.00</td>
<td>46.00</td>
<td>37.20</td>
</tr>
<tr>
<td>Roper</td>
<td>Playground</td>
<td>9.00</td>
<td>4.00</td>
<td>10.00</td>
<td>10.00</td>
<td>3.00</td>
<td>7.20</td>
</tr>
<tr>
<td><strong>Sums</strong></td>
<td></td>
<td>181.20</td>
<td>182.00</td>
<td>220.00</td>
<td>157.00</td>
<td>137.00</td>
<td>130.80</td>
</tr>
<tr>
<td><strong>Averages</strong></td>
<td></td>
<td>18.12</td>
<td>18.20</td>
<td>22.00</td>
<td>15.70</td>
<td>13.70</td>
<td>13.08</td>
</tr>
</tbody>
</table>

### Table A-3: Amount of signs per amenity in each park

<table>
<thead>
<tr>
<th>Park</th>
<th>Amenity</th>
<th>Amount of Signs</th>
</tr>
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<tbody>
<tr>
<td>Northeast</td>
<td>Restroom</td>
<td>3</td>
</tr>
<tr>
<td>Northeast</td>
<td>Playground</td>
<td>5</td>
</tr>
<tr>
<td>Northeast</td>
<td>Picnic</td>
<td>5</td>
</tr>
<tr>
<td>Possum</td>
<td>Playground</td>
<td>7</td>
</tr>
<tr>
<td>Possum</td>
<td>Picnic</td>
<td>6</td>
</tr>
<tr>
<td>Greentree</td>
<td>Restroom</td>
<td>2</td>
</tr>
<tr>
<td>Greentree</td>
<td>Playground</td>
<td>6</td>
</tr>
<tr>
<td>Greentree</td>
<td>Picnic</td>
<td>5</td>
</tr>
<tr>
<td>Roper</td>
<td>Picnic</td>
<td>5</td>
</tr>
<tr>
<td>Roper</td>
<td>Playground</td>
<td>4</td>
</tr>
</tbody>
</table>
Sidestream Smoke: smoke coming directly from the burning tobacco.
Mainstream smoke: smoke that the smoker exhales.

Figure A-1: Average annual number of deaths, 2000-2004

Figure A-2: Secondhand smoke graphic
Figure A-3: Preemption of local smoke-free indoor air ordinances
APPENDIX B
NO SMOKING SIGNAGE

Figure B-1: Example of signage

Figure B-2: Example of signage

Figure B-3: Signage used in project
## APPENDIX C
### PARK SAMPLE SELECTION LIST:

<table>
<thead>
<tr>
<th>PARK AREAS</th>
<th>LOCATION</th>
<th>PICNIC AREA</th>
<th>PLAYGROUND</th>
<th>REST-ROOMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.N.N.E. PARK</td>
<td>TER</td>
<td>X+</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>CEDAR GROVE PARK</td>
<td>1200 NE 22 ST</td>
<td>1400 NE 8</td>
<td></td>
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</tr>
<tr>
<td>CITIZENS FIELD GREEN ACRES PARK</td>
<td>AVE</td>
<td>3704 SW 8</td>
<td>X</td>
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</tr>
<tr>
<td>GREENTREE/KIWANSS CHALLENGE</td>
<td>AVE</td>
<td>2101 NW 39</td>
<td>X**+</td>
<td>X</td>
</tr>
<tr>
<td>KIWANIS/GIRL SCOUT PARK</td>
<td>NW 8 ST &amp; 8 PL</td>
<td>900 SE 15 ST</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>LINCOLN PARK</td>
<td>500 BLK S MAIN ST</td>
<td>1007 NW 5 AV</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>NW 5 AVE PARK</td>
<td>AVE 501 NE 16</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>NORTHEAST PARK</td>
<td>AVE 1700 NE 31</td>
<td>X**+</td>
<td>X</td>
<td>X-L</td>
</tr>
<tr>
<td>NORTHEAST 31ST AVE. PARK</td>
<td>AVE 1400 NE 8</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>NORTHEAST COMPLEX</td>
<td>AVE 5701 NW 34</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>NORTHSIDE PARK</td>
<td>ST NW 42 AVE AND NW 9</td>
<td>X**+</td>
<td>X</td>
<td>X-L</td>
</tr>
<tr>
<td>OAK HILL PARK</td>
<td>ST 2611 SW 31</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>PHOENIX PARK</td>
<td>PL 4009 NW 53 AVE</td>
<td>X**+</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>POSSUM CREEK PARK</td>
<td>ALBERT &quot;RAY&quot; MAKKY WESTSIDE PARK</td>
<td>1001 NW 34 ST</td>
<td>X**+</td>
<td>X</td>
</tr>
<tr>
<td>ROPER PARK</td>
<td>2 ST 401 BLK NE</td>
<td>X**</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SHARMIE FFAR PARK</td>
<td>321 NW 10 ST</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

81
<table>
<thead>
<tr>
<th>PARK AREAS</th>
<th>LOCATION</th>
<th>PICNIC AREA</th>
<th>PLAYGROUND</th>
<th>REST-ROOMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMOKEY BEAR PARK</td>
<td>2300 NE 15 ST</td>
<td>X**</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SPRINGHILL PARK</td>
<td>AVE 918 SE 5</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPRINGTREE PARK</td>
<td>AVE 2800 NW 39</td>
<td>X**</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SWEETWATER PARK</td>
<td>UNIVERSITY AVE</td>
<td>X**</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>T.B. MCPHERSON PARK</td>
<td>1717 SE 15 ST</td>
<td>X**+</td>
<td>X</td>
<td>X-L</td>
</tr>
<tr>
<td>TUMBLIN’ CREEK PARK</td>
<td>600 SW 6 ST 1900 SE 4</td>
<td>X**+</td>
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</tr>
<tr>
<td>WOODLAWN PARK</td>
<td>ST NE 4 AV AND 15 ST SE 9 ST AND 8 AV 508 NW 2 ST 424 NW 6</td>
<td>X**+</td>
<td>X-B</td>
<td>X-L</td>
</tr>
<tr>
<td>TOT LOT #1</td>
<td>15 ST</td>
<td>X**+</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>TOT LOT #2</td>
<td>8 AV</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>TOT LOT #3</td>
<td>508 NW 2 ST 424 NW 6</td>
<td>X**+</td>
<td>X</td>
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<tr>
<td>TOT LOT #4</td>
<td>AVE</td>
<td>X</td>
<td>X</td>
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<tr>
<td>TOT LOT #5 (BARBARA HIGGINS PK)</td>
<td>1352 SE 2 ST</td>
<td>X**+</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>HIDDEN GEM TOT LOT</td>
<td>NW 32 PL AND 20 LN</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>MOTHER LUCILLE PERKINS TOT LOT</td>
<td>318 SW 7 PL 820 NW 4 AVE NW 24 ST</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>DOLLIEREE BOWENS TOT LOT</td>
<td>NW 24 ST 300 BLK 300 BLOCK</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>DUCK POND</td>
<td>NW 26 ST</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>HIBISCUS PARK</td>
<td>NE BLVD</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>DUCK POND</td>
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<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>PARK WITH FOUNTAIN</td>
<td>10 SW 36 ST</td>
<td>X</td>
<td>X</td>
<td></td>
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<tr>
<td>GRAND MOTHER LOT (PARK CLOSED)</td>
<td>405 SW 5 AVE</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
June 29, 2011

TO: Heather N. Platter; Dr. Steven Pokorny
  3100 SW 35th Place Apt. 8A
  Gainesville, FL 32608

FROM: Ira S. Fischler, PhD; Chair
       University of Florida
       Institutional Review Board 02

SUBJECT: Exemption of Protocol #2011-U-0671
  Effects of Smoke-Free Zone Signage in Public Parks

SPONSOR: None

The Board has determined that your protocol is exempt from review. This exemption is issued because this protocol does not involve the use of human participants in research in accordance with 45 CFR 46. Human participants are defined by the Federal Regulations as living individual(s) about whom an investigator conducting research obtains (1) data through intervention or interaction with the individual; or (2) identifiable private information.

Should the nature of your study change or if you need to revise this protocol in any manner, please contact this office before implementing the changes.

IF:dl
DATE:        July 8, 2011

TO:        Steven B. Pokorny, PhD; Heather Platter; Chase Ryant
          224 SE 24th Street, Room 4149
          Gainesville, FL 32641

FROM:      Ira S. Fischler, PhD, Chair
          University of Florida
          Institutional Review Board 02

SUBJECT:  Approval of Protocol #2011-U-0672

TITLE:   Effects of Smoke-Free Signage in Public Parks and Park Attendees Attitudes and Beliefs Regarding Public Smoking Policies

SPONSOR: None

I am pleased to advise you that the University of Florida Institutional Review Board has recommended approval of this protocol. Based on its review, the UFIRB determined that this research presents no more than minimal risk to participants, and based on 45 CFR 46.117(c), An IRB may waive the requirement for the investigator to obtain a signed consent form for some or all subjects if it finds either: (1) That the only record linking the subject and the research would be the consent document and the principal risk would be potential harm resulting from a breach of confidentiality. Each subject will be asked whether the subject wants documentation linking the subject with the research, and the subject's wishes will govern; or (2) That the research presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context.

The IRB authorizes you to administer the informed consent process as specified in the protocol. If you wish to make any changes to this protocol, including the need to increase the number of participants authorized, you must disclose your plans before you implement them so that the Board can assess their impact on your protocol. In addition, you must report to the Board any unexpected complications that affect your participants.

This approval is valid through June 28, 2012. If you have not completed the study by this date, please telephone our office (392-0433), and we will discuss the renewal process with you. It is important that you keep your Department Chair informed about the status of this research protocol.

ISF:dl

Figure D-2: IRB approval 2
APPENDIX E
PHOTOS

Figure E-1: Playground sign

Figure E-2: Playground sign
Figure E-3: Playground sign

Figure E-4: Picnic pavilion signs
Figure E-5: Picnic pavilion sign

Figure E-6: Playground sign
Figure E-7: Cigarette butts

Figure E-8: Cigarette butts
LIST OF REFERENCES


Dejmek, J., Solansky, I., Podrazilova, K., & Sram, R. (2002). The exposure of nonsmoking and smoking mothers to environmental tobacco smoke during different gestational phases and fetal growth. Environmental Health Perspectives 110(6), 601-606.


BIOGRAPHICAL SKETCH

Heather Nicole Platter was born in April of 1988 in Fort Lauderdale, Florida. She lived in the same house with her parents until she moved to join the Gator Nation at the University of Florida as an undergraduate. Heather was accepted into the Master of Science in family, youth, and community sciences 4+1 program her senior year of her undergraduate program. Heather completed her Bachelor of Science in family, youth, and community sciences in 2010 earning Cum Laude. In fall of 2010, Heather continued with her Master of Science degree along with being accepted into the Master of Public Health certificate program in social and behavioral sciences. Heather’s mother passed away suddenly after being diagnosed with lung cancer in May after her first year in graduate school. This loss developed Heather’s passion and goals for her future career in research and teaching. Heather plans to earn a Ph. D. in public health in social and behavioral sciences with a focus on global tobacco control research and policy. She would eventually like to become a professor at a University.